

FERMILAB NEWS

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FERMILAB AND RUSSIAN SCIENTISTS EXPLORE CHANNELING IN CRYSTALS

Tim Toohig, Fermilab physicist, has an affinity for the Russians, and they in turn get along well with him.

It's something like a symbiosis, where fine-honed scientific minds in the two countries have gotten together to work on an experiment that may have possibilities for high energy physics in the future. But right now, it's more research than application.

It's called "channeling," and the layman could think about it this way. Imagine a billiard ball rolling along a channel, swinging from side to side but never leaving the channel because the sides are too high.

Now picture a beam of charged particles shot out of an accelerator and into a perfect crystal--one that has no flaws in its atomic array. The fast-moving charged particles enter the crystal in the space between the atoms and continue unobstructed through the crystal. The beam of particles cannot escape from the crystal until it has emerged from the other end.

Once they are in the crystal, they follow a channel between atoms by swinging--like that billiard ball--from side to side. As a single charged particle nears an atom, the electric field around the atom becomes higher and higher until the particle cannot come any nearer. It then swings back toward the center of the channel and to regions of lower potential energy. In this manner, the charged particles continue their see-saw journey uninhibited through the crystal.

Physicists describe the crystal as being "transparent" to the beam of particles. And it must be a perfect crystal, otherwise misplaced atoms or contaminants may end up in the channel and impede the beam--much like something in the stainless steel vacuum tube in the Main Ring at Fermilab would disrupt the beam of protons.

Some of the crystals Toohig and the



...Tim Toohig (left), Fermilab physicist with the Energy Doubler-Saver, and Dr. Edward Tsyganov, Joint Institute for Nuclear Research, confer in an experimental trailer at Dubna...

Russian collaborators, led by Dr. Edward Tsyganov, have used were grown by Russian cosmonauts in space where zero gravity leads to more perfect crystal growth. The physicists have used monocrystals of silver, germanium and silicon in their experiments.

What would happen if a crystal were slightly bent? Would the beam of charged particles stray out of the channel or follow the bend? The experimenters found that the beam followed the bend, thus opening imaginative applications in future years.

"Tsyganov had speculated that if a monocrystal were carefully bent, these coherent atomic forces could be used to bend a charged particle beam along a trajectory determined by the bend in the crystal," said Toohig. "In a final run at the Joint Institute for Nuclear Research at Dubna in August, it was determined that, indeed, the 8 GeV proton beam followed the bend of a one centimeter-long silicon crystal out to an astonishing 26.5 milliradian. This is equivalent to about one-third of the bend from the Fermilab accelerator to the Proton Laboratory.

(Continued on Page 2)

(Continued from Page 1)

"The effective electric field that was achieved with such a curvature is equivalent to a magnetic field of about 100 Tesla. Calculations show that in certain applications, by using crystals, one can bend high energy beams by a factor of about 1,000 more than by using conventional magnets. If one takes into account the fact that in the TeV region, a crystal of the order of several feet could be used with reasonable transparency, one can envision promising applications of crystals in high energy beam optics."

Toohig also is enthusiastic about upcoming experiments that will be run on the 70 GeV accelerator at Serpukhov, where "the scientists plan to explore other aspects of this fascinating marriage of high energy and solid state physics."

The initial phase of the research was conducted at Dubna, about 70 miles north of Moscow. The work is now shifting to Serpukhov, where the collaborators will study what happens at these higher energies. Serpukhov is about 70 miles south of Moscow and the eventual site of the Russian's 3 TeV accelerator.

Toohig has been at Dubna twice, once for two weeks and once for eight months. He expects to return to Russia early next year to continue his research with Tsyganov and the other members of the collaboration. The other Fermilab collaborator is Dick Carrigan of the Research Division. Tsyganov in turn has been at Fermilab to continue his studies. He returned to his country in November. Another American institution that is collaborating is State University of New York at Albany.

Earlier experiments were carried out here in the Meson Laboratory using much of the same apparatus now in Russia. These runs, done in 1977, clearly demonstrated the channeling phenomena at the highest energies ever.

Channeling is not a new discipline, said Toohig. Solid state physicists have been investigating it for several years, but in the thousand and million electron volt energy regions, much lower than the energy levels high energy physicists are now taking it to. Toohig credits solid state physicists with building a strong foundation in the field.

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...Multi-national research team at Dubna. A portion of the equipment can be seen at the left of the photograph. Seated in the front are Tim Toohig (left) and Dr. Edward Tsyganov. Leaning against the wall and to Dr. Tsyganov's left is his wife, Nina Tsyganova, an engineer...

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VAN POOLING POSSIBILITIES

Fermilab would like to encourage the consideration of van pooling for Laboratory employees.

If an employee can organize a group of 9 or 10 paying riders and is willing to accept ownership and driving responsibilities, it may be possible to arrange for some assistance in obtaining a no down payment loan for the purchase of a van.

This and other information on van pool operating costs, insurance, rider and driver commitments, organization and other information, are available from Support Services, headed by John Colson. Carol Weissert, the van pool coordinator, can be contacted at Ext. 3470.

HOW'S THAT AGAIN?

"A letter recently arrived at the CERN COURIER office asking for more information on a high intensity 'moon beam' at a well-known national laboratory. We guess they really meant muon beam, unless somebody is looking to start an experiment to measure moon pair production, or to measure parity violation in moon decay, or to check moon number conservation."

CERN COURIER

DON'T FORGET CAR WITH PINK WHEELS

Remember the car with the pink wheels?

It's pasted on top of the metal box that's on top of Beverly Kaden's desk in the Public Information Office, CLL-W. In the box are cards that contain the names of persons who are interested in forming car pools and where they live.

Already at least two successful car pools--one from Aurora and one from St. Charles--have been formed. Any person who wants to join or organize a car pool is invited to look through the names and addresses in the box and to add his or her own name.

Because of anticipated rise in the price of gasoline caused by imminent price increases in imported oil, carpooling looks more and more attractive to Fermilab employees.

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SCIENCE WOMEN TO MEET

The Chicago area chapter of the Association for Women in Science will meet Dec. 3.

The session, their 12th, will consist of a social hour at 5:30 p.m. followed by the dinner and program. The event will be held at the Cypress Restaurant, 500 E. Ogden Ave., Hinsdale.

Speaking at the program will be Rep. Susan Catania of Chicago, chair of the Illinois Commission on the Status of Women. She will report on the activities of the commission. Afterwards, workshops about Illinois legislation of concern to working women will be led by Catania, Rep. Giddy Dyer, Hinsdale, and Rep. Anne Willer, Hillside.

For reservations, call Janice Wenger, chapter secretary, 325-2804.

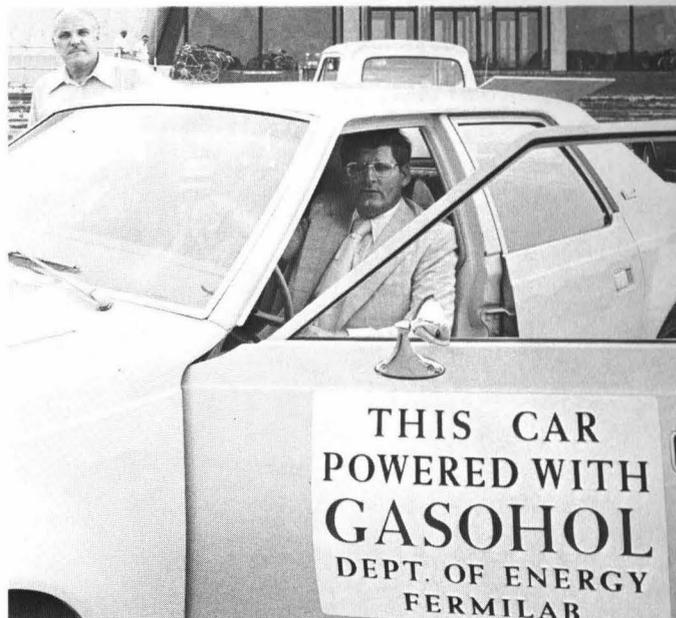
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CONGRATULATIONS, IT'S A BOY

Ryan Daniel measured 19" long and weighed 5 pounds, 13 ounces when he was born the evening of Oct. 21 at Hinsdale Hospital.

He is the first child of Vic Kuchler, Architectural Services, and Kathy Kuchler, Technical Services.

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...Ronald F. Zeitler, administrative officer with the DOE office at Fermilab, tries out one of the Laboratory's cars. Looking on is John S. Colson, head of Support Services at Fermilab...

HOW TO CUT DRIVING BY 15 MILES A WEEK

It'll save you money and it'll help make this country less dependent on imported oil.

How? Cut your driving by 15 miles a week. President Carter has asked the people of this nation to cut back their driving by that amount. Here are some easy tips from the Department of Energy to do just that:

1--Set aside one day each week as your car-free day. Is there one day each week when you could leave your car at home and find other ways to get where you want to go?

2--Join a work pool, school pool or shopping pool. Carpooling can save you a lot of miles and money--as much as \$650 in gasoline every year.

3--Trim your driving by two miles a day. Keep a street map handy to be sure you're taking the shortest routes. Try to run errands closer to home.

4--Before you grab your car keys, think ahead. How many trips could you combine? Are you sure each trip is necessary?

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...1979 Fermilab Volleyball League champions. They won all 22 of their matches. Front row (L-R) are Mike Shaevitz, captain Linda Even, Romesh Sood and Karl Varga. Back row (L-R) are Bob Trendler, Joe Gehard, Drew Wallace and Terry Lahey. Not shown are Laticia Chavez and Maris Abolins. Substitutes were Glenn Federwitz, Paul Allcorn and Kay Trendler...



...1979 Fermilab Volleyball League second place team. They won 20 of their 22 matches. From the left are captain J. P. Morgan, Laura Sedlacek, Mike Armstrong, Rose Muth, Rupert Crouch and Roy Justice. Not shown are Carolyn Hines, Jim Jensen, Wally Habrylewicz and Tom Callans...

CREDIT UNION PUTS NEW RESTRICTIONS ON LOANS

Recent events and circumstances have forced the Argonne Credit Union and its branch office at Fermilab to put new restrictions on loans, said John Chonko, credit union manager.

First, at the beginning of November, the National Credit Union Administration required all credit unions to maintain substantially larger liquid reserves in cash and short term investments.

Second, many credit union members are withdrawing their savings and purchasing higher yielding money market certificates.

Combined, this means that "the credit union has less money available to lend and is obliged to cut back on loans," said Chonko. "We have had to put new ceilings on all auto and other loans, ask for higher down payments and decrease repayment terms. Ready cash add-ons will be limited to \$300, and their frequency will be restricted. Some loans will be curtailed completely for the immediate future and some loan interest rates will rise."

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TICKETS AVAILABLE TOMORROW

Tickets for the NALREC Christmas dinner and dance will go on sale tomorrow (Nov. 30).

They are available from any NALREC member. The \$10 charge includes a social hour from 6:30 to 7:30 p.m., dinner, 7:30 to 9 p.m. and dancing, 9:30 p.m. to 1 a.m. the next morning.

The menu will consist of soup, prime rib of beef, baked potato, green beans almondine and vanilla ice cream. Jazmin, the band, will provide the background music.

The event will be held at St. Andrews Country club.

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BIRD LOVERS, YOU'RE NEEDED

The DuPage Audubon Society will hold its fourth annual Christmas bird count Dec. 15.

The Fermilab site will be included in the area surveyed. The society is seeking volunteers. Interested persons should contact Paul Mooring, 295 Abbotsford Court, Glen Ellyn, Il. 60137, phone 469-4289.

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