FERMI NEWS

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Photo by Reidar Hahn

Lederman at 80 **8**

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So This Physicist Walks into a BAR...

Photos by Jenny Mullins

Fermilab Director Michael Witherell described steps in progress to increase luminosity at the Tevatron.

by Judy Jackson

The Department of Energy's Peter Rosen counseled users to work on communicating physics to "Joe and Janine Sixpack."

Picture your local watering hole. That's where the Department of Energy's Peter Rosen recommends field-testing the message of particle physics. Sidle up to "Joe and Janine Sixpack," Rosen suggests, and lay some neutrinos on them. If the skimpy little particles don't do it for the Sixpacks, see how they respond to superconducting magnet technology or the World Wide Web—whatever it takes to get the barroom buzzing over baryons.

Potential pick-up lines from particle physics made Rosen's point about the need for improved physics communication, part of his remarks to Fermilab users at the 35th Users' Annual Meeting, held at Fermilab on June 10 and 11. Also on the agenda: Fermilab Director Mike Witherell on the state of the laboratory, the Beams Division's Dave McGinnis on the state of the Tevatron and Run II, and Fermilab users on the state of experiments and projects past, present and to come. Via videotape, Stanford Linear Accelerator Center Director Jonathan Dorfan led users on a brisk but comprehensive tour of SLAC science. Users discussed the perennial problem of what to do about falling federal funding for physics. Chez Léon chef Tita Jensen served a memorable dinner, and users ended the evening with what has become *una bella tradizione* at the Users' Meeting: meatballs, *cannoli* and *grappa* at *Festa Italiana* in the Barn, hosted by Fermilab's Italian delegation.

It was our annual reminder that Fermilab is not just a physics laboratory but a unique community of scientists.

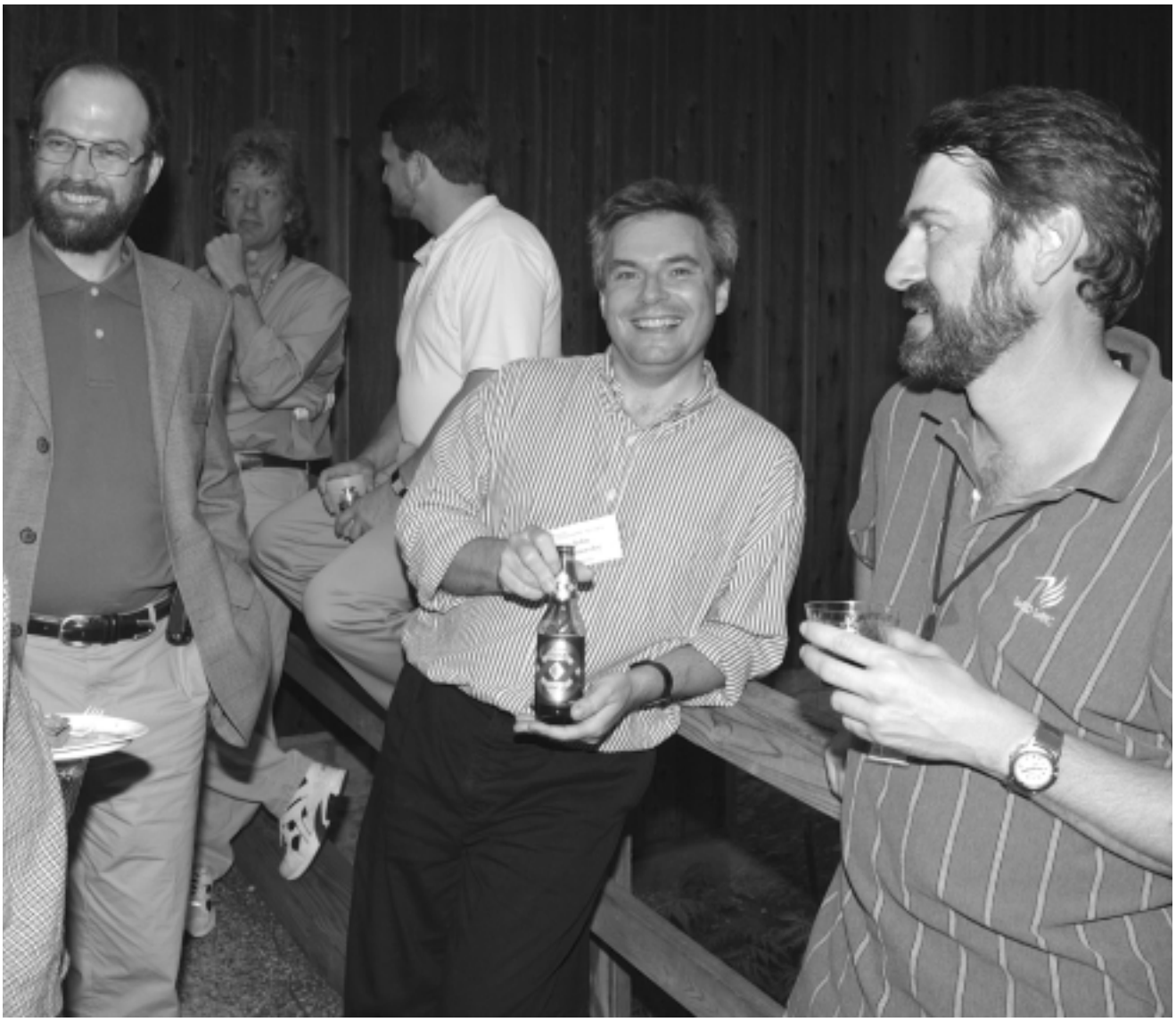
ON THE WEB:

Annual Users Meeting

www.fnal.gov/orgs/fermilab_users_org/users_mtg/2002/index.html

Streaming Video

http://vmsstreamer1.fnal.gov/VMS_Site_02/Lectures/Users2002/Ray/index.htm



Photos by Reidar Hahn

Fermilab users relaxed at the Kuhn Barn at the end of the day during the Annual Users Meeting. This DZero group consisted of (from left) Michael Fortner of Northern Illinois University (also the mayor of West Chicago), with co-spokesperson John Womersley and Harry Melanson of Fermilab.

Eyes on Run II

Concern for the progress of Run II at the Tevatron permeated the Users' Meeting, as it does all of Fermilab. As the users met, the Fermilab Beams Division was winding up a two-week shutdown for the installation of new devices to raise the accelerator's collision rate from what Witherell called Run II's "disappointing start."

Rosen reminded the audience how much is at stake.

"There is much interest in Washington as to the progress of Run II," Rosen said. "It is essential for Run II to succeed. All of us on the outside are waiting for new physics results. Run II at the Tevatron is a key issue for the whole physics program."

Witherell described efforts to raise the Tevatron's collision rate, showing a plot of rising accelerator luminosity over recent months.

"Run II is the most important element of our program," he said. "There has been much progress since March. Some solutions have been found. There are many more to go. The general strategy is to improve the antiproton efficiency, improve the proton intensity at low beta [where collisions occur], and improve the [antiproton] stacking rate. In October, we will integrate the Recycler. Every doubling of the data sample makes possible new possibilities and opens up a whole roster of new physics results."

Run II at the **TEVATRON** is a key issue for the **WHOLE PHYSICS PROGRAM.**" –Peter Rosen

Photo by Reidar Hahn

Fermilab physicist and CDF user Robin Erbacher (right) organized the Fermilab Users' Meeting. Erbacher, sharing a table with John Conway of Rutgers, was "pleasantly surprised by the interest people showed in the Washington situation" with respect to support for high-energy physics.

The Beams Division's Dave McGinnis gave users still more specifics on the division's ongoing push for higher luminosity.

"The Tevatron Department helix work has paid off," McGinnis said, describing adjustments to the paths of particles orbiting the accelerator. "The big thing missing is the amount of pbars going to low beta. Only thirty percent of the pbars are getting through to collision. Are there enough pbars? Yes. There are plenty of pbars coming out of the Accumulator, but they are not making it to low beta. They are getting lost when they come out of the Main Injector and go into the Tevatron. The problem is interbeam scattering."

McGinnis described three steps to fixing the problem: better helices, smaller beam size and bigger beam apertures. He said the current shutdown would lead to improved stochastic cooling for a smaller antiproton beam size and described a new "dual lattice" operation also designed to deliver more antiprotons to the collision points.

On the Bright Side

All was not low-luminosity angst. Rosen expressed "a note of confidence" in the laboratory, based on the turnaround in the NuMI construction project.

"A year ago, NuMI was in serious trouble," Rosen said. "The laboratory has turned the project around, and now we all are confident that NuMI will succeed."

Witherell concurred.

"The excavation of NuMI's onsite tunnel is complete," he said. "Two-hundred-twenty-five of the 486 planes of the MINOS detector are in place. The NuMI project management deserves much credit. Further, MiniBooNE is ready to go, with the first neutrinos right around the corner in July 2002."

Users learned of progress on Fermilab's contributions to the Large Hadron Collider at CERN. Witherell reported that the Fermilab-led U.S. program for the Compact Muon Solenoid detector at the LHC has begun to prepare for the transition from detector construction to the CMS research program. He noted that the US LHC accelerator program, also led by Fermilab is 73 percent complete, and has received excellent reviews.

Photo by Reidar Hahn

Pat Sorenson and Diane Snyder of Fermilab's Users' Office made sure users felt "at home and loved" at their annual meeting at Fermilab.

E791, The Gift that Keeps on Giving

Fixed-target experiments at Fermilab ceased taking data in 1999. Nevertheless, an overview of fixed-target experiments by the University of Virginia's Sasha Ledovskoy presented an astonishing number of recently published fixed-target results—including new results just published by E791, an experiment to study the decay of charm particles, which stopped taking data in 1991.

Along with reports from current experiments and proposed projects came consideration of the longer-term future of particle physics. Witherell cited the recently completed High Energy Physics Advisory Panel plan that proposed a linear collider in the US.

"There are many constraints on moving forward with the plan," Witherell said, "with a federally imposed annual cap of $19 million in funding for linear collider R&D funding, including a cap of $3 million at Fermilab. When the government responds with more funding for linear collider R&D, that will be a sign that they are getting serious about responding to our field's recommendations."

Rosen described the formation of an international linear collider steering group that expects to meet in Amsterdam in July.

"How can we put the linear collider on a path to construction?" he asked. "We all recognize that the linear collider will be an international project from the word go. Governments need to find how they will work together. In this country, a strong group has been established to guide R&D and physics and to help make the case to the Sixpacks."

Heads up, Joe and Janine. A linear collider may be coming soon to a barroom near you.

Photo by Reidar Hahn

Professor Giorgio Bellettini, CDF physicist, *Commendatore della Repubblica Italiana*, and dean of the Italian delegation at Fermilab, hosted *Festa Italiana* at the Kuhn Barn.

Photo by Jenny Mullins

Benn Tannenbaum, UEC Chair and Fermilab user from UCLA, drew applause when he announced he'll spend next year in Washington as a Fellow of the American Physical Society. Tannenbaum said users are generally happy with life at the lab, although they would like a footpath to DZero and better onsite taxi service.

Poster Session:

New Perspectives 2002

Fermilab's Graduate Students Association sponsors a poster session each year during the Users' Meeting, sponsored by the lab and by Universities Research Association, Inc. New Perspectives also carries the endorsements of the American Physical Society and the Division of Particles and Fields. Graduate and undergraduate students present their work in talks, and in displays—which always attract a good crowd on the second afternoon of the Users' Meeting, accompanied by refreshments.

Fermilab Director Michael Witherell presented the George Michail Memorial Poster Awards for 2002 to: Muge Karagoz Unel, Northwestern University, "Beam Halo Monitoring at CDF" (first place, $250); Angela Bellevance, Rice University, "KTeV Search for K_L → pi (0) mu (e)" (second place, $150); and David-Christopher Cox, Indiana University, "Neutrino-Nucleon Scattering in BooNE and the Spin of the Proton" (third place, $100).

The poster award is named for George Michail, a student from Greece who graduated from Harvard and was working on his Ph.D. thesis at Fermilab. He was interested in heavy flavor physics and CP violation in the B-meson system, and for his Ph.D. thesis he worked on a measurement of the "Time Dependent Mixing Parameter of B_0-B_0bar Mesons" in proton-antiproton collisions. Just before finishing his thesis, in October 1996, Michail died in Chicago from injuries sustained in a head-on car crash with a drunk driver. He was 28.

Beam Halo Monitoring at CDF / **Muge**

KTeV Search for K_L → pi (0) mu (e) / **Angela Bellevance**, Rice University

ON THE WEB:

Graduate Students Association of Fermilab
www.fnal.gov/orgs/gsa/

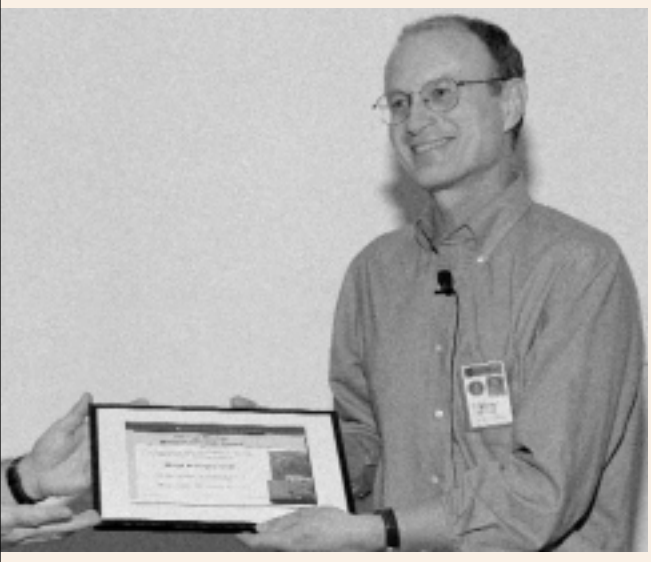
George Michail (1968-1996)
www.fnal.gov/orgs/gsa/calendar/past_events/AaF/michail.html

Photo by Reidar Hahn

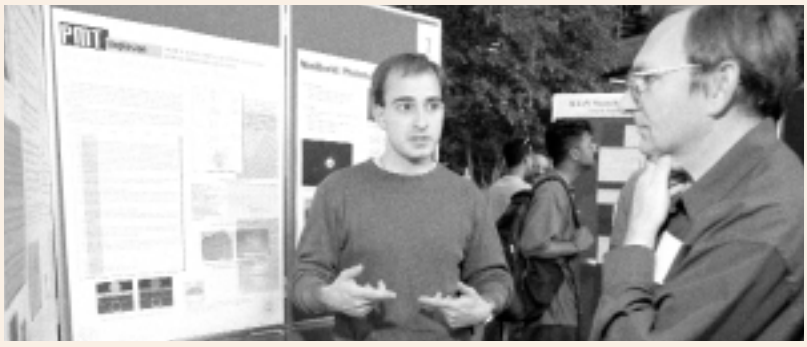
MiniBooNE Overview / **Kiril Datchev and Jocelyn Monroe**, Columbia University

J/psi Differential Cross-Sections at Hera-B / **Mark Buchler**, Wayne State University

CMS PMT Test Station / **Ugur Akgun**, Firdevs Duru, University of Iowa



Karagoz Unel, Northwestern University



PMT Tests and Performance in the MiniBooNE Experiment / **Justin May**, University of Michigan

Photos by Jenny Mullins

Neutrino-Nucleon Scattering in BooNE and the Spin of the Proton / **David-Christopher Cox**, Indiana University

Photos by Reidar Hahn

An Explicitly Radiation-Hard Radioactivation-Free Fast-Gas Cerenkov Calorimeter / **Mark Kane**, Iowa State University

LEDERMAN AT 80

Future of the field calls for charisma and courage

by Kurt Riesselmann

When Leon Lederman surveys particle physics from the vantage point of his ninth decade, he sees a field challenged to translate the excitement of future discoveries into the means and finances to make those discoveries happen.

"Particle physics suffers more from being infected by the socio-political mood of the day than from lack of spectacular opportunities for major and profound discoveries," said Lederman, who recently celebrated his 80th birthday. "I can't remember a time—and I go back to Democritos—when the prospects were as clear. For this, some credit goes to our close and mutually profitable connections to astrophysics. *But*, we must play our cards right, we must seek out our most charismatic spokespersons and, above all, each of us must draw courage and confidence from the incandescent glory of our heritage and from the fascinations of the work we must do."

The 1988 Nobel Laureate is still very much involved in science and education policy. In addition to serving on many advisory boards, Lederman is a member of the physics department at the Illinois Institute of Technology, and is resident scholar of the Illinois Math and Science Academy, a state-run residential high school he helped to found.

"At IIT, I mainly encourage the new HEP group under Dan Kaplan, which is not only involved in three important Fermilab experiments but has taken a strong leadership role in helping Fermilab with accelerator problems and R&D," said Lederman. "At IMSA, I bring very innovative thinkers to interact with the students. Nobel types, Poets Laureate, business tycoons, astrophysicists, military leaders. Also, we do unusual projects like the book that fifteen students wrote: 'Portraits of Great American Scientists,' which presents biographies of fifteen renowned scientists."

Science education has become a prime focus of his activities. Lederman, who was Fermilab director from 1978 to 1989, has played a key role in establishing Fermilab's education resources, including raising financial support.

Mary Cullen has been the Director's Aide for three Fermilab directors: Mike Witherell (1999-present), Leon Lederman (1978-1989) and John Peoples (1989-1999).

ON THE WEB:

Leon Lederman, Director 1978 to 1989
www.fnal.gov/projects/history/lederman.html

The Lederman Science Center
www-ed.fnal.gov/ed_lsc.html

The 1988 Nobel Prize in Physics
www.nobel.se/physics/laureates/1988
www.nobel.se/physics/educational/poster/1988

Leon Lederman, facing the heroic task of blowing out 80 candles. (He did just fine!)

Photos by Reidar Hahn

Tita Jensen, *Chez Léon* chef for 23 years, surprised Lederman with an extra-large cake.

"When Leon came to Fermilab, he was frustrated that there wasn't a teaching opportunity," said Marge Bardeen, who is the head of Fermilab's education department. "So he created one. He started Saturday Morning Physics to teach students.

"He was surprised to see that teachers came along, and so he decided that the lab could do something for them. He had this idea how we could make the resources of the lab available to K-12. He really plowed into this, as you would do to learn a new scientific field."

Today, the staff of Fermilab's Lederman Science Education Center and the education department train and work with six to seven thousand teachers every year. And about 150 high schools across the country, including IMSA, have started teaching science in a physics-chemistry-biology sequence, an idea heavily promoted by Lederman.

"It isn't that nobody ever looked at this before," Bardeen said. "But Leon has become a focus for people who are interested in this approach. He is out there promoting the idea and organizing support. And Leon having a Nobel Prize certainly helps. He's able to bring people together. He calls and gets people to meet."

Lederman has given talks around the country to convince education experts and school boards that high school science education should begin with physics and eventually lead up to the most complex field, biology. Physics is the conceptual underpinning to the study of systems in many other fields. Starting with classes in physics exposes students early on to concepts such as atoms and electricity, which are, for example, necessary to explain chemical reactions and communication among biological cells.

"I am working hard on changing the current high school science curricula...trying to dump the one hundred year old biology-chemistry-physics sequence," Lederman said. "If you think finding the Higgs particle is hard..."

COME FROM BEHIND

Success

On the 25th anniversary of the b-quark discovery, Fermilab scientists recall overcoming a slow start

1977: Leon Lederman (Columbia University, now with IIT) and (seated in front) John Yoh (Columbia University, now at FNAL).

ON THE WEB:

The Bottom Quark Discovery
www.fnal.gov/projects/history/botqrk.html

E288: The Experiment Coordinator's Story
fnalpubs.fnal.gov/archive/1997/conf/Conf-97-432-E.pdf

The Quark Theory
www-cdf.fnal.gov/physics/public/quark.html

by Kurt Riesselmann

Research can be as dramatic as a sports tournament. Even if you are off to a slow start, your team still can show a strong performance in the playoffs.

The discovery of the bottom quark, found twenty-five years ago at Fermilab, is a case in point.

In the seventies, collaborators of the Fermilab experiments E70 and E288 were at the center of a drama that unfolded over a seven-year period. It included such exciting times as the "November revolution" in 1974, when experimental groups at Stanford and Brookhaven simultaneously reported the discovery of a fourth type of quark, the charm.

By any luck, and with better timing, that discovery could have been made at Fermilab.

"Fermilab unfortunately was just one step behind," said John Yoh, who joined Fermilab in the early seventies. "We had a new machine, and there were several experiments that—if they had been further along—could have discovered the J/Psi," the particle composed of a charm quark and anti-quark.

The J/Psi announcement came only nine months after scientists from Columbia University and Fermilab decided to upgrade their experimental apparatus known as E70 and proposed in a one-page letter to director Robert Wilson that with the follow-up experiment, called E288, they would search for particles like the W boson to "publish these and become famous." Their colleagues in California and on Long Island, however, were the first to stand in the limelight.

"After the November revolution we at E70 realized that we had missed the boat," Yoh recalled.

But the experimenters at Fermilab were far from throwing in the towel. They knew that Fermilab's new Main Ring accelerator would eventually be fifteen times more powerful than Brookhaven's AGS ring, presenting a huge window of opportunity to produce new, heavier particles.

"There was a huge mass region, totally unexplored," recalled Leon Lederman, the spokesperson of E70 and E288. "We were on a hunt for vector mesons and anything new would have been welcome."

By the spring of 1977, E288 experimenters had made another upgrade to their experiment, collecting one thousand times more data than in 1975. Fermilab's first major discovery was just around the corner.

Fermilab photos

From left: Walt Innes (FNAL, now SLAC), Karen Kephart (FNAL), Jack Upton (FNAL), Frank Pearsall (FNAL), Bruce Brown (FNAL).

"After a few weeks with the new configuration, we found that the probability to produce muon-antimuon pairs peaked sharply at about ten times the proton mass," said Dan Kaplan, who worked on E288 as a graduate student and is now a physics professor at the Illinois Institute of Technology. "We were observing a new quark."

The new result from Fermilab, soon identified as the bottom quark, had a big impact.

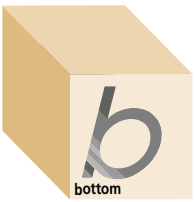
"The discovery of the charm quark convinced people that quarks are more than a mathematical construct," said Jeff Appel, who moved from New York to Batavia to lead the E70 team as Lederman's deputy. "The subsequent discovery of the bottom quark convinced people immediately that there must be a third generation. There were expectations that another quark—probably three times heavier than the bottom quark—should exist."

Nature, however, made it more difficult for the 'quark detectives' to find the missing piece. It took another eighteen years until scientists discovered the bottom's partner—the top quark, which was twenty-five times heavier than the bottom quark. Scientists had to wait for construction of Fermilab's Tevatron accelerator, completed in 1986, to create collisions powerful enough to produce top quarks. Why the tiny particles—first seen in 1994—are as heavy as a gold atom is still one of the big mysteries of the subatomic world.

Today, bottom quark physics is more important than anyone could have imagined.

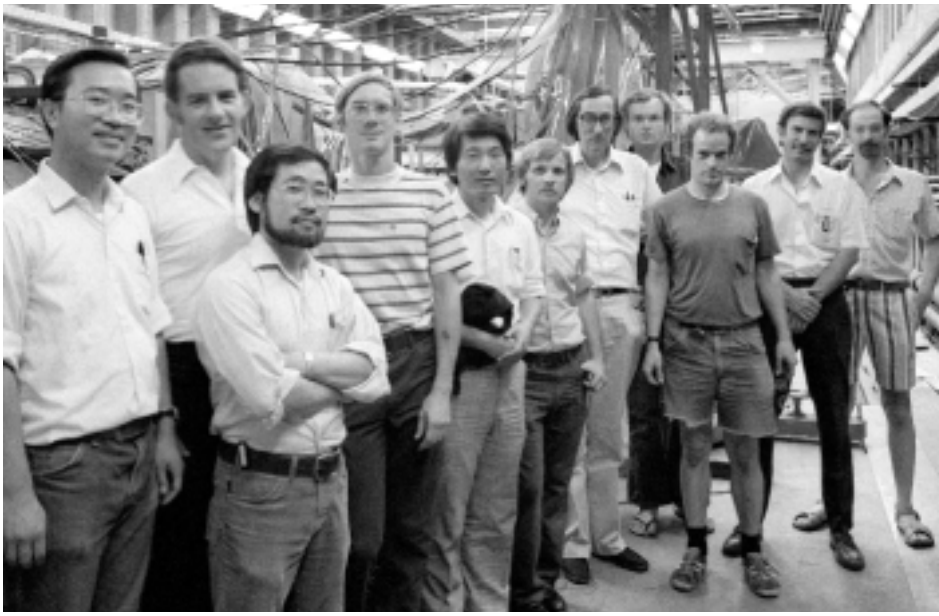
"This Fermilab discovery has generated a huge activity: two large new accelerators adding to the Tevatron, which has been a workhorse of the subject," said Lederman, who shared the 1988 Nobel Prize for a neutrino experiment he carried out at Brookhaven in 1962. "New major detectors at Fermilab, DESY and CERN... I would think the attention is flattering, matched only by neutrino physics as the two HEP activities that stand outside of pushing the frontiers of energy."

Particles containing bottom quarks are the perfect instrument to learn more about a tiny flaw in the mirror-like behavior of matter and antimatter. The imperfect symmetry, referred to as CP violation, may be the key for why the universe has matter—including the stuff we are made of.



"Yesterday's discovery is today's tool," said Appel. "Scientists have built B factories in California and Japan to study this. And our Fermilab experiments, CDF and DZero, should provide excellent answers, too."

Play by play, particle physics continues its success story around the world.



It took about 20 physicists and technicians, from Columbia University, Fermilab and the State University of New York at Stony Brook, to find the bottom quark. Left to right: Dave Hom (formerly Columbia University), Chuck Brown (FNAL), Al Ito (SUNY, now FNAL), Bob Kephart (SUNY, now FNAL), Koiji Ueno (FNAL), Ken Gray (FNAL, now retired), Hans Sens (Columbia University, now ILNL, France), Steve Herb (Columbia University, now DESY, Germany), Jeff Appel (FNAL), Dan Kaplan (SUNY, now IIT).

Collaboration members not shown in these photos: David Snyder (Columbia University, now Gallaudet University), Taiji Yamanouchi (FNAL), Hans Jöstlein (SUNY, now FNAL), William Sippach (formerly FNAL) and people from the Fermilab accelerator division.

Particle Physics
MADE PAINLESS

When nothing means something

DZero collaboration:
Still on the trail of extra dimensions.

An experimental null-result is not the end of the trail in the search for extra dimensions

by Greg Landsberg

Photo by Jenny Mullins

Greg Landsberg

When you're searching for something, you can usually count on finding it in the last place you look.

The search might take you through countless nooks and crannies, but each one that comes up empty serves to reduce the number of nooks and crannies remaining to look.

Physics works the same way—in fact, all of science works the same way. If we don't find something in one place, that doesn't necessarily mean the "something" doesn't exist. We might not have looked in enough places. But at the same time, we've scratched one more place off the list, reducing the number of nooks and crannies that lie ahead.

Here's a case in point: the monojet—a single quark or gluon spotted in a particle detector, appearing to recoil against nothing. Could the last place we look for it turn out to be an extra dimension? A recent result from Fermilab's DZero detector tells us we haven't yet reached that last place to look—but we have trimmed the list.

Since the late 1970s, when the first proton-antiproton collider was built at CERN, physicists have been intrigued by the idea of finding a monojet, the simplest particle signature imaginable. On the surface, this scenario would seem to violate the conservation of momentum, but in fact the lack of a second object in the detector might also imply that another undetected particle (or particles) was produced in the collision along with the jet, and balances the momentum of the jet.

For a perfectly sealed particle detector, there is only one known type of particle that can be missed: the neutrino, which can easily pass through the entire Earth without a single interaction.

ON THE WEB:

Searching for Extra Dimensions
DZero Plain English Summary
http://www-d0.fnal.gov/public/pubs/extra_dim/index.html

Gravity in Large Extra Dimensions
Berkeley Lab Research Review
http://www.lbl.gov/Science-Articles/Research-Review/Magazine/2001/Fall/departments/frontline/physics.html

Since no detector is perfectly sealed, some other processes could appear to be a monojet because the balancing particle has escaped or eluded us. For example, a dijet event (two quarks scattering off each other) could look like a monojet if one of the pair escapes detection by literally falling through the cracks in the detector. Since dijets are produced in proton-antiproton collisions all the time, they might represent an important background, even if the number of cracks is very small and the cracks themselves are tiny.

What if the particles produced along with the jet are of an unknown kind—something we can't yet identify? Then, if we see an excess of monojet events above the prediction from the known physics processes, we might have a hint of new physics beyond the Standard Model, our current picture of the universe.

The theory of supersymmetry spurred a monojet search as early as the 1970s. In supersymmetry, every integer spin particle (a boson or force-carrier) has a semi-integer partner (a fermion) and vice versa. In addition to doubling the total number of fundamental particles, this theory predicts massive neutral particles barely interacting with other matter, which would be produced in violent proton-antiproton collisions along with the other ingredients in the particle soup.

Carlo Rubbia, co-winner of the 1984 Nobel Prize with Simon Van der Meer for the discovery of the W and Z bosons, thought he and his colleagues had seen evidence for supersymmetry in an excess of monojet events in the UA1 detector at CERN's proton-antiproton collider in the early 1980s. However, the evidence was not confirmed by the CERN UA2 experiment, and Rubbia's monojets turned out to be background from underestimated physics processes. The monojet lost some of its allure.

Fast forward to 1998, and enter Nima Arkani-Hamed of UC Berkeley, Savas Dimopoulos of Stanford, and Georgi Dvali of New York University. These three theorists proposed that the universe could be a much bigger place than we think. Our three spatial dimensions could be extended to five, or perhaps even more, by the existence of extra dimensions that are curled up with a microscopic radius—although that radius might be as large as a millimeter.

Photo by Jenny Mullins

Hai Zheng of Notre Dame University presented the DZero results in a June 14 seminar.

This new hypothesis offered a possible solution to the disturbing "hierarchy problem" of the Standard Model:

Why is gravity about 10^{38} times weaker than the other three forces of nature?

That's 100,000,000,000,000,000,000,000,000,000,000,000,000
(a hundred billion billion billion billions) times weaker.

Extra dimensions could offer a simple answer: Gravity is just as strong as other forces, but it appears weak to us because it propagates through the entire space, including extra dimensions, and thus spends only very little time in the three-dimensional world of our everyday experience, where all other particles and forces are stuck.

This theory of extra dimensions predicted large numbers of monojets in proton-antiproton collisions, with the "missing" particle being a quantum of the gravitational field, the graviton, escaping into the extra dimensions (see Fig. 1). Monojets regained their allure.

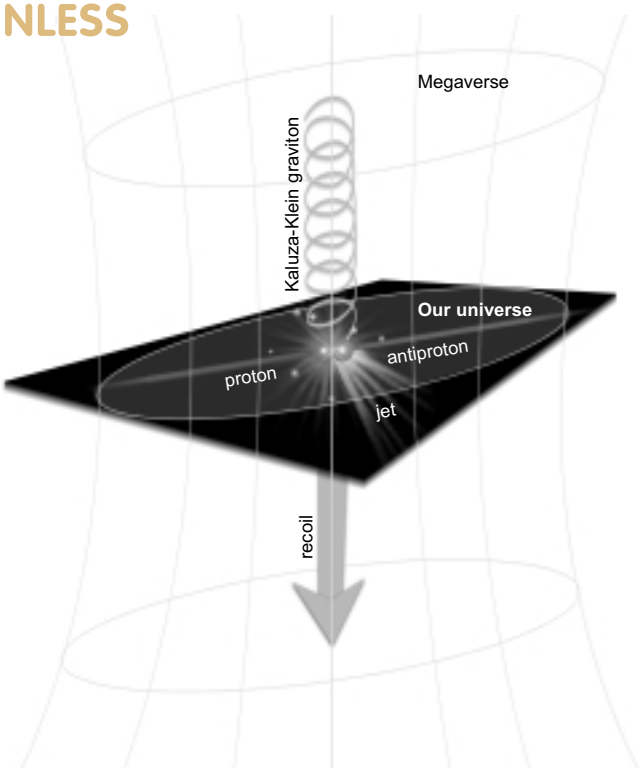


Figure 1. Artist's view of a monojet event produced in a proton-antiproton collision. The jet is recoiling against the graviton that escapes in the extra space. Our entire three-dimensional world gains an extra momentum in extra space to conserve total momentum.

Both Fermilab collider detectors, CDF and DZero, have searched for monojet signatures in the huge amount of data recorded in Collider Run I of the Tevatron (1992-1996). Given the UA1 experience, it was extremely important to estimate all possible backgrounds very carefully, distinguishing them from an excess of monojet events that might indicate the "echo" from extra dimensions.

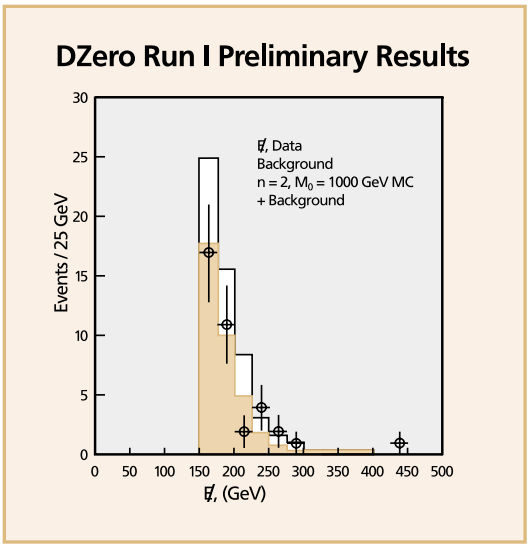


Figure 2. "Missing" momentum in the monojet candidate events. Data (points) clearly agree with the predicted background (colored bars), and not with an extra dimensions hypothesis (open bars).

The DZero team, the first to carry out a search for extra dimensions at a hadron collider, reported results on its search for the monojets in a June 14 seminar at Fermilab, offered by experimenter Hai Zheng of Notre Dame University. DZero physicists sifted through 60 million proton-antiproton collisions and identified a sample of about 300 monojet-like events.

The next, most important step was to identify possible backgrounds and filter them out.

It turned out that one additional background, not quite envisioned in the Standard Model, is the signature of very energetic cosmic rays passing through the Earth (including the DZero detector). Muons account for most of the cosmic ray flux reaching the surface of the Earth; very rarely, these muons interact in the dense material of the detector, depositing some of their energy there. In some cases, this energy deposit looks like a single jet, mimicking the monojet signature.

Other backgrounds include W and Z particles recoiling against a jet, with the products of the W or Z decay missed or mismeasured by the detector. Careful comparison of the characteristics of the background and expected signal events allowed The DZero team to design special criteria, or "cuts," to reduce these backgrounds significantly. As a result, the monojet sample was reduced to some 30 events, consistent with the predicted backgrounds (see Fig. 2).

This result was used to put stringent limits on the size of extra dimensions. For example, if there are only two of them, they should be curled up tighter than about 0.2 mm each. Analogous limits were set on other numbers of extra dimensions. These limits are comparable with, and complementary to those obtained in the sister channel: production of monophotons in electron-positron collisions, recently studied at CERN's LEP machine. Especially for more than four extra dimensions, the Tevatron sensitivity exceeds that at LEP.

It's interesting to note that in string theory, the preferred number of extra dimensions is six or seven; any number of those can be as large as predicted by Arkani-Hamed, Dimopoulos, and Dvali. However, the sensitivity to extra dimensions in the monophoton channel at the Tevatron is not as high as at LEP, as the very recent CDF analysis has demonstrated.

The non-observation of an excess of monojet events is, of course, less exciting than a discovery. However, it is an important step toward a possible discovery in this channel. Collider Run II of the Tevatron will increase the previously recorded data sample by two orders of magnitude. DZero has performed the first search for extra dimensions in the monojet channel, resulting in stringent limits on their size, and demonstrated that accurate accounting for the backgrounds is possible in this very challenging and exciting signature for new physics.

We're trimming the list of places to look.

CALENDAR / LABNOTES

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

FERMILAB DANCING GROUPS

International folk dancing is held from 7:30 to 10 p.m., Thursdays, at the American Legion Post, 22 S. Second St. in Geneva. 'Silk and Thistle' Scottish country dancing meets from 7:30 to 10 p.m. Tuesdays at the Main St. Recreation Center at the southwest corner of Hill and Main Streets in Glen Ellyn. Both locations offer wood floors, air-conditioning, and ample parking. Newcomers are welcome at both groups at any time and many dances are fully taught. Contributions towards the cost of the room are requested but not obligatory.

On Thursday, July 4, the dancers will celebrate the holiday with a folk dance party from 5 to 9 p.m. at the Geneva location. Accordionist Don Weeda of Austin, Texas will provide live music for dancing. Participants are encouraged to bring food and non-alcoholic drink to share. For this special event a donation of $5 will be requested. More information is available by calling 630-584-0825 or 630-840-8194 or by e-mailing folkdance@fnal.gov.

JULY 2

Chicago River Boat Tour sponsored by NALWO; bus from Lederman SciEdCtr parking lot at 9:30 a.m. Contact Selitha Raja, 305-7769 or selithar@peoplepc.com to register. Visit the website at http://www.fnal.gov/orgs/nalwo/rivertour.htm.

JULY 8:

Deadline for housing reservations, 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 or email housing@fnal.gov.

ASK-A-SCIENTIST PROGRAM

The popular Ask-a-Scientist program takes place every Saturday from 1 to 3 p.m. at Fermilab's Lederman Science Center. Scientists will meet visitors to answer questions ranging from "What is dark matter?" to "How do you accelerate a particle close to the speed of light?" The Science 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.

P5 WEB BOARD

High-Energy Physics Advisory Panel chair Fred Gilman, acting on the recommendation of the DOE/NSF HEPAP Subpanel on Long-Range Planning, has established a website for comments from the U.S. high-energy physics community on setting up the Particle Physics Project Prioritization Panel (P5). P5 is seen in the Subpanel's report as being the keeper of the particle physics roadmap and as acting to set priorities for medium sized projects (with a cost of roughly $50M to $500M).

Go the Web site at: http://wb.hep.net:8080/~p5

MILESTONES

AWARDED

■ Ph.D. to Simona Murgia, Michigan State University; for her research on searching for large extra dimensions using diphotons at the CDF experiment.

■ Ph.D. to Antoni Munar Ara, Universitat de Valencia (Spain) for his research contributions to the CDF experiment. His work was supported by the INFN Sezione di Pisa (Italy).

DIED

■ Harold F. DeLaney, of Plainfield, Ill., an electrician for 10 years at Fermilab; on June 2, 2002.

■ Harland B. Gerzevske, of Carol Stream, Ill., electronics technician at Fermilab, on May 18. He was 58.

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, July 3
Closed

Dinner
Thursday, July 4
Closed

Lunch
Wednesday, July 10
Grilled Duck Breast and Peppered Mango Salad
Lemon Cheesecake with Blueberry Compote

Dinner
Thursday, July 11
Roasted Peppers with Creamed Feta
Pan Roasted Pork Tenderloin with Corn Risotto
Green Beans with Citrus Butter Sauce
Ginger Souffle with Chocolate Crème Anglais

Lunch
Wednesday, July 17
Danish Open Sandwiches with Cucumber Salad
Cold Lemon Souffle

Dinner
Thursday, July 18
Hearts of Romaine with Roquefort and Pecans
Flounder with Hazelnut Butter Sauce
Vegetable Pilaf
Cherry Phyllo Strudel

Lunch
Wednesday, July 24
Grilled Fajita Salad
Cumin Seasoned Corn
Coffee Ice Cream with Fudge Brownies and Kahlua Chocolate Sauce

Dinner
Thursday, July 25
Shrimp Salad with Chipotle Dressing
Barbecued Pork Ribs
Glazed Greens with Bacon
Roasted Potatoes with Garlic and Rosemary
Chocolate Pecan Tart

FERMI NEWS

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The deadline for the Friday, July 19, 2002, issue is Tuesday, July 9, 2002.
Please send classified ads and story ideas by mail to the Public Affairs Office, MS 206, Fermilab, P.O. Box 500, Batavia, IL 60510, or by e-mail to ferminews@fnal.gov.
Letters from readers are welcome.
Please include your name and daytime phone number.

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CLASSIFIEDS

FOR SALE

■ '00 Honda Accord EX, 4dr. sedan, signet silver, leather, 33K, automatic, cd, air, moon roof, cruise control, new brakes, $16,500. billk@fnal.gov, x4173.

■ '98 Explorer XLT, 4x4, V6, light blue w/ gray leather, A/C, cruise, tilt, power windows, locks and driver seat, CD/tape, running boards, roof rack, alloy wheels, off-road size tires, original owner, runs and looks great, 96K miles, asking $8,800 o.b.o. MUST SELL! Contact Terry at 630-782-9936 or blackjackkarney@msn.com (Below Kelley Blue Book $11,375 and NADA $13,650).

■ '95 Dodge Spirit, 4 door, V-6, AC/PS/PB, 78K miles, good condition. All maintenance records with car. $3,500. Jackie 630-898-7931.

■ '93 Nissan Sentra, silver grey, 2 door, 5 spd., 6 CD Kenwood changer, cruise control, power steering, power mirror. Look new, runs great, very reliable, $2,055 o.b.o. Lucas x4366 or nxuan@fnal.gov

■ '92 Toyota Corolla DX 130K miles, 5 spd. manual, great runner, somewhat rusty $1,700 o.b.o., alexahin@fnal.gov, x3471.

■ '89 Dodge Daytona, blue 2 door hatchback, 89K miles, 4 cylinder, automatic. Runs well. $900. Mark x4472 or ruschman@fnal.gov.

■ '86 Mustang GT, red with gray interior, 74K miles, 5 speed, garage kept. Blaupunkt AM/FM/cassette with amplifier and subwoofer, repainted six years ago. Must see to appreciate $5,595. Tim x4070.

■ Scott's tractor made by John Deere, 15HP Kohler, Hydro transmission, cruise control, 42″ cut, Mulching Vac 3 system, new battery, like new, $995. Cannondale bicycle trailer. Seats two children. Total capacity 80 pounds. Asking $50. Call Dave at x2971 or 630-393-1246 or e-mail harding@fnal.gov.

■ Men's 23″ 10 speed bicycle, good condition, asking $40. Please contact steele@fnal.gov, or 630-752-8949.

■ Craftsman 220V air compressor and 50 feet of hose, air impact gun, ratchet wrench, chisel with some bits, and drill. All for $50 o.b.o. contact rsward@fnal.gov or Randy at 847-658-1939 after 6:00pm.

■ 9-drawer dresser, 18″w x 72″l x 31″h, solid wood, dovetail drawers, great condition, $50. Office desk, 3′ x 5′ $20. x6821 or 630-892-4564.

■ Pull out dining table extends to 10 feet $70 o.b.o. Tim x4070.

■ Sewing machine w/4-drawer desk, Brother Pacesetter model XL711 (c. 1972). Needs oiling. Includes many spools of thread, bobbins, needles, and more (sorry no instruction booklet), $30, West Chicago. Contact Bob at x4700.

HOUSE FOR SALE

■ 4 bdrm, 2/5 bath, 2450+ sq ft, Summerlyn model located at a large cul-de-sac lot, 1/2 acre with landscaping and large deck, 3 season sunroom, finished basement. Offered at $269,000. Call 630-761-0947.

BIBLE STUDY

■ Bible study begins August 7 at Noon in the Huddle/Cross Over Gallery. All are welcome to join us. For more information call Jeff Ruffin x4432.

ARTS SERIES

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

Embarking on their 35th anniversary season, the musicians of Los Folkloristas continue their mission set in 1966, "to preserve and record the traditional music of Mexico and Latin America." Carrying more than 100 instruments in their collection, and performing music of up to 15 different countries and pre-Columbian Mexico, this seven-member ensemble presents a musical journey through Latin America. In addition to traditional instruments, Los Folkloristas brings an abundance of organic instruments such as turtle shells, dried cocoons, and gourds. Background explanations are provided, offering descriptions of the universal themes of love, respect, and understanding found in this music, regardless of the country or time in which it was written.

George Winston

Los Folkloristas

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

Celebrated pianist/composer and Windham Hill flagship artist George Winston closes out the summer series at Fermilab. In 1998, Winston celebrated his 25th anniversary as a recording artist. His first album, "Ballads and Blues," was released in 1972 and later picked up by Windham Hill Records. Among his most memorable albums include "Autumn," "December," "Winter Into Spring," and "Summer." "Autumn," which recently celebrated its 20th anniversary, almost single-handedly launched Winston, Windham Hill Records, and the genre of contemporary adult instrumental music. Inspired by blues, rock, R&B, and jazz, Winston began playing organ and electric piano in 1967. He switched to acoustic piano in 1971 after hearing recordings by some of the legendary swing pianists, specifically Fats Waller and Teddy Wilson.

For tickets or information call 630-840-ARTS, or go to: www.fnal.gov/culture/.

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