FermiNews

Fermi National Accelerator Laboratory

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INSIDE

High school teacher Paul Johnson, from Alaska, works on CTeV hardware during his fellowship. **See page 6.**

Photo by Reidar Hahn

Fermilab physicist Peter Mazur with a prototype particle detector for the Pierre Auger Project. The project will build two giant observatories—each containing 1,600 of the detectors spaced 1.5 kilometers apart over an area of 3,000 square kilometers—to discover the unknown source of very high energy cosmic rays. Mazur and other Auger collaborators built the detector at Fermilab.

Auger Project Selects Site

A giant observatory in Utah will try to solve the mystery of high-energy cosmic rays.

by Judy Jackson, Office of Public Affairs

Scientists of the Pierre Auger Project, whose goal is to discover the source of very high-energy cosmic rays, announced on September 13 the choice of the project's northern-hemisphere observatory. The 150-member collaboration will build a Rhode Island-sized detector array in Millard County, Utah to observe the air showers from mysterious high-energy cosmic rays that zoom to earth. In November, 1995, the Auger Project chose a site near Mendoza, Argentina, for the project's southern-hemisphere observatory.

"We are beginning a new astronomy where the 'light' is not electromagnetic radiation, such as radio waves, visible light, or gamma rays, but protons and nuclei," said Nobel laureate physicist James Cronin, leader of the project. "Because the sources of these cosmic rays are unlikely to be uniformly distributed in the sky, it is essential to observe the whole sky to locate the sources of these cosmic rays. Each Pierre Auger Observatory can be likened to a telescope with a very wide field of view. With observatories located at mid-latitudes in both hemispheres, we can observe the entire sky as the earth turns."

Collaborators chose among proposed sites in Spain, Mexico and Utah. "The Utah site meets the requirements of the Auger Project very well," said Fermilab physicist Paul

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A Family Publication

by Judy Jackson, Office of Public Affairs

It started out in 1963 as a lab newsletter, published now and then. Today the CERN Courier is an international journal with a circulation of 27,500, serving, in its editor's phrase, "the entire family of high-energy physics."

The Courier's 20,000 English-language copies (7,500 are printed in French) now reach readers far beyond the CERN community, in the U.S., the U.K., Germany, Italy, and 75 other countries around the world. "As there are only about 7,000 high energy physicists worldwide," says Gordon Fraser, the Courier's editor since 1987, "most of the readers are scientists outside the specialist domain, and students."

Recent surveys characterize the "outside" readers of the Courier's 10 yearly issues as primarily scientists in other fields, educators, scientific administrators, and people in industry. Not to mention dental patients; a Fermilab employee who grew up in Switzerland reports that the Courier regularly turns up in the waiting room of at least one Geneva dentist.

In the early 1970s, under the leadership of former editor Brian Southworth, the Courier broadened the scope of its coverage to look beyond events at CERN, the European Laboratory of Particle Physics. A meeting of lab directors in New Orleans in 1975 formally endorsed the expansion of the Courier's beat to include international high-energy physics.

From around the world of particle physics research, laboratory correspondents submit to Fraser material they consider newsworthy; Fraser, in turn, calls on the network of correspondents for information about developments at their laboratories.

Almost from the moment it took on its international role over two decades ago, the Courier's successive editors have wrestled with the issue of balanced coverage for global high-energy physics. In a 1983 Courier article, then CERN Courier Advisory Panel Chairman Maurice Jacob, wrote, "The reader will rarely find a representative balance in any one particular issue—indeed some issues may even appear polarized. But averaged over several months, the balance is apparent." Fraser pursues the analogy of the family, observing that, as in most families, one member or another sometimes feels left out. However, like Jacob, he says, "Coverage has to be averaged over several issues."

Fraser recognizes that some Fermilab readers aren't so sure it all comes out even. "I bring this up hesitantly," he said in a recent conversation, "but I am very conscious that at Fermilab there is a feeling of animosity toward the CERN Courier, a feeling that isn't present at other labs. I'm not sure why."

Greg Bock, project manager for Fermilab's KTeV experiment, offered a possible explanation. "The Courier is a faraway publication run by a different lab," he said. "Sometimes it seems as if it's written to be more international, but it's really about CERN. But it's easy to snipe at them. Actually it's good, and I read it whenever I get it. True, it seemed as if they never covered Fermilab's E731 data; yet every time NA31 tightened a bolt, the CERN Courier ran a feature story," he added, referring to comparable experiments at the two laboratories. "On the other hand, I don't think I ever talked to our Fermilab correspondents about submitting a story on 731."

Fraser says he is eager to work with Fermilab to publish Laboratory news, and news in the making. "In some respects, worldwide elementary particle physics resembles a game of soccer," he says, "with rival but nevertheless friendly teams striving to score research goals. Once scored, the research goals become scientific monuments, while their scorers achieve fame and are showered with honors. The CERN Courier aims to cover the assiduous preparatory teamwork and skilful play as well." ■

Your CERN Courier Correspondent

Fermilab's Office of Public Affairs now serves as the Laboratory's correspondent to the CERN Courier. The Public Affairs Office encourages members of the Fermilab community to submit articles, ideas, and suggestions for articles about Fermilab for publication in the Courier. Call (x3351), e-mail (topquark@fnal.gov) or stop by (Wilson Hall 1E). Public Affairs staff will help with writing, editing and photography.

Little Harvest on the Prairie

Fermilab invites all to the 1996 Fermilab Prairie Seed Harvest

Photos by Reidar Hahn

Dr. Bob Betz, Fermilab prairie consultant, with Sandor Feher Jr., son of physicist Sandor Feher of the Technical Support Section, at the 1995 prairie seed harvest.

By Donald Sena, Office of Public Affairs

As summer winds down and the tell-tale signs of autumn emerge, Fermilab—in keeping with a fall tradition—offers users, staff members, contractors, families and friends a chance to join in the Laboratory's annual Prairie Seed Harvest, scheduled for two upcoming Saturdays, Sept. 28 and Nov. 2.

Fermilab Prairie Project organizers teach volunteers to recognize particular plants and then clip the ripe flower heads for seeds. Fermilab uses the seeds to enrich newer prairie tracts at Fermilab and to share with other prairie restoration projects. Although a mechanical harvest is also done, the public harvest is vital. Mechanical harvesting doesn't get as many of the specialized plants as when the volunteers go out, said Bob Lootens, lead groundskeeper.

"The seed is used to enrich young prairie and help build diversity into the grasslands," Lootens added.

The fall event is becoming increasingly popular, with about 180 people participating last year, including families and school classes.

Tallgrass prairies once blanketed northern Illinois, "The Prairie State." However, during the area's settlement in the 19th century, agriculture consumed all but a tiny remnant of the native grasslands.

Science teacher Maryon Tilley with some of her students from Morton West High School in Berwyn at last year's harvest.

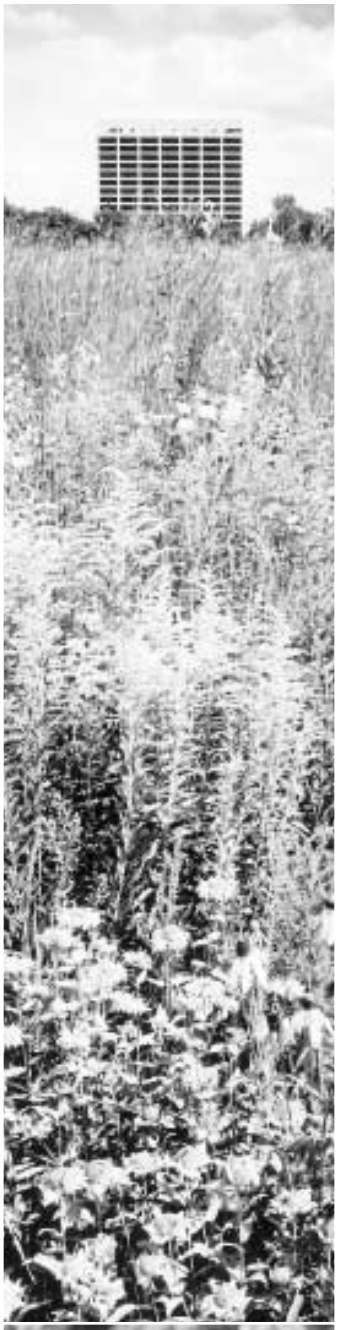
Fermilab has a long-standing dedication to restoring the prairie, working for more than 20 years to revive the historical grasslands on its Batavia site. More than 1,000 acres of tallgrass prairie are in various stages of reconstruction.

This year's harvest will take place on Saturday, Sept. 28 and Saturday, Nov. 2, from 10 a.m. to 2 p.m. Volunteers are welcome to spend as much or as little time as they wish, and refreshments will be provided.

Those interested in participating should wear field clothing and gloves, and are encouraged to bring pruning shears and paper grocery bags, if possible. On-site directional signs will direct volunteers to harvest sites.

In case of bad weather on the scheduled dates, call the Fermilab switchboard at (630) 840-3000 to see if the harvest is canceled.

For more information, call the Fermilab Public Affairs Office at (630) 840-3351. ■



HIGH ENERGY PHYSICS

made painless

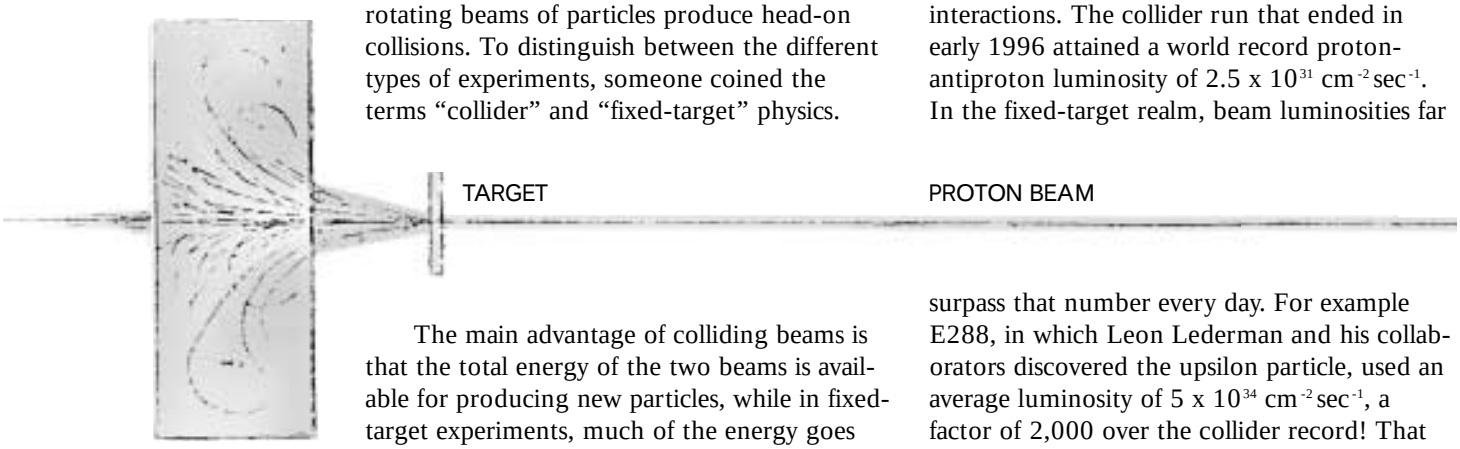
Fixed-Target Physics

"Fixed" means stationary, as in "fixed in place," rather than "repaired."

by Peter H. Garbincius, Physics Section

In 1911, New Zealand-born physicist Ernest Rutherford announced that he had used beams of alpha particles (ionized helium atoms) from the decay of radium to discover the atom's extremely dense core that is its nucleus. Rutherford's study of particles scattering off a foil target is a prototype of many of today's "fixed-target" experiments. At Fermilab, fixed-target experiments use high-energy protons from the Tevatron to hit metal targets and create secondary particles or beams at ten experimental halls.

From the late 1930s through the early 1970s, the particle accelerator governed both nuclear and particle physics experiments. Today we would call them fixed-target experiments, in which accelerated particles hit internal or external targets; at the time the experiments were just called "physics." In the early 1970s a new method of studying fundamental phenomena came into wide use, in which counter-rotating beams of particles produce head-on collisions. To distinguish between the different types of experiments, someone coined the terms "collider" and "fixed-target" physics.



The main advantage of colliding beams is that the total energy of the two beams is available for producing new particles, while in fixed-target experiments, much of the energy goes toward moving forward the particles that result from the impact with the target. Thus, colliding beams represent the high energy frontier—up to 1800 GeV in the last Fermilab collider run. In the current fixed-target run, the energy available for production of particles is considerably less than in the collider, up to a maximum of 39 GeV. Therefore the production of massive particles like the *W* and *Z* bosons and the top quark is possible only with colliders, and even the somewhat lighter bottom quarks are more copious in the colliding beam mode.

Colliding beams are impressive, but we shouldn't sell fixed-target physics short. In the fixed-target mode, we can use the protons from the accelerator directly, or we can form secondary beams consisting of a combination of other quarks, or leptons, or photons. Like a chemist concentrating and purifying his sample before he begins his measurement, fixed-target experimenters can prepare beams enriched in the specific particles of interest. This allows them to study their interactions or decays relatively cleanly, free from backgrounds of less interesting particles.

Former Director Leon Lederman often spoke proudly of Fermilab's beams of hot and cold running protons, neutrons, photons, electrons, muons, neutrinos, pions, kaons, and all the stable hyperons, up through the Omega–minus, and, of course, their associated antiparticles. With these beams of quark composites, we can study a number of different quark interactions and decays. Variety is the spice of experimental physics!

Furthermore, fixed-target experiments make use of a higher luminosity, or rate of interactions. The collider run that ended in early 1996 attained a world record proton-antiproton luminosity of 2.5×10^{31} cm^{-2} sec^{-1}. In the fixed-target realm, beam luminosities far surpass that number every day. For example E288, in which Leon Lederman and his collaborators discovered the upsilon particle, used an average luminosity of 5×10^{34} cm^{-2} sec^{-1}, a factor of 2,000 over the collider record! That experiment required a specialized set-up to make use of such high luminosity, but it yielded a special discovery—the bottom quark.

The point I would like to leave you with is that collider and fixed-target physics approaches are complementary and allow one to study the universe from different viewpoints with different tools. When we require the maximum energy, colliding beams are the only choice. However, in those cases where sheer energy is not the highest consideration, for more controlled environments, for precision experiments, and for searches for and studies of rare phenomena, the fixed-target approach is often better. ■

Profiles
PARTICLE PHYSICS

John ("Jack") Steinhoff

Fire Chief

Employee I.D. #2773

He's very active attending meetings, keeping Fermilab up to speed with new stuff in the industry. He has an excellent rapport with fellow chiefs in the surrounding community."

by Leila Belkora, Office of Public Affairs

Photos by Reidar Hahn

At 6 feet 5 inches tall, with an imperturbable air and ready smile, Fermilab Fire Chief Jack Steinhoff looks like the kind of person who can take charge when the alarm bells sound. And in his 21 years at Fermilab, beginning as a fireman and including a stint as shift captain, Steinhoff has responded to quite a few alarms: fires, such as the one that burned about 50 acres on the perimeter of Fermilab last April; floods, including the inundation in July which triggered about 30 alarms in one day; and people stuck in elevators or in vehicles overturned on the road. Just about the only summons he can't recall, in fact, is the time-honored bane of firemen, the cat up a tree.

When someone dials 3131 to report a fire or other emergency, the phone rings in the Communication Center, and the staff there dispatches the fire department. "We handle calls for elevator release, a hazardous spill, fire alarms, smoke or odor investigation, vehicle accidents, and flooding... And they call us if they don't know who else to call," says Steinhoff. He adds, "We do basic life support—that includes CPR. We cannot administer drugs or defibrillate you; for advanced life support we have the Tri-City Ambulance from Batavia to respond. Yeah, we can deliver babies. Never had to, but [one couple] were close."

Steinhoff says Fermilab presents some challenges that municipal fire fighters do not face, and that his group is always aware of the large investment Fermilab has in equipment and experiments. "In our initial response we try to reduce as much damage as possible through extinguishment and also do our best to protect the experiments," he says. Romesh Sood, Steinhoff's supervisor and head of the Emergency Management Department, says, "Jack is very conscientious. He truly cares and does a good job in leading the fire department and mitigating the emergencies. I often hear compliments."

On the whole, Steinhoff feels that his team has a good rapport with physicists around the Lab. "Fermilab has approximately five flammable-gas experiments which we—the Fire Department, all three shifts—toured. The physicists were right there, helping us to understand what they do and where the shut-offs are, because the experiment is not manned (by them) 24 hours a day. So in case the alarm does come here at 1 o'clock in the morning when they're at home, we must know what to do."

Although Steinhoff knows practically every valve, alarm, and sprinkler system on the site, you can tell from his office that he straddles two worlds: the Lab, and the world of firefighters everywhere. There's a Chicago Fire Department mug on his desk, and a mobile of pewter fire trucks hangs from the ceiling. He wears a colorful fireman tie clip, a Christmas gift. His calendar is a special kind, with color-coded days to show which of the three shifts are on duty. Steinhoff is married and has a son and daughter, whose photos adorn the window sill in his office; his son recently switched from the Fire to the Police Science curriculum at Waubonsee College.

Sood says Steinhoff's participation in fire trade organizations outside the lab is one of his strengths. Says Sood, "He's very active attending meetings, keeping Fermilab up to speed with new stuff in the industry. He has an excellent rapport with fellow chiefs in the surrounding community.... I'm very glad to have such a good team member." ■

Catalyst for Better Science Education

By allowing teachers to become researchers and students, Fermilab programs stimulate change in the nation's schools.

by Donald Sena, Office of Public Affairs

As teenagers across the country once again bid farewell to the summer and become students again, some of their teachers return to the classroom having spent time at Fermi National Accelerator Laboratory as students themselves. Science teachers from Pennsylvania to California participated in and learned about sophisticated scientific research and modern physics, while preparing new curricula and projects that will allow them to pass on their knowledge and enthusiasm about science to their classes.

Photo by Reidar Hahn

Paul Johnson, a high-school teacher from Alaska and one of the 1996–97 Fermilab fellowship teachers, inspecting hardware for the KTeV experiment.

At the same time, more high-school teachers are arriving at the Laboratory to immerse themselves in experimentation and study, which will eventually translate into new physics lessons for more students.

The teacher development programs, sponsored by Fermilab with money from state and federal grants, the Department of Energy, the private sector, Universities Research Association, and the Lab itself, continue a long tradition of teachers and scientists working together on science education, allowing Fermilab to reach thousands of students each school year through gifted instructors.

TRAC Program

Jeff Appel, now head of the Physics Section, and Arlene Lennox, now head of the Neutron Therapy Facility, first brought K–12 teachers to Fermilab to conduct research in 1983, predating any DOE national program. The early program included only local teachers and required them to work five days a week on research. Soon after, DOE began encouraging national laboratories to offer a teacher enhancement program, called TRAC, and open it nationally, requiring four days of research and one day to develop educational materials. At first Fermilab used the national money to leverage more positions by providing partial funding as funding for research shrank, Fermilab changed the program to correspond more closely with DOE's TRAC guidelines.

TRAC is an eight-week summer program that brings teachers from across the nation to Fermilab. Along with conducting research on an actual experiment, the teachers develop methods for translating the experience to the classroom—for example, creating new instructional units or making a World Wide Web page for lessons. The teachers for the 1996 session came from the local area and from school districts as far away as Philadelphia, Arizona and Georgia.

Teachers can return to Fermilab in subsequent summers. These teachers, informally called TRAC Grads, must be paid out of the experiment's budget.

Marge Bardeen, manager of the Education Office at Fermilab, said her team hopes that through experiencing scientific experimentation, the instructors may change some of the ways they teach science, focusing on more open-ended, problem-based learning opportunities for children. Bardeen said they encourage teachers to include some modern physics when they return to their classroom. At the Lab, TRAC teachers have mentors, scientists assigned to guide the teacher through the research and review any new curriculum or projects.

Since 1983, more than 200 teachers have conducted research through the TRAC program, and many more students have been affected by the teachers' experience. In the past, the Laboratory has accommodated up to 28 teachers each year; however, due to decreased national funding levels for science education, Fermilab had only 14 this year, supported by high-energy physics funding.

Fermilab hopes to offer summer research appointments as in the past. The future of the program will depend on the overall high-energy physics budget.

At least one teacher now understands the importance of the program at Fermilab and hopes it will continue. Anita Brook–Dupree, a middle school teacher at a magnet school in Philadelphia, spent part of her summer at the Laboratory. During her time here she wrote a new curriculum for her classes entitled "Things

We Cannot See." Brook–Dupree based the class lessons on what she learned at Fermilab and a curriculum already developed by the Lederman Science Center. She purchased the curriculum and adapted some of the teacher lessons for her own style. Brook–Dupree said about 180 students from sixth to eighth grade will take the class.

From having the children cut a piece of paper into smaller and smaller pieces to using a microscope to learning about particles, Brook–Dupree will attempt to get the children to understand the concept of "small" by encouraging investigation in the classroom.

Upon hearing the funding scenarios for education efforts, she said if places like Fermilab stop offering these programs due to a lack of money, she doesn't foresee anyone picking up the slack, which would leave a gap between frontier science and teachers at the high-school level.

"Teachers in large urban school districts rarely get this kind of opportunity; the funding is just not there to send us anywhere," said Brook–Dupree. "It's really been great to be in the position of 'learner' again. That will help me as I deal with my kids. It helped me to see how they learn, how it feels to be frustrated, how it feels to be learning something brand new."

Besides the TRAC program, Fermilab sponsors other staff development programs, such as a course that instructs teachers how to integrate Internet resources into their curriculum.

Fellowship

Another education effort at the Laboratory is the Fermilab Teacher Fellowship Program. Kevin McFarland, a Fermilab physicist working on the NuTeV experiment, is a Lederman Fellow at the Laboratory. One requirement of a Lederman Fellow is to develop science education programming—an assignment McFarland calls a good fit, for his strong interest in education efforts. He decided to start a sabbatical program after meeting Len Bugel, a math and science teacher at the Stratton Mountain School in Vermont and a 1994 TRAC participant. After his stint in TRAC, Bugel said he raised the proposal to spend an entire year researching at Fermilab. McFarland liked the idea and asked both Appel and Fermilab Director John Peoples about Lab funding for the program.

"The initial impetus was meeting Len, and I saw the interest of a high school teacher to do research and try to integrate his kids."

The sabbatical program, funded from the Fermilab director's discretionary funds, requires the teacher to participate in research at the laboratory for one year, while developing a curriculum.

Bugel became the first teacher in the new program and worked on the NuTeV experiment, learning how physics is done today. He said his time at Fermilab greatly enhanced his skills as a teacher, and he has incorporated many ideas upon his return to the mountains. For instance, he is teaching a conceptual physics course to ninth-grade students for the first time in his 23 years as a teacher.

"This is a direct result of my attending Paul Hewitt's CP Symposium at Fermilab in June, and hearing what Leon Lederman had to say about teaching physics before chemistry or biology," said Bugel, of the Education-Office-sponsored program. "In my senior physics class, I will be doing more open-ended labs and projects and fewer 'cook-book' labs, also as a result of my Fermilab experiences. We will definitely be spending time next spring on some simple high-energy topics, and will do some experimentation involving cosmic rays, including measuring the muon lifetime—something I worked on at Fermilab along with other TRAC teachers. The idea that science is an ongoing process as well as a body of knowledge seems to get lost in the rush to 'cover the material' in most science courses. I hope by involving students in research projects without well-known right answers, I can bring some of the excitement of this process to them."

Photo courtesy of Brook-Dupree

Anita Brook-Dupree, a TRAC teacher this past summer, with one of her middle school classes in Philadelphia in June. She said she enjoyed becoming a student again herself this year at Fermilab.

Bugel wrote some Web pages for high school teachers hoping to improve their science education skills, including a "blurb" about teaching relativity. (URL: http://cordelia.fnal.gov/~bugel/teacherfellow.html

McFarland agrees the year-long program benefits both teacher and experiments. The teacher participates in all aspects of the study from the planning phase to the "grunt work"—

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TRAC / Fellowship

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an experience that just eight weeks cannot provide. McFarland said that Bugel will be included in NuTeV's author list, and added that the experiment has felt Bugel's departure. NuTeV is a small collaboration, and the teacher became an active participant.

"The teacher leaves here a scientist," said McFarland. "In every sense, Len is one of our collaborators."

The experiment benefits from having an "outsider" take a fresh look at the study, said McFarland. The teacher also forces the physicists to explain in detail their goals and ideas to nonscientists, something the science community must do for its survival, the Lederman Fellow added.

McFarland said he chose fixed-target work for the sabbaticals because in 1995 they were designing and building the experiments. He hopes that the collider experiments will pick up the program in future years.

Paul Johnson, an electronics and physics teacher in Alaska, participated in the TRAC program in 1991 and is now in the fellowship program working on KTeV. Johnson said he teaches about 80–100 students each year in Fairbanks, Alaska and advises students in the Alaska State Science Symposium, where students build sophisticated experiments. In his proposal to participate in the fellowship, he outlined benefits that the program would bring to his school district.

"Students would establish a link with the premier particle physics experimental facility in the United States...There would be continued contact with professionals constituting an important part of students maturing, as well as providing a valuable source of information," Johnson wrote in his sabbatical outline.

Johnson is a collaborator on KTeV, where he is developing hardware, learning about software and writing computer programs. He said hardware is his specialty, but programming is one of his weaknesses and is something he wants to learn. Johnson said he is sometimes a "load" on the collaboration, as he is still getting up to speed. However, his mentor, Fermilab physicist Juliana Whitmore, had other words for his role. She said Johnson is a "really big asset to KTeV." He tackles problems willingly, and, when he does get stuck, he finds someone to work through the problem with him. Whitmore said she hopes to put Johnson on shift in the control room, immersing him in the day-to-day activities of the fixed-target experiment. Johnson, like Brook–Dupree, relishes the role of teacher-turned-student.

"Part of the excitement about this for me is the fact that there are so many unanswered questions," said Johnson. "It's like taking an exploratory voyage someplace. If you were with Christopher Columbus, he couldn't have told you what he was going to find; he just knew he was going somewhere. So, it's my voyage with Columbus."

Bardeen says the fellowship at Fermilab is similar to another program that ran for only one school year in 1992–93. During that sabbatical, Bob Grimm, chairman of the science department at Fremd High School in Palatine, helped develop many of the exhibits at the Lederman Science Center. She said no matter what program Fermilab sponsors now or in the future, they will all have one common element.

"Fermilab is a catalyst for educational change. We can't make change happen because that has to come from the teachers in the schools. But we can be a catalyst to stimulate the change, to put people in touch with what the best practice is. We do that through the Teacher Resource Center, we do it through the programs, we do it by bringing the students here," said Bardeen. "We're trying to show [teachers] how science is done so they can emulate that in the classroom." ■

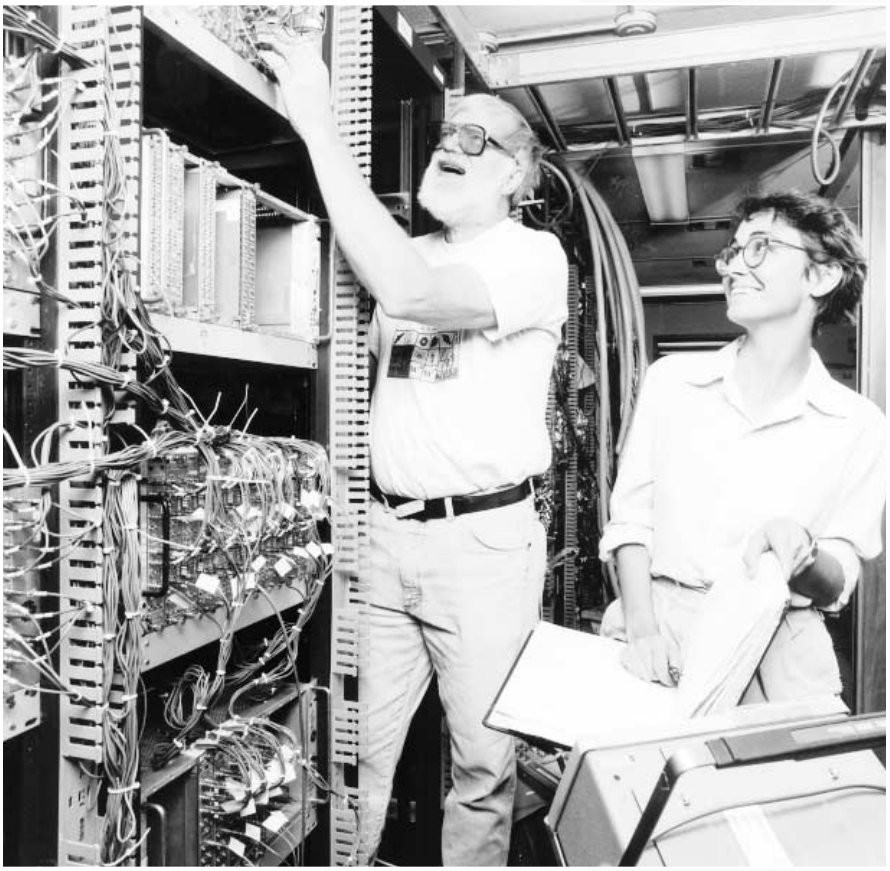

Photo by Reidar Hahn

Len Bugel, a teacher from a Vermont high school, works with Columbia University physicist Cindy McNulty as part of his TRAC tenure in 1994. Bugel was the Laboratory's first fellowship teacher in 1995–96.

Auger Project

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Mantsch. "It is an excellent site. We are eager to begin the design and construction of the two observatories." Collaborators said that existing infrastructure, including roads and a nearby power plant, influenced the final choice. "It was a close vote. The Mexican site in particular had many good features," Mantsch said.

Cosmic rays are fast-moving particles from space that constantly bombard the earth from all directions. These particles, usually protons, strike air molecules in the atmosphere, creating cascades of secondary particles, called air showers. The Auger Project takes its name from the discoverer of extensive air showers, French physicist Pierre Auger, who first observed the phenomenon in 1938. Scientific theory can account for the sources of low- and medium-energy cosmic rays that strike the earth, but the origin of the rare high-energy cosmic rays remains a mystery—one that Auger collaborators hope to solve.

The Auger Project's two observatories will measure the nature, energy and direction of these high-energy cosmic rays—the most energetic particles in nature, with more than 100 million times the energy of particles produced by the most powerful particle accelerators on earth. Physicists hope that tracking these rare particles will reveal the source of their enormous energies and provide new insight into the evolution of the universe itself. "The sources that we discover will have to be objects with unique properties," Cronin said. "No known astrophysical objects have the properties required to produce cosmic rays of such high energies. Thus, we will make new discoveries in astrophysics or particle physics, or both."

Each Auger observatory will contain 1,600 particle detectors, special 3000-gallon water tanks spaced 1.5 kilometers apart over an area of 3,000 square kilometers. An optical fluorescence or "fly's eye" detector will sit at the center of each array. The Auger Project hopes to begin cosmic ray observations early in the next century. Collaborators estimate the cost of constructing the observatories at approximately $100 million.

The collaboration includes scientists from 40 institutions in 19 countries. "I believe the Auger project is providing the rare opportunity for scientific collaboration on an equal footing between developed and developing countries," said physicist Alberto Etchegoyen, spokesman of the project's Argentine group. "We aim at constructing two similar observatories, one in each hemisphere, with a collaboration spread over the world. Hopefully we are undertaking a path that future international scientific collaborations will follow."

Funding for development of the Auger Project comes from the United Nations Educational, Scientific, and Cultural Organization and from science agencies of participating nations. The Department of Energy, Fermilab and the National Science Foundation supported the project's design study. Universities Research Association, Inc., the consortium of research universities that manages Fermilab, has also provided funding for the project, which includes scientists from Argentina, Armenia, Australia, Bolivia, Brazil, Chile, the Peoples Republic of China, France, Georgia, Germany, Greece, Japan, Mexico, Russia, Slovenia, Spain, the United Kingdom, the United States, and Vietnam. ■

Photo by Reidar Hahn

Diego Ravignani, Auger Project collaborator, poses on a detector tank in the Tech Support parking lot.

CERN photo

Pierre Auger on Cosmic Rays

"In his excellent paper, Louis LePrince Ringuer, citing a remark of Powell's at the Conference of Bagnères-de-Bigorre in 1953, declared that from that date on, particle accelerators took the place of cosmic rays, which more or less faded into the background. And yet, even today accelerators have not caught up with cosmic rays. For in 1938, I showed the presence in primary cosmic rays of particles of a million Gigavolts—a million times more energetic than accelerators of that day could produce. Even now, when accelerators have far surpassed the Gigavolt mark, they still have not attained the energy of 10^{20} eV, the highest observed energy for cosmic rays. Thus, cosmic rays have not been dethroned as far as energy goes, and the study of cosmic rays has a bright future, if only to learn where these particles come from and how they are accelerated…
We have no good theory to explain the production of the very-high-energy particles that make the air showers that my students and I discovered in 1938 at Jean Perrin's laboratory on a ridge of the Jungfrau."
—Pierre Auger

Updates

August 22—September 12

ACCELERATOR

At the August 26 All-Experimenters meeting, Bob Mau, head of accelerator operations, reported that the cooldown for the Tevatron would start August 27; his prediction was accurate and beam came up two days later. David Nevin, head of the Facilities Engineering Services Section, reported that his team had fixed the power feeders that triggered the 10-day shutdown. Subsequently, Mau reported at the Sept. 9 All-Experimenters meeting that the Tevatron was involved in high-energy physics for 121 hours during the previous week. Craig Moore said the goal of the Accelerator Division's team was to deliver a beam with an intensity of 1.5 E13 for the week of Sept. 9, then hopefully raise the intensity to 1.8 E13 for the week of Sept. 16.

FIXED-TARGET

FermiNews reached many fixed-target physicists and spokespeople on September 12. They provided this update on fixed-target experiments.

E799 / E832 KTeV Chicago graduate student Peter Shawhan says the experiment started running with a low-intensity proton beam on Saturday, August 31, and that the collaboration has since seen "real kaon decays, including CP-violating ones. We're proud to have rediscovered CP violation."

E815 NuTeV "We're taking successful neutrino data and starting preliminary analysis," said spokesman Bob Bernstein.

E872 Donut Spokesman Byron Lundberg says, "We're aiming for our construction phase to end mid-October, and then…bring on the beam."

E866 NuSea Experimenters started taking data with hydrogen and deuterium targets on September 3. Physicist Chuck Brown said, "To zeroth order, things are working. We're getting the right ratio of counts in our target. The point is to measure this to one percent, but before you get to one percent you have to get 10 percent. Everything is going swimmingly."

E781 SELEX "We're taking data and analyzing data right now. We're still trying to understand our detector," said Antonio Morelos, a physicist on the experiment. Spokesman Jim Russ was "in the pit" and not reachable when the phone rang.

E862 Antihydrogen Reached on Sept. 12, spokesman Dave Christian said, "We're looking at the very first interactions of antiprotons in our gas jet target today!"

E831 FOCUS "We're taking data and seeing lots of charm. We showed our charm signals at the All-Experimenters Meeting last Monday," said physicist Harry Cheung.

E871 HyperCP is not taking data yet, as experimenters wait for the Lab to complete work on the beamline. "There's still some rigging that has to be done on the beamline, and there are still some parts of the detector not complete," said physicist Michael Longo.

E835 Charmonium "We have completed assembling the apparatus and have floated it (on its air casters) onto the antiproton beamline. We saw our first interactions between antiprotons and the protons of our hydrogen gas jet on Sept. 11," said physicist Stephen Pordes. ■

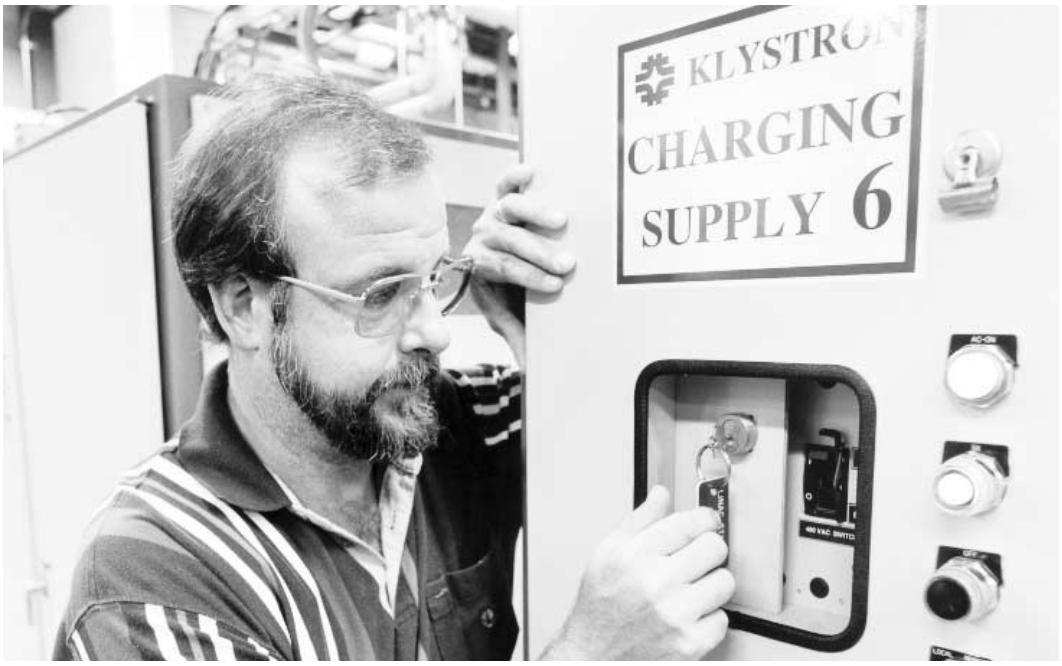

Photo by Reidar Hahn

NEW PATENT AWARDED

Dan Darimont, of the Accelerator Division, pictured here with his Captured Key Electrical Safety Lockout. This device, for which he received a patent in October 1995, is used with the Linac's power supplies. The device prevents workers from accessing the equipment while it's energized, and prevents a worker from energizing the power when an engineer is accessing a supply cabinet.

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

Wednesday
Lunch
September 25

Lebanese Platter
Tabbouleh
Hummus
Baba Gannoush
Shish Kebab with Pita
Baklava

Thursday
Dinner
September 26

Terrine of
Chicken Livers
Braised Monkfish
Saffron Rice
Sauteed Spinach
with Garlic and Lemon
Frangelico Soufflé

LAB NOTES

1997 RECREATION FACILITY MEMBERSHIP

Recreation Facility memberships for 1997 will go on sale September 2 in the Recreation Office, WH15W. Sale hours are 8:30 a.m.-5 p.m., Monday through Friday. Regular memberships are $50 and student memberships are $25. Only renewal memberships may be purchased through Fermilab internal mail, MS 126. Please enclose completed application form and check. Applications are on the Web under the Benefits/Recreation page. All 1996 memberships expire October 1. For more information, call Jean x2548.

CAREER ASSESSMENT WORKSHOP FOR GRADUATE STUDENTS AND POSTDOCTORAL RESEARCH ASSOCIATES

Fermilab and Universities Research Association, Inc. will sponsor a two-day Career Assessment Workshop for graduate students and postdocs who intend to make the transition into non-academic employment. The workshop will be held on Monday and Tuesday, October 28-29, 1996 from 9 a.m. - 4:30 p.m. in Wilson Hall 15SW conference room. The seminar will be run by Jarosz Associates, Career Continuation Consultants, and will cover topics such as networking, interviewing skills and résumé preparation. The course is open to all students and postdocs from the Fermilab community. Class size is limited to 10 people. The seminar is cosponsored by Fermilab and URA and will be held free of charge.

URA SCHOLARSHIPS REQUIRE SAT TEST

Candidates for Universities Research Association (URA) scholarships are reminded that the scholarships are awarded on the basis of SAT (Scholastic Assessment Test) scores. Thus, high-school seniors are reminded to sign up for a fall testing date if they have not already taken the tests.

URA awards a number of scholarships to regular, full-time 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.

Scholarship applications will be available after the first of the year and they are due March 1, 1997.

MUSCLE TONING CLASS/ FALL SCHEDULE

Tuesday & Thursday, October 8 through December 12 from 5:30-6:30 p.m. at the Recreation Facility. Cost is $50. Registration and payment deadline, Friday, October 4. Registration can be made in the Recreation Office, WH15W or mail your name, class name & check payable to Bod Squad to MS 126. Must be a current facility member. Questions? Contact the Recreation Office,X2548, 5427 or E-mail, fnal::jeanm.

Photo by Reidar Hahn

FIRE DEPARTMENT GARDEN

All around the western suburbs, home gardeners are reaping the rewards of their toil in the form of red, ripe tomatoes, cool cucumbers and other vegetables—and the Fermilab Fire Department is no exception.

Firefighter John Babinec (left in photo) has been planting the garden for about seven years, allowing the firefighting team to have fresh cucumbers, tomatoes, green peppers and hot peppers in their salads while on shift. This year, firefighter Chris Williams (right in photo) added sunflowers for aesthetic purposes, and they grew to more than 10 feet tall.

Captain Steve Lusted, pointing out the sunflowers, said, "Look what buffalo chips will do!"

CLASSIFIEDS

FOR SALE

■ Snowco snowmobile trailer, 6 ft converted to 7 ft. One foot height 2" x 4" rails for hauling wood, $150. Call Mike, x4948.

■ 1987 Winnebago motor home, Ford 7.5 liter engine, 64K miles, 24.5 ft long, sleeps 5, A/C, exc. cond. inside and out, ready to go! Call x3027 or (630) 932-1450.

■ Bedroom set, full size bed with bookcase, headboard, new box springs mattress, double dresser with mirror and chest. $300. Call Greg, x3011 or (630) 557-2523.

■ 1990 Honda Civic LX sedan. 5-spd, A/C, AM/FM/cassette. pwr windows & locks; 101K miles; body in good cond. Runs fine, but needs engine work soon to fix oil-into-antifreeze leak. NADA trade-in ave. $4,275. Best offer over $800 takes it. Call Barry, x2230 or (630) 879-5339 evenings.

■ Apple Stylewriter 1200, low usage $125 obo. Call Matt, (630) 393-0330.

■ 1993 Ford Thunderbird LX, 5.0 liter V8 engine, standard Thunderbird amenities plus automatic temperature control, rear window defroster, dual illuminated visor mirrors, pwr antenna, 7-spoke cast aluminum wheels, anti-lock brakes. Excellent condition, with 32,000 miles. $9,500. Call Don, x4309.

■ X-Large heavy duty Amana washer/dryer, gas, white, 3 yrs. old, $475 o.b.o. Sears lawnmower, gas, mulch., 4.5hp, 20in. - 2 seasons, $175 o.b.o. All in exc. cond. Call Leslie, x8435 or (630) 665-8188.

■ 66 Ford Thunderbird for restoration or parts. From Oklahoma, body panels in good condition, 400 cu. in. V8 engine. Last operated in 1982. $500 firm. Call Russ, x2888.

■ Wheaton Oaks ranch-style townhouse for sale $209,000. 2 bedroom, 2 car garage, basement, laundry room, clubhouse and pool. Call Barbara at (630) 393-7885.

■ Montgomery Ward microwave oven, full-feature with automatic probe, 1.2KW input 800W output pwr, good cond. $50 o.b.o., Call Hengjie, x4490 or e-mail to mahengjie@fnal.gov.

■ 1983 Mazda RX7 GS model, sunroof, 5 spd., black, 126k miles, good cond., $2,300, o.b.o. Call Ron, x3482 or (630) 406-6828.

REMINDER

Employees must confine the use of interoffice mail to Laboratory business. They may not use it for personal business, including the mailing of chain letters.

CALENDAR

SEPTEMBER 24

Wellness Works sponsors brown bag lunch on "Desktop Defense," ergonomic techniques by Maureen Huey. Noon-1 p.m., One West.

Lernen Sie Deutsch! It's that time again! Get out your rusty German knowledge and polish it, or start with this exciting language. Learn about the country, their people and, of course, the language. Angela Jöstlein, a native of Germany, will teach. A nominal fee for materials will be charged. The first meeting is held at 5 p.m. in the conference room at 20 Neuqua, just outside Lab 7, across from the Gym. We will form classes then. You may also call Angela at (630) 355 8279 or e-mail Hans at Jostlein@fnal.gov. See you there !

SEPTEMBER 28

Fermilab Arts Series will host the Christian McBride Quartet. Christian McBride, still in his early 20's, is the most sought-after young bassist on the jazz scene. He has already made over 70 recordings as a side man with artists such as Joe Henderson, Betty Carter, Pat Metheny, Benny Green and Joshua Redman. He recently released his debut album as a leader on Verve. Born in Philadelphia in 1972, Christian studied classical bass with Neil Courtney, a bassist with the Philadelphia Orchestra. While a junior in high school, he met Wynton Marsalis, who asked him to sit in with his band in a concert the following week at the Academy of Music. Set to go to Juilliard on scholarship, he was snatched up by Bobby Watson and has been touring every since. States frequent collaborator Joshua Redman, "I've been blessed to work with Christian. If genius exists he definitely has it." Tickets $15. 8 p.m., Ramsey Auditorium. Call 840-ARTS for information and reservations.

MILESTONES

BORN

[redacted]

RETIRED

Don Walker, on August 30, 1996. He started at Fermilab on July 30, 1973. Walker worked for FESS Operations-Mech. as a Maintenance Mechanic IV.

Thomas Groves, on August 30, 1996. He started at Fermilab on April 8, 1974. Groves worked for Accelerator Division Controls as an Applied Scientist III.

FermiNews
Fermi National Accelerator Laboratory

[redacted]

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Please send your article submissions, classified advertisements and ideas to the Public Affairs Office, MS 206 or E-mail: ferminews@fnal.gov

FermiNews welcomes letters from readers. Please include your name and daytime phone number.

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