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INSIDE:

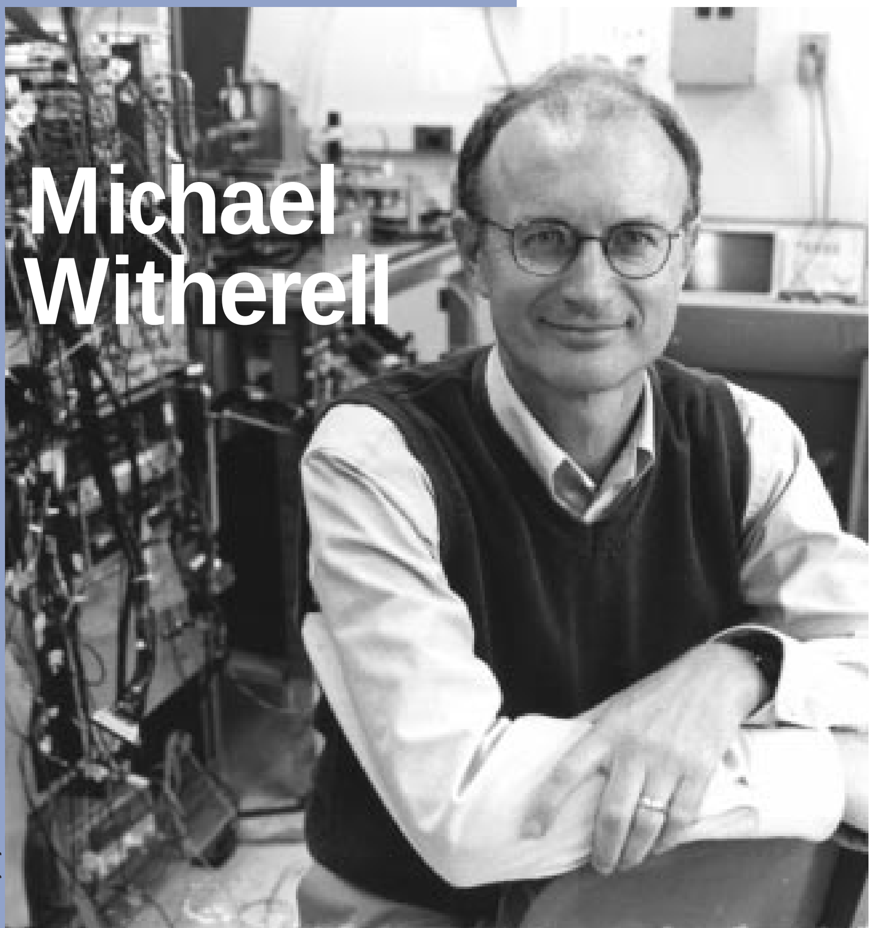


Photo by Djamel E. Ramoul

Michael Witherell

New Fermilab Director Appointed

by Sharon Butler

Michael Witherell, a professor at the University of California, Santa Barbara, with a distinguished career in experimental particle physics, has been named to succeed Fermilab Director John Peoples.

Congratulating Witherell on his appointment, Secretary of Energy Bill Richardson noted that Witherell is a leader in his field and will be taking on the directorship of the Laboratory at a time of extraordinary opportunities for new discoveries in the fundamental nature of matter and its forces.

"We here at the Department of Energy look forward to working closely with Dr. Witherell to ensure that the U.S. remains a world leader in particle physics research," Richardson said.

"The Fermilab community is very fortunate to have Mike Witherell for its fourth director," Peoples said, "because, having worked at the Laboratory as an experimenter, he already knows us. The U.S. particle physics community is also fortunate because, as chairman of the High-Energy Physics Advisory Panel, he has guided the formulation of the advice that has shaped the field's research program. Finally, he is no stranger to difficult choices. As chairman of the 1992 HEPAP subpanel, he led his colleagues to present clear options for the future without ducking the difficult issue of a shrinking budget."

The search for a new director began last year, when Peoples announced his intention to retire on June 30, 1999. Universities Research Association, Inc., which operates Fermilab, formed a committee of respected physicists to canvas the world for candidates. On March 5, URA announced Witherell's appointment, effective July 1.

URA President Fred Bernthal commented, "With his broad knowledge and experience, Mike is a perfect choice to lead the Lab and the high-energy physics community into the next millennium."

Bernthal added, "We are grateful to George Trilling, chair of the Search Committee, and his committee colleagues for their thorough and conscientious effort in helping us reach this very successful outcome."

When Witherell conducted experiments at Fermilab from 1978 to 1990, he never dreamed that one day he would be the Laboratory's director. "My career just didn't seem to be pointed in that direction," he said.

Indeed, since earning his Ph.D. from the University of Wisconsin in 1973, Witherell has pursued an academic career, working at every major particle physics laboratory in the country. He was an assistant professor at Princeton University and then moved to the University of California, Santa Barbara, where he was appointed professor in 1986.

Witherell's work on experiment E691 at Fermilab from 1983 to 1990 brought him the prestigious W.K.H. Panofsky Prize in Experimental Particle Physics, awarded in 1990, and election to the National Academy of Sciences last year, one of the highest honors accorded a scientist in the United States.

The goal of E691 was to study particles containing charm quarks. The E691 collaboration proposed adding to the existing Tagged Photon Spectrometer, built for the E516 experiment, two components based on newly developed technologies: a silicon vertex detector and a high-speed data acquisition system. The success of this strategy was evident almost immediately: In data from the first five percent of the run, Witherell remembers seeing a charm signal larger than any in earlier experiments. The full experiment identified about 10,000 charm events, while similar previous experiments had collected no more than 100. The higher statistics guaranteed more compelling scientific results than any to date.

In electing Witherell a member in 1998, the National Academy of Sciences noted that his pioneering work in the application of silicon vertex detectors and high-speed data acquisition systems "profoundly influenced all subsequent experiments aimed at the study of heavy-quark states."

Indeed, both technologies are far more advanced now than they were in the mid-1980s and are extensively used at Fermilab. Witherell noted with amusement that E691 used only nine silicon sensors. By comparison, the upgraded CDF detector will have well over 1,000. But some things haven't changed. Just as the CDF and DZero collaborations are now impatiently awaiting fabrication of their silicon strips at Micron Semiconductor, so Witherell remembers collaboration members back in 1984 flying to England to prod the same manufacturer into hurrying delivery of the new technology.

More recently, Witherell's research has focused on understanding the source of the asymmetry between matter and antimatter known as CP violation. Since 1993, Witherell has been working on the design and construction of the BaBar experiment at the Stanford Linear Accelerator Center. The experiment, to begin operating this year, will measure the asymmetry in decays of B mesons, particles composed of a B and an anti-B. Although CP violation was first discovered in neutral kaons, scientists expect the effect to be multiplied many times over in certain decay modes of the B meson. With far more data to analyze, physicists hope to gain further insight into the phenomenon.

Over the last three years, Witherell has been chairing HEPAP, which advises DOE on funding priorities for high-energy physics. Witherell was also a member of the recent HEPAP subpanel chaired by Fred Gilman, which was charged with recommending a scenario for an optimal and balanced high-energy physics program over the next decade, with new facilities to address physics opportunities beyond the Large Hadron Collider. When completed, the LHC, currently under construction in Europe, will take over the energy frontier from Fermilab.

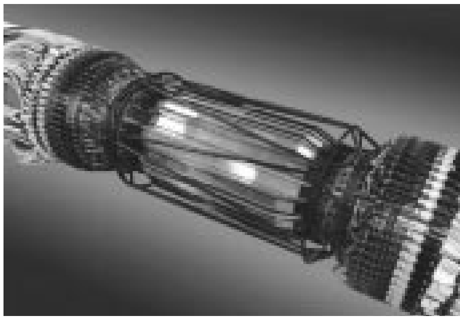
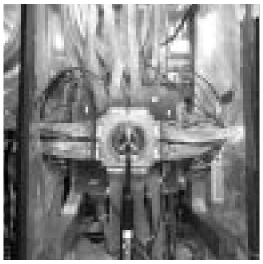


Photo by Roy Kaltschmidt of LBNL

Silicon vertex detector for the BaBar experiment.

Witherell expects his job as director to involve three responsibilities: overseeing this large and diverse laboratory so that operations run smoothly and efficiently; working with the larger high-energy physics community to shape the future direction of the field (an area where laboratory directors play a special role, he said); and winning support from funding agencies and elected officials in Washington.

"The Laboratory is in a strong position," he said, citing the increases in luminosity the accelerator will achieve in Run II, enabling experimenters to accumulate more data than ever before. "In addition, exciting new physics results from past runs have recently been announced." For the long term, though, he recognizes that there will be challenges.


Fermilab Photo

Apparatus for E691, in 1985.

"We will require new facilities to address pressing scientific questions if the field of particle physics is going to remain vital," Witherell said, adding, "I didn't take this job because I thought it would be easy."

RECYCLER BEAM MAKES SMOOTH DEBUT

by Mike Perricone

With recycled particles and recycled parts, the Recycler will change the way Fermilab conducts its antiproton business. Along the way, it may also show that some of the best new ideas can be old ideas that have been recycled, too.

The unique Recycler will be used to recover and store antiprotons, those rare and costly particles comprising one component for collider experiments in the Tevatron. Sharing the two-mile tunnel with the new Main Injector accelerator, the Recycler is also the world's largest collection of permanent magnets, a key ingredient in its low-cost construction.

And it works.

A beam of protons moved through about one-third of the Recycler ring on January 12, 1999, before ending its run by being absorbed at a temporary steel target. Since protons and antiprotons have the same mass but the opposite charge, the protons moved in the opposite direction than the antiprotons will take when the Recycler is operating under "real" conditions.

But moving particles "backward" in the machine was barely worth noting, compared to the level of success demonstrated by the permanent magnets. The proton beam was navigated along a curved path some two-thirds of a mile long without needing any course adjustments from the corrector magnets, which have been recycled from the old Main Ring accelerator that has been dismantled, with its functions assumed and extended by the new Main Injector.

"We were confident it would work because of the magnetic field measurements that were done when the permanent magnets were built, but the beam always has the final word," said Cons Gattuso of the Main Injector Department, who is Operations Specialist for the Recycler.

"But it was also very surprising," he continued. "A lot of us thought we would need to have the corrector magnets on and running in order to get the beam all the way around. We have correctors throughout that region, but we didn't have to use them."

The beam also carried three critical messages: first, that the magnets had been aligned correctly; second, that there were no obstructions in the beam path; and third, that the Recycler was a true 8-GeV machine, meaning everything had been done right the first time, and the machine's energy level was a good "match" with the Main Injector.

Permanent magnets are a BIG HIT in the UNIQUE Machine that Combines the OLD and the NEW.

"If it hadn't worked, we would have had to remove all the magnets from the tunnel and rebuild them," Gattuso said. "With permanent magnets, we have no way of adjusting the magnetic field without taking the magnets out of the tunnel. In the Main Injector, we adjust the magnetic fields so that an 8-GeV beam is centered in the beam pipe. When we injected that beam into the Recycler, and it was running in the middle of the Recycler beam pipe, we knew the magnets had been designed and built correctly."

The last of the magnets are being installed in the coming weeks, along with the last sections of vacuum pipe and instrumentation for measuring the beam's intensity, while the accelerator complex is shut down to allow construction access in the tunnels.

"It will be interesting to see what the remaining two-thirds of the ring has in store for us," Gattuso said.

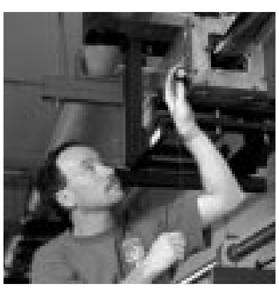
When it's completed, the Recycler might have an old idea recycled for its future: electron cooling, which has a history dating back to 1978 at Fermilab, though that history had a long hiatus between 1986 and 1995.

Electron cooling was first developed in Russia and first tested in the laboratory in Novosibirsk, in Siberia, where Sergei Nagaitsev received his university training. Nagaitsev now has an office along Fermilab's Linac corridor, complete with a poster of the classic VW Beetle, another recycled idea. He is working on the project to adapt electron cooling for use in the Recycler, alongside the stochastic cooling process that has become the standard in maintaining high-energy particle beams.

Photos by Reidar Hahn

Reed Dewey, of contractor Borg Mechanical, welds sections of the Recycler vacuum tube.

Cons Gattuso, Operations Specialist for the Recycler, checks out the radio frequency cavities and a new section of the vacuum tube waiting to be installed.



John Kyle of the Particle Physics Division's Technical Centers works on aligning the Recycler magnets.

"At one point, electron cooling was considered an effective way to cool antiprotons coming from the target," Nagaitsev related. "However, stochastic cooling was invented and it turned out to be superior to electron cooling when the antiproton beam comes away from the target very hot, at very large angles. Stochastic cooling was invented at CERN (the European particle accelerator laboratory), and it led to the discovery of the W and Z bosons and to a Nobel Prize for Simon van der Meer and Carlo Rubbia (in 1984)."

Stochastic cooling, which shifts individual particles within the beam, can only take the cooling process so far before getting bogged down. For the Recycler, electron cooling will take over after stochastic cooling has reached its limit, and then cool down the beam to a small enough cross section for reuse in Tevatron collisions.

A 200-MeV cooling ring had actually been built at Fermilab to test both electron and stochastic cooling, in an area that is now a parking lot alongside the Booster tower. The ring was decommissioned in 1983, and many of the parts were sent to be recycled at the Indiana University Cyclotron Facility—coincidentally, where Nagaitsev earned his doctorate. He's been bringing the idea back to life at Fermilab since 1995, and if all goes well, the electron cooling system will be installed for use on the Recycler some time within the next four years.

In electron cooling, a segment of the Recycler up to 150 feet long will actually house two particle beams—an antiproton beam and an electron beam—racing side-by-side and bumping into each other. The antiproton has 2,000 times the mass of the electron; when they bump, the antiproton gets nudged while the electron absorbs most of the energy of the collision and flies off at an angle. Essentially, the electrons take away energy from the outer edge of the antiproton beam, reducing the size of its cross section.

For electron cooling to work, the particles must be traveling at the same velocity. For an 8-GeV antiproton beam, that translates into a 4-MeV electron beam with 700 milliamps of current, which could take huge amounts of power to generate—approximately 2 megawatts. Nagaitsev described electron cooling as an everyday tool for low-energy particle beams, but said that using it for high-energy beams (such as in the Recycler) has been impractical. Nagaitsev hopes to change that through the work underway in part of a fixed-target building at Fermilab, and at test facilities provided by National Electrostatics Corporation in Middleton, Wisconsin.

The system uses a conventional electron gun and a trademarked variation on the classic Van de Graaff electrostatic generator called the Pelletron, which uses a chain filled with metal pellets (hence, "Pelletron") instead of a belt to charge a high-voltage terminal.

"The components are mainly old technology, and there's really nothing exciting about them," Nagaitsev said. "But the combination we're putting together is new. What's really exciting is that to generate the power we need, we're forced to use a trick. That trick is called beam recirculation."

The electrons used to cool the antiproton beam are recollected, and their energy is recaptured and restored to the Pelletron. Nagaitsev said the system recycles about 99.999 percent of its beam energy. Once the system is pumped up and running, it can be maintained with an introduction of power equal to the small loss incurred in the system.

In one example, Nagaitsev said a level of 300 kilowatts (needed to run the various motors and power supplies for generating and focusing the beam) could be sustained by adding just three watts from a Pelletron charging power supply, with the rest recycled from the electron beam. Nagaitsev said the system under development has now generated as much as 700 milliamps of current, "and this is the level we need to achieve electron cooling in the Recycler."

It's an idea whose time has come and gone and come back again, altogether fitting for a machine called the Recycler.

How to Make ANTIPROTONS

Rare particles reside in the realm of everyday reality at Fermilab.

by Mike Perricone

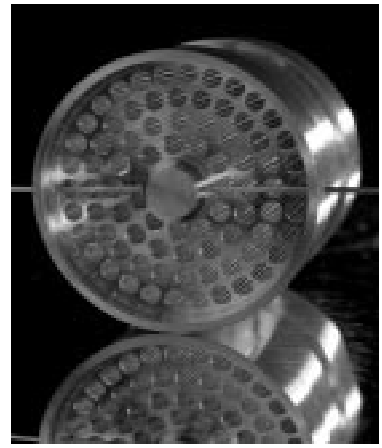


Photo by Reidar Hahn

A prototype for the target where antiprotons are produced from proton collisions.

Antimatter is the stuff that science fiction dreams are made of: use it as a power source, and you can embark on your own "Star Trek." Or so the movies tell us.

Antimatter will remain the fuel of dreams for the foreseeable future. But antimatter in the form of antiprotons—the mirror image of protons, carrying the same mass but an opposite (negative) charge—is a fact of everyday life at Fermilab, and nowhere is the production process better known or documented.

Collecting just 19 antiprotons requires a million collisions between protons and a fixed target. There are about $2x10^{25}$ antiprotons to the ounce; it would take about 20 billion years to produce a full ounce of antiprotons at Fermilab. As rare as they are, antiprotons fuel hopes for new discoveries. The observation of the top quark in 1997, for example, resulted from the collision of protons and antiprotons.

The Antiproton Source, the triangular-shaped ring wedged between the Booster and the new Main Injector, has three main components: a target, where antiprotons are produced; and two storage rings. The Debuncher accepts pulses of antiprotons and begins cooling them into a beam; and the Accumulator refines that beam into a dense core and stores it.

Antiprotons originate as a beam of 120-GeV protons extracted from the Main Injector and transferred to the target, a drum consisting of sections of nickel. The proton beam is directed not toward the end of the drum, but through the side. The drum is rotated after each "hit," so the proton beam does not keep landing in the same place.

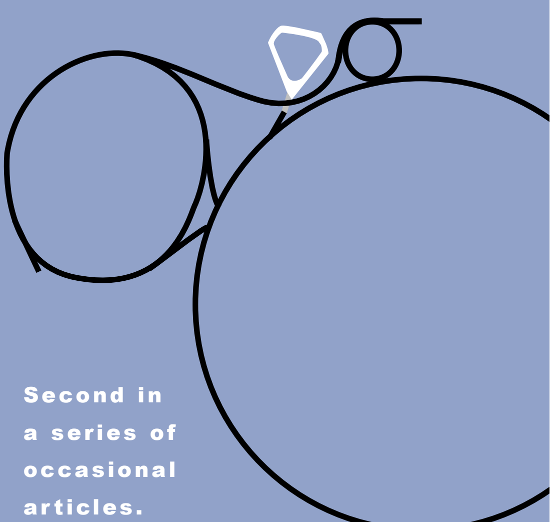
"If we hit the same spot all the time, we would destroy the target," explained Dave McGinnis of the Antiproton Source.

The particles coming off the target are splayed in all directions, but they must be channeled through a beam pipe of limited diameter. But conventional magnetic focusing, using two separated quadrupole magnets, like those in the Main Injector, requires too much space and allows the beam to spread out too wide to fit the downstream beampipe. Each of the quadrupoles focuses the beam in just one plane, horizontally or vertically. The solution is a magnetic lens focusing in both planes simultaneously.

"The only way to do that," said McGinnis, "is to take a (tubular) hunk of metal and run a ton of current down through it, so that the magnetic field provides focusing that is radially inward no matter what plane you're in."

The lens is made of lithium, a metal light enough to prevent the antiprotons from scattering. The lens is surrounded by a transformer to supply the necessary current of 650,000 amps. The current, magnetic field and radiation subject the lithium lens to tremendous stresses.

Follow THE PARTICLES



Second in a series of occasional articles.

Photo by Reidar Hahn

Fermilab Director John Peoples was the project manager for the design and installation of the Antiproton Source.

"We're on our 20th lithium lens," McGinnis said. "They cost about $100,000 each. We try to get 10 million pulses from a lens."

After the jumble of particles is focused through the lithium lens, a pulsed magnetic field kicks out positively charged particles and bends negatively charged particles farther along the beam path. There are other negatively charged particles in addition to the antiprotons; but these, primarily pions, decay quickly. What's left is a beam of antiprotons.

The antiprotons come off the target in bunches 20 nanoseconds apart, bound for the Debuncher Ring. Using radio frequency accelerating cavities, the Debuncher eliminates the bunch structure to reduce the beam's very large energy spread. This process takes only 40 milliseconds, with a two-second wait before the Main Injector accelerates another batch of protons to make antiprotons. The Debuncher uses this extra time to "pre-cool" the beam.

The antiprotons produced at the target station form a diffuse (or random) beam that would not be useful for colliding beam physics. Stochastic cooling removes the randomness of the particles. Since heat can be defined as randomness of motion, like the randomness of motion of a gas in a balloon, a less-random beam is said to be cooled.

"In stochastic cooling," McGinnis explained, "we go to every little antiproton in the beam and say, 'Are you random? Are you moving around? If you are, please stop!'"

Stochastic cooling also dictates the distinctive triangular shape of the Debuncher and Accumulator.

"The Debuncher would love to be a circular ring," McGinnis said. "But we want to have it in the same tunnel as the Accumulator, which is a triangle to help in stochastic cooling—our bread and butter. Most of the Antiproton Source has been designed to be a very good stochastic cooling machine."

Actually, the Accumulator is a pseudo-triangle with flat sides and rounded corners. The corners act as

Photo by Fred Ullrich

An aerial view shows the distinctive rounded triangle shape of the Antiproton Source, with Wilson Hall in the background.

"IT USED TO TAKE 20 to 24 hours TO BUILD UP ENOUGH ANTIPROTONS TO SUPPLY THE TEVATRON," MCGINNIS SAID. "NOW IT WILL TAKE US ABOUT 12 HOURS.

a prism, separating out particles with different momenta; as they go around the corner, particles with low momenta go to the inside of the track, while particles with high momenta go to the outside of the track.

To resolve or "see" antiprotons, the stochastic cooling systems must have wide bandwidths on the order of several billion Hertz (gigahertz). Microwave phased-array antennas (pickups) that are placed on the walls of the beam pipe detect the motion of the antiproton beam. These pickups intercept the electromagnetic wake of the high-speed antiproton beam—like detecting the motion of a boat traveling on a river by recording the size of the wake that hits the riverbank.

Even with such huge bandwidths, the stochastic cooling systems cannot resolve the motion of a single antiproton: there's too much noise from all the other antiprotons passing over the pickup at the same time. Only a phenomenon called "mixing" makes cooling possible.

Mixing is just what it says: particles with different momenta take different times to travel around the ring, and get spread out over the beam. After a few turns around the ring, the initial "noise" signal is replaced by a weaker "noise" signal from a more diffuse set of background antiprotons. Eventually the noise averages to zero and the cooling system can resolve a single antiproton.

The signal detected by the pickup is next amplified by a factor of 10^{15}(picowatts to kilowatts), then filtered and applied to the kicker array. Because mixing can quickly re-jumble the antiprotons, the pickup signal must travel to the kicker array in less than one half of a millionth of a second. Since an antiproton takes about 1.6 millionths of a second to make the trip around the Accumulator or Debuncher, the pickup signal must take an underground short-cut across the rings to arrive at the kicker array in time. The kicker array, very similar to the pickup array, transmits electromagnetic waves to the center of the beampipe which deflect (or kick) the antiproton beam in the right direction.

After pre-cooling in the Debuncher, the beam is transferred to the Accumulator and merged with antiprotons created during previous Main Injector cycles. Stochastic cooling increases the density of the beam by a factor of about 18,000 to make it useful for colliding beam physics. In the Debuncher, where there are about 50 million antiprotons, the cooling process takes seconds. But in the Accumulator, with as many as a trillion antiprotons, cooling takes tens of minutes.

With so few antiprotons in the Debuncher, the thermal noise generated within the pickups themselves can overwhelm the antiproton signal. Among the major upgrades for Run II, the pickup temperature will be lowered from -320 degrees Fahrenheit to -440 degrees, reducing that noise. The frequency range of the cooling systems will grow from 2-4 GHz to 4-8 GHz. Also, the bandwidth of the main Accumulator cooling system will grow from 1-2 GHz to 2-4 GHz to increase the rate for accumulating antiprotons. To stabilize the cooling system with this large increase, the Accumulator "mixing" was modified by changing the strength and location of several quadrupole magnets.

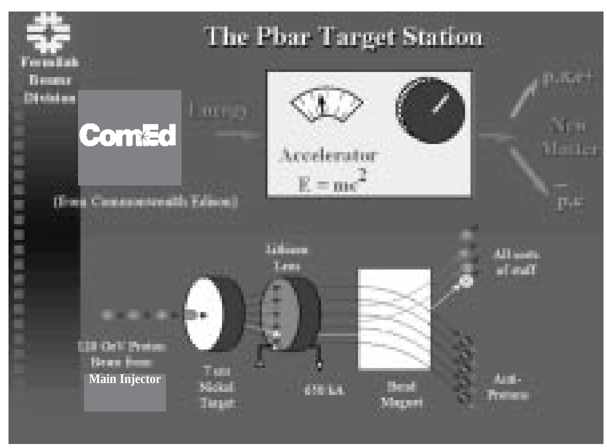


Illustration by Dave McGinnis

How antiprotons are made: The "big picture" (top) shows lots of power running through a particle accelerator and producing new matter. The diagram (bottom) shows protons from the Main Injector passing through the nickel target, moving on to the focusing lithium lens, and then to magnetic separation. The positively charged excess particles are directed in one path, and the negatively charged antiprotons in the opposite path.

Once the 8-GeV antiproton beam is packed up nice and tight, it's ready for transfer back to the Main Injector, where it will be accelerated to 150 GeV and handed over to the Tevatron.

"It used to take 20 to 24 hours to build up enough antiprotons to supply the Tevatron," McGinnis said. "Now it will take us about 12 hours. With our upgrades, the process will go much faster and we'll produce a much denser beam of particles."

And use that beam to fuel the hopes of new discoveries in particle physics.

Counting Birds


Photo by Reidar Hahn

Great Egret

Every year for the last 22 years, serious birders have been doing a Christmas Bird Count at Fermilab, part of a national bird census organized by the Audubon Society. This past Christmas, when unseasonably warm weather hung on in Illinois (until a record blizzard chased it away), the count beat all counts to date.

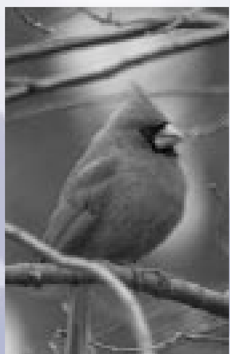


Photo by Nagendra Kolluru

Northern Cardinal

Fifty-five species were identified on the property, with record numbers of some regular visitors. Waterfowl were everywhere—geese of all kinds, like the pesky Canada geese, of course, as well as snow geese and greater white-fronted geese—lingering here because of the warm temperatures rather than continuing their journey farther south. Birders counted 68 northern shovelers, distinguished by the long flat bills they use to skim the surface of the water for algae. Winter travelers were here, too, like dark-eyed juncos and American tree sparrows, feasting on seed heads in fields and scrubby areas. There were the familiar faces of year-round residents—native species like mourning doves and black-capped chickadees. Great blue herons, which have been nesting onsite for at least the last decade, were seen picking their way along the edges of the ponds and canals, hunting for fish. The great horned owl was still out in the oak savanna. By February, she was trading nests, as she's been doing for years, with the local red-tailed hawk.


Photo by Reidar Hahn

Red-tailed Hawk

The census brought surprises, too, like a flock of 70 sandhill cranes—the first time the species has ever appeared in Fermilab's Christmas Bird Count. It was the first time, too, that anyone had seen a rusty blackbird here—yet one more reason why Fermilab remains one of the best places to birdwatch in the entire Chicago area.

Photo by Nagendra Kolluru

Marsh Wren

Photo by Nagendra Kolluru

Golden-crowned Kinglet

Photo by Nagendra Kolluru

Northern Pintail

Photo by Carl R. Sams II

Sandhill Cranes

Note: Not all the birds pictured were observed during the Christmas count.

the talk of the lab

People Ask the Darnedest Things

The Fermilab webmaster receives questions daily from far-flung correspondents. Many of the questions seek lessons in basic principles of physics, and their answers could undoubtedly fill a book: Why do particles and antiparticles annihilate one another when they meet? Why can't we see the photons that mediate the electromagnetic force? Why is the neutron unstable? Why do you think the top quark is the end of the particle line? How strong is the strong force?

Some correspondents are eager to propound their own theories. "Have you tried the idea that quarks are conglomerates of inertial photons?" wrote one person. Another said that the speed of light was not 300,000 kilometers per second: "This is only the crystallization of space-time into the remaining six dimensions." Still another figured that "the speed of light will only be achieved by a pulling action and not by a pushing action."

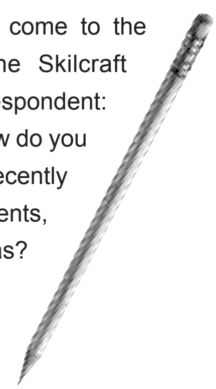
We have some regular correspondents, like Dan Derrig, whose eighth-birthday wish was to visit Fermilab. At 7 years old, Derrig wrote to say he had discovered the mass of the neutrino: .789 MeV for the electron neutrino, 69.94 MeV for the muon neutrino and 891.7445 MeV for the tau neutrino. The webmaster broke the news gently: His calculations rested on false assumptions.

Another youngster, nine-year-old Riley (Buddy) Cumberland proposed a design for an "exelrator" to "accelerate subatomic particle that have a charge to about the speed of light without a lot of electricity." The design is on Fermilab's Web site. Fermilab physicist Bill Foster responded for the webmaster, saying, "I was delighted to see someone of your age working on a problem as tough as the one in your letter."

The webmaster is called on to help with all kinds of problems, not just those related to high-energy physics. One apparently beleaguered fellow wrote from Texas, "where fire ants take control of everything." He wondered whether the microwave oven could be built without a door and placed on top of fire ant mounds to "cook these babies."

There are some unusual questions. One correspondent wondered whether a person's aura was made of quarks.

He had read that the energy of an aura can get stuck on earth when a person died, and that ghosts were merely the energies of these auras, or quarks. Did Fermilab study auras? the correspondent asked. Foster again aided the webmaster in responding. "First thing: quarks aren't anything special!!! Almost your whole body is made of quarks," he wrote. And no, "Fermilab does not do any research on auras or any supernatural stuff."



Finally, it's not clear why some questions come to the Fermilab webmaster, instead of, say, the Skilcraft company. Wrote one recent apologetic correspondent: "This might seem like a silly question, but how do you keep pencil erasers from drying out? I recently acquired hundreds of old pencils for my students, but the erasers are dry and brittle. Any ideas? Thanks."

—Sharon Butler

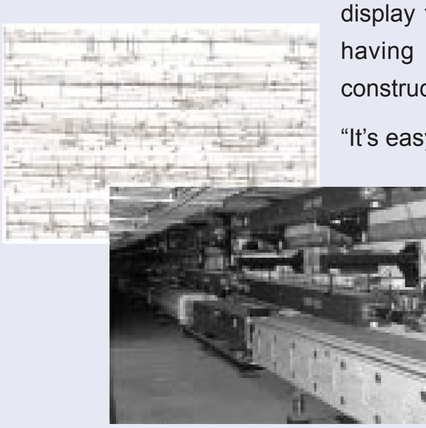
Clicking and touring the Recycler

With a click of a mouse button, the dense schematic drawing at the Fermilab Recycler website turns into a photo gallery. Click on a section of the drawing, and up pops a color image of that segment of the tunnel—real-life magnets, beam pipe and cabling.

the talk of the lab

"It's a good tool to have," said Cons Gattuso of the Main Injector Department, who is the Operations Specialist for the Recycler. "It's useful to people who have not had a chance to go down into the tunnel and see the layout for themselves. And it means we can bring in people who know how to commission an accelerator, but don't know the specifics of this machine—for example, people who have worked on the Main Injector and then help out with commissioning the Recycler. They can familiarize themselves with how things are done."

The site (www-recycler.fnal.gov) is still under construction. Gattuso spent a weekend putting the display together, despite having no experience in constructing a Web page.



"It's easy to do with the Recycler, because there are fewer adjustable components than there are on the Main Injector," he said. "But eventually, I'd like to have the whole ring set up this way."

—Mike Perricone

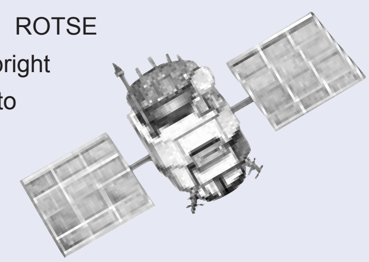
Cold War payback: GRB990123

When the BATSE and Beppo-SAX satellites spotted a gamma ray burst that was millions of times brighter than a supernova, the discovery had its roots in Cold War technology.

Satellites capable of detecting gamma ray bursts were developed in the 1970s to detect emissions from nuclear weapons during the peak of the weapons standoff between East and West. Now they're used to detect gamma rays and x-rays from distant astronomical objects—like the gamma ray burst event of January 23, 1999 (GRB990123), the subject of a presentation by Timothy McKay of the University of Michigan (a former Fermilab researcher) in the Lab's Wednesday afternoon colloquium series.

The satellites relayed information to ROTSE (Robotical Optical Transient Search Experiment), a collaboration of the University of Michigan, Los Alamos National Lab and Lawrence Livermore National Lab. And the collaboration was able to track the burst in "real time," beginning its observations 22 seconds after the burst began, because of an accident.

"The (satellite's) tape deck broke, and we had to use the real-time downlink that is usually reserved for the military," McKay said.



About a half-minute after the ROTSE observation, the burst was bright enough to be easily visible to amateur astronomers with telescopes. The burst, which McKay described as "the most luminous object ever observed," probably posed more questions than it answered.

"How far away was it? That's the basic problem of astrophysics," McKay said. "We don't know how the energy was emitted, or the source of the energy. Is it coming from a star-forming region?"

But McKay said the data showed a high red shift, an indication of large distance, and "the energies were enormous:" on the order of 10^{51} ergs. By contrast, a nova is in the range of $6x10^{44}$ ergs.

Whatever all the results will eventually say, McKay declared: "The future is very bright for gamma ray bursts."

—Mike Perricone

LETTERS TO THE EDITOR

Reading the last couple of issues of FERMINEWS has moved me to write and congratulate you on the new look of the magazine. It is even more reader-friendly, particularly for those lay readers outside the technical community who find it an essential guide to your work. Not only that, but I continue to be impressed by the way in which you elevate everyday life at Fermilab into interesting features that give a real sense of community.

As possible ideas that could be the kernel of a future inspiration, I am always intrigued by the menus in your restaurant! I say this because the BBC office here at Millbank, in London, where we produce the political news out of the Westminster government across the road, has no staff canteen. We DO have a young lady who brings sandwiches around in a plastic box twice a day, so we can eat at our desks.There is a limit to the appeal of this. Anything, therefore, that looks like the promise of exotic food, albeit across the Atlantic, takes on a special meaning.

I am also a keen photographer (LRPS, Licentiate of the Royal Photographic Society), so I am interested in the illustrations. Some of the published portraits are excellent, and I am always pleased when you are able to let your photographers free to exploit the obvious artistic potential of hi-tech machinery. More please, and perhaps profiles of your photographic team?

Finally, I was also amused and impressed by the seasonal page I found on the Net, "Santa at Nearly the Speed of Light." After reading it I was left wondering whether, in light of the recent news about kaon-antikaon transformation and the question mark raised over the "reversibility" of time, Santa's presents, once past, could become presents again. And did Charles Dickens know more than he admitted with the concept of Christmas Past, Present and Future in "A Christmas Carol"? Might the violation of time symmetry by kaons be renamed "The Scrooge Effect"??

Chris Rogers
BBC South West Political Editor
Millbank, London, & Plymouth, England

Howdy—quick comment on a Milestone in a previous issue. I know how anxious we all are for winter to come to a quick close but, given our current Canada geese population, is the fact that they have paired up, with lust in their blessed little hearts, really such a plus?

Jim Kerby

MILESTONES

HONORED

Graduate student Eric Hawker of Texas A&M, on Fermilab Experiment E866, for his Ph.D. dissertation. The award was given by the American Physical Society's Division of Nuclear Physics. His thesis advisor was Dr. Robert E. Tribble of the same university.

DIED

On February 26, Bjoern H. Wiik, Director of DESY, in an accident. Wrote Brian Foster, spokesman for the ZEUS Collaboration, "Bjoern was a great scientist, a great leader and a good friend to many of us. He will be sorely missed."

Why are these people smiling? Yet another NuMI Project milestone nears completion as the NuMI Project Management Plan is delivered to DOE's Ron Lutha by NuMI Project Manager Tom Fields. Approval of this document, the Laboratory's plan for managing the $136-million NuMI project, was one of the action items from the DOE Baseline Review of NuMI in November 1998. Left to Right: Fermilab Director John Peoples, Tom Fields, Ron Lutha and Bob Wunderlich, of DOE.

— David Ayres

Photo by Reidar Hahn

Fermilab Arts Series Presents

Jazz Passengers featuring Deborah Harry

The Jazz Passengers is a fitting name for this group of zany, adventurous musicians. This odd collection is made up of composer/saxophonist Roy Nathanson, Curtis Fowlkes trombone and vocals, vibraphonist Bill Ware, bassist Brad Jones, the multi-percussion talents of E.J. Rodriguez, and the amazing violin playing of Rob Thomas. **The group is joined by none other than guest vocalist Deborah Harry, the legendary front singer of Blondie!** Don't miss this provocative performance on March 6, 1999, at 8 p.m. in Fermilab's Ramsey Auditorium.

With roots in the conception jazz band of the late 1970s, the *Lounge Lizards*, the band has now recorded six albums in this current configuration. Their combination of music and comedy that has taken them from The Knitting Factory (a performance space in NYC) cult status to festival stages all over the world.

They have now been joined by the legendary pop/rock goddess Deborah Harry. While most universally recognized for her role in the group *Blondie,* Deborah has also achieved individual status as a solo artist. Throughout her career Deborah has experimented with different formats of music, proving her seemingly unlimited vocal abilities compatible with just about every genre of music. She has reinforced her acting career, performing most recently in *Heavy*, co-starring Shelly Winters and Liv Tyler, which was featured in the Cannes and Toronto film festivals in 1995.

Tickets are $20 and available by calling (630) 840-ARTS.

Chez Léon MENU

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
HTTP://WWW.FNAL.GOV/FAW/EVENTS/MENUS.HTML

LUNCH
WEDNESDAY, MARCH 10

Game Hens with Coconut Curry Sauce

Basmati Rice with Black Beans

Coconut Cake with Caramel Sauce

DINNER
THURSDAY, MARCH 11

Fettuccine Carbonara

Roast Leg of Lamb with Balsamic Sauce

Grilled Vegetable Ratatouille

Lemon Cake with Fruit Compote

LUNCH
WEDNESDAY, MARCH 17

Fontina, Mushroom and Bacon Lasagna

Caesar and Onion Bagel Crouton Salad

Walnut Coffee Tart with Coffee Cream

DINNER
THURSDAY, MARCH 18

Onion Soup Gratinee

Salmon and Spinach Wellington

Exotic Greens with Fontina and Walnuts

Hazelnut Torte with Frangelico Crème Anglais

FERMINEWS

FERMILAB
A U.S. DEPARTMENT OF ENERGY LABORATORY

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CLASSIFIEDS

FOR SALE

- ’97 Honda Accord EX wagon,black, 26K miles, very good condition. $16,500. Contact David, x4001 or dcc@fnal.gov.
- ’68 Yamaha Grand Prix YR-2 motorcycle, 10k original miles, good shape, sitting in garage for 3 yrs. Make offer. Call Greg Lawrence, (630) 557-2523 or x3011.
- 88″ reclining sofa. Comfortable, in good condition. Transitional style with neutral gray color, $200. Contact Nan, x4550 or nlarson@fnal.gov.
- Golf Eq, Titleist DCI Irons 2-SW, reg. flex, steel shafts, $250. Cobra metal woods, titanium driver, 3 & 5 woods, reg. flex, graphite shafts, exc. cond., $250. Topflite carry bag, w/stand, new, $50. Umbrella, new, $10. Variety of balls. Call Jim, x4293 or (630) 585-0907.

FOR RENT

- Apartment to sublet: unfurnished, 1 bdrm in Warrenville, $635/mo. Phone Thornton, x3150.

WANTED

- House to rent w/yard for a dog. Professor coming to Fermilab on sabbatical from 6/1/99-8/1/00. Contact Alice Bean, abean@ukans.edu.

CALENDAR

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

MAR 6

Fermilab Art Series presents: *Jazz Passengers, Featuring Deborah Harry,* $20. All performances begin at 8 p.m. in Ramsey Auditorium, Wilson Hall. For tickets or more information call (630) 840-ARTS.

MAR 9

Wellness Works presents: “Comparing Exercises,” Covert Bailey’s Video Series, noon–1, in 1 West.

MAR 10

The Fermilab Barnstormers Radio Control Model Club annual Delta Dart Night, Kuhn Barn at 5:30 p.m. All employees & their families are invited. The Delta Dart is a small rubber band powered airplane constructed of balsa wood & tissue paper. Build one in ~ 45 minutes then fly it for fun & prizes. Barnstormers will guide you through the construction & give tips for flying. Materials are $1 for adults & teenagers, juniors (12 & under) are free. The junior’s fly off begins at 7 p.m. For more info call Fred Krueger, x5516, or Jim Zagel x4076.

MAR 12

International Film Society presents: *The Killing.* Dir: Stanley Kubrick, (USA1956, 85 mins.) Film at 8 p.m. in Ramsey Auditorium, Wilson Hall, $4. (630) 840-8000.

MAR 14

Barn dance in the Kuhn Village Barn 7 p.m. All dances are taught, people of all ages and experience levels welcome. Admission is $5, children under 12 are free (12-18 $2). Sponsored by the Fermilab Folk Club. For more info, Lynn Garren, x2061 or Dave Harding, x2971.

MAR 16

Wellness Works presents: “How to Get Fit Fast”, Covert Bailey’s Video Series, noon–1, in 1 West.

MAR 18

Wellness Works presents: Get the Facts on Fat! By Kim Pedroza-a registered dietitian, Edward Hospital, Naperville, noon–1 in 1West.

ONGOING

NALWO coffee, Thursdays, 10 a.m. in the Users’ Center, call Selitha Raja, (630) 305–7769. In the 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. English classes on Tuesdays at the Users’ Center. Beginners from 9–10 a.m. & intermediate students, 10–11 a.m. Fee of $4 per morning. Students welcome to attend both classes. Lessons taught by Rose Moore, (630) 208-9309.

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