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INSIDE

Right: Scott Walters, a new journeyman, at work in Fermilab's Machine Shop.

Below: Thomas Nurczyk, recent graduate of the apprentice program, works on a new computer–aided machine.

Photos by Reid Ohlhoff

Journeymen Graduate from Revitalized Apprentice Program

The Technical Division plans to continue the successful Machine Shop program

by Donald Sena, Office of Public Affairs

It's a Fermilab program that carries on an ancient tradition—with a 21st century twist.

The Technical Division's Machine Shop apprenticeship, revitalized after nearly a decade, recently produced two talented new machinists from the challenging five–year program. Along with mathematics study and training on traditional machines, Scott Walters and Thomas Nurczyk received formal instruction on sophisticated computer–aided machinery, the first apprentices to do so. Those machines, along with computer–aided design, represent the future of an enduring industry.

The concept of experienced craftsmen training young people in a skill or trade has been around since the earliest times; laws from 18th century BC in Babylon required artisans to pass on their skills. Formal apprentices emerged in the Middle Ages with the craft guilds of western Europe, where young men with talent or desire learned a valuable skill by working with and learning from a master. The tradition continued through the ages, and, whether plate–making in William Blake's England or blacksmithing in the colonies, apprenticeships were necessary for perfecting a trade and making a living.

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Tritium Monitoring at Fermilab

by Donald Sena, Office of Public Affairs

In the wake of Energy Secretary Federico Peña's removal of Brookhaven National Laboratory's contractor, environmental managers at many of the agency's national laboratories are intensifying efforts to evaluate tritium monitoring in the broader context of reassessing their labs' interactions with the environment.

At a recent environmental monitoring workshop hosted by Fermi National Accelerator Laboratory, representatives from 10 national laboratories summarized their monitoring programs, discussed vulnerabilities on their sites and shared experience and expertise on numerous issues. During the workshop, Fermilab's environmental managers reviewed the Lab's tritium history and monitoring efforts, while presenting some puzzling data on one area of the Batavia, Ill. campus.

What is tritium?

Hydrogen is a chemical element that occurs widely in nature and, with oxygen, makes water (H_2O); an ordinary hydrogen atom nucleus contains one proton and zero neutrons. Tritium, with a half–life of 12.3 years, is an isotope of hydrogen that contains two neutrons and one proton in its nucleus. In nature, tritium readily becomes part of water molecules, giving it high mobility. The Illinois Environmental Protection Agency sets a limit of 20 picoCuries per milliliter (pCi / ml) for tritium in drinking water, which is found in the aquifer—a large source of water available for domestic use that flows horizontally through the upper layer of the bedrock underlying the Fermilab site. Above the aquifer, ranging from 40 to 70 feet in depth, sits the glacial till, which is mostly saturated with water known as ground water. That ground water moves from the surface to the aquifer at a rate that varies with the soil permeability. The I-EPA does not place tritium limits on the ground water in the till due in part to the fact that the volume of water available is considered insufficient for domestic use. Nor does the I-EPA limit the amount of permissible tritium in surface water; however, the U.S. Department of Energy puts a guideline limit on discharges of tritium to surface water at 2,000 pCi / ml.

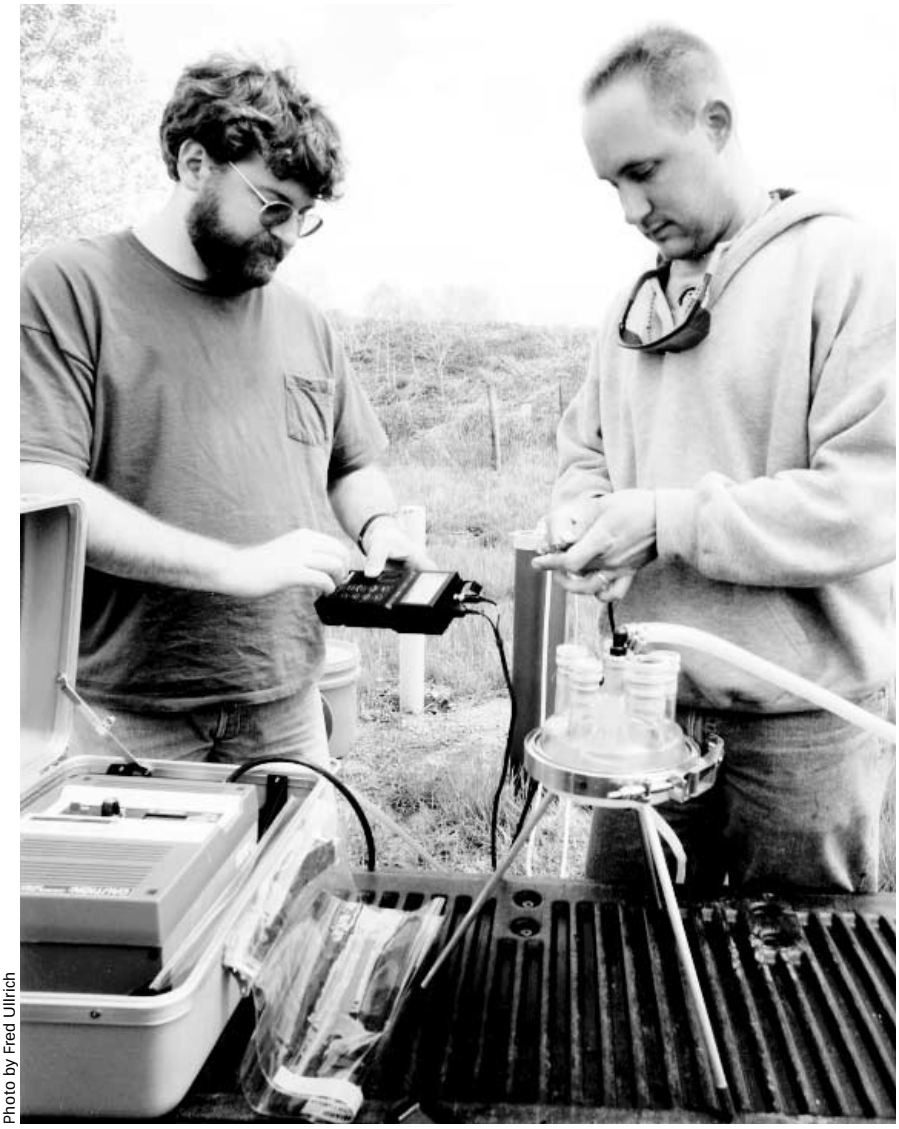

Photo by Fred Ullrich

Members of the ES&H Section sample water for tritium at an experimental area.

Fermilab produces low levels of tritium and other radionuclides as part of its high–energy physics research, according to Rod Walton, associate head for environmental protection.

"Fermilab is a fairly clean operation because of what we do and what we don't do," said Walton, referring to the fact that Fermilab does not have a nuclear reactor and does not build weapons nor perform biological research.

The Laboratory produces tritium when protons, accelerated to high energies by particle accelerators, strike beam targets, absorbers, and other devices in the beampipe.

The highest concentrations of tritiated water on site are contained in a small number of the Laboratory's closed-loop water systems. The water in these few systems is kept separate from all the other water on the Fermilab site. Once the tritiated water in these closed–loop systems reaches certain levels, it is drained from the system, solidified and disposed of at a designated low-level radioactive waste facility.

The amount of tritium found in the soil outside of target and absorber vaults is minimized by concrete and steel shielding that surrounds the beamline; however, it is not possible to completely avoid tritium production in soil. Because of its mobility in the environment, tritium has been the focus of much of the environmental monitoring activity at Fermilab through the years.

Monitoring efforts

Fermilab's Beams Division personnel consistently check the closed–loop systems for leaks, while the ES&H Section monitors the rest of the site for tritium in the surface water, ground water and aquifer. The extensive monitoring program comprises many strategies, including the study of the geology of the 6,800–acre site. Walton states that Fermilab is built upon glacial till that has an extremely low level of permeability, which keeps water flow to a minimum. How low is the permeability?

"Actually, the Fermilab soil is so impermeable that it would meet the standards for capping a hazardous waste landfill," said Walton. Thus any tritium in the ground water would move through the till at a very slow pace, allowing time for it to decay into harmless byproducts. Brookhaven, conversely, is built upon sandy soil, allowing tritiated water to move much faster.

The environmental team also evaluates construction of monitoring wells at the Laboratory, studying when and if to install wells at certain sites. Bill Griffing, head of the ES&H section, said the benefits of monitoring wells must be balanced against the risk of installing them.

"Drilling wells can inadvertently create conduits for transporting contaminants to the very sources of water we are trying to protect," Griffing said.

Presently, Fermilab has 38 wells at various sites and depths to monitor tritium levels. Many of the wells extend to the aquifer, where the Lab has never detected tritium.

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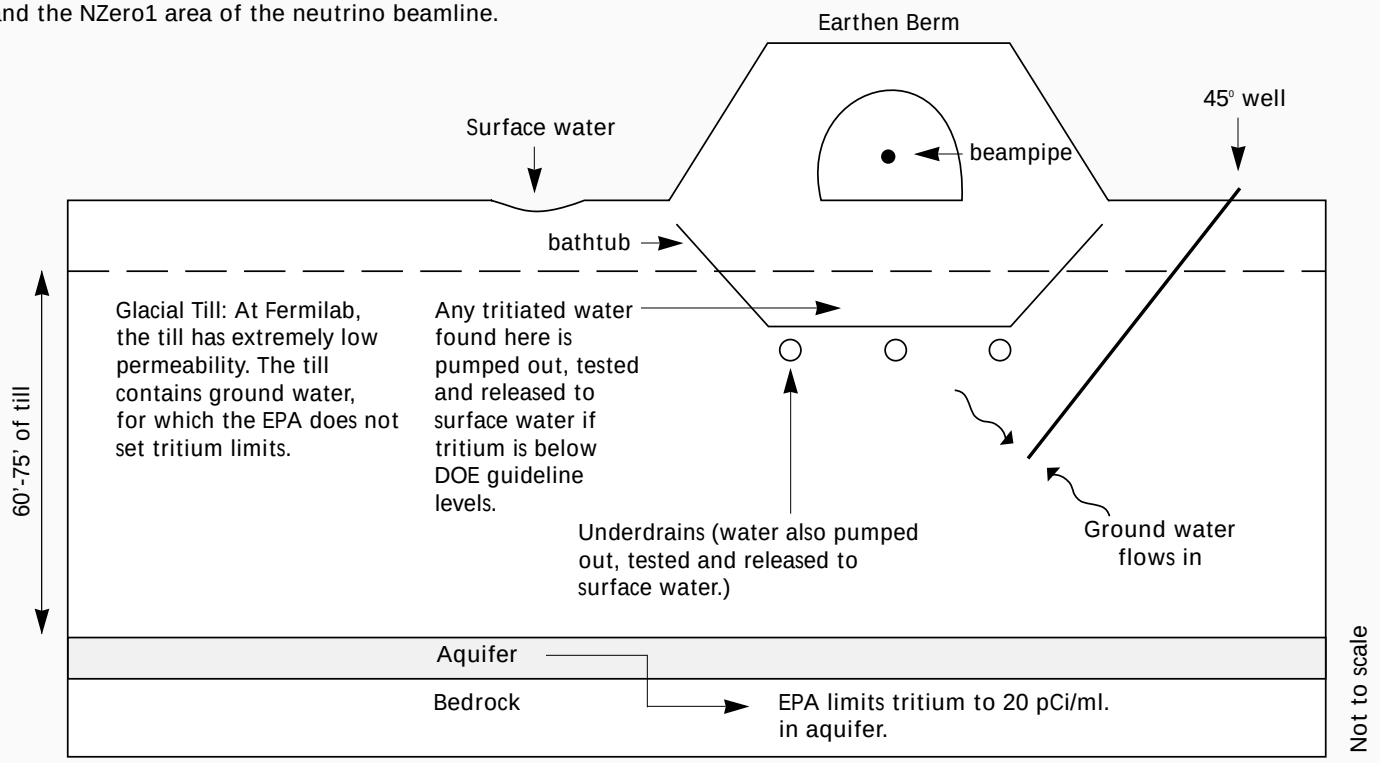
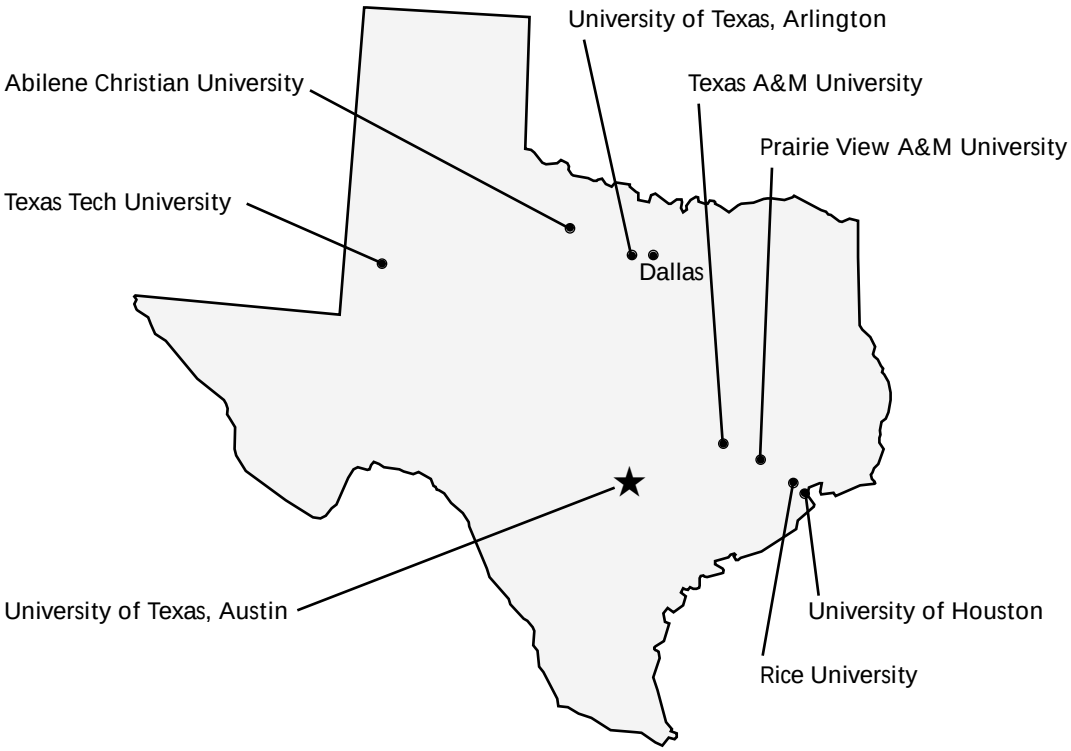
Fermilab's Geology and Monitoring

Fermilab produces only low levels of tritium on the site due to the nature of Lab activities. This schematic shows the geology of Fermilab and the NZero1 area of the neutrino beamline.



From Texas to Fermilab and beyond



Institutions with physicists and students conducting experiments or analyzing data at Fermilab.

Physicists and students from eight Texas universities conduct forefront particle physics research at Fermilab.

by Katherine Arnold, Office of Public Affairs

To ranchers, the vast Texas landscape is reminiscent of the Old West. To oilmen, the land is as good as gold. To college football fans, the Lone Star State is home to deep-rooted rivalry steeped in tradition. And to particle physicists, a 52-mile ring in the Texas soil once represented the future frontier for high-energy physics experimentation and discovery.

Although the Superconducting Supercollider (SSC) termination dealt a blow to the field of particle physics, scientists from universities across Texas continue forefront research at the present frontier of high-energy physics — Fermi National Accelerator Laboratory in Illinois.

"Continuing basic research, such as that performed by Texas A&M physicists at Fermilab, is vital to America's strength as a technological leader, to our country's economic growth and to our academic institutions' success," said U.S. Rep. Kevin Brady (R-Texas), whose district includes Texas A&M University.

The Lone Star State researchers have a diverse presence at Fermilab. Nearly 40 scientists and about 25 graduate students from eight different Texas universities conduct research at the Laboratory, attacking projects such as magnet development, software implementation, and studying the existence of matter in the universe.

Texas A&M University

James White, associate professor of physics at Texas A&M University, has been working on the DZero collider detector at Fermilab since 1990. His research into new phenomena focuses on searches for supersymmetry, a theory that assigns every elementary particle a super partner, or sparticle, which doubles the particle spectrum. The idea of supersymmetry was invented on a purely theoretical basis, but there are strong reasons that suggest it may exist.

"Fermilab has an excellent chance to view supersymmetry in the next few years," White said. "This will totally revolutionize our knowledge of the existing universe."

The theory would solve a number of theoretical problems in the Standard Model, and would provide an ideal candidate to explain the mysterious dark matter, which is believed to constitute 90 percent of the matter in the universe, White said. Specifically, the Texas A&M team at DZero is focused on finding the supersymmetric partners of the *W* and *Z* bosons, two force-carrying particles.

Similarly, a separate team of three physicists from Texas A&M, including Robert Webb, is working on a supersymmetry project at CDF, Fermilab's other collider experiment. He and Peter McIntyre from Texas A&M have been part of the CDF collaboration since its inception in 1984. Both scientists and their students are looking forward to the increased data to be provided by the Main Injector, Fermilab's newest accelerator now under construction.

"We're looking at standard models as well as looking for weird new things," said Webb, who has been conducting experiments at Fermilab since 1976.

Rice University

Marjorie Corcoran is no stranger to Fermilab; she began her research at the Lab as a graduate student from Indiana in 1975. Since then, she has joined the faculty at Rice University and is now working on KTeV, one of nine fixed-target experiments now running at the Lab.

KTeV comprises two experiments; E799 studies a wide range of rare decay modes, and E832 is studying the neutral kaon system. Both experiments are exploring a phenomenon known as CP-violation. The particle interactions that lead to the predominance of matter over antimatter in the universe may be the key to understanding why it is possible for particles to outnumber antiparticles.

Corcoran is studying one of the many types of rare decay modes; specifically, a kaon's decay into a neutral pion, a muon and an electron.

"This is something that has never been seen, and would be forbidden by the Standard Model," Corcoran said.

Also working on KTeV, undergraduate students from the Houston campus helped rebuild the drift chambers and are involved in data analysis.

But Rice's presence at Fermilab does not end with KTeV. Paul Padley, faculty fellow at Rice and member of the DZero collaboration, is currently focused on upgrading the data acquisition system for the 5,000-ton detector.

"There are 100,000 channels [of visible light photon counters] to be tested before they go into the detector," Padley said.

Padley and his students who are working on the new data acquisition system must ensure that the upgraded components can keep up with the increased luminosity, or number of particle collisions. The Main Injector will allow for many more particle collisions per second at both CDF and DZero. The present detector

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Photo by Reidar Hahn

Doug Benjamin (left) and Alan Sill from Texas Tech University analyze equipment at the Silicon Detector Facility.

Photo by Katherine Arnold

Marjorie Corcoran, a physics professor from Rice University, takes a shift in the KTeV control room.

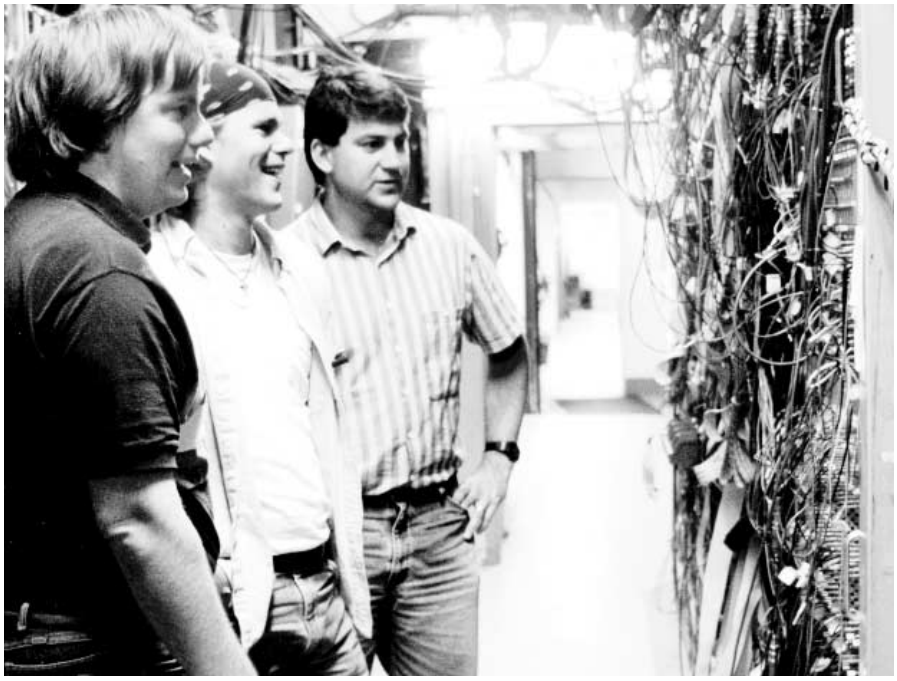

Photo by Katherine Arnold

Don Isenhower, associate professor at Abilene Christian University, Josh Bush, an undergraduate physics student at ACU, and Rusty Towell, a graduate student from the University of Texas at Austin, check connections for the hodoscopes in the detector.

Texas

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data acquisition systems would be flooded without the critical upgrades.

Padley, a former research scientist for the SSC, now divides his time between Rice and Fermilab, while also collaborating on the Large Hadron Collider (LHC) project at CERN.

"With the upgrade coming online, we're going to be very busy," he said.

University of Texas at Arlington

Scientists from the University of Texas at Arlington are building a new intercryostat detector (ICD) for Run II at DZero. UT Arlington has sole responsibility for these detectors, and its 10 researchers at Fermilab are currently working on prototype design.

"All the technology has already been established," said Elizabeth Gallas, a post-doctorate student and co-manager of the ICD, "but something like this has never been built before. It's now a matter of bringing it all together."

The inner components used in Run I surrounded the beamline in a circular array of 64 detectors. However, scientists must reconfigure DZero for Run II, because they are installing a solenoid magnet that will improve the detector's tracking of charged particles. The photomultiplier tubes, which are responsible for collecting and converting signals from the plastic scintillator, will not function in the magnetic field; thus the UT Arlington team must redesign the detector.

The new design uses a scintillator layer that fits in the gap between two calorimeters. The scintillator will give off a signal of light for each interaction with a particle from a collision, said Andrew White, a physics professor at UT Arlington. The photomultiplier tube will then convert the light signal into an electrical signal. The ICD ultimately measures the energy of jets emerging from proton–antiproton collisions.

"If you measure the energy in the direction of these jets it allows us to work backwards to understand the details of what goes on in these collisions," White said.

Abilene Christian University

ACU maintains its presence at Fermilab on E866, or NuSea, another of the fixed-target experiments. E866 will measure the distribution of anti-up and anti-down quarks in the proton.

The ACU group, which includes two faculty members and several undergraduate students, is responsible for rebuilding and maintaining the hodoscopes, which are plastic scintillators in the detector. The hodoscopes provide a fast signal to indicate that an event of interest has taken place in the detector.

As an undergraduate, Rusty Towell, now a graduate student from the University of Texas at Austin, worked on the hodoscopes for E789, E866's predecessor. He took the opportunity to return to Fermilab and work with the ACU team for his graduate work.

ACU gives many undergraduates the opportunity to work at Fermilab.

"Involving undergraduates (at Fermilab) is what sets ACU apart from other universities," said Don Isenhower, associate professor at Abilene Christian University. "There is nothing on the detector the undergrads can't or haven't fixed," he said. Five undergraduates will work with Isenhower this summer programming software, analyzing data and running shifts at the experiment.

"Working on the experiment gives a good taste of what research is really like and how things are done," Isenhower said. "It's also not just benefiting physicists. We get a lot of electrical engineering and mechanical engineering majors out here too."

Josh Bush, an undergraduate physics student, plans on being a high-school physics teacher, and is using his experience at Fermilab to enhance what he can teach in the classroom.

"This gives me a chance to see the components of physics put together," he said. "This is the stuff you can't learn from a textbook."

Photo by Reidar Hahn

Physicist Vaia Papadimitriou from Texas Tech University checks electronics at CDF.

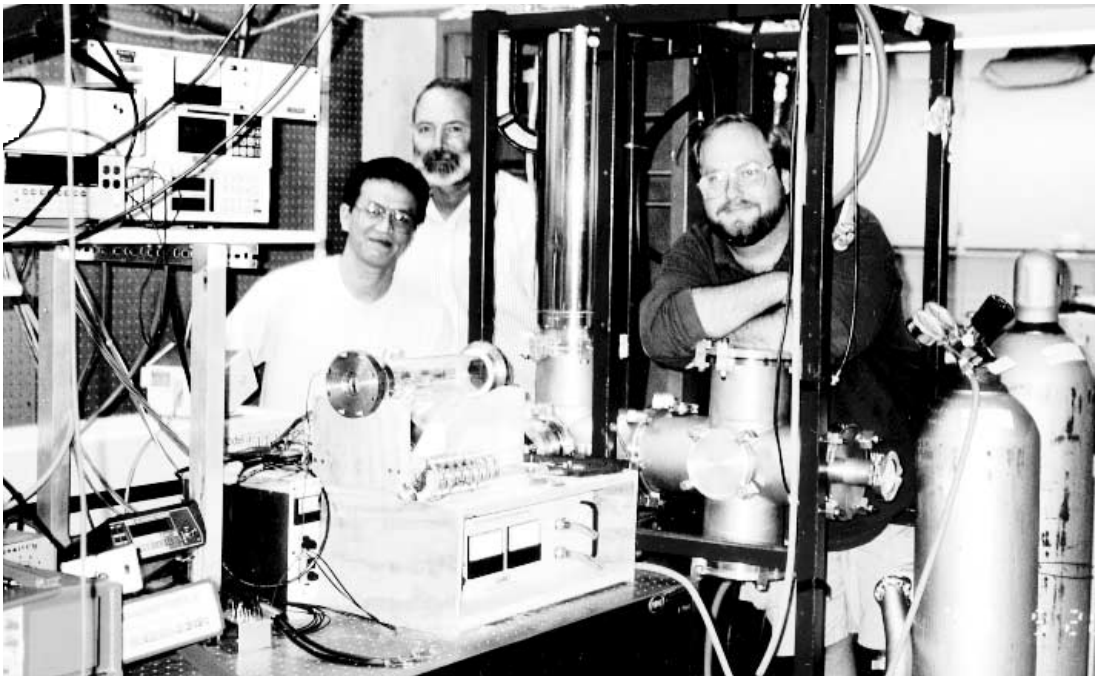

Photo courtesy of Texas A&M University

Kiki Hosea (left), a post-doctoral student, James White, associate professor of physics, and David Brookes, a graduate student, work at Texas A&M University on a detector for cold dark matter searches.

Texas Tech University

Internal reviews are one of the important facets of detector maintenance, and Alan Sill, an associate professor from Texas Tech University, is in the midst of an evaluation of CDF. Sill recently completed one stage of the internal review, which he said is as extensive as an external audit.

Although the reviews are important, the cornerstone of Sill's work at Fermilab is his involvement in silicon vertex detector upgrades.

"The next generation of the silicon vertex detectors will be quite ambitious," Sill said. The upgrades will move the detectors from about 46,000 to almost 600,000 channels of electronics, he said. This will give precise vertexing and tracking of collisions in three dimensions.

One of the biggest challenges of all the upgrades occurring at CDF is compensating for the change in rate of particle interactions, Sill said.

"Everything is going to be happening faster in Run II, and the machine will be delivering collisions and interactions faster," he said.

The challenge will be to implement calorimetry and electronics that can keep up with the speed. To do this, the Texas Tech team will be using a new microchip originally developed for the SSC.

Sill started working with CDF in 1991 as a post-doctoral student. When he joined the faculty at Texas Tech, Tech did not have a high-energy physics program, but started one because of the now-defunct SSC. Now, the relatively new program has three faculty members, three postdocs, and a handful of graduate students working on CDF.

A New Frontier

Groups from other Texas universities have also used Fermilab for their research, and the schools mentioned have many other scientists and students at the Lab conducting cutting-edge research. These physicists may work at the current frontier for high-energy physics, but the Large Hadron Collider under construction at CERN represents the next frontier for particle physics. But until that happens, Fermilab remains the place to come for the highest energy particle collisions.

"You at Fermilab, along with SLAC, are the premier laboratories in the world for this research," said U.S. Rep. Joe Barton (R-Texas).

Alan Sill points out that the LHC will not come online for years, and, until it does, the primary research in high-energy physics will be at Fermilab.

"The way to have a successful LHC program is to have a successful Tevatron program," Sill said. ■

Photo by Reidar Hahn

Elizabeth Gallas, a post-doctorate student from UT Arlington, reads data from the detector prototype.

Photo by Reidar Hahn

Jill Perkins (seated) from UT Arlington, Doug Norman from Texas A&M, Elizabeth Gallas from UT Arlington, and Djoko Wirjawan from Texas A&M look at data from prototype detectors.

DZero Gets a Magnet

By Judy Jackson, Office of Public Affairs

They did it with time to spare. A "director's milestone" for the DZero upgrade project called for delivery to Fermilab of the detector's long-awaited superconducting solenoid magnet by May 15, 1997. Three days early, on Monday morning, May 12, the magnet arrived on a flatbed truck, completing the last stage of its two-week journey from Yokohama, where the Toshiba Company had built and tested it under a $1.9M contract signed in January 1995.

"They are jumping out of their skins over there," said Project Manager Gene Fisk of his jubilant collaborators at the detector site, shortly after the truck pulled up. Fisk had come to Wilson Hall to announce the magnet's arrival and buy a morning cup of tea. "The magnet is ushering in a new era for DZero."

The new magnet uses current-carrying coils of superconducting wire to create a magnetic field for tracking the momentum of charged particles that emerge from high-energy proton-antiproton collisions within the DZero detector. The two-ton magnet, built to a Fermilab design, is 2.8 meters long, 1.4 meters in diameter, and "looks like a tin can," Fisk said. The magnet is the first "thin" solenoid for a particle detector to operate at a magnetic field strength of 2.0 Tesla.

Collaborators said the magnet will help in the identification of electrons and open up new opportunities at DZero for the study of charm and *b* particles. The investigation in the *b* quark system of the matter-antimatter asymmetry called CP-violation is a priority of frontier particle physics research worldwide.

"With this magnet, we can do some exciting *b* physics," Fisk said.

The magnet will also improve identification of top quark candidates and will be especially useful for precision measurement of the momentum of muons, an important aspect of the physics of *W* and *Z* bosons and the search for the Higgs boson.

A new superconducting solenoidal magnet for the DZero collider detector arrived by truck on May 12.

Fermilab engineers Kurt Kremptez and Russ Rucinski, and physicists Rich Smith, Ryuji Yamada and Fisk, among others, worked closely with Toshiba scientists during the design, fabrication and testing of the magnet. The team tested the magnet to full 2 Tesla field on March 5 in Japan.

"The superb performance of the magnet was toasted with both saki and champagne at the close of the day," reported Smith, who was on hand for the tests.

"This is clearly a milestone," said DZero Cospokesman Hugh Montgomery, who was finishing breakfast in the Fermilab cafeteria when the magnet arrived. "It is literally the core of the DZero upgrade."

Some at the breakfast table evinced a certain skepticism. "Wait a minute," cracked KTeV Project Manager Greg Bock. "Isn't this the magnet that they've been bragging for years about not having?"

"One builds the best detector possible within the funding constraints of the time," DZero's Montgomery replied. "The magnet technology and costs of 1984, when they conceived the original detector, led DZero to concentrate resources on calorimetry and muon detection rather than central tracking, a choice that gave all the physics promised and more—CERN was supposed to discover the top quark. Physics evolves, and by 1990 when we began planning the upgrade, technology—and in particular high precision silicon detectors—had advanced to the point where it made sense to incorporate a solenoidal magnet."

Photos by Reidar Hahn

The new magnet, in its packing case.

Installing the magnet and associated structures will take about a year, and hooking up the requisite electronics and computing will be a major undertaking.

"Using this magnet for physics depends on DZero's successful construction of a million-channel tracking system in the next two years," Montgomery said.

With not a moment to lose, the collaborators put away their breakfast trays and headed back to their outpost on the energy frontier. ■

Apprenticeship

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The nature of industry, business and education in the U.S. has changed, but the idea of apprentices has remained. During the first 15 years of Fermilab's existence, a vigorous apprenticeship program trained new machinists to build exotic and precise parts and components for high–energy physics experiments. In the mid–1980s, the program languished due to budget constraints, among other problems. However, about six years ago Paul Mantsch, then head of the Technical Services Section, along with Charles Matthews, head of Fermilab's Machine Shop, revived the apprenticeship program. The original Lab apprenticeships lasted four years, but Matthews said he decided to add a fifth year for CAD / CAM training, because most of the machine work in the 21st century will be done on the computer-aided machines. It is a strategy that sets Fermilab's apprenticeship apart from many others, as most current programs keep CAD / CAM separate from training on traditional machines. Matthews said making CAD / CAM a formal part of the program trains versatile machinists with confidence in all areas of any machine shop.

Photo by Reidar Hahn

At a recent awards ceremony, Scott Walters and Thomas Nurczyk each received an official membership card from the International Association of Machinists and Aerospace Workers, commonly known as "the card," which certifies them as official journeymen instrument machinists. Left to right, Nurczyk, Charles Matthews, head of the Machine Shop, Peter Limon, head of the Technical Division, and Walters.

The program

Walters and Nurczyk, both nine–year veterans of Fermilab, said they enjoyed the program, finding it challenging if a bit tiring. The two new journeymen went through a rigorous selection process that included passing an Illinois Department of Labor test, interviewing with the apprenticeship committee at Fermilab and meeting one-on-one with Matthews. The Machine Shop veteran said both Walters and Nurczyk emerged at the top of everyone's list and were given the first two slots of the new program. (The program will continue this year; the Technical Division is in the process of selecting the new class of apprentices).

Walters, formerly an electrical technician at DZero, and Nurczyk, formerly a technician in the Meson Assembly Building, said the apprenticeship has given them invaluable skills they will have for the rest of their lives. The men spent five hours per week in classroom study and 35 hours per week at the machines learning and practicing with instructors. Both spent many hours of their own time with homework in mathematics, including trigonometry and geometry. Walters and Nurczyk also studied shop theory, welding, heat treatment, metallurgy, drafting, CAD / CAM and machine repair, where the apprentices had to disassemble and rebuild a machine as part of their training. During the early years of the program, the men worked with mentors, seeking guidance and building confidence. The new journeymen will use their skills to support Fermilab's experimental program by building sensitive and complicated parts for all areas of the Laboratory and many experiments, including the Large Hadron Collider, the Sloan Digital Sky Survey and the upgrades at DZero and CDF, Fermilab's two collider detectors. The parts, along with the experience of building them, are often unique to high–energy physics laboratories.

"For the most part, what comes in here needs to be highly accurate, and we need fast turnaround, so the [machinists] need to be adaptable," said Matthews. "We try to build that into the program. We teach [the apprentices] to think critically, to have confidence and go about a job in an organized manner."

Walters and Nurczyk said they enjoy the challenges of the work, especially the parts they build on the newer machines, known as Computer Numerical Control machines or CNC's.

When asked to name a particular part they enjoyed building, Nurczyk said with a laugh, "You usually just remember your mistakes." Walters agreed, but said he especially enjoyed building a "noise box" for the Linac. The large, multi-segmented aluminum structure limits the noise of the electronics for a solenoid's transformer.

Walters and Nurczyk look forward to more challenging projects for the experimental program. Both said they wished that they heard more about their parts' performance, adding once they build a part they seldom hear about how it worked or how it fits in with the larger picture. Nonetheless, the new journeymen said they understood that although their work in the trenches may not bring the glory, it is still appreciated.

"That's all right," said Nurczyk. "We're the linemen and [the physicists] are the halfbacks." ■

Tritium Monitoring

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Also, Fermilab personnel from the Beams Division and the ES&H Section have worked together to identify areas of the Laboratory with the greatest potential for soil activation based primarily on beam history, as well as a host of other pertinent parameters. The team has identified five of these sites at Fermilab: the Antiproton Source, the CZero beam absorber, the Proton East target/absorber area, the Switchyard and the NZero1/NZero2 area in the neutrino beamline. For each of these areas, Fermilab Director John Peoples will appoint a committee to study the data needed to confirm or make a revised estimate of how much tritium may be in the soil. To date, the Antiproton Source committee, which will serve as a model for the other committees, is gathering data. There are two more nascent committees, including one for the CZero area and one for the neutrino beamline. The Proton East and Switchyard committees will be formed later this year.

"We are putting people on these committees who were involved in either the design or operation of experiments in each of these areas," Griffing said. "We have been fortunate to bring back some former employees out of retirement to assist us with this initiative."

In most of the areas where soil activation was expected to occur, Fermilab developers installed a series of underdrains to intercept the migration of tritiated water as it moves downward through the soil with rain water. These underdrains lead to sumps that ES&H routinely analyzes for tritium. Fermilab environmental managers said they believe these sumps are fairly effective at capturing most of the tritium that leaches from the zones of soil activation surrounding the various beamlines' targets and absorbers. Griffing said it is impossible to know just how effective these underdrains are in intercepting the tritium; as a result, he said it is necessary to use other methods to evaluate movement of tritium in the glacial till. To accomplish this goal, his team uses computer modeling to calculate the expected tritium in the soil outside of these beam interaction areas. The environmental managers then plug these estimates into a computer model that considers the soil permeability, the decay rate of tritium and a host of other variables to conservatively estimate the concentration of tritium. All computer modeling conducted to date suggests that there is little reason to worry about introducing tritium to the aquifer beneath Fermilab. However, Griffing said relying on computer modeling is not enough.

Photo by Fred Ullrich

Fermilab regularly monitors water on the site.

"One of the lessons of the recent Brookhaven tritium problem is that you need to challenge all of your environmental monitoring assumptions," said Griffing. "The environmental monitoring folks at Brookhaven thought they understood their sampling results. Actually, they didn't. Worse yet, they dismissed some elevated levels of tritium that were reported nearly a decade ago and missed an opportunity to identify the problem much earlier. I don't want that to happen here. We need to be completely honest with ourselves; confirm what we think we know and admit what we don't."

Case study: neutrino beamline

For instance, Griffing detailed an example of monitoring results that has continued to defy the understanding of the environmental monitoring team at Fermilab. Two years ago, the Fermilab environmental team saw an unexpected increase in tritium levels collected from one of four shallow glacial till ground water monitoring wells installed beneath one of the oldest experimental areas of the Lab, NZero1/NZero2—one of the five sites that a committee will study. Fermilab personnel installed the four 45-degree wells in 1988 as a means to confirm the absence of tritium below an impermeable liner, called a "bathtub," which was laid beneath the target stations during their

construction in the 1970's (see diagram, pg. 3). Fermilab also installed the wells to serve as an early warning device, designed to alert Laboratory officials to the presence of tritium in the till's ground water before it reached the underlying aquifer.

"For many years, the tritium levels measured in these four shallow wells ranged from below detection limits up to about 10 pCi/ml," said Griffing.

In 1995, however, the tritium level began to rise in one of the four wells, hitting a high of 80 pCi/ml in December of that year.

Quarterly testing turned into monthly testing at the site, as the environmental team attempted to understand the unexpected rise. After more analysis and tests, the environmental team began to suspect the well itself might be causing the problem due to its construction. Walton said the contractor who installed the 45–degree well used concrete as grout, a material no longer used for filler because it can deteriorate and open passageways for water to flow more rapidly down the outside of the well casing rather than through the undisturbed till. Walton and crew offer this as one possible explanation for the sudden rise in tritium.

"What we don't understand is whether the tritium we are seeing in this one well is really the front edge of a tritium source created 20 years ago when we were regularly targeting in this location and which is slowly migrating downward through the till, or whether it was artificially introduced through contamination or some sort of short-circuiting mechanism as Walton has proposed," said Griffing.

The ES&H leader said his team will continue to study the problem at the neutrino beamline to understand the anomalous tritium readings. Furthermore, analysis of samples from monitoring wells drilled into the bedrock aquifer near the neutrino beamline has not shown detectable tritium.

"We take these data seriously," said Griffing. "We obviously have our work ahead of us in the Neutrino area to more fully understand the nature and extent of soil activation that has occurred through many years of use." ■

CALENDAR

JUNE 11

Health Fair, Wilson Hall Atrium from 11 a.m. - 2 p.m. Must have supervisor's permission to attend. Demos: Home Exercise Equipment by Nordic Track, Massage Therapy, and Bio-Feedback for stress reduction. Screening/Assessments: Blood Pressure & Stress, Glaucoma/Vision, Back & Posture, Body Fat, Pulmonary Function, Blood Sugar. Consultation with an exercise physiologist, consultation with a nutrition consultant, treatment assessment for nearsightedness. Prize drawings, give aways, games & information.

JUNE 13

International Film Society Presents:
Matewan - dir. John Sayles, USA (1987) 8 p.m. in Ramsey Auditorium, Admission $4.

ONGOING

English lessons, Thursdays 10–noon in the Users Center, call Janet Antonio, (630) 769-6518.
NALWO coffee mornings, Thursdays 10 a.m. in the Users' Center, call Selitha Raja, (630) 305-7769.
In the Village 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.

LAB NOTES

HEPIC

The High Energy Physics Information Center (HEPIC) is a web-based information server that contains much HEP-related information, search capabilities, and links to various HEP Resources throughout the world. HEPIC exists to aid the HEP researcher in locating information quickly and efficiently. It is intended to be the "server of servers" for the HEP community.

A few services are: (1) the HEP Virtual Phonebook, the most nearly complete physics phonebook in existence; (2) many newsletters; (3) global HEP search, providing fast unified searching of HEP information across multiple experiments and locations; and (4) comprehensive information on experiments, conferences and more. Please take a look at http://www.hep.net.

MILESTONES

BORN

Amanda Michelle Jackson, to Gerry (BD/Main Injector) and Lauren Jackson on May 28 at LaGrange Community Hospital.

HONORED

Mike Turner, of the Theoretical Astrophysics Group, named a member of the National Academy of Sciences.

RETIRING

■ Jack Pfister, I.D. 4530, on August 15 from the Directorate.

■ Robert Shovan, I.D. 851, on June 30 from the Particle Physics Division/Engineering and Tech. Teams.

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

Lunch
Wednesday
June 11

Danish Open Sandwiches
with Cucumber and Dill Salad
Scandinavian Apple-Almond Cake

Dinner
Thursday
June 12

Grilled Onion Salad with
Mixed Greens and Goat Cheese
Grilled Sea Bass
Vegetable of the Season
Chocolate Pecan Layer Cake

Lunch
Wednesday
June 18

Pita Stuffed with
Tita's Dominican Chicken
Tropical Fruit

Dinner
Thursday
June 19

Salad Nicoise
Grilled Salmon
Lemon Risotto
Grilled Vegetables
Almond Torte
with Chocolate Sauce

CLASSIFIEDS

FOR SALE

■ '90 Red Probe GL, 5-speed manual trans, 95k miles, Air Cond. $3,300. Call Giulia Santoro, x3589.

■ '89 Chrysler LeBaron Coupe 2.5L w/turbo. Power doors, windows, etc. Reliable, beautiful condition inside & out. $2700 obo. Contact (630) 393–6345.

■ '80 Pontiac Phoenix 5dr Hatchback. Well maintained. Reasonable condition, 95k miles, AC, PS, PB, AM/FM radio. New Batt, radiator, plugs, anti-freeze, air filter. $400. Call Tom, x5768 or (630) 879–5650.

■ '86 Nissan Sentra, 108k miles, good condition. $1000. 2dr, blue color, A. Morelos, x3600; x3956 or morelos@fnal.

■ 3 Loveseats, Italian-made, leather, excellent condition, $800 each. Call Farhad, x5016 or (630) 778–7878.

■ Computer Desk 29" x 46" w/hutch $15. Matching teakwood set: Desk 54"W x 23"D $60, Credenza 48"W x 15.5"D x 25" H, Bookcase 48"W x 47"H x 11.5"D, Desk organizer $20. Call Roy, x8364 or (630) 665–8246.

■ Hedstrom metal swing set with 2 swings, lawn swing, glider, & metal slide - $40. Wood sand box with 2 seats - $5. Big Wheel tricycle with adjustable seat - $5. Call Jerry @ x4571 or (630) 801-9408 or email JerryZ@fnal.gov

■ Johnson Outboard Motor 9 1/2 HP rebuilt in '95, $500 obo; 16 ft. Fiberglass DuoMarine Boat needs work, hardware already removed and rough sanding completed $100 obo; GE Gas Stove Profile Series, Stainless Steel, Natural and LP Gas Jets. Self Cleaning Oven, Sealed Burners. Paid $1,350 in October asking $1,100. Will deliver within reasonable distance to the lab. Compaq Tech PC 286 with built in monochrome display $50 obo; Ski's - Atomic Arc 195 Salomon 547 Sport Bindings, size 12 US or 13 EU Trappeur 2000 boots also have ski and boot bag $200. Trailer frame and axle $50 obo. Call Terry x4572 or email skweres@fnal.gov.

■ Single family home, 2 story, 4 bedrooms, 2.5 baths, 2 car garage. Cul-De-Sac location w/wooded surrounding, beautiful decorated/maintained in nice neighborhood. Hot tub in splendid 3-seasons room. Naperville School District 204, close to Fermilab, low utility bills, $151,990. Call Yan & Weiming Yao, (630) 820–9269.

■ Beautifully updated home in Warrenville/Summerlakes. Four spacious bedrooms, large closets, MB walk-in and 1.5 baths. All new light oak kitchen cabinets & new vinyl flooring. Freshly painted and airy. You will love the space & private yard with storage shed. Close to I-88, schools (District 200), & shopping. Clubhouse w/pool, tennis, and gym. Call Barbara at (630) 393–2885.

FOR RENT

■ Spending a year at SLAC or Stanford? Immaculate 3 bedroom townhouse in downtown Palo Alto beginning July 1. Fully furnished. Basement study wired w/ISDN and multiple phone lines. Two underground parking spaces. One bedroom occupied by caretaker, relative of owner. Two friendly cats in residence so no more pets. Perfect for nonsmoking professional couple or friends @ $2000/month for one year lease. Call John, x2529 or (630) 377–9252.

■ Townhouse to share in Butterfield Subdivision. 4 bedrooms, close to I-88. Full house privileges. $450/month plus 1/2 utilities. Call (630) 978–0789.

■ 1 bedroom apartment($570/month) is available in Batavia. Approximately 15 minutes from the Lab, near downtown of Batavia, Randall mall. Free water gas. I will offer TV and video. Move in after middle of June. If interested contact Satoshi Hidaka, email hidaka@fnal.gov, or (630) 761-0917 or x2176.

WANTED

■ New and used voices for Fermilab Choir. Every Tuesday, Noon, Ramsey Auditorium.

■ August rental house - Professional European family seeks furnished rental house in Aurora/Naperville area for month of August. Call Sam, x4567 or (630) 231–1791.

■ Highly interactive, experienced childcare sought. Long-term position from July 1997 caring for a pleasant, musical 2 1/2 year old girl five days/week, 9–5. Cognitive development training desirable; English fluency and car necessary. Salary very competitive. References please. Nicole Jordan, Warrenville, 393-3970.

Photo by McGuire

Fermilab Arts Series to host bluegrass bands

The Fermilab Arts Series will host two top bluegrass bands Saturday, June 14, 1997, at 8 p.m. in Fermilab's Ramsey Auditorium.

The Nashville Bluegrass Band is the most awarded band working today, earning three Grammy Awards and Grammy nominations for each of its albums released since 1988.

The Lonesome River Band is one of the fastest rising bands on the bluegrass circuit, with their latest album, *One Step Forward*, topping the bluegrass radio album and singles charts for five solid months.

Tickets are $17 and are available through the box office at (630) 840-ARTS.

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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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