

# F E R M I N E W S

F E R M I L A B A U.S. DEPARTMENT OF ENERGY LABORATORY



Photo by Jenny Mullins

## USERS: Fermilab Wouldn't Be the Same Without Them 2

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# USERS



Fermilab

Wouldn't

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Them

**Cover photo:** Fermilab employees and visitors from Brazil, with the Mobius Strip sculpture at Wilson Hall. Brazil sends one of the larger groups to Fermilab with 37 users; Brazil's CBPF is one of the larger international institutions, with 21 users. Front Row: Fernanda G. Garcia, Sergio Zimmermann, J. Rafael Silva and Ricardo F. Barbosa. Back Row: Moacyr Souza, Guilherme Cardoso, Lucian Piccoli, Carmem da Silva, Eduardo Gregores, Sergio Novaes, Moyses Kuchnir.

by Mike Perricone

**T**hey're called "users," but Fermilab's guest and visiting scientists are woven inextricably into the fabric of the laboratory.

In fact, users often represent the fabric of the laboratory as distinctively as many full-time and long-term researchers, and their official description comes as something of a surprise. They might be guests, but Fermilab has been their home for a long time.

Just a couple of examples: Harry Weerts of DZero and Vaia Papadimitriou of CDF, both longstanding integral members of the large detector experiments. They also represent the lab's widespread international base, with its links to nearly 1,000 international researchers from 113 institutions in 29 countries, and to more than 1,500 researchers from 101 institutions in 31 states across America. But even these categorical distinctions can become a bit indistinct.



Photo by Reidar Hahn

Vaia Papadimitriou

Papadimitriou, originally from Greece, counts as a user from Texas. She came to Fermilab in 1985 as a graduate student on experiment E731 (CP Violation, completed 1988) by way of the University of Chicago. In 1990, she was named the lab's first Leon M. Lederman Fellow, awarded for a first postdoctoral appointment in experimental physics at Fermilab. She worked at CDF through 1994 on the fellowship. And in keeping with Lederman's commitment to the teaching of physics, fellows

participate in Saturday Morning Physics and other educational programs.

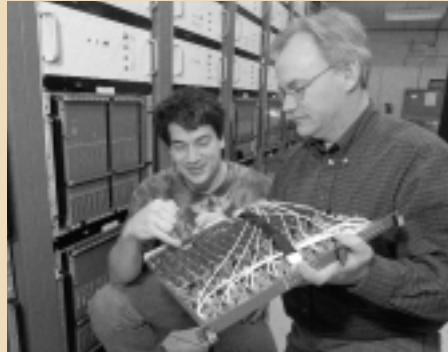
For Papadimitriou, it was just the beginning of a dedicated and energetic level of public contact. She has been teaching at Texas Tech since 1994, continuing her work at CDF, and extending the outreach activities that the Lederman Fellowship originally encouraged. She led several public tours of the 5,000-ton CDF detector before it was rolled into the collision hall to begin Collider Run II of the Tevatron in March 2001.

"These have all been very rewarding experiences for me," Papadimitriou said. "I have seen families with two or three kids, and sometimes carrying babies, growing excited with what they saw, asking questions and coming again to the next tour. Visitors sometimes stayed for three hours, asking us detailed questions about our work."

Papadimitriou's courses at Texas Tech range from nuclear and particle physics and electromagnetism for undergraduate and graduate physics majors, to general physics for pre-med students. She was on sabbatical at Fermilab during the Fall semester with two students under her wing. Contact with students and with the public is as important to her as research.

"The young people who come here to visit will perhaps encourage their own kids to study science," she said. "They will know more about it, and hopefully they will not put physics in a castle on top of a mountain that is only for 'the few and the brave.' Hopefully, physics will be more approachable for them. Physics is exciting, and it is fun to share and communicate that excitement."

# “COLLABORATORS regularly visit Fermilab from **all over** the **WORLD**”



Photos by Reidar Hahn



Portraits of Fermilab users, clockwise from top left: University of Pennsylvania group at CDF collision hall (from left, kneeling: Nigel Lockyer, Tianjie Gao, Cheunhui Chen, Joel Heinrich; standing: Joe Kroll, Peter Wittich, Dave Ambrose, Denys Usynin, Isamu Nakamura, Rolf Oldeman, & Andrew Kovalev back row: Matthew Jones, Shin-Shan Yu (Eiko) and Walter Kononenko. Richard Schirato of Los Alamos National Laboratory and Andrew Green of Indiana University working on electronics for the Data Challenge at DZero. Jennifer Raaf of the University of Cincinnati at MiniBooNE. Professor Nguyen Mong Giao, foreground, with students Trang Hoang (left) and Han Do, of the Physics Institute in Ho Chi Minh City. Seth Flaxman of Columbia University at Lab E.

Weerts has a different communication challenge: as cospokesperson at DZero, he shares the charge of coordinating the efforts of more than 500 researchers from 73 institutions, covering a rainbow of languages and cultures, in building and operating the detector and ultimately producing physics results. How is it done?



Harry Weerts

Photo by Reidar Hahn

“Meetings, meetings and more meetings,” Weerts said. “We rely very much on email and the Web. Also very important are our three or four collaboration meetings during the year, as well as our annual workshop.

We also organize many smaller, very focused topical workshops, which typically take place at participating institutions instead of here at Fermilab. One advantage we have is that we are one of the first experiments to really ship our data all across the globe. The other main ingredient is that collaborators regularly visit Fermilab from all over the world.”

Weerts, originally from The Netherlands, counts as a user from the state of Michigan. He arrived at Fermilab as a postdoc in 1981 on experiment E594, a neutrino fixed target experiment. He joined the faculty at Michigan State University in 1983, and has been classified as a user since then. As cospokesperson at DZero since 1996, he has shared in management responsibilities including the extensive upgrade effort readying the detector for Collider Run II of the Tevatron. But it’s a little different being a manager with few actual “employees,” with work often done by researchers representing individual institutions and projects, sometimes having limited time at the lab, and conducting some work at home institutions.

“Most of the time it’s exhilarating, because you work with colleagues from all around the globe,” Weerts said. “Sometimes it’s frustrating, because you have a clear goal and mandate, but cannot tell anybody directly what to do. But somehow, this system works, and most of the time my collaborators are willing to accept guidance—though after discussion. Basically it works on the basis of the respect that people have for all the individual managers, at every level.”

# USERS

Also at every level, encountering an array of languages represents the norm at Fermilab, a multinational hub in the traditionally internationalist field of high-energy physics. While users from the U.S. (1,521) outnumber foreign users (983) in 2002, the number of foreign institutions represented at Fermilab (113) actually outnumbers domestic institutions (101). The margin is fairly consistent: the 2001 count showed 100 U.S. institutions and 104 international institutions, but the breakdown in 2000 was 101 domestic and 116 international institutions.

Representing this global congregation is Fermilab's Users Executive Committee, with a chairman elected each year and members (drawn from both the users' community and Fermilab) serving overlapping terms of varying lengths.

"I would describe the environment as normal human interaction, but with a clear flavor of the

various countries from which people come," said UEC member Rick St. Denis of CDF and Glasgow University in Scotland, a user since 1984. "To me, it is not unlike a standard American family wedding where the Irish, or Polish, or Italian families try to plan things and everyone is related to people everywhere of all origins."

The UEC accepts challenges that range from helping with visa problems, to improving onsite transportation, to obtaining new office space for both detector collaborations, to organizing educational and outreach efforts, to staffing the weekly Ask-A-Scientist sessions at the Lederman Science Education Center—and, of course, to insuring the best physics for users.

"In Run II, we hope for a watershed of physics and continued cracking of the Standard Model along its seams," said St. Denis. "I hope that as we investigate the various physics topics we can find inconsistencies. This may well be enshrined in a search for the Higgs."

More than 600 Fermilab users are classified as students (nearly 400 from the U.S.), and education



Photo by Reidar Hahn

Michel Sorel of Columbia University, Eric Zimmerman of the University of Colorado at Boulder, and Len Bugel of the Stratton Mountain School in Vermont, with MiniBooNE Horn.

is a UEC priority. Graduate students can often be found leading guided tours of the lab, or dashing off to make physics presentations at schools throughout the surrounding area. The UEC also organized a mentoring get-together last year for young scientists to talk with experienced scientists about their work and their career. There's also the "general assembly," the Users Annual Meeting held each summer at Fermilab, truly a lab-wide event.

"The Users' Meeting is a time for the whole lab to get together and learn what everyone else has been up to," said UEC chair Benn Tannenbaum of CDF and the University of California at Los Angeles.

"We will have speakers from all experiments on site covering as many of the different research areas as possible," added Tannenbaum, who came to Fermilab as a summer student in 1989 and joined CDF as a graduate student in 1992. "We also will have speakers from the Department of Energy and the National Science Foundation discussing funding priorities. We will have a State of the Lab talk from Fermilab Director Michael Witherell, and we also hope to have a State of the Lab talk from SLAC Director Jonathan Dorfan. The URA will be there, to discuss their perspectives on the future and to present the annual URA thesis award."

The UEC also organizes an annual spring visit to Washington, DC with users visiting members of Congress and their staffs to familiarize them with science education and research efforts under way in their home districts, and with science ties around the world.

"Science is an international effort," Tannenbaum said, "and the physical sciences are important to everyone."

From Massachusetts to Hawaii, from Russia to Argentina, from Canada to China, Fermilab users bring that point home. 🌍



Photo by Jenny Mullins

Sergei Denisov (left) of IHEP Protvino, with Russian graduate students at Lab F.



# USERS BY THE NUMBERS

## INTERNATIONAL USERS / TOP 10 INSTITUTIONS

Institution	Phys.	Grad.	Total
1. IHEP-Protvino (Russia)	64	2	66
2. INFN-Pisa (Italy)	34	14	48
3. JINR-Dubna (Russia)	39	1	40
4. U. of Tsukuba (Japan)	15	21	36
5. INFN-Frascati (Italy)	21	4	25
6. ITEP-Moscow (Russia)	24	1	25
7. CBPF (Brazil)	16	5	21
8. U. of Oxford (UK)	12	8	20
9. U. of Padova (Italy)	12	8	20
10. CEA-Saclay (France)	18	1	19

## BY COUNTRY OF HOME INSTITUTION

Italy, 203; Russia, 176; United Kingdom, 94; Japan, 93; France, 75; Germany, 48; South Korea, 45; Brazil, 37; Peoples Rep. of China, 29; India, 25; Canada, 20; Mexico, 20; Taiwan, 17; Switzerland, 15; Sweden, 14; Czech Republic, 12; Netherlands, 12; Greece, 8; Spain, 8; Colombia, 7; Belarus, 4; Finland, 4; Argentina, 3; Israel, 3; Poland, 3; Ecuador, 1; Slovakia, 1; Turkey, 1; Vietnam, 1.

## U.S. USERS (AFTER FERMILAB, 281) / TOP 10 INSTITUTIONS

Institution	Phys.	Grad.	Total
1. Lawrence Berkeley National Lab	43	13	56
2. U. Michigan-Ann Arbor	28	23	51
3. U. of Rochester	24	24	48
4. SUNY-Stony Brook	18	16	34
5. Michigan State U.	21	12	33
6. Harvard U.	18	13	31
7. U. of Illinois Urbana-Champaign	16	15	31
8. Argonne National Laboratory	28	1	29
9. U. of Chicago	18	11	29
10. U. of Minnesota	17	10	27

## BY STATE OF HOME INSTITUTION

Illinois, 439; New York, 158; California, 148; Massachusetts, 102; Michigan, 87; Texas, 72; Indiana, 68; Pennsylvania, 52; Florida, 36; New Jersey, 30; Minnesota, 27; New Mexico, 27; North Carolina, 26; Arizona, 22; Kansas, 21; Virginia, 19; Washington, 17; Iowa, 16; Colorado, 15; Ohio, 13; Connecticut, 12; Tennessee, 12; Louisiana, 10; Oklahoma, 9; South Carolina, 9; Puerto Rico, 7; Hawaii, 6; Washington, 6; Oregon, 4; Alabama, 3; Nebraska, 3.

## TOTAL USERS

U.S.	Physicists	Students	Subtotal	Institutions
University	721	398	1119	94
National Laboratories	386	16	402	7
<i>Subtotal</i>	<i>1107</i>	<i>414</i>	<i>1521</i>	<i>101</i>

Non-U.S.	Physicists	Students	Subtotal	Institutions
University	468	178	646	90
National Laboratories	301	36	337	23
<i>Subtotal</i>	<i>769</i>	<i>214</i>	<i>983</i>	<i>113</i>

<b>TOTAL</b>	<b>1876</b>	<b>628</b>	<b>2504</b>	<b>214</b>
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Czech researchers Sasa Kupco of the Institute of Physics-Academy of Sciences, and Karel Soustruznik of Charles University, at DZero.

# Wine Returns to Wine & CHEESE

by Judy Jackson

**O**n Friday, February 22, 2002, after a decade-long absence, wine returned to Wine and Cheese at Fermilab, reviving a longstanding laboratory tradition.

Since 1972, scientists at Fermilab have been winding up the work week with a 4:00 Friday Joint Experimental Theoretical Physics Seminar on a physics topic of wide interest: “Electroweak Symmetry breaking at the Tevatron,” perhaps, or the ever-popular “Measuring Leptonic CP Violation with NUMI Off-Axis Beams”

And since 1972, during the half hour before the ritual ringing of a cowbell signals the start of the seminar, Fermilab scientists have been meeting for wine, cheese and conversation.

Theorist J.D. Jackson, now of Lawrence Berkeley National Laboratory, formerly of Fermilab, described the birth of this Friday-afternoon Fermilab tradition in “Early Days of Wine and Cheese,” an essay in the 1992 Fermilab Annual Report.



“Bob Wilson and his troops in the field were straining to complete the experimental areas and to raise the energy and intensity of the machine,” Jackson wrote. “The early experiments struggled to be ready for whatever the machine would produce. Typically, work on the accelerator proceeded during the week; late on Friday beam to experiments was begun for the weekend. With luck, there would be some hours of running.

“The contrast of the theorists ‘doing their thing’ while the machine builders and experimenters heroically did the necessary spurred [former Fermilab theorist Marty] Einhorn to propose a weekly seminar to help provide some sense of common purpose and intellectual food for the whole community.

To avoid conflict with urgent meeting of one sort or another, 4 p.m. in Friday afternoon was chosen. Obviously, there had to be a come-on to draw people back to the West Conference Room at the end of each stressful week. Wine and cheese were the answer.”

Physicist Jim Sanford gave the first talk, on September 29, 1972, to an audience of about 40, Jackson’s essay recalled.

As for the wine and cheese: “My informal expense ledger for that date shows \$6.72 for bread and cheese and \$9.43 for 2 gals. CK Mondavi Burgundy.”

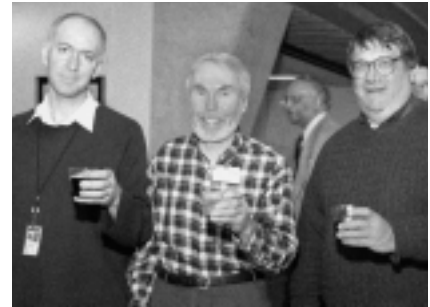
*Expense*

*The Experimental Theoretical Seminar*

Sept 29/72	Bread & cheese (Pascucci, pd.)	6.72	
	2 gals. CK Mondavi Burgundy (E. pd.)	9.43	
	Bread & cheese for Oct 4/72 (E. pd.)	3.22	
	+ 2 gals. Mondavi Burgundy (E. pd.)	17.07	
Oct 11/72	Bread & cheese	2.72	
Oct 12/72	Bread & cheese	2.72	
Oct 13/72	Bread & cheese	3.22	
Oct 20/72	Bread & cheese	34.62	- 2.20
Oct 27/72	Bread & cheese		
Nov 3/72	8 gals. CK Mondavi Burgundy		
Nov 6/72	2 gals. wine - for personal use	4.93	- 4.30
Nov 15/72	Bread & cheese (S. pd.) (pd. to MBE)		
Dec 1/72	1 gal. wine - personal use	15.92	
Dec 1/72	4 gals. wine + bread (pd. to MBE)	24.82	
Jan 5/73	4 gals. wine + bread & cheese (pd. MBE)	39.6	
Feb 26/73	Food (pd. MBE)		
March 2/73			



J.D. Jackson proffers a playful fist at former Director John Peoples, who substituted apple juice for the original wine in 1992.



Jackson offers a toast with Bill Foster (left) and Peter Limon, who revived the wine tradition.

Photos by Reidar Hehn

In the beginning, Jackson bought the wine. He wrote of an encounter with Priscilla Duffield, described as Wilson's administrative "enforcer," in 1972.

"One day, a month or so after the seminar's debut, word about the Friday afternoon going-on reached Priscilla. She stormed into my office, looking for my scalp. 'What do you think you're doing, serving wine at that seminar. Don't you know it's illegal to spend government money on such things?' I said that I wasn't spending government money on the wine. She said, 'Well, who is paying for it?' I said, 'I am.' And she said, 'Oh.' It was the one time I saw Priscilla just a little bit penitent."

Eventually the expense of the wine and cheese seminar outgrew Jackson's resources, and Universities research Association, the contractor that operates Fermilab for the Department of Energy, took over the funding. For 20 years, the Joint Experimental Theoretical Physics Seminar, preceded by half an hour of wine and cheese, flourished.

Then, in 1992, apple juice struck.

Concerns about the possibility of wine consumption by under-age students led then-Fermilab Director John Peoples to remove the wine from Wine and Cheese. The name stayed the same ("Apple Juice and Cheese" never caught on), and the seminars continued; but the wine was gone.

Until, last month, in the Jacksonian tradition, two Fermilab physicists brought it back.

In November 2001, physicists Bill Foster and Peter Limon received Employee Performance Recognition Awards for their work on a design study for the Very Large Hadron Collider. The two decided to use proceeds from the award to put the wine back into Wine and Cheese. The donated funds provide not only wine but also the services of a licensed bartender to steer the under-aged to the apple juice in the corner.

"The main reason for the donation was that carrying on the wine and cheese without the wine gave a feeling that bureaucracy was triumphant," said Foster.

At 3:30 on Friday, February 22, a larger-than-usual crowd gathered on the Wilson Hall second-floor crossover to re-inaugurate the Wine and Cheese Seminar. It was an exuberant half hour, enlivened by reminiscences of Wine and Cheeses past. At 4:00, the cowbell rang, and the crowd trooped off to a lively seminar.

The speaker was J.D. Jackson. He described the event in a February 25 letter.

"I made my trip to Fermilab last Friday to speak at the re-inaugural of the Wine and Cheese Seminar, officially the Experimental and Theoretical Physics Seminar. After the wine and cheese interlude, I spoke on the Historical Roots of Gauge Invariance. My presentation seemed to be well received."

Well received, indeed. The crowd loved it. For the time being, at least, Wine and Cheese was back. 🍷



Technology with a special twist: Standing in front of the outdated ACPMAPS parallel computer, Paul Mackenzie (left) talks to physicist Aida El-Khadra as Mackenzie (again!!!) inserts a storage tape. A panoramic photo scan made this scene possible in 1991.



# A NEW generation

by Kurt Riesselmann

**E**ver since Albert Einstein became the most famous physicist in the world, people have linked the word 'theorist' to three things: chalkboards, equations and bad hair.

Well, it's time to add an item to the list: supercomputers.

Using paper and pencil, theorists have captured new ideas, revealed intricate mathematical relations and carried out page-long calculations. But times have changed. For many applications, physicists now prefer to attack their models and equations with the best computers available. The Fermilab theory group became one of the top players in the area of computational physics with the installation of a supercomputer called ACPMAPS in 1989.

"For a short period of time we had—by some measures—the fastest supercomputer in the world," recalled Mark Fischler, who developed sophisticated software for the users of the 50-gigaflop supercomputer. "The rest of the world, of course, caught up quickly."

Scientists developed ACPMAPS to carry out computations involving the strong force that binds quarks together. A theory called quantum chromodynamics provides the equations that describe—in principle—the evolution and properties of all quark systems. In reality, even today's most powerful computers can handle only crude approximations of the full QCD theory using a four-dimensional lattice. A typical calculation approximates a volume as large as a proton by a grid of 24x24x24 points. The fourth dimension, which keeps track of the evolution in time, might be cut in 48 slices. For a thirteen-year-old supercomputer, such a 660,000-point lattice is tough to deal with even for simple approximations. Theorists, of course, would like to obtain more accurate results by using lattices with even more points and better approximations.



The new supercomputer at Fermilab: more power in less floor space.





# of supercomputers

"If you had infinite computing power, you could do anything," said physicist Massimo di Pierro, who develops and programs algorithms for lattice calculations. "But in practice, the full QCD algorithms take too long. So you need to approximate. We absolutely understand how to approximate QCD. You develop tricks and new techniques. That's a necessity. Only if we had an infinite amount of computing power, the uncertainty in our results would go to zero."

Good lattice calculations are essential to extract information from some of the best particle experiments under way, including measurements on the mixing of quark systems.

"Without precise lattice calculations, measurements of the mixing of strange B and Bbar mesons here at Fermilab will not illuminate the tiny difference in the behavior of matter and antimatter," said theorist Paul Mackenzie, a Fermilab expert on lattice calculations. Scientists rely on these results to learn more about the origin of all matter in the universe.

Since fall of 2001, Fermilab has gained the financial means of cranking up its computing power for lattice QCD. Introducing the Scientific Discovery through Advanced Computing program, the Department of Energy awarded Fermilab almost

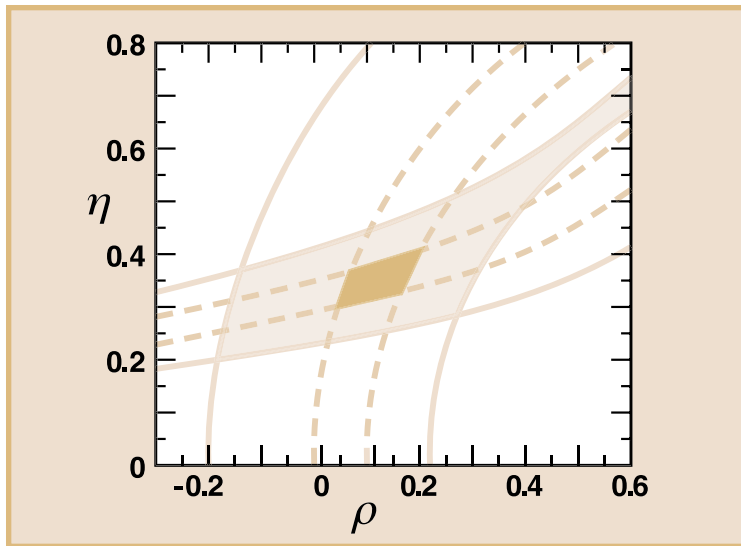


Photos by Reidar Hahn



Computer specialist Don Holmgren (left) gives theorist Paul Mackenzie a tour of the new SGI machines used for simulations of quark-quark interactions. The photo on the left shows the wiring needed to let the 80 computers communicate with each other.

# supercomputers



Lattice calculations will greatly enhance our knowledge of the parameters that describe why antimatter behaves differently than matter. Scientists expect that lattice computations will reduce the uncertainties from the shaded area to the much smaller dark area over the next few years.

two million dollars over the course of three years to develop a new supercomputer system. The SciDAC grant is part of a nation-wide effort to provide teraflop computing power for lattice theory projects in nuclear and high energy physics, one of many SciDAC computing initiatives.

“Refinement of computing algorithms is important,” Mackenzie said. “But brute computing force plays a significant role, too. Both are important: they multiply each other.”

The Fermilab theory group has been a leader in developing the theoretical methods to make lattice calculations feasible and effective. With the grant money, Mackenzie and his colleagues can now improve on computing power as well. Collaborating with scientists from universities and national laboratories, Fermilab theorists have decided to build a computer cluster consisting of 512 PCs.

## ORDER BY CATALOGUE

“Right now, we have a prototype of 80 nodes,” explained Don Holmgren, who is responsible for the assembly of the new machine. “This system is already more powerful than ACPMAPS. In the next six months, we will buy and integrate another 176 machines.”

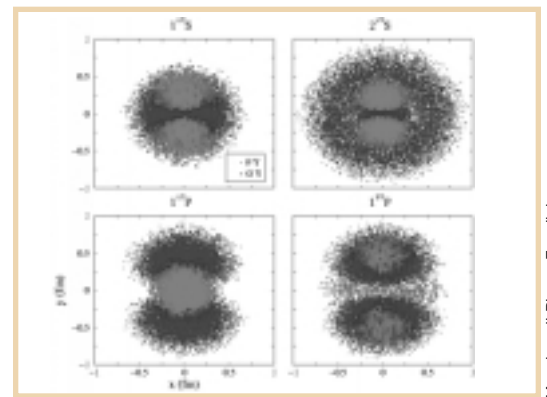
In contrast to the old ACPMAPS machine, the new supercomputer will consist entirely of components available off the shelf. Each node will have a processor capable of more than one gigaflop, and all nodes will be able to communicate with each other.

“There are two opinions in the world on how to proceed: commodity-built or purpose-built,” explained Mackenzie, who leads the Fermilab project. “The ACPMAPS system is a purpose-built machine. It was built for Fermilab theorists and collaborators, and it is hard to upgrade. Our new machine is commodity-built. It will serve as a user facility and is easy to upgrade. That’s a great achievement of commodity hardware.”

Holmgren agreed.

“We bought the prototype cluster in 1999 for about three thousand dollars per node,” he said. “In June 2002 we’ll be buying components that are four times better while prices go down. Every year, we’ll buy the best PCs, eventually discarding the oldest ones. With this approach we’re riding the price-performance curve.”

The 80-node prototype, bought in 1999 for a quarter of a million dollars, is two to three times faster than ACPMAPS, which cost about three million dollars in 1989. The final cluster will be over ten times faster than the prototype.



Excitations of a composite particle consisting of a heavy quark and a light antiquark.

Massimo di Piero, Fermilab

## COMMUNICATION IS THE KEY

To create a teraflop machine (one million million floating point operations per second) for lattice theory, scientists need both high-speed processors and high-speed communication.

“For our machine, high-performance communication is more important than in experimental analysis,” Mackenzie pointed out.

The Computing Division and experimental groups at Fermilab have experience in building PC farms with hundreds of nodes. In these systems, however, there is less need for superfast communication among all nodes. Each node is capable of analyzing the data of a particle

collision without exchanging data with parallel nodes. When the analysis of an event is complete, the node reports the results and requests the next set of data without input from the other nodes.

In lattice QCD computations, communication among different nodes is a crucial element of the calculation.

"We require communication among all nodes since they all need to share data on the quark fields," explained Mackenzie. "Each node is responsible for a subset of lattice points, and each node constantly exchanges information with neighbors."

For certain calculation procedures, like Fourier transforms, even the neighbor-to-neighbor communication is not sufficient. Instead, all nodes must share the values of their lattice points. Finding superfast communication hardware is the key to creating the best lattice supercomputers.

"If you spend all your time communicating, you're not calculating," Holmgren said. "But, all we care about is calculating. For our prototype system, we spent as much money on the communication switch as on the computers."

The prototype system relies on a single powerful switch that can connect up to 128 nodes. With this switch, the cluster can simultaneously conduct 64 conversations between pairs of nodes without them slowing down each other.

Adding more and more PCs to the cluster creates new challenges by itself.

"In three years we may have about one thousand nodes," Holmgren said. "At that point it becomes kind of a daunting task. If you need to do something manually for each PC, it quickly adds up.



Photo by Reidar Hahn

In the early 90s, Mark Fischler (left) and George Hockney developed a special software framework, called CANOPY, which allowed theorists to use the ACPMAPS supercomputer to calculate properties of quark interactions. Scientists used the machine to carry out the first computation of the strong coupling constant, a milestone in lattice QCD.

Say it takes fifteen minutes to work on one machine. For all machines, that's 250 manhours – six weeks for a single person. Clearly, we need to find smart ways of maintaining these machines."

The SciDAC program will help to develop the necessary infrastructure as its grants fund both hardware and software. In addition, the program encourages research institutions to collaborate and make joint proposals.

"The science advisory committee recommended that the lattice community coordinates the use of all computers," Mackenzie explained. "Subsequently, DOE asked for a long-term plan for lattice calculations in the U.S. For the first time, we see a coordinated effort. The SciDAC program has unified the efforts of individual groups into a national plan."

Due to the new lattice initiative, experimenters know that their data will be even more valuable. #

## SciDAC projects in lattice QCD:

### SciDAC projects in lattice QCD:

Three national labs and seven universities receive SciDAC funding to improve the U.S. infrastructure for lattice gauge computing. The goal is to build 10-teraflop hardware for lattice QCD by 2006. The sites obtaining new installations are:

**Brookhaven National Lab, working with Columbia University:** development of a purpose-built supercomputer with 10,000 processors.

**Thomas Jefferson Lab, working with Boston University and Massachusetts Institute of Technology:** development of a commodity cluster for computing the structure of the proton and hadron physics.

**Fermilab, working with University of Arizona, University of California at Santa Barbara, University of Illinois at Urbana-Champaign, University of Utah:** development of a commodity cluster for computing Standard Model parameters like weak matrix elements.



# A Foot IN the Door

*Lab's public access evolving,  
but not all the way back*

by Mike Perricone

**W**alkers and joggers are back, and so are bicyclists and birdwatchers.

Like the rest of the country, Fermilab is edging in the direction of normal operations—but slowly, and one step at a time.

“We are still at a heightened level of security,” cautioned deputy director Ken Stanfield, “and we’ll remain there as long as the Department of Energy determines the need for an increased security level and the nation is advised to stay on alert.”

Long a favorite recreation spot for its neighbors, the lab is once again opening the site for some recreational use during normal business hours and on weekends. Pedestrians and bicyclists can now enter the lab from either the west or east side, without obtaining identity badges or visitors’ passes. Visitors cannot enter a laboratory building—except the Lederman Science Education Center—without identity badges or visitors’ passes. Motor vehicles are still restricted to the west entrance, off Kirk Road at Pine Street, and motorists must obtain visitors’ passes to enter on lab business.

The latest changes continue a process that began soon after the terrorist attacks of September 11, 2001. Like the rest of the country, the lab’s immediate response placed a priority on security—effectively placing a lid on the lab. No visitors were allowed except on lab business, and all public recreational use was halted. Neighbors accustomed to jogging, walking their dogs, bicycling, taking the nature trails or birdwatching seemed to accept the change, but that acceptance frequently included a kicker in phone calls or emails: “When do you think you’ll be open again?”

Yet there were special events that went forward, running smoothly enough to demonstrate that public access did not necessarily entail security problems. The first was the symposium celebrating the centenary of Enrico Fermi’s birth, on Friday, September 28. The symposium had been planned for months, with speakers from across the country, and with the public invited. But the general air of uncertainty evidently reduced the turnout.

“The attendance was disappointing,” said symposium organizer and Fermilab theorist Chris Quigg. “On the other hand, the Larry Krauss lecture was a big success and was a nice gift to the community. It was very important to hold the event as planned—for the practical reasons that the 100th birthday doesn’t come around every day and that we had assembled a remarkable group of speakers who couldn’t easily be rescheduled together. It was also important for symbolic reasons: To show the values and human qualities we hold dear, even—and especially—in times of stress. “



Photos by Jenny Mullins

Visiting motorists must enter Fermilab from the west side, and stop at the Lederman Science Education Center to receive visitors’ passes or meet a lab escort.



The lab has resumed a level of recreational access including tours, bicyclists, birdwatchers—even skiers, if they enter the site on foot.



Photos by Reidar Hahn

The Fermilab Arts Series, with origins dating to the earliest days of the lab, was forced to cancel its Sept. 15 Opening Night performance by flutist Carol Wencinc and harpist Nancy Allen, with air traffic still grounded throughout the country (the performance is rescheduled for May 4). But the rest of the schedule remained intact, with supervised access that included dedicated parking areas. Several events have been sellouts in 800-seat Ramsey Auditorium, as well as the entire debut season of the Sunday afternoon chamber music series in the second-floor gallery of Wilson Hall.

“Thanks to great cooperation throughout the lab, we’ve been able to comply with security restrictions with the least amount of inconvenience to our patrons,” said Arts Series coordinator Janet MacKay-Galbraith. “As the only lab function open to the public, our programs have been very well received, and the public has expressed its appreciation for being able to come to the laboratory. The Arts and Lecture Series was originally conceived as a community outreach tool, and it has never fulfilled that mission more effectively than in the last six months.”

At the Lederman Science Education Center, guided tours for school groups resumed within a matter of weeks, though some schools canceled previous arrangements. Larger presentations such as The Wonders of Science will proceed with special permission. Guided tours for the public have recently been reinstated, with advance sign-up required. The Science Education Center is open during normal business hours on weekdays, and now hosts the Ask-A-Scientist program each Saturday afternoon from 1 p.m. to 3 p.m.

“Casual visitors have been pretty scarce since September,” said Fermilab education director Marge Bardeen. “Overall, I would say that schools and colleges have been most understanding of the situation in which we found ourselves. Teachers and faculty were disappointed that they could not bring students to the lab. But they are signing up again in record numbers—perhaps to make up for the time missed, although it’s too early to tell.”

Other educational efforts, such as the longstanding Saturday Morning Physics program for high school students, continued uninterrupted.

Openness to the public has been a key element in the lab’s operating philosophy from its earliest days, and citizens of the neighboring communities have come to view the site as something akin to public parkland.

“We value our neighbors, and we value their presence at our lab,” Stanfield concluded. “We like to feel that we enhance the quality of life for this area in many ways. And we certainly hope to resume our longstanding, welcoming presence with our neighbors, as soon as the time is right.”

**On the Web:**

For the latest updates on public access, visit the News box on Fermilab’s Home Page [www.fnal.gov](http://www.fnal.gov) (or call Public Affairs at 630-840-3351)

# the

## Farewell, FNALD

Parting is, indeed, such sweet sorrow, although Shakespeare could not have imagined his words applying to a computing cluster.

“So much of the work that people do here is tied up in these systems, that it really is hard to let them go,” said Steve Wolbers, deputy head of Fermilab’s Computing Division, who faces the task of “de-commissioning” the cluster called FNALD by the end of March.

That’s a polite way of saying shutting it down and moving it out, because the Feynman Computing Center needs the space, and needs the power and cooling capacities that FNALD is absorbing.

But computing systems often seem to be obsolete almost as soon as they hit the market. What’s the pull with FNALD? Simply this: in a world of instant change, FNALD has served Fermilab scientists as reliably as an old friend for more than 20 years. Even the “migration” (moving users to different systems) has lasted years longer than expected: begun in 1995, it was supposed to be complete by 1998.



The original Digital Equipment Corporation VAX components and their successors have been in one location or another, in one form or another, since before 1980—before the Feynman Computing Center was constructed, even before CDF itself was completed. First, they served almost the entire Fermilab community, then they stood as the primary computing resource for the CDF collaboration starting in the mid-80s. Why did the system last so long?

“The VMS operating system was extremely efficient in doing scientific computing,” Wolbers said. “The hardware was robust and reliable, the clustering of components meant you add or remove components as needed, it was a common language available in almost every university physics department around the country. It was good. It ran, and ran well, for a long time.”

Installing the VMS clusters represented a switch from mainframe computers to what were called mini-computers at the time. The stacking of components might sound similar to the current use of PC farms, but the VMS cluster offered an even more powerful concept that farms still have not attained: a single file view with single log-in and common access to disc and tape. VMS also offered an advantage over contemporary systems.

“One of the big fights in those days, if you can believe it, was whether or not it was ‘sensible’ to spend money on computers to do ‘chit-chat’ as opposed to only batch computing,” said David Ritchie of CD-Online and Database Systems, who was involved in the initial installation. “It meant doing ‘interactive computing’ in which human beings sit at a terminal and type text into the computer that is to be read somewhere else by another human being, not a computer program. The alternative was writing and running programs whose only purpose was to read data files and write other data file results, which one then transcribed via a typewriter into a paper document submitted for publication.”

“What happened,” Ritchie continued, “was that people found that working on the VAX’s was actually quite productive. They had tools like e-mail for communicating with collaborators, good interactive editors, the ability to run really large programs, and an ability to have more than one person active on the computer at a time. Thus, people quickly gravitated to it as a place to work and to collaborate.”

Importantly, individual collaborations could add components, as, for example, CDF’s Italian contingent did around 1986 (as shown in the photo, with computer department head Hugh Montgomery, left, and research head Ken Stanfield, right, flanking CDF collaborators Antonio Bellini and Giorgio Bellettini).

“In its heyday, FNALD had a total of 21 computers, four of which I know for sure were supplied by the Italians,” said Rick Colombo of CD-CDF Computing and Analysis, who has maintained FNALD through much of its lifetime. “Those four



computers were part of 11 computers that we called the ‘K’ boxes. They were used within FNALD much like we now use a farm, only they were literally part of FNALD and not isolated. Certain jobs were run specifically on these 11 nodes, the Italians getting some preferential treatment running batch jobs on the ‘K’ boxes for their contribution.”

But finally, the PC explosion, the advent of Windows and LINUX, and the direction of the computing industry meant the bell was tolling. The Computing Division will hold a send-off on March 27.

“It did a great job in its time,” Wolbers said. “It’s time to move on.”

—Mike Perricone



## CALENDAR

### FERMILAB ARTS SERIES:

#### SOLAS

Saturday, March 23, 2002  
\$20 (\$10 ages 18 and under)

"... the best Irish traditional band in the world."  
— Boston Herald



No band in Irish music today has risen faster and farther in such a short time than Solas. Formed about five years ago, this versatile group has already received three consecutive awards from the Association for Independent Music for Best Celtic Recording: *Solas* (1996), *Sunny Spells and Scattered Showers* (both 1997), and *The Words That Remain* (1998). The band has appeared on Garrison Keillor's "A Prairie Home Companion," NPR's "Morning Edition," "Mountain Stage," "World Café," CNN's "World Beat" and "Showbiz Today," and NBC-TV's "Weekend Today Show." With similar speed, Solas progressed from clubs to theaters and headlining status at festivals. Band members include John Doyle (guitar); Seamus Egan (flute, banjo); Winifred Horan (fiddle); Mick McAuley (accordion, tin whistle); and one of the best in the new generation of singers in Ireland, Deirdre Scanlon.

Related Links: [www.flemtam.com/so.html](http://www.flemtam.com/so.html)

#### LUMA

Saturday, April 20, 2002  
\$18 (\$9 ages 18 and under)

"The show never fails to amaze, it is literally and figuratively illuminating." — Chicago Tribune

While almost impossible to describe, LUMA embodies a breakthrough in family performance art, similar to those of Imago, Mummenschanz and Michael Moschen. Using new light technologies and various performance art disciplines, LUMA transforms a darkened theater into a spatial canvas, where three-dimensional illuminated objects and chaotic characters paint surreal worlds

Website for Fermilab events: <http://www.fnal.gov/faw/events.html>

All Fermilab Arts and Lecture Series programs begin promptly at 8 p.m. in Ramsey Auditorium, in Wilson Hall. For more information, call 630-840-ARTS, send a fax to 630-840-5501, or email [audweb@fnal.gov](mailto:audweb@fnal.gov).

### FERMILAB LECTURE SERIES:

**The Dark Side of the Universe:  
Beyond Stars and the Starstuff We Are Made Of**  
Dr. Michael Turner, Fermilab and University of Chicago  
Friday, April 5 at 8 p.m., Ramsey Auditorium  
Tickets: \$5

Cosmologist Michael S. Turner is trying to crack the mystery of why the expansion of the universe is speeding up and not slowing down, and the nature of the dark energy causing that accelerated expansion. He has made important contributions to inflationary universe theory, to the idea that dark matter is a new form of matter, and to understanding how structure formed in the universe. Turner is the Bruce V. and Diana M. Rauner Distinguished Service Professor and Chair of the Department of Astronomy & Astrophysics at



the University of Chicago. He also holds appointments in the Department of Physics and Enrico Fermi Institute at Chicago and is a member of the scientific staff at the Fermilab. With Edward "Rocky" Kolb, Turner established the Theoretical Astrophysics Group at Fermilab and wrote the monograph, "The Early Universe."

Tickets are non-refundable. For further information or telephone reservations, call 630/840-ARTS weekdays between 9 a.m. and 4 p.m. Phone reservations are held for five working days, but will be released for sale if not paid within that time. Fermilab is only accessible from the west side entrance at Pine Street and Kirk Road. For a map or further information, please see our web page at [www.fnal.gov/culture](http://www.fnal.gov/culture).

### ONGOING NALWO

Free English classes in the Users' Center for FNAL guests, visitors and their spouses. The schedule is: Monday and Friday, 9:30 a.m. to 11:00 a.m. Separate classes for both beginners and advanced students.

### WELLNESS WORKS SEMINAR

Healthy Cooking, Healthy Eating, a lecture and food sampling. April 3, Noon to 1 p.m. in WH 1West with Michele Kinzler, Registered Nutritionist, Central DuPage Hospital

of colorful motion. Fireflies dance, fireworks explode, and iridescent maidens trapeze to an eclectic score in a performance that is part puppetry, part dance, part fireworks, with a little Big Top action thrown in. The Philadelphia City Paper described LUMA as "a magical treat in the dark. It's part visual lullaby and part sweet, funny circus of light." Appearing last June on *The Tonight Show with Jay Leno*, LUMA has also been featured at Philadelphia's renowned Fringe Festival, and at the Spoleto Festival where they were deemed "definitely the coolest thing...appropriate for young children."

Related Links: [www.sroartists.com/luma.html](http://www.sroartists.com/luma.html)



LUNCH SERVED FROM  
11:30 A.M. TO 1 P.M.  
\$10/PERSON

DINNER SERVED AT 7 P.M.  
\$23/PERSON

## Chef Léon MENU

FOR RESERVATIONS, CALL X4512  
CAKES FOR SPECIAL OCCASIONS  
DIETARY RESTRICTIONS  
CONTACT TITA, X3524  
[HTTP://WWW.FNAL.GOV/FAW/EVENTS/MENUS.HTML](http://www.fnal.gov/faw/events/menus.html)

**LUNCH**  
**WEDNESDAY, MARCH 20**  
*Pesto-crusted chicken breast*  
*Caramelized onion and roasted red pepper linguine*  
*Espresso sundae with dark chocolate sauce*

**DINNER**  
**THURSDAY, MARCH 21**  
*Lobster bisque*  
*Beef tournedos with morels*  
*Steamed asparagus*  
*Rosemary potatoes*  
*Chocolate souffle with raspberry coulis*

**LUNCH**  
**WEDNESDAY, MARCH 27**  
*Pork loin with apple salsa*  
*Spaetzle with bacon and onion*  
*Plum marzipan turnovers*

**DINNER**  
**THURSDAY, MARCH 28**  
*Wild mushroom tart with herbs*  
*Grilled sea scallops on greens*  
*Endive and apples*  
*Crepes with caramelized pineapple and banana in ginger glaze*

## F E R M I L A B

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The deadline for the Friday, March 29, 2002, issue is Tuesday, March 19, 2002. Please send classified ads and story ideas by mail to the Public Affairs Office, MS 206, Fermilab, P.O. Box 500, Batavia, IL 60510, or by e-mail to [ferminews@fnal.gov](mailto:ferminews@fnal.gov). Letters from readers are welcome. Please include your name and daytime phone number.

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## CLASSIFIEDS

### FOR SALE

■ '99 Dodge Dakota Sport ext. cab 4x4, loaded, solid truck, strong performer, sound and alarm professionally installed. Call for detailed description. \$18,500 o.b.o. Michael Barbon x3924, or 847-428-8266.

■ '98 Dodge Dakota club cab SLT truck. Black with gray cloth interior, 3.9L V-6 engine, 4-spnd auto, PS, PB, AC, intermittent wipers, AM/FM/Cass, tilt wheel, power locks and windows, sliding rear window, rear cap and much more. 45K, 6 year warranty. \$13,500, 630-505-0276.

■ '98 Chevy C1500 W/T 1/2-ton, 27,600 miles, AM/FM/Cass/CD with 12-disc changer, A/C, auto, cruise, Ziebart and Paint Protection maintained annually, excellent condition, \$10,800 o.b.o., 630-505-0276.

■ '95 Ford Escort LX 4-dr, 94 K miles, air conditioning, automatic, electric power mirror, dark green, \$2,500 o.b.o. hidaspal@fnal.gov, 630-840-6856.

■ '90 Toyota Corolla, auto, 4dr. a/c, 86K+ miles, original owner, clean \$2,300 o.b.o. 630-851-0413.

■ 4 new tires, Goodyear Eagle P205/55R16 all for \$40; weight bench and weights, \$25. Greg x4606 or 630-557-2523.

■ Set of 33" BFGoodrich tires on Eagle polished aluminum rims, 6-bolt Chevy lug pattern, \$800. Draw-Tite class 3 hide-a-hitch w/2" receiver for S10 or S10 Blazer, \$100. Steel snowmobile trailer w/tilt, spare tire, \$400. Century fiberglass truck cap, black, for short bed. Sliding windows in front and sides, \$500. 2000 Kawasaki Lakota four-wheeler, 50 hours ridden easy, \$3,000. Home 815-787-9415 ask for Bill, dymond@fnal.gov or x 3691.

■ '73 Crestliner 14' boat with Sea Bird trailer. 5-1/2 HP Johnson Seahorse motor, 2-electric trolling motors, Garmin Fish Finder, dual anchors with cranks, misc fishing poles, tackle, vest, etc. \$3,800. Call 630-505-0276.

■ i-Mac Computer DV Special Edition-400 MHz Power PC, G3-128 MB of SDRAM, call for detailed description x3924. Used 6 hours, \$700 o.b.o., 815-498-4517.

■ Dahlquist DQ20 speakers, black, in good shape, packed in original boxes, sold new for \$900 each \$500 for the pair o.b.o. Dallas x3190 or 630-879-3441.

■ Zano's Spa and Salon Gift Card. \$70 Value, great gift idea. Call Jerry at X4571

■ Furniture refinishing and restoration. Pick-up and delivery services available. Call 815-695-5460. x3762.

### NOON BIBLE CLASS

Each Wednesday at noon in the Huddle off the Cross Gallery. The 1-year study will end soon. Our next topic is Heaven: How to get there. You are invited. Jeff Ruffin x4432, ruffin@fnal.gov.

### TOWNHOME FOR RENT

North Naperville (Kingspointe), close to I-88 & Rt 59 Metra Station. Two bedrooms, 2.1 bathrooms. One car attached garage. All appliances. Available March 1st, \$1,300/month. Daniel/Cecilia. Email: daniel@fnal.gov. Call 393-0149 (eve).

### HOMES FOR SALE

■ 3 bedroom tri-level in Lake Holiday, 2 bath, professionally landscaped, Sandwich Schools, large lot, 3 beaches, boating, fishing, water-skiing, low taxes. Available after April 1, 2002. \$145,900. Call ext. 3499.

■ 4-bedroom, \$199,999, just south of Fermilab in Butterfield Subdivision (10 minutes by car, 20 minutes by bicycle). The house is energy efficient and has a great sunroom, hardwood floors, cathedral ceilings, two full baths, and a loft. Contact Willem Blokland, wblokland@aol.com.

## LAB NOTES/CALENDAR

### VIRTUAL ASK-A-SCIENTIST

The next science chat with Fermilab scientists Roger Dixon and Robin Erbacher will take place on Tuesday, March 19, from 1 to 3 p.m. CST. During this time a link on the Fermilab homepage ([www.fnal.gov](http://www.fnal.gov)) will take you to the chat room. For further information, please see [www.fnal.gov/pub/inquiring/virtual/virtual\\_aas\\_info.html](http://www.fnal.gov/pub/inquiring/virtual/virtual_aas_info.html).

### MEET SCIENTISTS AT SCIENCE CENTER

The popular Ask-a-Scientist program takes place every Saturday from 1 to 3 p.m. at Fermilab's Lederman Science Center. Scientists will meet visitors to answer questions ranging from "What

is dark matter?" to "How do you accelerate a particle close to the speed of light?" The Science Center with its hands-on science displays is open Monday through Friday from 9 a.m. to 4 p.m. and every Saturday from 9 a.m. to 3 p.m. Visitors must use the Pine Street entrance.

### BLOOD DRIVE

Fermilab's blood drive will be held on March 19, 2002 9 a.m. to 2 p.m. at WH Ground floor EOC room and the NE ES&H Training Room. Due to the overwhelming turnout we had last summer, we are expanding our efforts to have more Heartland Blood Center staff on hand to shorten the waiting time. Please call Lori at ext 6615 or email [LLimberg@fnal.gov](mailto:LLimberg@fnal.gov) to schedule an appointment. Walk-ins are welcome (we will try to work everyone in), but scheduled appointments will take priority.

### SUMMER DAY CAMP

Registration for the 2002 Fermilab Summer Day Camp program, for children age 7-12, will begin March 1. Registration deadline will be March 28. A lottery drawing will be held on March 29 and notifications will be sent out that day. Cost for each session is \$225. More information can be found in the Recreation Office, the Recreation web page at <http://fnalpubs.fnal.gov/benedept/recreation/recreation.html>, Day Care or Accommodations Office.

### RECREATION DEPT.

Adult Outing-Spirit of Chicago Island Fever Cruise, March 16 Muscle Toning, Tai Chi, & Pilates Classes Climb a Mountain Exercise Program Discount Movie Ticket Sales, Entertainment Book Sales. Information can be found at the Recreation web page <http://fnalpubs.fnal.gov/benedept/recreation/recreation.html>

## MILESTONES

### RECOGNIZED

■ 213 employees and users who volunteered their time to support K-12 activities and education programs, during a reception hosted by director Mike Witherell on Feb. 20.

### NAMED

■ Hugh Montgomery, as new Associate Director for Research. Mike Shaevitz, who filled the position since July 1999, will return to his post as Professor of Physics at Columbia University at the end of Summer, 2002.

### AWARDED

■ Ph.D. to Marcello Santo Nicola, Centro Brasileiro de Pesquisas Fisicas, Brazil. For his research related to the E769 experiment at Fermilab.

■ Ph.D. to Juan Estrada, University of Rochester. For research related to the DZero experiment.

### ELECTED

■ As CDF Cospokesperson: Nigel Lockyer (ID 03577V, University of Pennsylvania), for a two-year term to begin June 1, 2002. Lockyer succeeds Franco Bedeschi.

### RETIRING

■ Howard Casebolt, ID 2462 BD-Environmental Safety & Health, effective March 29, last day March 15.

■ Edward Wilmsen, ID 4579 PPD Division Office, effective May 31, last day March 19.

■ Philip Martin, ID 5111 BD-DH Headquarters, effective April 20.

<http://www.fnal.gov/pub/ferminews/>



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