FermiNews

Fermi National Accelerator Laboratory

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WHAT'S NOBEL GOT TO DO WITH IT?

The seminal discoveries in the 1950s and 1970s that earned this year's Nobel prize in physics had far-reaching impact and continue to influence the direction of research at Fermilab today.

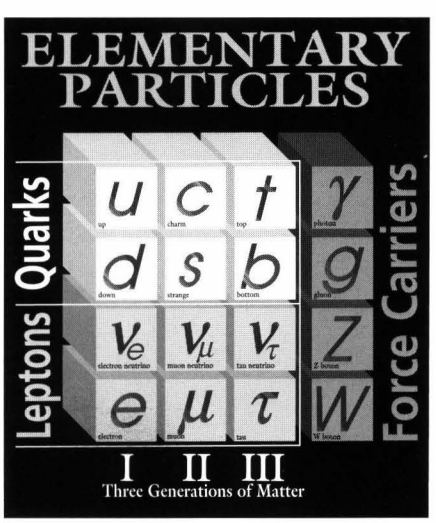
by Leila Belkora, Office of Public Affairs

Much of Fermilab's strategic plan for science in the 1990's, including top quark physics, CP violation studies, and fixed-target experiments to study neutrinos, is in some way rooted in the experiments in elementary-particle physics carried out by the 1995 laureates.

On October 10, the Royal Swedish Academy of Sciences awarded the 1995 Nobel prize in physics to Martin Perl and Frederick Reines. Perl won for the discovery of the tau particle, a discovery that arose from a series of experiments he and his colleagues conducted between 1974 and 1977 at the Stanford Linear Accelerator. The tau is a massive but short-lived relative of the electron. Reines was honored for his success in detecting the neutrino at the U.S. Nuclear Regulatory Commission's Savannah River Plant, along with colleague Clyde Cowan (now deceased). The discovery of the tau and the detection of the neutrino are both milestones in the physics of leptons, the category of particles that includes the electron, muon, and tau and the associated electron, muon and tau neutrinos.

Photo by FRED ULLRICH

Fermilab physicist Gina Rameika, project manager for Fermilab's planned long-baseline neutrino experiment, stands where neutrinos will emerge from the beam hall and points toward Minnesota, future site of the experiment's detector.



Perl's discovery of the tau signaled the existence of a third generation of quarks, still unknown experimentally in the early 1970s. Quarks and leptons together form families of subatomic particles, so the discovery of a new lepton implied the existence of two new quarks in the same family. Fermilab collaborations found both—the bottom quark in 1977 and the top quark in 1995. Today, research continues on determining their masses and other characteristics.

The discovery of the tau was also a significant event along the way to KTeV, a Fermilab research initiative to study decays of neutral K mesons. One consequence of the existence of a third generation of quarks, as revealed by the discovery of the tau, is that the Standard Model of particle physics permits some rare events that violate a fundamental principle of symmetry. Without the third generation of quarks, physicists would need to find another explanation for this CP violation, which was found experimentally in 1964. KTeV and related experiments with B mesons at the collider detectors will help answer the question whether or not CP violation can be entirely explained within the Standard Model.

Reines' detection of the neutrino also opened up a new field of experiments. His work centered on the electron neutrino. After Perl found the tau lepton, physicists began to

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ACCELERATOR TV: DECODING CHANNEL 13

By Donald Sena, Office of Public Affairs

This particular television channel will not win "sweeps week" nor command much interest from advertisers. However, Channel 13, providing essential data about the status of Fermilab's accelerator and its critical beams of protons and antiprotons, is a hit with many physicists and engineers.

Each segment of the screen, seen on television monitors around Fermilab, offers information relevant to different tasks at the Laboratory. At a glance, operators and experimenters can check the sizes of the proton and antiproton bunches; track the beam's luminosity; note the size of the antiproton stack and determine if the proton beam is going into the Tevatron or being used to make antiprotons, among other useful facts.

"There is a lot of synchronizing of [data] that allows you to look at the screen and determine what each machine is doing," said Wally Kissel, the Accelerator Division staff member who developed the computer program that automatically updates the information. "There's embedded expertise" in the display.

Ron Lipton, a DZero experimenter, said he checks the screen as he walks by it to keep informed about the status of the accelerator.

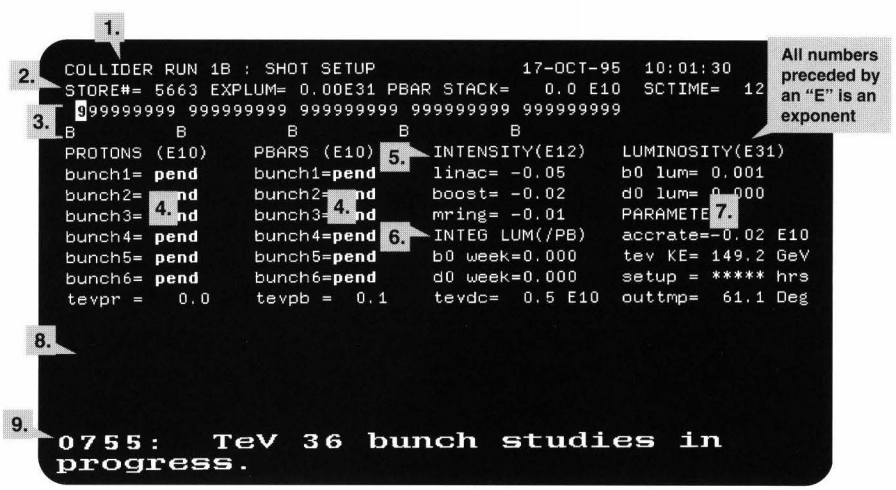
The channel "is a very important piece of information that the accelerator [team] provides to the 'customers'" of the beam, said Lipton.

There are six versions of the screen: two for collider operations, one for fixed-target experiments (accelerator personnel will update the display as KTeV comes on line in the late spring), one for shutdown and startup modes and two screens for when the beam is not running.

At first glance, Channel 13 seems daunting, leaving some people wishing they had a remote control to channel surf. But a quick tour of the screen helps make sense of the technical information, allowing everyone to become an informed viewer.

This article explains the two collider screens, the most relevant to Fermilab's current experiments. A future FermiNews article will cover the updated fixed-target screen.

SHOT SET-UP SCREEN



1. This line gives the name of the present collider run, along with the date and time. Operators use the "shot set-up" screen when transferring lower energy particles into the Tevatron at the beginning of a storage sequence; a store includes injection and acceleration of protons and/or antiprotons to a high energy. Operators use the "collisions" screen when protons and antiprotons are colliding in CDF and DZero.

2. On the second line, the "store #" counts the number of times protons and antiprotons have been stored since the beginning of collider operations; this number includes successful stores, as well as other types, including studies. "Explum" is expected luminosity based on the current stack of pbars (antiprotons) and "pbar stack" refers to the number of pbars in the accumulator. "Sctime" stands for supercycle time–the time it takes to run through one cycle of events; in collider operations, this is usually 200 seconds.

3. The next two lines lead a viewer through each individual step of a supercycle. A cursor moves across the line, jumping down when it gets to the letters, as the cycle passes from one stage to the next. The "9" on top indicates that antiprotons are being stacked or the beam is tuning up for stacking mode. The "B" means that the proton beam is going into the Tevatron. As the cursor moves across the line, Laboratory staff can follow along and know exactly what the accelerator is doing at any given point.

- Also, the channel could display an "E" (study cycle), "A" (Antiprotons going into the Tevatron) or "D" (reverse injection). Each step along the top of the two lines generally takes 2.4–3 seconds. Each step along the bottom of the two lines can take a variable amount of time. When a supercycle ends, the cursor jumps back to the left.

4. Protons and antiprotons eventually become clumped together in bunches, and there are six bunches of each in the ring at one time. These two columns note the size of each individual bunch. The last line in each, standing for Tevatron protons and Tevatron pbars, measures the sum of bunches 1–6.

5. This reading measures the beam's intensity in the separate accelerators.

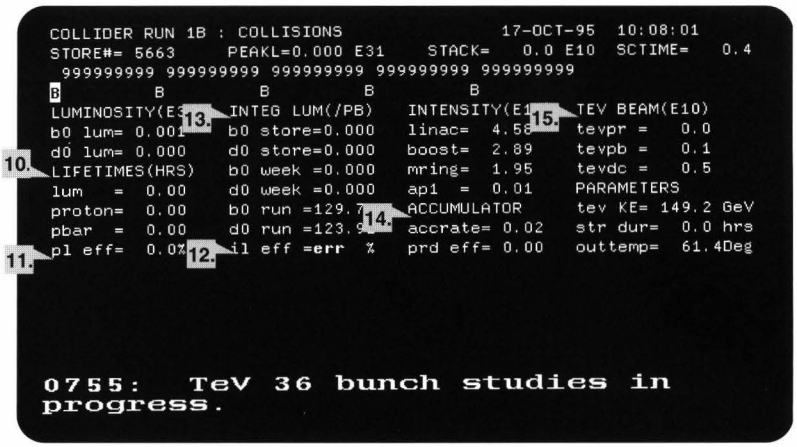
6. This section of the screen measures the integrated luminosity–the summation of luminosity over a set period of time–at the collision points for the week. "Tevdc" refers to the summation of protons and antiprotons together in the Tevatron.

7. The last column displays the luminosity for BZero (CDF) and DZero collision points; the accumulation rate for antiprotons ("accrate") and the Tevatron's kinetic energy, which is the particles' energy given by the bending field.

Finally, the column rounds out with the time it takes to set up a particular shot and the outdoor temperature.

8. Channel 13 uses this space for computer-generated messages (not seen here) that display the status of the accelerator and beam. This message is translated into a computer-enhanced voice, allowing staff to keep up with the accelerator's stages and not have to watch the screen constantly.

9. Operators add large scrolling messages, describing the major events of the day or hour, at the bottom of the screen and precede them with a timestamp.



COLLISIONS SCREEN

At first glance, this screen looks nearly identical to the shot set-up version but there are many subtle differences. The top four lines of the two screens are generally the same. However, "explum" is replaced with "peakl," which provides the beams' luminosity at the start of the collisions.

10. The "lifetime" lines predict the time, in hours, when protons, antiprotons and luminosity will decay to about one third of their present value.

11. "pl eff" (peak luminosity efficiency) reflects how much the peak luminosity should be and compares it with how big it actually is. This is a one-time reading measured at the beginning of a shot.

12. The "il eff" (integrated luminosity efficiency) is similar to the "pl eff" but is a measure of the current integrated luminosity compared with the expected integrated luminosity at this point in time.

13. This section gauges the integrated luminosity for CDF and DZero for the store, week and entire run.

14. The "accumulator" area reveals the accumulation rate and production efficiency for antiprotons. A nominal level for the production efficiency is about 16 antiprotons for every one million protons.

15. The "tev beam" column measures the sum of particles in the six proton bunches (tevpr), six antiproton bunches (tevpb), and the total number of particles in the Tevatron, including beam outside of the twelve bunches (tevdc).

Finally, the bottom of the screen is the same as the shot set-up version.

It doesn't provide ball scores, lotto numbers or stock quotes, but Channel 13's data-packed screen helps Fermilab users and employees track the progress of the accelerator with up-to-the-second information and calculations—and with no boring reruns! ❑

NEUTRON THERAPY TO REOPEN AT LAB

By Judy Jackson, Office of Public Affairs

Fermilab's Neutron Therapy Facility, which stopped treating cancer patients on June 30, 1995, will soon resume patient treatment. Officials of Fermilab, Universities Research Association, Inc., and the Department of Energy announced the signing of a one-year contract with Saint Joseph Hospital, of Elgin, to operate NTF as a satellite clinic of the hospital's Regional Cancer Care Center. The contract took effect on November 1, and NTF staff expect to begin offering treatment within days.

"I am pleased that Fermilab and Saint Joseph Hospital are going to resume treatment of patients with the Linac beam," said Fermilab Director John Peoples. "It is a fine example of exploiting the Linac, a facility that makes our forefront research in particle physics possible, for a second purpose, at only a small additional cost."

Neutron therapy uses a beam of neutrons, a byproduct of the Fermilab Linear Accelerator's proton beam, to irradiate locally advanced tumors of the prostate and salivary glands, as well as bone and soft sarcoma tumors. Clinical studies indicate that effective treatment with neutrons requires high-energy beams such as those produced at Fermilab.

Fermilab's Neutron Therapy Facility began experimental treatment of cancer patients in 1976 under the auspices of the National Cancer Institute. NCI supported the Neutron Therapy Facility until 1985, when the established efficacy of neutron irradiation ended its status as an experimental treatment. Since 1988, Fermilab had operated the facility under contract with Rush Presbyterian-St. Luke's Medical Center, which provided physician support for the facility. In June, Rush terminated its contract with the Laboratory, citing low patient volume.

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-John Peoples, Fermilab director

Upon termination of the contract with Rush, Fermilab Associate Director Bruce Chrisman announced that the Laboratory would "undertake a process of deliberate review in deciding how to pursue further medical applications of particle beams at Fermilab," including the possibility of a contract with another health care provider.

Arlene Lennox, Fermilab manager of the Neutron Therapy Facility, said she was delighted when Saint Joseph Hospital officials called to express their interest in operating NTF. "I am very excited about working with them and the physicians in Dr. Geoffrey Smoron's radiation oncology group," she added. "And fortunately, the hospital was able to hire nearly all of our original Fermilab staff." Three members of the NTF staff, including Lennox, will remain Fermilab employees; three have joined Saint Joseph's staff. ❑

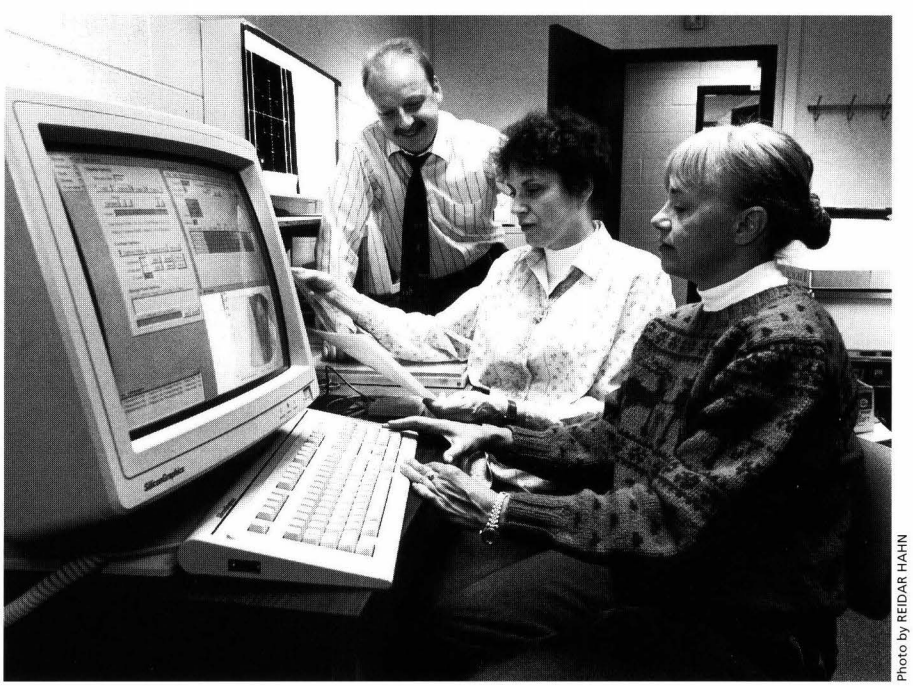


Photo by REIDAR HAHN

Brian Pientak, Arlene Lennox (middle) and Barb Bennett, NTF staff members, prepare for the return of neutron therapy to Fermilab. The clinic, which will operate under a contract with Saint Joseph Hospital, is scheduled to reopen in November.

NEW USERS EXECUTIVE COMMITTEE

by Donald Sena, Office of Public Affairs

Fermilab's Users Executive Committee seated its newest members and selected officers for 1995-96 at its most recent meeting on September 23. The group elected Al Goshaw from Duke University as chairperson and Maury Goodman from Argonne National Laboratory as secretary.

Goshaw explained in a recent interview that the UEC is a vital link between Fermilab's users and Laboratory management.

"The purpose of the UEC is to provide a forum for all Fermilab users to discuss both scientific and administrative matters relevant to the organization and operation of the lab," said Goshaw. "It is a sounding board for users."

The UEC, founded in 1967, represents scientists from around the world. Goshaw succeeds Nick Hadley from the University of Maryland as chairperson.

The Duke professor outlined some issues at the forefront of the UEC's agenda. First, the high-energy physics community must confront its future in a time of increased budget constraints. He stressed that the government's belt-tightening puts a heightened emphasis on the cooperation between users and Laboratory management.

In an October 11 letter to users, Goshaw said, "...the opportunities for exciting, frontier high energy physics research at Fermilab are better than ever with a strong, diverse physics program planned for the next decade. However, it will be important for the Lab and Users to strengthen their cooperation to take advantage of these opportunities within the constraints of limited funding."

Goshaw explained that the UEC should tap users' vast geographical base by encouraging them to get Fermilab's word out about its important research.

Photo by REIDAR HAHN

Top row, left to right: Joey Huston, Alfred Goshaw, Nicholas Hadley, Gerald Jackson, John Yoh. Front row: Jay Hauser, Maury Goodman, Patricia Mcbride, Juliana Whitmore, Richard Partridge. Not pictured: Janet Conrad, Daniela Bortoletto and Stephen Wimpenny

Also, the UEC will assemble various committees affecting different parts of users' existence at the Laboratory, including issues facing younger physicists, academic and continuing education opportunities and high-performance computing questions.

Goshaw said the UEC will also continue some of the more "hidden" work that the committee has performed in the past. This includes a trip to Washington, D.C. to discuss Fermilab and its future with the Universities Research Association, the Department of Energy and with members of Congress.

This activity "makes sure that the high quality work done at Fermilab is known at the highest levels," said Goshaw. ❑

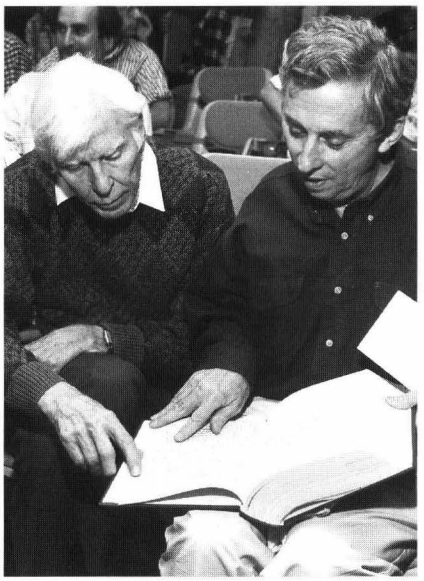
The following people make up the new UEC (an asterisk indicates a continuing member):

- Daniela Bortoletto*, Purdue University.
- Janet Conrad*, Columbia University
- Al Goshaw*, Duke University.
- Nicholas Hadley*, University of Maryland.
- Joey Huston*, Michigan State University.
- Gerald Jackson*, Fermilab
- Stephen Wimpenny*, University of California, Riverside.
- Maury Goodman, Argonne National Laboratory.
- Jay Hauser, University of California, Los Angeles.
- Patricia McBride, Fermilab.
- Richard Partridge, Brown University.
- Juliana Whitmore, Fermilab
- John Yoh, Fermilab.

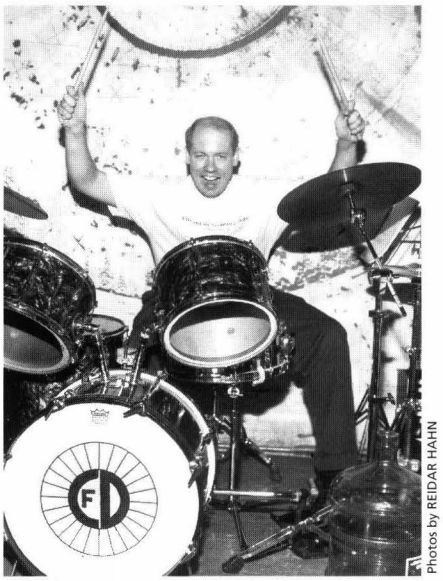
CDF CELEBRATES 10TH ANNIVERSARY

On Friday, October 13, members of the CDF collaboration celebrated the tenth anniversary of proton - antiproton collisions at the detector.

At a morning colloquium, spokesman emeritus Alvin Tollestrup recalled the events of a decade ago, and cospokesman William Carithers presented a bound volume of CDF's first 100 papers to Director John Peoples.



Physicist Alvin Tollestrup, (left) CDF spokesman emeritus, examines a volume of CDF's first 100 published papers, presented to Dr. John Peoples at a morning colloquium.



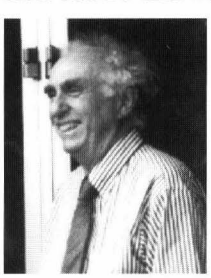
John Skarha, CDF collaborator from Johns Hopkins University and drummer for CDF's rock band, Drug-Sniffing Dogs, entertained guests at an evening celebration at Kuhn Barn.

Photos by REIDAR HAHN

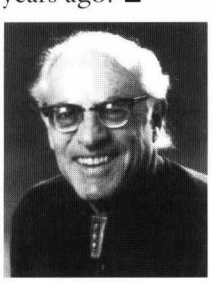
What's Nobel got to do with it?
continued from page 2

think about an experiment to detect the tau's companion neutrino, and just such an experiment is now in preparation at Fermilab. The E872 collaboration hopes to be the first to observe tau neutrinos and may also find evidence for the "oscillation" of neutrinos among the electron, muon and tau types. Fermilab's NuMI experiments, now in the planning stages, are a further exploration of neutrino oscillations, aimed at searching for neutrino mass.

Many experiments at Fermilab today have their roots in Nobel-prize-winning work. The fact that we can trace so much current or planned research to the lepton physics of Reines and Perl illustrates the fundamental importance of the experiments this year's prize winners carried out 20 and 40 years ago. ❑



Martin Perl



Frederick Reines

"Did you know...?"

- A Nobel prize can be awarded posthumously but only if the formal recommendation was made before the honoree died.
- If a person awarded the Nobel declines the prize (because the winner's government forbids acceptance, for example), but comes forward later to accept it, the person gets the gold medal and certificate, but not the money.
- Alfred Nobel established the prizes in Chemistry, Physics, Medicine or Physiology, Literature, and International Peace, all of them fields in which he took an active interest; the central bank of Sweden later established the Economics prize.
- One must be recommended by a Nobel committee to receive a prize–self-nomination is an automatic disqualification. One even receives the opportunity to nominate a candidate by formal invitation from the Nobel committee.

The last 5 Nobel prizes in particle physics

1995 M. Perl and F. Reines, for discovery of the tau lepton and detection of the neutrino, respectively.

1992 G. Charpak, for advances in detector physics, including the invention of the multiwire proportional chamber.

1990 J. Friedman, H. Kendall, and R. Taylor, for experiments confirming the existence of quarks.

1988 L. Lederman, M.Schwartz, and J. Steinberger, for demonstrating that neutrinos come in more than one flavor and the discovery of the muon neutrino.

1984 C. Rubbia and S. van der Meer, for detection of two W particles and the neutral Z particle.

MILESTONES

BORN: A son, Joseph IV, to Joe Incandela, Fermilab physicist and CDF collaborator, and Helen Incandela, on October 9 in Chicago.

BORN: A daughter, Emily Kiana, to Colleen Yoshikawa, of the Director's Office staff, and Cary Yoshikawa, DZero collaborator and University of Hawaii graduate student, on October 14 in Aurora.

BORN: A son, Isaiah Jamal Earnest, to Crystal Ruffin, of the Travel Office staff, on October 4 in Aurora.

MARRIED: Rich Kron, Fermilab astrophysicist and University of Chicago associate professor, and Deborah Bakken, a paleoanthropologist, on September 22 in Montana.

HONORED: University of Chicago at Illinois professor and DZero collaborator Howard S. Goldberg; recipient on October 17 of the United States Professor of the Year award from the Carnegie Foundation for the Advancement of Teaching. Goldberg worked with the Fermilab education staff to develop the widely-used Teaching Integrated Math and Science (TIMS) curriculum for improved primary school science teaching.

BENEFIT NOTES

■ New CIGNA/PPO ID cards. Participants in the CG/CIGNA PPO medical plan now have two ID cards. To make it easier for you to access your benefits, CIGNA will combine all the important information for both the PPO medical benefits and RxPrime prescription drug benefits on one ID card. This is the one and only card you will need to receive medical and prescription drug services. The new card will be mailed to your home during the month of November. Please be sure to carry your new card with you and present it whenever you need medical services or prescriptions.

GIVING TO CHARITY

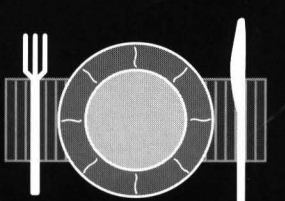
■ 1996 Crusade of Mercy Campaign. All Fermilab employees recently received information about the 1996 United Way/Crusade of Mercy Campaign. Through the Laboratory's payroll-deduction program, you may support one, two or three charities of your choice. Participation in the payroll deduction program is completely voluntary. In order to enroll, you must pledge a minimum of $26 for one charity and $39 for two or more charities. All charities must be approved by the Internal Revenue Service. A partial list of approved organizations was included in your information packet. There are many more, including SciTech, an interactive science and technology museum founded by Fermilab Physicist Ernie Malamud.

One of the easiest ways to make a difference in your community is by signing a payroll-deduction authorization card. Please take some time to think about how you can help in the coming year. For further information, you may contact Ruby Coiley at x8365.

THANKS

With this issue, the Fermilab Publications Office hands off production of FermiNews to the staff of the Office of Public Affairs. Thanks from FermiNews readers to Publications staff Cindy Crego, Jean Slisz, Sue Hanson and Cyndi Rathbun.

Chez Léon Menu



Lunch served from 11:30 a.m. to 1 p.m. - $8.00/person
Dinner served at 7 p.m. - $20.00/person

For reservations call x4512

WEDNESDAY, NOVEMBER 8

Chicken Stir-Fry with Vegetables
Steamed Basmati Rice
Mixed Fruit in Ginger Syrup

WEDNESDAY, NOVEMBER 15

Crepes Stuffed with Ham and Mushrooms
Duxelles in Madeira Cream Sauce
Baby Greens with Watercress Dressing
Cold Lemon Soufflé with Madeleines

THURSDAY, NOVEMBER 9

French Onion Soup
Roasted Baby Pheasants
Wild Rice with Mushrooms
Grilled Vegetables
Apple Strudel with Cranberry Sauce

THURSDAY, NOVEMBER 16

Celery Root Soufflé
Roast Loin of Pork with Apples and Prunes
Braised Red Cabbage
Roasted New Potatoes with Dill
Marzipan Cake with Chocolate Frangelico Sauce

FERMILAB CALENDAR

NOV. 4

Concert featuring music of Mozart, Beethoven, Schubert, Schumann, performed by Marco Fornaciari, violin, and Antonella Bellettini, piano. Onstage, painter Giuliano Ottaviani will paint images inspired by the music. 8 p.m. in Ramsey Auditorium. For information call Luciana Crovato at 2986.

NOV. 10

Film: Tom Jones. Young man's misadventures in 18th-century England. Academy award-winning film of British director Tony Richardson. 8 p.m. $4.

NOV. 12

Arianna Quartet. Fermilab's quartet in residence performs music of Haydn, Stravinsky and Schumann. 2 p.m. $5.

NOV. 14

Are you waking up in the middle of the night and failing to return to a restful sleep? If so, "Good Mornings: The XYZZZ's to Better Sleep" is for you. Presented by the Wellness Works Committee. Diane Schmidt will give the "Brown Bag Seminar" from noon to 1 p.m. in 1 West.

NOV. 18

The Fermilab Arts Series presents Sergio & Odair Assad. The Duo guitarists perform at Fermilab's Ramsey Auditorium on Saturday, November 18 at 8 p.m. For tickets ($15) and more information call the box office at (708) 840-ARTS. Please note that both the east and west gates are open to the public for Fermilab Arts Series events.

NOV. 30

High blood pressure, or hypertension, is considered the "silent killer." Come to a blood pressure screening, "Fit for Life," presented by Greg Wojciechowski, 11:30 a.m. to 1 p.m., Users Office.

DEC. 5

Brown Bag Seminar, "Options for Eldercare." What's available? How to access services? What to do when "you're miles away and still caring." Presented by Carol McIntyre, Elderday Center in Geneva; noon to 1 p.m., 1 West Conference Room. For information call EAP Office at x3591.

CLASSIFIEDS

FOR SALE

■ Magnavox color television set, works well, $75; chest of drawers, $50; wedding dress, size 6, white silk satin, no lace, long sleeves, off shoulder, $400; Prima Sankyo silver flute, artist model valued new at $3,700, will sell for $1,500 without head joint; Beautiful leather bomber jacket (brown), zipper is broken, $25; like-new Doc Marten shoes, women's size 8, $30. Call Janet at x2059.

■ Polaroid SX-70 Land camera with carrying case. Excellent condition. $30/o.b.o. Call Hank at x8105 or 708-475-1160.

■ 1988 Ford Bronco II XLT 4 wheel drive, 5 speed, 62K miles, ABS,air,power windows & door locks, AM/FM stereo/cassette, tilt wheel, cruise control, luggage rack, running boards, cargo cover, new tires, exhaust & battery. Clean, little rust. $7000. o.b.o. Call x2279.

WANTED

■ Highly interactive, experienced childcare sought. Position to take care of a 1-year-old girl 4 days a week starting in January. Hours: 9:30 am–5:30 p.m. Monday–Thursday; half day on Friday could be arranged.

Cognitive development training desirable; English fluency necessary. Salary competitive. References please. Call Nicole Jordan of Warrenville, 393-3947.

REWARD

■ For information leading to the recovery of a bicycle stolen from front steps of Wilson Hall in late September or early October. Teal-colored Giant Attraction mountain bike with back rack and female-style seat. Call Janet at x2059.

The deadline for the Friday, November 17 issue of FermiNews is Tuesday, November 7.

Please send your article submissions, classified advertisements and ideas to the Office of Public Affairs.

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

FermiNews

Fermi National Accelerator Laboratory

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