FermiNews

Fermi National Accelerator Laboratory

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INSIDE

Detour Ahead

East Entrance to Close Temporarily

Fermilab will close the east entrance to the Laboratory from 6 a.m. Monday, August 19 through 8 p.m. Friday, August 23, to permit maintenance on the railroad grade crossing by the Elgin, Joliet and Eastern Railroad. During the temporary closing, employees and others who normally enter via Batavia Road on the east side of the Laboratory must enter instead via Pine Street on the west. The entrance will also be closed to bicycles and pedestrians.

Detour signs will reroute traffic via Route 59 south, Butterfield Road west, and Kirk Road north to Pine Street. Questions? Call the Office of Public Affairs at 630-840-3351.

Photo by Jenny Mullins

Glenn Blanford, a graduate student from the University of California-Irvine, at work on the new Fermilab home page that will debut at the end of August.

High-Energy Physics

Birthplace of the Web

by Eric Berger, Office of Public Affairs

In mid-1991, when it spun its first thread from CERN to Fermilab, hardly anyone had ever heard of the World Wide Web. Now, only four years later, the Web is woven through the fabric of our culture, connecting people all over the planet in a new medium of communication. But of the millions who type "http://www...." each day, how many realize that—like the universe itself—it all began with high-energy physics?

What started out as tool for far-flung scientific colleagues to share each others' data may ultimately count among high-energy physics' most significant contributions to modern technology.

The Web was born in 1990, when Tim Berners-Lee, a computer scientist at CERN, the European Laboratory for Particle Physics, programmed the first types of computer codes, called protocols, that allowed a computer any-

continued on page 8

From the City of Broad Shoulders, a Giant in Research:

The University of Chicago

Enrico Fermi (left), Herbert Anderson, and John Marshall, at the Chicago cyclotron in 1953.

by Leila Belkora, Office of Public Affairs

It's hard to think of a university whose physics research is more closely entwined with Fermilab's than the University of Chicago. The high energy physics group from Hyde Park is a pillar of both the colliding beam and fixed-target programs at Fermilab. Theoretical astrophysicists at the university led Fermilab's expansion into research in cosmology. Chicago professor David Schramm is a member of Fermilab's Board of Overseers. Most visibly linking the two institutions is the late University of Chicago physicist Enrico Fermi, for whom the Department of Energy rededicated the Lab in 1974.

The University of Chicago, in turn, benefits from its proximity to the world's most powerful particle accelerator. Physicist Val Telegdi, a pioneer in the study of weak interactions, and Chicago luminary Jim Cronin, who joined the department in 1972, lured students and postdoctoral fellows to Chicago to do research at the Lab. The new arrivals recruited more researchers to help build and run experiments. "I remember Fermilab in its infancy," said Cronin, who left Princeton to be closer to the new accelerator in Batavia. "It was wonderful. It was a brand new lab, and Robert Wilson was a great leader."

If there's a downside to having a national lab in one's backyard, it's the temptation to work all day and all night. Henry Frisch, a leader of Chicago's CDF contingent, recalled earlier times when he worked overnight shifts at the controls of his experiment, then drove back to campus to teach class. "It wasn't so bad when the class was at 9 a.m., but a class at 11 a.m.—that's just about the time when I shut down."

Kaons and Calorimeters

E799 and E832 are the latest in a series of Fermilab experiments with Chicago roots studying weak interactions. Their common theme is kaons, particles composed of strange quarks. Together the experiments go by the name of KTeV, for "Kaons at the Tevatron."

In experiments at Brookhaven National Lab in 1964, Princeton physicists Val Fitch and Jim Cronin discovered that kaons decay into secondary particles without maintaining nature's usual evenhandedness with respect to matter and antimatter. This quirk, known as CP violation, may be the key to understanding how matter came to dominate antimatter in the early universe. E832 will measure the kaons' CP-violating decay rates to a precision of one part in 10,000, and is poised to detect the first new manifestation of CP violation in more than 30 years. E799 is looking for even rarer CP-violating kaon decays.

The centerpiece of the Chicago group's contribution to KTeV is the cesium iodide calorimeter, 2 meters (6.5 feet) on a side and composed of 3100 crystal blocks. The calorimeter measures the energy of particles emanating from kaon decays by recording the light emitted as the particles pass through a scintillating material. Chicago physicists previously built a lead-glass calorimeter, but an experiment as demanding as KTeV needed an instrument that is less susceptible to radiation damage, more sensitive to low light levels, and more uniform in its response. The research

Members of the University of Chicago KTeV group. Standing: Jim Graham, Yau Wah, Breese Quinn, Earl Swallow (hidden from view), Steve Bright, Greg Graham, Colin Brown, Ed Blucher, Peter Shawhan, Val Prasad, Erik Zimmerman; kneeling: Rick Kessler, Bruce Winstein

The Fermi Connection

Before there was a national accelerator facility, Chicago had one of half a dozen cyclo-synchrotron accelerators in the country. Enrico Fermi used the Chicago cyclotron in studies that indicated protons and neutrons might have more elementary constituents. When Chicago physicists became Fermilab users, the magnet from this machine migrated to Fermilab, where it served as an analysis magnet. It now sits in the New Muon Hall.

Fermilab users at the University of Chicago pose in front of the Henry Moore Sculpture, "Nuclear Energy." Back row: Melvyn Shochet, Carla Grosso-Pilcher, Alexis Amadon, Colliness Morris; front row: Roland Winston, Ray Culbertson, Dave Toback, Jeff Berryhill, Harold Sanders, Peter Wilson and John Dusatko.

group settled on cesium iodide after years of investigating other crystals, including barium fluoride.

Junior faculty member Ed Blucher, one of Chicago's recent recruits, said putting all the crystals together was a complex operation, because the elements vary in size and in their response to a given signal. "When people look at the whole set-up they get a kind of glow, because they know thousands of pieces came together," he said. E832 spokesman Bruce Winstein notes that by the early 1990s, 25 graduate students from Chicago and other institutions had obtained their Ph.D.s using the previous calorimeter; he expects twice this number from the new one.

At HEP's Door

Both Roland Winston, who chaired the Chicago Physics Department for six years, and Jim Cronin have exercised their intellectual freedom at University of Chicago to pursue other interesting areas of research. Winston and his colleague Yau Wei Wah built transition-radiation detectors for KTeV, but Winston also designs devices to collect and intensify solar radiation. Reflecting on the wide range of problems that Chicago physicists turn to, Winston said, "I think it's partly the environment here which allows people to do their own thing, and partly that high energy physics collects the people, and presents capable people with challenges....We have made a revolution in the optical and solar energy fields, and I think we can lay that at high-energy physics' door."

Cronin said high-energy physics taught him to "think big" in attacking questions in cosmic ray physics. Said Cronin, "The most compelling problems in cosmic ray physics have to do with the highest energy particles—those with energy 100 million times higher than the energy at Fermilab. Nature's got some great accelerator, but the flux of particles is low, so to attack the problem we have to think big."

Top quarks and triggers

In the mid 1970s, Chicago faculty members Henry Frisch and Melvyn Shochet formed a group to participate in the design and construction of CDF, the first colliding-beam detector at the lab. "The Chicago responsibility for the detector is the hardware trigger system, which in the last run selected typically the ten most interesting events each second, out of the roughly one million collisions that occurred during that second," said Shochet.

The CDF group at Chicago participates in the physics analysis as well, said Shochet, focusing on properties of the *W* boson, the top quark, and the search for exotic objects. Even undergraduates get involved. "Our undergraduates have been working with us almost from the beginning ... They do a variety of things from working on electronics, to helping us with software, to analyzing data, so that they really get the whole spectrum of elementary particle physics research," he said.

Photo by Reidar Hahn

Edward "Rocky" Kolb, theoretical astrophysicist, and Henry Frisch, CDF physicist, cross paths on the front steps of Wilson Hall at Fermilab.

For the next run, the CDF team is completely rebuilding the trigger system to take advantage of the increased rate of collisions that the Main Injector will provide. Along with colleagues at the University of Pisa, the group is developing an innovative technique for finding *b* quarks at the trigger level. They will look for particle tracks that point not to the place where a proton and antiproton collided, but to a point a few millimeters away where the *b* traveled before it decayed. "We're constantly trying to move aspects of analysis into the trigger, because the frequency of collisions is getting so high, in order to cull a few interesting events, you have to use all the 'handles' you have available," said Shochet.

Astrophysics

Fermilab's foray into theoretical astrophysics began in earnest in the early 1980s when Edward "Rocky" Kolb and University of

continued on page 10

How I Spent my Summer Vacation

by Eric Berger, Office of Public Affairs

First off, let me apologize to John Cumalat.

John was the first physicist I interviewed this summer. Finding him provided my first challenge as a Fermilab neophyte and budding science writer. Navigating the fixed-target area roadways seemed like trying to find someone's house in the suburbs without the benefit of street signs. But—a few nervous minutes late—I finally found John at the Wideband Lab that houses his experiment, E831.

He showed me the experiment's massive detector and the beamline, and explained why they needed to produce and study charm particles. I nodded studiously, took copious notes and asked questions I thought sounded intelligent. Problem was, I didn't understand a word he said.

I have an undergraduate degree in astronomy and took a healthy number of physics courses during my four years at the University of Texas. But when he spoke about Cerenkov counters and photomultiplier tubes, he lost me, just as he would have lost 99.9 percent of the human race. At that point, I realized I might need to learn a few things this summer.

I am two semesters away from earning a master's degree in journalism from the University of Missouri. Eventually I want to land a job as a science journalist, and I want to have the ability to talk to scientists like John about their work and write stories most people can understand. One of the first rules of writing science for the public involves continually asking, "Could my mother understand this?"

(Sorry, Mom.)

But, like most scientists today, physicists speak their own language. Take the electron, muon and tau. Most of us know that the tiny electron zips around the atomic nucleus. But the muon? We know there's a Muon Lab on site, but what goes on there? And what about the tau?

It's not really so hard to understand, and therein lies the real challenge. If we can cut through the jargon and discuss concepts, we can all grasp the basic ideas behind nearly all science.

In the case of the electron, muon and tau, we already have a nodding acquaintance with the electron. The others? Well, the relationship among these three particles resembles that of boxing weight classes. The electron takes the role of lightweight, the muon the middleweight and the tau the heavyweight. Basically they all do the same thing. Like an electron, the muon and tau orbit nuclei, just as all three classes of boxers try to win their fights.

Photo by Reidar Hahn

You can tell I'm not a great science writer yet, because my analogy breaks down here. The problem stems from the fact that the muon and tau do not exist in nature, and we can only create them in our high-energy accelerators for short periods of time. Also, the muon actually weighs A LOT more than the electron—about 210 times as much—and the tau weighs even more— 3,500 times the electron.

Why so heavy? Good question. We don't know. When we find out, we'll have taken one more step toward understanding our universe.

And that's another fundamental challenge for science today. The scope of research and the reality of everyday life sometimes seem to have grown so far apart they appear nearly irreconcilable. If people don't know why studying something matters, why should they spend tax money to fund it? But if scientists can help people understand the concepts, they might support basic research.

My part of the solution to this problem entails understanding ideas and passing them along in a clear way. For the past 12 weeks I've had an opportunity to do that. I hope to return someday—to tell the world about your next big discovery.

See you then. ■

Summer intern Eric Berger spent 12 weeks working in the Public Affairs Office, writing science articles about the science and the people of the Fermilab community. Berger is a journalism graduate student at the University of Missouri. In his final FermiNews *article, he reflects on his impressions of the Laboratory and his future as a science writer.*

HIGH ENERGY PHYSICS
made painless

This Week: Acceleration

"Accelerator" is Fermilab's middle name. The head of Fermilab's Accelerator Division explains a basic idea of high-energy physics in everyday language.

by Dave Finley, Accelerator Division Head

Acceleration is a change in speed or direction.

When I drove to work this morning, I used the gas pedal to accelerate, the brake pedal to decelerate, and the steering wheel to change direction. Occasionally, the road surface caused a change in direction vertically. All of these are examples of acceleration.

Fermilab accelerators increase the speed of protons by increasing their energy. We change the energy of a proton by putting it in an electric field that interacts with the positive electric charge of the proton. To get protons started, we pass them through an electric field that gives them an energy of 750,000 electron volts: the voltage times the electric charge of the proton.

Then the protons enter the Linac, where we carefully synchronize the electric field by applying a voltage at just the right time so that when the protons pass by they get a nudge in the right direction. The nudge comes from a device called a radiofrequency, or rf, cavity. The protons pass once through a series of these cavities in the Linac and come out with an energy of 400 million electron volts. One thirtieth of a second later, at their next check point, the Booster has increased their energy to eight billion electron volts.

The circular design of the Booster and the later accelerators allows us to use a single rf cavity over and over again to accelerate the protons, cycling them through the same cavity many times. The Main Ring takes protons to an energy of 150 billion eV.

Up to now, the final accelerator, the Tevatron, has taken protons to energies as high as 980 billion eV. We intend to get to one trillion eV for Collider Run II. A proposed new accelerator at CERN, in Europe, is designed to accelerate protons to seven trillion eV.

Higher energy has crucial advantages for particle physics. The higher the energy of the protons, the more energy is available when particles collide, for conversion into mass and energy of new particles that emerge from the collision. This conversion of energy into mass is an application of Einstein's relationship $E = mc^2$.

The proton is not fundamental. It is composed of tinier particles—the quarks—held together in the proton by particles called gluons. The higher the energy of the accelerated proton, the higher the energy of its components. It is the relationships of the component quarks and gluons that particle physicists are trying to understand better.

Some of the questions physicists ask are: How tiny are quarks? Is a quark also a composite of other particles? Does every particle we see now have another partner that we have not yet uncovered? Where does mass come from anyway? The higher we make the energy of the quarks by acceleration, the better we can answer these kinds of questions. (And the more likely we are to uncover other questions we haven't dreamed up yet.) For example, the higher we make the energy of the quarks, the closer they can get to one another. This helps answer the question: "How tiny are the quarks?"

The better we can accelerate particles, the better we can explore this tiniest world. ■

Wilson Hall Dumbwaiter to Carry Data Once Again

by Keith Chadwick and Al Thomas, Computing Division

Wilson Hall's designers recognized from the outset that Fermilab researchers would need computers. But no one at the time realized how fast the volume of data would grow, or how much computing it would take to analyze it.

In the "old days" of computer programs on punched cards, data came in from open reel tapes and went out via reams of line printer paper. To move all this tape and paper in and out of the computing hub, designers included a dumbwaiter elevator in the design of Wilson Hall. It would serve as a data conduit, supplying cards and tapes to the computer operations center, then located on the seventh and eighth floors. Memories differ on how long this model of operation persisted, but the crush of technology soon rendered the elevator unsuitable for its intended purpose. In 1980, when the elevator car jammed stuck at the thirteenth floor, Fermilab abandoned the system.

Photo by Fred Ullrich

Keith Chadwick (left) and Mark Kaletka hold plastic tubes for optical fibers like the ones just visible above Chadwick's left hand. Behind dumbwaiter, Keith Coiley holds a stack of old-fashioned magnetic tapes of the kind the dumbwaiter once carried. In seconds, the fibers will transmit more data than the dumbwaiter carried in its lifetime.

Almost from the first occupancy of Wilson Hall, computing staff began installing the first in a succession of electronic data communications systems—soon to become networks. The systems progressed as technology advanced, and each new system required installation of a new set of cables. Data rates for desktop connections rose from less than 1,000 to over 10 million bits per second. Projections show that continuing growth will place even more demands on the network infrastructure.

To support expanding data communications for the coming five to 10 years, network experts in the Computing Division have made a plan to allow delivery of gigabit (billion bits)-per-second communications to every desktop in Wilson Hall. The plan defines a single location ("Fiber Central") to which all desktop and other computers could eventually directly connect via optical fibers. Each Wilson Hall desktop will be able to communicate with any other computing workgroup, no matter where it sits within the building.

The ability to recognize previous communication conventions over the new optical fibers will allow for a gradual transition from older communications schemes, rather than requiring an overnight migration of all desktops to the new technology. Perhaps most important, the new scheme will accommodate changing future requirements. Installation involves running small 8-mm diameter plastic tubes from Fiber Central to each desktop. Contractors will use compressed air to install the appropriate number and types of optical fibers required for each location. When requirements at that location change, installation of new fiber takes a matter of minutes.

By now, readers have probably guessed that the venerable dumb waiter shaft that once carried punched cards will now house the optical fibers and plastic tubes connecting Fiber Central, on Wilson Hall's eighth floor, to each floor of the building. In the first few seconds of operation, the optical fibers will carry more information than the old elevator car did in its entire operational life.

The first phase of installation will begin in August, when contractors run trunk lines of plastic tubes vertically within the elevator shaft from Fiber Central, to terminate in distribution units that will replace one of the old elevator hatches on each floor. On a few floors, this will require moving some office furniture. Project Manager Keith Chadwick will alert occupants of each floor well before construction crews arrive. Chadwick asks those with questions to call him at 840-2498.

Phase Two, the installation of plastic tube, fiber and modular connection jacks in offices, will begin sometime in early FY1997. This later phase will require planning with building occupants before installation begins. A future issue of *FermiNews* will announce the schedule of floor-by-floor installations. ■

Profiles
PARTICLE PHYSICS

Carolyn Hines

Telecommunications Manager

Employee I.D. #47

As a long-time employee, Carolyn's knowledge of the lab's activities and its employees is a great asset. She is truly a pleasure to work with, as I am sure anyone that comes in contact with her will attest."
Jeff Irvin

Photo by Fred Ullrich

Carolyn Hines (left) hands off a radio to Janette Larson, a member of her telecommunications team.

Photo by Fred Ullrich

By Donald Sena, Office of Public Affairs

Although her job is to keep everyone at Fermilab communicating with each other—a task that she has been performing for nearly 30 years—Carolyn Hines is surprisingly reticent.

The telecommunications manager admits she isn't comfortable talking about herself or her accomplishments; however, her contribution to the Laboratory in support of high-energy physics speaks for itself. Hines keeps the Fermilab community in touch with each other and with the outside world via phone lines, data cable, two-way radios and other means. Whether it's a phone call from the fixed-target experimental area to the accelerator control room, a professor discussing a physics theory with a student via e-mail, or an alert security guard using his radio to summon the Fermilab Fire Department, Hines' duties affect nearly every employee and user every day.

Hines knows that the users' ability to communicate with colleagues and students at their universities—sharing vital information by telephone, fax, the internet or teleconferencing—allows them to spend an extended time away from their home institutions in order to conduct research at Fermilab. By the same token, professors and students in the midst of an experiment or data analysis can keep in contact with Fermilab after they return home to teach.

"Whatever their needs are, we try to fulfill them, and that includes experimenters and employees," said Hines.

Sound simple? Probe a bit further and the understatement of that description becomes clear. Hines and her team answer requests from construction companies for underground cable locations, repair and program more than 1,000 pagers and maintain radio and walkie-talkie equipment. Hines is also the Laboratory's frequency "guru," assigning the radio frequencies used by two-way communication.

One of her most demanding tasks is the management of Fermilab's telephone system, including data-specific lines. On the routine level, her team installs or relocates phones for employees and users. On the more complicated end, Hines and her team recently designed and installed the phone system for the Main Injector.

Hines says a challenging aspect of her job is keeping pace with fast-moving technology. She has seen the gamut of communications advances move through Fermilab, from operators using old plug boards and rotary phones to electronic switching systems and advanced telephones with voice mail.

A Fermilab History

Although Hines is shy about speaking about herself, others can't say enough about the job she does.

"Carolyn clearly understands that everyone at the lab is her customer and does whatever is necessary to serve them, usually under tight time constraints or less-than-optimal circumstances. As a long-time employee, Carolyn's knowledge of the lab's activities and its employees is a great asset. She is truly a pleasure to work with, as I am sure anyone that comes in contact with her will attest," said Jeff Irvin, executive assistant in the Business Services Section.

While in charge of linking Fermilab's communication lines, Hines is also a vital link to the Laboratory's past. She was hired in 1967 and was responsible for transportation and the nascent communications system. As the lab grew, that system became more complex and she eventually dropped other responsibilities.

In the late 1960s, Hines was part of two Laboratory milestone events that she remembers with pride. She helped with the logistics of the groundbreaking, which occurred on a snowy Dec. 1, 1968—her birthday. Hines also helped purchase the very first bison for Fermilab's herd, now one of the most popular visitors' attractions.

Hines looks back on these two events with a smile. However, she can't look back too long or some new technology may emerge. And as scientists strive to understand the mysteries of matter, Hines knows that the vital sharing of information, expertise and ideas relies on her ability to keep the lines of communication open. ■

The Web at Fermilab

continued from page 1

Tim Berners-Lee, who wrote the software protocols to set up the World Wide Web in 1990 and 1991. He now directs the W3 Consortium, an open forum of companies and organizations with the mission to realize the full potential of the Web.

where to contact any other computer and communicate unfettered by log-in accounts and database incompatibilities.

"He's someone who thinks very clearly about the fundamentals, but besides this, he happened to come upon his idea at the right time," said Ruth Pordes, Computing Division Online Systems Department head. "His idea was to make distributed information over a network easily accessible to the whole world, and to work out the protocol of how to do that."

In its infancy, an internal laboratory version of the Web allowed high-energy physicists at CERN to share data and papers within their own network, but it remained difficult to connect to outside servers—from CERN to Fermilab for example—to share documents with other scientists.

Pordes, who had met Berners-Lee at international meetings, invited him to visit Fermilab for a few weeks in January, 1991. The visit coincided with a conference on hypertext, familiar to most Internet users as the "link" function of Web browsers. The conference gave Berners-Lee a stimulus for developing his ideas.

Berners-Lee returned to Fermilab in 1992. During his visit he made the first one-click link between the CERN server and Fermilab's central computers.

"We installed it (the CERN Web server) on FNALV and we linked it up to the documents used for data-taking and later analyses," Pordes said.

Fermilab's Jonathan Streets, leader of the Experiments Online Support Group, helped Berners-Lee set up the system.

"He and I wrote the server on FNALV that served the documents," Streets said. "Now anybody could come in and get them. That was the first time anybody could use the same interface to read documents pertaining to both data-taking and analyses—because we had very different databases."

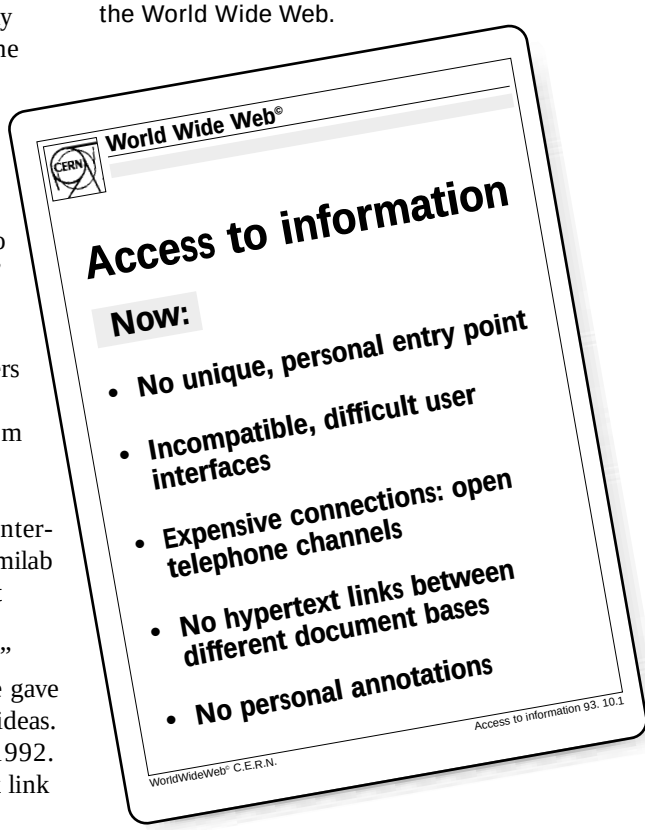
Before Berners-Lee wrote the hypertext transfer protocols each computer server generally required a separate log-in account and had a different documentation system, making smooth communication between systems difficult. Berners-Lee's software (the Web), broke down the barriers dividing the hardware (the Internet).

The following summer, Berners-Lee gave the first United States presentation on the World Wide Web's merits.

"Ruth basically has to take credit for spotting the Web," said Vicky White, Computing Division deputy head. "We both knew Tim Berners-Lee's work, but she showed the first interest in it."

That Was Then...

Berners-Lee used these two transparencies in a 1992 Fermilab talk highlighting the World Wide Web.



Fermilab joined the World Wide Web early. The Sloan Digital Sky Survey, an ambitious sky-mapping project in which Fermilab collaborates, became one of the first projects to adopt the Web in 1992.

"Sloan is a project that has a far-flung collaboration, and we felt having information that could be easily retrieved would be beneficial," Pordes said.

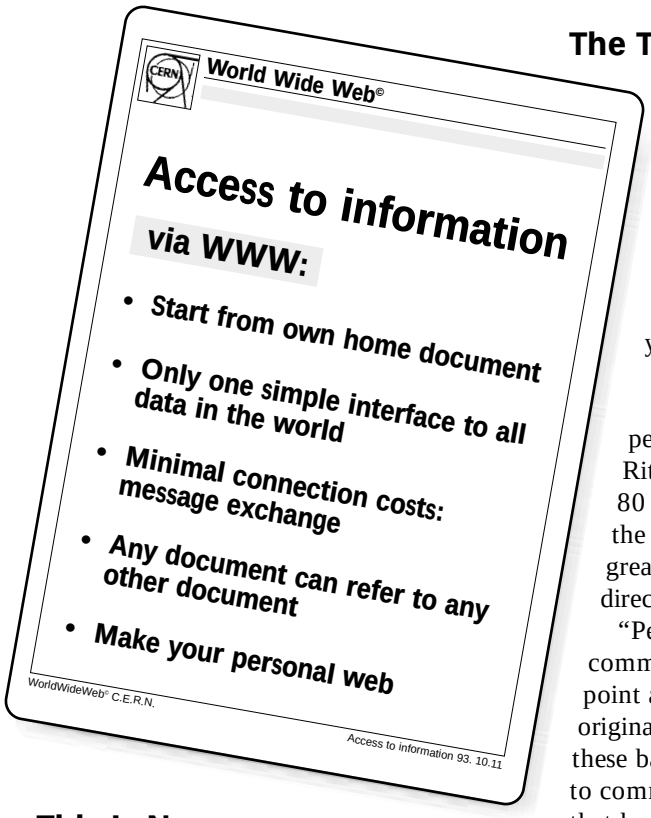
Beyond High-Energy Physics

Berners-Lee and others soon discovered the Web applied to areas well beyond high-energy physics.

"After that, he started working on protocols for the World Wide Web in order to have communication not only among physicists, but also to be able to find information from all the various other places available," Pordes said.

The next step required making the technology more accessible. Current Internet users surf the web using browsers such as Netscape or Web Explorer that offer windows into the Web. But in 1992 none of these mouse-friendly programs existed. A program called Mosaic paved the way for later browsers.

"Around 1992 NCSA (National Center for Supercomputing Applications at the University of Illinois at Urbana/Champaign) started work on Mosaic," Pordes said. "In 1993 I invited Tim to Fermilab. I contacted NCSA and sug-



...This Is Now.

gested we go down and meet them. It was clear they were really going to market Mosaic. That was the first time we realized that he was really going to have a big success."

Mosaic brought many people outside high-energy physics into the Web.

"It wasn't until NCSA made Mosaic that the average person could see why this was really a good thing," said David Ritchie, who chaired the working group that designed the first official Fermilab home page.

Fermilab's role in the development of the Web came in bits and pieces.

"Fermilab filled one of several support roles," Pordes said. "There were people here who felt it was worthwhile at the beginning and were willing to put a little effort into it."

Pordes believes one of the reasons for the Web's phenomenal growth derives from its transatlantic origins, developing simultaneously in Europe and the United States.

"I think it's actually a big success partly because the Europeans felt this was their idea and they could adopt it and support it without thinking this was just something from America coming in and taking over," she said.

Another boost came when Stanford Linear Accelerator Center made SPIRES, a server that makes available journal article preprints, accessible to the Web, which attracted many scientists.

The Today and Tomorrow of The Web

What do long-time users of the Web think of today's glossy incarnation?

"People complain about it a lot, they complain that all the information that's on it is junk and it's too slow," Pordes says. "I just say, 'Well, would you rather have it or not?'"

Clearly, most would rather have it.

Recent studies have found that eight percent of businesses have Web sites. Ritchie believes that figure will grow to 80 percent or more, but he sees a wane in the gold-rush mentality and expects the greatest Web expansion to come from directions other than commercialism.

"People think the prime motivation is commercialism, but that's only a stopping point along the way," said Ritchie, the Lab's original webmaster. "It's really motivated by these basic kinds of desires by human beings to communicate to other human beings things that happen in their lives."

Growth on the individual level will come from new technologies that make access and manipulation of Web mechanisms easier. Ritchie feels that if such technology arises, the use of the Internet by individuals will skyrocket. Almost everyone who worked on the Web during its early years expresses surprise at its exponential growth.

"I think it's been absolutely amazing how quickly it's penetrated the average person's life," said White, of the Computing Division. "You never would have dreamt it three years ago."

Another interesting question remains the fascination new and continuing users have with the Web and the motivations that drive them to put many types of information online.

"There's a whole spectrum of motivations for people," White said. "It's probably the same reason people want to show you the photos of their grandchildren or their pictures of their vacation and to tell you about their work. It's a fundamental human need to share information. This is a tool that makes it easy to do that." ■

"It's a fundamental human need to share information. This is a tool that makes it easy to do that."

~Vicky White,
Computing Division

Photo by Fred Ullrich

Computer scientist Jonathan Streets picks up Amy, 5, and Joseph, 2, from Fermilab Day Care. In 1992, Streets and Berners-Lee wrote the software that linked Fermilab to the World Wide Web.

Construction Begins on Automatic Entrance Gates

by Judy Jackson, Office of Public Affairs

Construction began on August 5 for a system of automatic gates at the Laboratory's main entrance at Pine Street and Kirk Road. In mid-August, construction will begin for a similar gate system at the east entrance, where Batavia Road enters the Laboratory. When contractors complete the projects in late October, the gates will eliminate the need for guards at the entrances.

The Fermilab site will remain open to visitors every day during daylight hours and for special evening events. The new gates will increase access for visitors entering the Laboratory from the east; otherwise the gates should have a minimal effect on site access for Laboratory visitors.

Associate Director Ray Stefanski cited cost-savings associated with staffing the entrances as the motive for installing the automatic system. "The gates will pay for themselves in about a year and a half," he said.

Introduction of the automatic gates will mean some changes for employees, users, and other members of the Laboratory community. They will receive "gate cards" designed to be mounted on the back of a vehicle's rear-view mirror. The cards will activate the gate mechanism and open the gates.

Visitors to Fermilab will enter through separate sets of gates. Those entering the Laboratory by car at Pine Street, for example, will drive through an automatic gate much like the gate to a parking garage. On entering, the driver will receive a paper ticket. When the visitor leaves the Laboratory, bar coding on the ticket will allow the vehicle to exit through Pine Street. Similarly, those entering via Batavia Road will receive tickets allowing them to exit by Batavia Road when they leave the Laboratory.

Both the Batavia Road and Pine Street entrances will remain open to visitors daily during daylight hours. The new gates will not affect bicycle or pedestrian traffic at either entrance. Emergency vehicles will continue to have 24-hour access through the Laboratory.

Currently, Laboratory managers are seeking employee volunteers to test prototype automatic entry and exit gates at Pine Street, beginning in early September. "We're setting up this prototype to test the equipment and learn a little more about how well it will function under actual field conditions," Stefanski said. "We are hoping for 500 volunteers. We will distribute gate cards to the volunteers, for mounting on the backs of their rear-view mirrors. The gate cards will activate the gate mechanism; all that the driver does is slow down to let the gate open." Volunteer gate testers may sign up at the Communications Center on the first floor of Wilson Hall, where they will receive gate cards and instructions.

The prototype gates will also have push buttons, for the use of employees who don't yet have gate cards. The Laboratory will staff the gates to handle any difficulties during the test.

The Laboratory asks those with questions about the new entrance gates to call the Office of Public Affairs at 630-840-3351. ■

U of C

continued from page 3

Chicago astrophysicist Michael Turner started a group with a three-year grant from NASA to apply what Fermilab researchers learned about particle physics to the fast-growing field of cosmology.

"What we saw as our niche was the study of the early universe and particle astrophysics," said Kolb, who, along with Turner and Josh Frieman, has formal affiliations with both Fermilab and Chicago. He added, "We did good work and got recognized for it. Subjects like inflation, the cosmic microwave fluctuations, dark matter—they've now been absorbed into the larger discipline of astronomy."

The experimental astrophysics group at Fermilab formed in the early 1990s, again with strong ties to the University of Chicago. Faculty members Rich Kron and Steve Kent divide their time between Fermilab and the university as part of their work on the Sloan Digital Sky Survey. The SDSS consortium is building a telescope to map galaxies and quasars. Fermilab participants will contribute their expertise in handling large volumes of data at high speed: the Lab's responsibility is to provide the data acquisition and analysis systems.

Like their colleagues everywhere, physicists at the University of Chicago are intent on exploring physics at the energy frontier. What characterizes the Chicago group is the breadth and depth of their presence at Fermilab. Says Frisch, summing up their hard-working ethic: "The excitement about Fermilab, in my mind, is that it's the premier exploration tool anywhere in the world, and it should be exploited as hard as possible." ■

Graduate Student Wins Young Investigator Award

Katja Langen is a graduate student at the University of Wisconsin, pursuing a Ph.D. in Medical Physics using data from Fermilab's Neutron Therapy Facility. The Young Investigator award is issued by organizers of a symposium in microdosimetry—including the European Commission, DOE, and the Medical Research Council in the UK—and will pay for her attendance at a medical physics conference in Oxford, England in September. She will present a paper on her thesis topic, "Microdosimetric Investigations in the Fast Neutron Therapy Beam at Fermi National Accelerator Laboratory." Arlene Lennox and Thomas Kroc of NTF and Paul DeLuca of UW-Madison co-authored the paper, which reports studies of the effects of neutrons in the body on a micrometer scale. ■

Photo by Fred Ullrich

Fermilab Users Sweep OJI Grant Awards

To support research by outstanding—but untenured—high-energy physicists, DOE provides flexible five-year funding awards on a competitive basis. Five of the six Outstanding Junior Investigators whose research DOE funded this year are Fermilab users, or work in close collaboration with theorists here. The sixth winner, Larus Thorlacius, is a theorist at Princeton. The five researchers with Fermilab connections are:

■ Janet Conrad, Columbia University, for a decay channel to look for heavy neutrinos in E815

■ Donna Naples, Kansas State University, for a multisampling drift chamber for the COSMOS and NuTeV experiments

■ David Gerdes, Johns Hopkins University, for studies of the top quark with an upgraded CDF tracking chamber

■ Aida El-Khadra, University of Illinois (formerly a postdoc at Fermilab, 1990-93), for research on Standard Model phenomenology with lattice QCD calculations

■ Lynne Orr, University of Rochester, for top quark physics and related issues in phenomenology

Accelerator Update

July 10—August 6

During this period, Fermilab's accelerator slowly returned to the business of supplying beam to the fixed-target experiments, recovering from the recent rains that soaked the Fox Valley.

Before the skies opened up, accelerator operators had pushed up the beam intensity to all of the experiments that were ready for beam. The accelerator had a few feeder faults in this stretch, but no major interruptions, according to Bob Mau, head of accelerator operations. (Feeders are the underground transmission cables that bring in electricity for the accelerator's power supplies.) Along with increasing the beam's intensity, accelerator experts were aligning septa for beamlines and performing other fine-tuning in the Switchyard when the rain arrived.

"We were progressing...but then the big thing that slammed us was the flood," said Mau.

The Flood

Record-setting rainfall on July 17 and 18 flooded the pumps at Casey's Pond, setting off a chain reaction of events that eventually brought Tevatron operations to a halt. Those pumps deliver cooling water to the compressors at the Central Helium Liquefier, which supplies the liquid helium to the superconducting magnets. As a result, the Tevatron warmed up to liquid nitrogen levels. If that wasn't enough, said Mau, a pond near the B3 service building flooded, sending water rushing down the steps of one service building into the accelerator's tunnel. Nearly two miles of the four-mile ring took on water, and some areas of B sector had four inches of water, enough to submerge the bottom of the Tevatron magnets.

The magnets themselves are water-tight, according to Mau, but a check of the protection, support and monitoring structure was necessary. Among other tasks, the accelerator staff replaced multiple beam loss monitors, which alert operators in the control room to how much radiation is lost at certain points in the ring. Fermilab staff used spare monitors set aside for the Main Injector. Mau said the most severe problem was averted when Facilities Engineering Services Section staff kept the sump pumps in the tunnel working.

"I've lived in the area for 26 years and I've never seen anything like this flooding," said Mau.

Clean-Up

Flood clean-up went quickly. Mau said the more time-consuming problem was getting the Tevatron cooled down again. The accelerator team needed two days to purify the magnet strings. Before the liquid helium starts flowing after a shutdown, accelerator staff must flush the pipes to clear out any impurities that could freeze and block the flow of helium. After that process, the accelerator needed five days to cool down. The Tevatron started running again on July 26, as more experimental halls prepared to receive beam.

"This past weekend (August 3 and 4) was pretty good; we had beam most of the weekend," said Mau. "We are slowly raising the intensity. So, we are...back where we were before the flood, which is tuning and trying to solve all of our little problems." ■

CLASSIFIEDS

FOR SALE

■ VHS video. Many recent titles $7 each. Perfect condition: still sealed or seen once. For the list of titles ask introzzi@fnal.gov

■ 1989 Ford Taurus LX Wagon, 3.8 liter, V6, A/C, P/S, P/B, P/W, P/L, Pwr. seats, crs., tilt, keyless entry, auto., AM/FM, cassette, $4,500. Contact Gianluca Gerard, x8426 or gerard@fnal.gov

■ Kenmore A/C unit, 12000 BTU, brand new, still in box, $500 firm, paid $598. Living room set includes 8 ft. couch, loveseat, arm chair, ottoman, 2 lamps w/shades, 2 end tables and 3 piece entertainment center. All-black modern contemporary w/mirror, glass and brass, very good condition. Will sell separately, asking $2,950 for everything. Paid $4,150. Contact Veronica at x2924 or home (630) 898-5639.

LAB NOTES

1997 RECREATION MEMBERSHIP

Recreation Facility memberships for 1997 will go on sale September 2 in the Recreation Office, WH15W. Sale hours are 8:30-5:00, Monday through Friday. Regular memberships are $50 and student memberships are $25. Renewal memberships must be purchased through Fermilab internal mail, MS 126. Please enclose completed application form and check. All 1996 memberships expire October 1. For more information, call Jean, x2548.

CAIF (CULTURAL ASSOCIATION OF THE ITALIANS AT FERMILAB)

CAIF (Cultural Association of the Italians at Fermilab) is showing Italian movies on Mondays and Wednesdays at the Users Center, beginning August 19, at 7:30 p.m. Admission is FREE for CAIF members. See NALCAL for titles.

CAIF

CAIF is sponsoring FREE Italian lessons. For more information, please contact Luciana Crovato at x2986 or e-mail: pisasec@fnal.gov.

WWW PAGE FOR BENEFITS, RECREATION AND WELLNESS WORKS

Benefits, Recreation and Wellness Works information can now be found on the Fermilab Home Page on the web under Fermilab At Work, Lab Services Section, Benefits Office. All information regarding all aspects of the Benefits Office, Recreation Office, Recreation Facility, swimming pool, Day Camp, registrations forms, classes, leagues, and Wellness Works program can be found on this page. The Recreation and Wellness Works area can only be accessed by laboratory personnel using an onsite internet connection. The new address is:
http://fnalpubs.fnal.gov/benedept/welcome.html.

MILESTONES

DIED

Steven Slawniak, computer professional in the Computing Division, on May 5, 1996. He began working at Fermilab in 1973.

Matthew Angst, of the Mechanical Support Section of the Accelerator Division, on July 30, 1996. He had worked at Fermilab since 1990.

CALENDAR

AUGUST 23

The Fermilab International Film Society presents *Lamerica*. Gino, a brash Italian con man, travels to Albania with his business partner to create a dummy corporation and reap riches from the country's battered economy. From one of the great masters of contemporary cinema comes a film of sweeping powers and raw beauty that was hailed as "the triumph of this year's New York Film Festival" by the New York Times. Dir.: Gianni Amelio, France/Italy (1994) 125 min.

AUGUST 24

Fermilab arts series to host Luther Allison. Chicago blues guitarist Luther Allison is back from a ten-year hiatus in Paris, and is stealing the show wherever he plays - from the Chicago Blues Festival to the London Blues Festival. Allison became a sensation at the 1969 Ann Arbor Blues Festival, and during the '70s was Motown's sole blues act. Despite strong releases, Luther failed to break into the big time, which prompted his move to Paris in the early '80s. He returned to the US in 1993, where his album "Blue Streak" hit #2 on the Billboard Blues Charts. In addition he won 5 W.C. Handy Awards in May, including Blues Entertainer of the Year, Blues Album of the Year and Blues Instrumentalist of the Year. Tickets $17. 8 p.m., Ramsey Auditorium. Call 840-ARTS for information and reservations.

AUGUST 25

The Fermilab Barnstormers invite you to attend the 7th Annual Tony Frelo Model Biplane Fun-Fly at Frelo Flying Field (on site). Spectators are welcome and refreshments are available. Registration for pilots starts at 8 a.m. and flying at 9 a.m. All pilots must be members of the AMA. Come on out and see the two-wingers fly! For more information, contact Alan Hahn, contest director at x2987

SEPTEMBER 4

1996-97 bowling season begins. A 31-week, non-sanctioned, mixed league at the Bowling Green Sports Center, starting at 5:30 p.m. Cost is $10. For more information call Terry O'Brien at x4851.

SEPTEMBER 5

Wellness Works sponsors "Caring for Your Elders," a two-part brown bag seminar presented by Kathleen O'Laughlin RN, MS, JD and Signe Gleeson RN, MS of Elder Care Solutions. Part 1: Home Care Options, Thursday, September 5, One West from noon to 1 p.m. Part 2: Making Nursing Home decisions, Thursday, October 3, Curia II from noon to 1 p.m.

SEPTEMBER 28

Fermilab art series to host 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 ever 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

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