

FermiNews

The Newsletter of the Fermi National Accelerator Laboratory

SCIENTISTS PLAN SEARCH FOR COSMIC ACCELERATOR

Fermilab's Tevatron, the most powerful particle accelerator on earth, can accelerate protons to an energy of 10^{12} electron volts (eV). Somewhere in space, out beyond our own galaxy, is an accelerator with considerably more oomph. It spits out particles that reach the earth with an energy as high as 10^{20} eV, 100 million times the energy of the Tevatron.

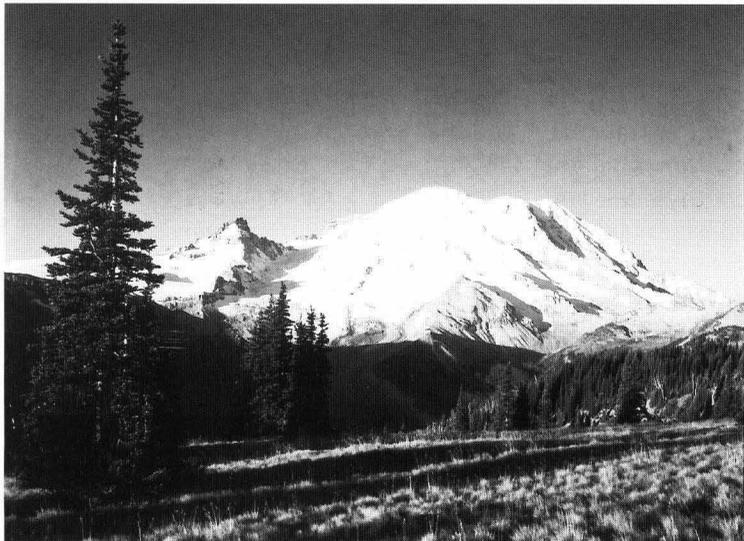
We know the accelerator is out there because here on earth we can detect some of the high-energy particles it produces. But where is this cosmic super accelerator, and how does it work? Scientists from 14 nations will meet at Fermilab beginning this month to plan an experiment to try to answer these questions and, in the process, learn more about the structure and origin of the universe.

Before the development of high-energy accelerators, physicists studied subatomic particles by observing cosmic rays, the somewhat misleading name for charged subatomic particles accelerated to earth at high energy from sources beyond the

In the 1950s physicists exchanged cosmic rays on mountaintops for intense particle beams in accelerator laboratories. Today, new cosmological questions have given physicists renewed interest in studying cosmic rays, this time with new technology and increased knowledge.

earth. They often set up experiments on mountaintops, where the atmosphere was thin. In the 1950s physicists exchanged cosmic rays on mountaintops for intense particle beams in accelerator laboratories. Today, new cosmological questions have given physicists renewed interest in studying cosmic rays, this time with new technology and increased knowledge.

Beginning January 30, 1995 an international design group will convene at Fermilab to produce a technical design report for a giant cosmic ray detector. The Giant Airshower Detector Design Group, led by co-chairpersons JIM CRONIN of the University of Chicago and PAUL MANTSCH of Fermilab's Technical Support Section, will work together for six months to produce a design document outlining the scientific justification, technical design, cost estimate and a worldwide



Discovering the source of high-energy cosmic rays is a search that has taken scientists from the depths of coal and copper mines to the mountaintops.

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TOP STUDENTS READY FOR REGIONAL SCIENCE BOWL

When the area's top high school science and mathematics students and their coaches arrive at Fermilab on February 25, 1995, they'll have one thing on their minds: "The word *atom* is from a Greek word meaning ... what?"

The answer to that question will probably be easy for most of these whiz kids (*Atom* comes from the Greek *atomos*, meaning "indivisible.") Instead, they'll be preparing for truly challenging questions, perhaps in astronomy or biology, when they take part in the 1995 Fermilab Regional Science Bowl.

The thirteen teams from Batavia, Bolingbrook, Burlington, Crystal Lake Central and North, Dundee, Hampshire, Hinckley-Big Rock, Frankfort, Huntley, Peotone, Lockport and Streamwood will square off in the upcoming academic rivalry, but only one

will compete in April at the U.S. Department of Energy's National Science Bowl® in Washington, D.C. Team members' friends and family are expected to turn out to cheer for their teams in Ramsey Auditorium. Spectators also are welcome.

The Regional Science Bowl competition will follow a double-elimination format, incorporating the same set of rules used at the National Science Bowl.

Participation in the Science Bowl provides national recognition for students who excel in science and math, encouraging continued academic excellence.

Preparing for the Fermilab Regional Science Bowl requires team members to study astronomy, biology, physics, earth science, chemistry, math and computer science questions. The Department of Energy gives participating teams a list of study categories, sample questions and a preparatory video tape. The rest is up to the teams—with the students supplying the knowledge and enthusiasm and the coaches providing the leadership and encouragement.

All students participating in the Fermilab Regional Science Bowl will receive a tee-shirt and lunch courtesy of DOE and Fermilab. The top four teams will be awarded trophies.

After the showdown at Fermilab, the winning team and its coach will travel, compliments of DOE, to the 1995 Na-

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tional Science Bowl® April 28-May 1 in Washington, D.C. The lineup for the National Science Bowl will consist of winners from all of the Regional Science Bowls held across the country and in Puerto Rico. The prizes for this year's Science Bowl have not yet been determined. Last year's awards included science trips to Geneva, Switzerland; London, England and Alaska.—*Brian Charles*

Want to Lend a Hand?

Running the Regional Science Bowl requires the efforts of many people. Sixty volunteers will be needed to be timekeepers, moderator/rules judges, scorekeepers and scientific judges.

You can become a part of this exciting educational event by contacting **ROBIN DOMBECK**, x8260, DOMBECK@FNALV. Your time commitment will be from 7:30 a.m. to 2:30 p.m., Saturday, February 25. Training will be done that morning. If you can support education programs by volunteering for all or part of the day, please contact us.



Robin Dombeck (r) helps a participant from last year's Science Bowl draw for a starting position. Milwaukee's Rufus King High School took first place honors in the 1994 competition. Batavia High School placed second.

NALREC ELECTS NEW BOARD OF DIRECTORS

Members of Fermilab's Nalrec committee recently elected a new board of directors for the 1995-1996 term. On December 15 members elected NANCYBARTLETT (TS), president; JOANN HALL (BSS), first vice-president; EDJUSTICE (RD), second vice-president; DOMINICK CARULLO (TS), third vice-president; LINDA BAGBY (RD), secretary; and ALAN PETITT (CD), treasurer.

Nancy replaces JESSE GUERRA (RD) who served on the Nalrec board for over a decade. "I want to thank Jesse for more than 10 years of service and dedication to Nalrec. He made great contributions to the organization," said Nancy.

The board now is seeking new members and encourages interested employees to contact Linda at FNALV::BAGBY,

x3100 or Nancy at FNALV::NANCYB, x2902.

Nancy would like to remind all employees that Nalrec is your employee recreation group. "If you have any recommendations to improve events please e-mail me at FNALV::NANCYB or call me at x2902. We would like your support and look forward to seeing you at our next event."

To kick off the year, Nalrec is sponsoring a ski trip to Cascade Mountain in Portage, Wisconsin February 17 through February 19. The trip includes deluxe motor coach to and from the ski hill, hotel and Fermilab; two nights lodging at the Holiday Inn, Wisconsin Dells; two-day lift tickets at Cascade Mountain and sandwiches and refreshments on the bus. The price for the trip is \$155 per



New Nalrec Board Members, (l-r) Ed Justice, Linda Bagby, Alan Petitt, JoAnn Hall and Nancy Bartlett (seated). Not pictured: Dominick Carullo.

person/double occupancy. Contact Nancy at FNALV::NANCYB, x2902 or Pat LaVallie at FNALV::PLAVALLIE, x3111 to sign up for the trip.

Make your plans now to attend the St. Patrick's Day party March 17. Information will be available soon in *FermiNews*. New entertainment is planned for this and other upcoming events.

FOR YOUR HEALTH & FITNESS

MAKING FRIENDS WITH WINTER

For most healthy people, winter is no excuse to get cold feet about outdoor exercise. Staying indoors, and not getting enough fresh air, exercise and exposure to natural light, can lead to seasonal depression, as well as general grumpiness. Our animal instincts say "hibernate." We tend to eat more and gain a few pounds. Regular exercise can help hoist us out of the winter blues, and make friends with winter.

EMBRACE THE CHANGE

Instead of regarding winter as an unfortunate barrier, find something about it to like. A positive attitude helps us cope with the challenges of winter conditions.

EXERCISE CAUTION

Some health conditions are not compat-

ible with cold, dry air. People with asthma may be better off enjoying winter through the windows as they swim indoors, or work out on indoor exercise equipment. People with high blood pressure and heart disease should check with their doctors about exercising in the cold. While exercise may provide a healthy stress, the additional stress of a cold environment may produce system overload.

DRESS FOR SUCCESS

Appropriate attire can help you exercise comfortably and safely. When dressing to go outdoors, consider the intensity of the upcoming activity. People new to cold weather exercise often overdress, get hot and sweaty, remove layers too late, and then get chilled. When you first go outside to

exercise, you should feel slightly cool. You'll warm up after a few minutes. Open a zipper or take off a layer the minute you start to sweat.

PREVENT COLD INJURY

Hands, toes, ears and nose are most vulnerable to frostbite. Even though most of you feels warm, extremities can still suffer frostbite. Warning signs are numbness and a white appearance. Wear gloves or mittens, warm shoes and socks, and something over your ears to prevent frostbite in these areas. Your nose may need covering, as well, on very cold or windy days. Wear a hat to prevent heat loss from the head.—*Barbara A. Brehm, associate professor of Exercise and Sport Studies at Smith College, Northampton, Massachusetts.*

THOUSANDS VISIT LAB DURING 1994

FY94 was another big year for tours and field trips to Fermilab.

Perhaps more than once you heard the noisy arrival of a bus load of students gathering in the Atrium or saw a mass of curious adults peering through the windows of the Main Control Room. Or maybe you remember thinking you could make it to your meeting on time—only to have the elevator doors open to a sea of inquisitive visitors headed for the 15th floor.

Helping our many visitors learn more about Fermilab and the work that we do is an important function of both the Public Information Office and the Education Office.

Now, let's take a look back and see exactly how much foot traffic passed through the Lab's front doors in the last year.

On their own and without any Fermilab staff members to guide them, an estimated 25,000 people came to Fermilab and took self-guided tours of the Laboratory. They toured Wilson Hall and the site in small groups of usually two to three persons with many stopping in on the weekend.

In the same time, the Public Information Office—sometimes with the volunteer help of Laboratory staff members—conducted 137 tours for high schools, colleges and universities, civic organizations, clubs and professional societies. Most of these tours took place during business hours, but many of them, including the Sunday Summer Tours, were special events scheduled on either a weekend or an evening. In all, approximately 4,100 people participated in a Public Information Office tour.

Aside from tours, other people learned about Fermilab by inviting a speaker from the Laboratory to address their group at an off-site location. Last year—not counting the many invited talks that Lab employees are asked to give—the Public Information Office and Lab volunteers gave 10 off-site presentations to more than 700 people. The subject of these talks varied depending on the group's particular interest, but the chance to interact with civic leaders and members of service organizations provided a mutually beneficial opportunity to discuss the Laboratory and its role as a premier research facility.

The Education Office, also with the periodic help of volunteer Laboratory staff members, experienced another record year of field trips to the Lederman Center, Wilson Hall and various areas of the site. In all, approximately 6,600 students took part in 145 field trips, immersing themselves in science and mathematics activities.

At the Lederman Center, more than one dozen hands-on experiments were available to many of these students, giving them the feel for the operations and experiments that take place at the Laboratory. The six different field trips available to visitors from grade school through

On their own and without any Fermilab staff members to guide them, an estimated 25,000 people came to Fermilab and took self-guided tours of the Laboratory.

high school offer the opportunity to participate in activities that engage their minds and peek their curiosity about the world in which we live.

Satisfying all of the groups and individuals who visit the Laboratory each year is no easy task. Every visitor has a different level of interest in and understanding of high-energy physics research, and relating Fermilab's story so that it can be understood by all takes a certain amount of talent and enthusiasm on the part of everyone who performs this vital communication function. To everyone who has had the patience to wait for the next elevator while a group of visitors rode to the 15th floor, and to those of you along the favorite tour stops who have been kind enough to answer an on-the-spot question, we thank you. And to all of the Laboratory personnel who volunteer their time to assist with the important task of communicating the Fermilab story, we offer a sincere and hearty "thank you" for your help in the past year and in coming years.—*Brian Charles*

Support Services Issues New Property Pass

Support Services has issued a newly revised property pass, now available in the Stockroom.

The new, larger property pass has an additional yellow copy that will be used by the Property Office when Laboratory property is off site over 30

days. Instructions for the form's use have also been added to the bottom of the form.

Holders of the old forms should dispose of them in the nearest appropriate recycling bin and withdraw new ones from stock as soon as possible.

COSMIC RAYS

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survey of possible sites for the detectors.

The working group will include researchers from Argentina, Armenia, Australia, Brazil, China, Egypt, France, Germany, Italy, Japan, Korea, Russia, Sweden and the United Kingdom.

In the current project, scientists won't be perched upon mountaintops, but will instead be using detectors spread over an area of thousands of square kilometers. Scientists hope the detectors will help to locate the origin of the highest energy cosmic rays, those with energies greater than 10^{20} eV. Scientists have yet to discover the origin of the highest energy cosmic rays or the mechanism that accelerates these particles to such great energies.

WHERE TO LOOK

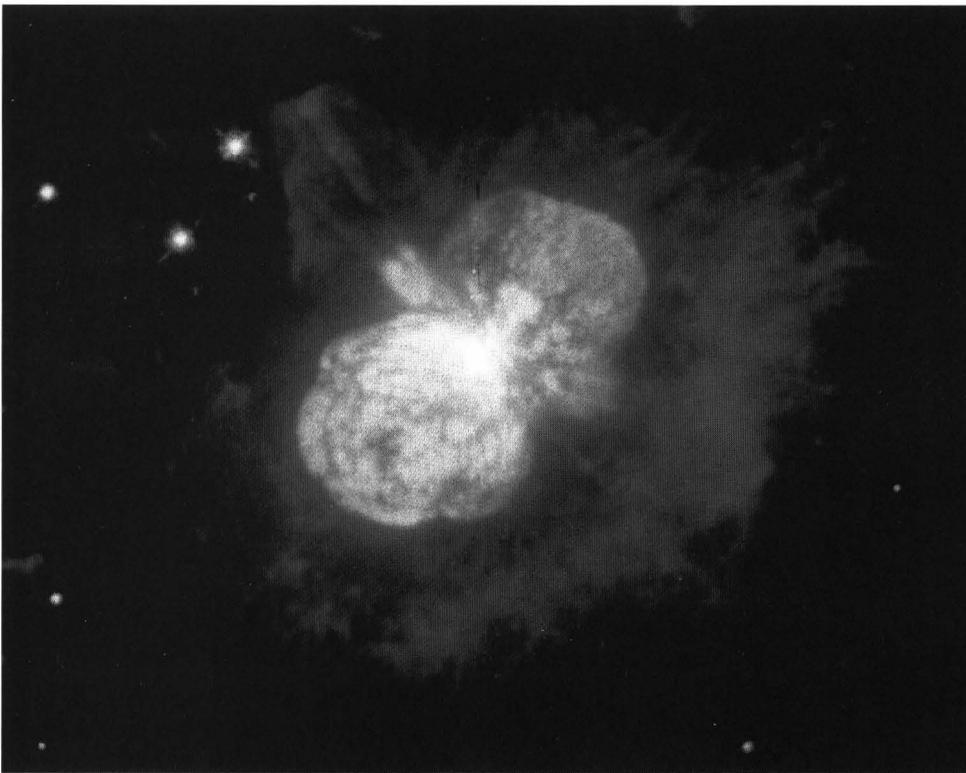
Detection of high-energy cosmic ray

particles relies on the measurement of the giant cascades, or extensive air showers, created when the cosmic rays enter the earth's atmosphere and collide with air molecules. These showers consist of hundreds of billions of particles spread over an area of 20 square kilometers, roughly the area of Fermilab. The rate of cosmic rays with energies over 10^{20} eV is only about one per square kilometer per century. About 10 such cosmic rays have been observed over the past 30 years.

Recently, two very high-energy cosmic rays were observed by air shower detectors stationed in Utah and Japan, observations that prompted Jim Cronin to make the original proposal for the new experiment. According to Paul, these were some of the highest energy cosmic ray events that scientists have seen in the last three decades of cosmic ray research.

A cosmic ray at the energy of 2×10^{20} eV was recorded at a 100 kilometer detector array in Akeno, Japan. A similar even higher energy event at 3.2×10^{20} eV was recorded by the Fly's Eye array detector in Utah. The Fly's Eye detector, built by the University of Utah, is segmented like the eye of a fly. It contains hundreds of photomultiplier tubes all pointing in different directions in the night sky to record the fluorescence of cosmic ray particle showers as they come through the atmosphere.

The proposed giant air shower detector will consist of a fly's-eye-type detector in the center of a large detector array. The array will cover 5,000 square kilometers and consist of 3,000 individual particle detectors spaced approximately one kilometer apart. These surface detectors will work simultaneously with the fly's eye and record particles as they hit the ground.



Could this exploding star be a source of cosmic rays? Scientists taking part in the Giant Airshower Design Group are confident they will one day find Mother Nature's mysterious cosmic ray accelerator.

The design group would like to construct two such air shower detectors, one to be built in the southern hemisphere and one in the northern hemisphere. Two detectors would cover the entire sky and increase the chances of finding high-energy cosmic ray events.

The detectors would also allow researchers to record at least 50 high-energy events a year. The trick, then, will be deciphering their origin and the mechanism that accelerates the cosmic rays. "This is where the interest and excitement lie," said Paul. "Since the highest energy cosmic rays are so energetic and bend very little in space, we should be able to look straight back and find their source. But when we tried to trace back the Fly's Eye and

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People Events

FERMILAB ARTS SERIES

AMSTERDAM LOEKI STARDUST QUARTET

"These four young players prefer to project a breezy, ironic, almost casual image to their art. But there is nothing casual about their impeccable intonation, masterly control...or flair for getting to the heart of many different musical styles."—*The Listener*

Formed in 1978, the Amsterdam Loeki Stardust Quartet brings a fresh and unconventional approach to playing recorder consort music. The four members of the Quartet, while still students at the Sweelinck Conservatory in Amsterdam, chose their name from one of their first arrangements: the "Loeki de Leeuw" ("Loeki the Lion") jingle featured in Dutch TV commercials. Despite its unusual name, the Quartet has won worldwide acclaim as a serious ensemble of unparalleled virtuosity. Hear what has impressed concert goers and radio listeners around the globe when the Amsterdam Loeki Stardust Quartet visits Fermilab's Ramsey Auditorium on Saturday, February 18 at 8 p.m.

The Quartet's repertoire ranges from

Renaissance and Baroque works to modern compositions, many of which are written or arranged by members of the Quartet. The group strives to present a wide range of techniques and sonorities within the framework of a recorder consort. Their Fermilab performance will include music from the 15th century, selections by Handel and J.C. Bach, and contemporary works by Dutch and American composers.

The ALSQ was the winner of the 1981 Musica Antiqua Competition in Bruges. Since then the ensemble has performed in Europe, Indonesia, Australia, Japan and the United States and has made numerous TV and radio broadcasts. The ensemble's first two recordings on Decca's l'Oiseau-Lyre label, *Virtuoso Recorder Music* and *Baroque Recorder Music*, both received the Edison Award, Europe's most prestigious record prize. *Extra Time* (1991) features the Quartet's performance of contemporary works. In 1993, Decca released *Capriccio di Flauti*, a special ALSQ compilation CD in honor of their 15th Anniversary.

Tickets for ALSQ are \$15. For reservations, call xARTS.



Amsterdam Loeki Stardust Quartet

MARK YOUR CALENDARS

The Wellness Works Committee has set its winter calendar of events. Upcoming activities include:

- Blood pressure screening February 21, 1995 from 11:30 a.m. to 1 p.m. in the Wilson Hall Atrium.
- Castle Orthopedics is scheduled to present a seminar on sports injuries with emphasis on knee injuries. The seminar is tentatively scheduled for February 28, 1995 from noon to 1 p.m. in 1 West Conference Room.
- Blood pressure screening March 21, 1995 from 11:30 a.m. to 1 p.m. in the Wilson Hall Atrium.
- Gregory Wojciechowski from the Fermilab Legal Office will give a talk on seniors and legal issues March 23, 1995 from noon to 1 p.m.

Congratulations

To Lynnette and MARK OBRYCKI (RD/EED) on the birth of their daughter Kaileigh Michelle Obrycki. Kaileigh was born on September 7, 1994 at 3:45 a.m. at Hoffman Estates Medical Center. She weighed seven pounds, seven ounces and was 19.5 inches long. Kaileigh is the Obrycki's first child.

TENNIS LEAGUE CROWNS WINNERS

The 1994 Fall Singles Tennis League ended on Christmas Eve and was a great success. A record high number of 28 players participated. The players were divided into four groups according to playing level. Players within each group were matched against each other and played one game per week for two months.

At the end of the tournament, participants were ranked according to the number of games won. These are the results, beginning with the highest level:

GROUP 1

Yasuo Fukui (RD)
Woohyun Chung (User)

GROUP 2

Romesh Sood (Directorate)
Mercedes Nylund

GROUP 3

Luc Demortier (CDF)
David Jarvis (AD)

GROUP 4

Jaco Konigsberg (CDF)
Stephane Colombi (RD)

Harper's Index

Height, in feet, of a West Virginia prison wall scaled last June by an escaping inmate using a cord made of dental floss: **18**

Percentage change, since 1992, in *New York Times* articles mentioning the "information superhighway": **+2,025**

MOVIE SCHEDULE

The Fermilab International Film Society presents movies from all over the world. Movies are shown at 8 p.m. Fridays in Ramsey Auditorium. Admission is \$3 for adults, \$.50 for children 12 and under.

■ January 27: *Das Boot*, An amazingly accurate account of the terrible hardships endured by German sailors when their U boat was forced to unheard-of depths during WWII. Wolfgang Petersen, director, Germany, 1981.

URA SCHOLARSHIP NOTICE

Candidates for Universities Research Association scholarships are reminded that applications are due March 1, 1995. Applications are available from and should be returned to Personnel, WH15SE, MS 124. Scholarships are awarded on the basis of Scholastic Aptitude Test (SAT) scores.

URA awards a number of scholarships to

regular, full-time Fermilab employees' children who are currently high school seniors and who will begin a four-year college degree program next fall. The maximum amount of the scholarship is \$3,000 for tuition and fees and is renewable for four years if the student progresses in good academic standing. Applicants will be notified regarding the scholarships in early April.

BENEFITS NOTES

USE IT OR LOSE IT

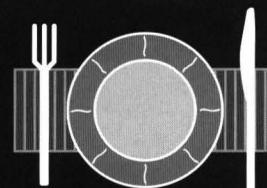
The latest reimbursement report from CIGNA shows that many employees have sizeable balances in their flexible spending accounts. The filing deadline for submitting 1994 eligible expenses to CIGNA is March 31, 1995. Don't wait to the last minute. The bills must be in CIGNA'S office on that day. If you don't use it, the IRS says you lose it.

UPDATES

Updated information on the dental plan and the business travel accident plan was mailed to all employee's mail stops this past week. The materials included replacement pages for your *Group Dental Plan* booklet and your *Life and Accident Plan* booklet. If you did not receive the materials, please call the Benefits Office at x3395, 4362 or 4351 for copies.

Chez Léon Menu

Lunch (Wed) \$8.00 • Dinner (Thurs) \$20.00
Reservations: x4512



Wednesday, January 25, 1995 • Nova Scotia quiche, mixed salad, poached pears with raspberry sauce

Thursday, January 26, 1995 • Vichyssoise, salmon in vodka cream sauce with green peppercorns, vegetable of the season, orange cake with Grand Marnier sauce

COSMIC RAYS

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Japan events to their sources, we found nothing that could account for their high energy. Our new experiment will explore this mystery."

Scientists theorize that the source of these rays probably lies outside the Milky Way galaxy. The size of our galaxy and the magnetic field strengths within it are insufficient to provide the observed acceleration. Theories point to supernovae or other very high-energy events that could accelerate these particles, or to the collapse of massive cosmic strings, the topological relics of the early universe.

Still another problem remains, Paul notes. "Very high-energy cosmic rays lose energy to cosmic background radiation as they pass through intergalactic space. Thus we know the source could not be farther away than 30 megaparsecs, just around the corner in intergalactic terms." A megaparsec is equal to three light years. However, we know of no astronomical object, either in our galaxy or within 30 megaparsecs, that could account for these highest energy cosmic rays.

By building these detectors, scientists may gain a better understanding of what drives cosmic rays, said Jim. "This could tell us either that there are astrophysical objects beyond our understanding that can accelerate cosmic rays, or it may reveal a source totally unexpected." ■

FermiNews

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Fermi National Accelerator Laboratory*

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CLASSIFIEDS

■ VEHICLES

1986 Chevy Nova CL, 4 door, AC, auto., stereo, rear defog, custom inter., tilt wheel, no rust, \$3,000. Call Sue at x3762 or 708-377-2526.

1984 Chevy S10 4x4 extended cab pickup, V6, auto., AC, AM/FM/cass., alum. wheels, new P235 on/off tires, Tahoe package, no rust, tilt wheel, \$4,600. Call Jim at 708-377-2526.

1979 Oldsmobile Regency, 4 door, good running cond., heat & tires, new battery, \$500. Call Jesse at x8696 or x4914.

■ MISCELLANEOUS

New car battery and tire. Call Jesse at x8696 or x4914.

Moving Sale: color TV, XT case, toys, table, bookshelf, bikes. Call Lourival at x2482.

Octagonal walnut club table, 4 matching chairs w/upholstered cushions, 1 leaf, table is 42"l x 42" w x 27" h (w/o leaf), exc. cond., \$300; Ladies Northwestern golf clubs, right-handed, powder blue/white bag, used twice, \$300; Smith-Corona Galaxie XII manual portable typewriter w/hard-sided carrying case, exc. cond., \$25.

Call Shelley at x3324.

Metal desk, 6 drawers, free for the taking, just haul away. Call 708-896-6146 after 5 p.m.

20+ cu. ft. chest freezer, good condition, \$100 o.b.o. Call Roy at x8364 or 708-665-8246.

■ REAL ESTATE

House for sale by owner: 2BR ranch, screened-in deck, large fenced backyard, attached 1 car garage, fully insulated attic, all appliances, 10 min. drive to Lab, North Aurora. Call Paula at 708-892-1468 or x3401.

3 BR house for rent, Naperville/Aurora, 10 min. from Wilson Hall, huge basement, washer, dryer, big refrig., \$1,275/month. Call 708-898-6806.

3 BR ranch in rural Kane County, 1.5 baths, full basement, den, 2 car garage, fireplace in basement family room, woodburning stove in living room, half acre, \$140,000. Call 708-557-2234.

■ WANTED

Wanted: 1 very warm sleeping bag, mummy-type preferred. Call Roy at x8364 or 708-665-8246.



The deadline for the
Fri., February 3, 1995
issue is WED., JAN. 25.
Please send your article
submissions or ideas to
the Publications Office.

