

## Proton Therapy Synchrotron Closer to Reality

Application of proton accelerator technology to the treatment of cancer has taken another positive step with the publication of *Design of a Proton Therapy Synchrotron* (Fermilab, June 1986), the conceptual design study for a new 250-MeV proton synchrotron medical accelerator at Loma Linda University Medical Center (LLUMC) in Southern California. The study was sponsored by LLUMC and carried out by a group of physicists and engineers of the Fermilab staff.

The design report was reviewed on June 26, 27 by the Proton Therapy Cooperative Group (PTCOG), an ad hoc group of physicians, medical physicists, accelerator designers, and potential equipment manufacturers who are interested in the development of proton accelerators for therapy use in hospitals.

The PTCOG is chaired by Dr. Herman Suit, M.D., of Massachusetts General Hospital, with Dr. Michael Goitien of Massachusetts General Hospital as Secretary. The group has met four times during the past year and a half.

The PTCOG endorsed the proton therapy accelerator as proposed in the design study, and recommended several modifications to the accelerator and facility designs which are currently being studied by LLUMC and the Fermilab accelerator design team.

The proposed proton therapy accelerator differs from Fermilab's existing Neutron Therapy Facility in more aspects than just the beam used for treatment. "This is not a typical Fermilab-style machine," Fermilab Deputy Director Phil Livdahl pointed out. "Unlike our Main Ring and TEVATRON, it is a very small [19 ft.-diameter central orbit] synchrotron." The development group at Fermilab will build and test an ion source, pre-injector, and prototype synchrotron, probably in the Industrial I building.

In 1946, Robert R. Wilson, Fermilab's Director Emeritus, proposed the use of

protons in radiation therapy, and the cyclotron that Wilson built at Harvard has been used in this type of therapy for many years. Although, following completion of the Fermilab Main Ring, Wilson, Donald Young, and Miguel Awschalom were interested in using Fermilab's accelerator for proton therapy, the medical community at the time expressed more interest in the possibilities of therapy with neutrons. The response to this interest was the construction, in 1974, of Fermilab's Neutron Therapy Facility.

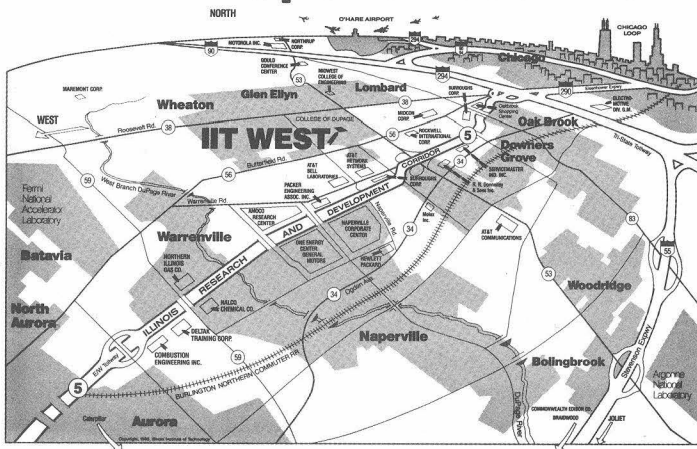
Due to the potentially improved dose localization to the tumor site characterized by charged particles, interest in proton therapy remained high enough that, in 1984, Awschalom, with the help of Frank Nezirick, Frank Hendrickson, and Lionel Cohen, wrote a proposal for a proton therapy facility at Fermilab. A series of proton therapy workshops and formation of the PTCOG resulted. The workshops led the Radiation Science Department at LLUMC to approach Fermilab to design and build a proton therapy accelerator for Loma Linda.

Approval for work on the proton therapy synchrotron has been provided by the Department of Energy under the "work for others" provisions of DOE policy. The state of Illinois has given Fermilab a grant under the Illinois Technology Commercialization Grant-in-Aid Program Act, administered through the Illinois Department of Commerce and Community Affairs, to explore the commercialization of this project as well as other Fermilab technology.

As Livdahl and Frank Cole note in their article "Fermilab Work on a Medical Accelerator" in the July issue of *Fermilab Report*, from which much of this article was excerpted, "We hope that the proton therapy accelerator will be so successful that many more hospitals will want one for themselves, but it is certainly not Fermilab's mission to compete with private industry in building many accelerators. We hope that industrial concerns will take over the technology we will develop and carry on from there to greater success."



# IIT West Opens Enrollment



The Illinois Institute of Technology has announced the opening of IIT West, "an education and research facility for west, southwest, and northwest suburban professionals, technology managers, part-time students, and the companies in which they are employed."

IIT West, located on the College of DuPage campus, offers graduate and upper-division undergraduate degree programs and courses in electrical engineering, mechanical engineering, computer science, and business administration.

For more information, write the Office of Educational Services, Illinois Institute of Technology, Main Building, 3300 South Federal - Room 202, Chicago, IL, 60616 or call (312) 567-3300.



## Family Picnic Information

**WHERE:** Playing fields next to Kuhn Barn.

**WHEN:** August 17, 1986, 11 a.m. to 6 p.m.

**WHO:** All Fermilab employees, users, DOE and Security personnel, contractor personnel, and families of all of the above.

**WHAT:** Door prizes throughout the day; hamburgers, hot dogs, soft drinks, other beverages, cotton candy, ice cones, and popcorn. Activities will include games, pony rides, swimming, clowns, and a DJ in the Barn. The ever-popular Dunk Tank will be in full swing, featuring Chuck Marofske, Tom Regan, Jackie Coleman, Jim Thompson, Etta Hill, Don Rapovich, Peggy Montgomery, and Toby Meyer among others. The Fermilab Barnstormers will coordinate an air show featuring radio-controlled airplanes and remote-control race car demonstrations.



Estimated number of diplomas that are printed on sheepskin: 3

Percentage of college freshmen who are enrolled in a remedial math class: 25

- from *Harper's Index*

## Tuition Reimbursement Reminder

The imminent onslaught of another school year means it's time for employees to consider the benefits of the Fermilab Tuition Reimbursement Program (TRP). A wide range of coursework is available in the Chicago area through community colleges and four-year colleges, universities, and graduate schools, and the TRP helps Fermilab staffers avail themselves of these educational opportunities.

All regular, full-time Fermilab employees are eligible for the program. Courses and degree majors which are job-related to your current position, or a possible future Fermilab job, are 100% reimbursable (except late fees and parking fees) including books. Courses up to 10 hours per term must be started and completed while you are a full-time employee, and you must satisfactorily complete each course in order to be eligible for reimbursement. Copies of grades and receipts for tuition, fees, and books are required for payment.

In order to enroll in the TRP, you must complete an Educational Support Request form and tax form pending final '86 congressional tax reform legislation) and obtain supervisor or group leader approval. Forms are available from, and returnable to, Ruth Christ, MS 113, WH 15 E.

Any payment made before grades are submitted is considered an advance. The pre-payment option is available to any regular employee who is not on probation. If course work is not satisfactorily completed, the advance must be repaid to the Lab.

College catalogues and current class schedules are maintained in the Training Office in the Personnel Department, WH 15 E. I'll also be happy to talk to you about your plans and goals, and help you find the answers you need. If you have any questions, please give me a call on ext. 3793.

- Ruth Christ

# Fermilab Flute Showcase is a "Trilling" Experience

The incredible spectrum of musical sound that can be produced by a simple pipe with holes makes Fermilab's Flute Showcase an event not to be missed! On Saturday, August 9, 1986, at 8:00 p.m. in Ramsey Auditorium, four exceptional flutists will provide a "high flut'n" time. Mistress of Ceremonies for the evening is classical flutist Carol Wincenc. Also performing are jazz flutist Stephen Kujala, composer Carlos Nakai, a native American flute expert, and Chinese bamboo flutist Tim Liu.

Artistic Director Carol Wincenc was principal flutist for five years with the St. Paul Chamber Orchestra. In 1978, she embarked on a solo career and has since been featured soloist with such orchestras as the London Symphony and the Milwaukee Symphony. She has also collaborated with colleagues such as Jean-Pierre Rampal, Jessye Norman, and the Guarneri String Quartet.

Steve Kujala, who tours frequently with Chick Corea, is considered one of the world's foremost jazz flutists. He studied flute with his father, Walfrid Kujala, who is principal piccolo of the Chicago Symphony Orchestra. Recognized for his "slide" flute technique, Steve Kujala is a "persuasive and delicate jazz stylist."

Carlos Nakai, a Navajo-Ute Indian from Arizona, performs on the traditional end-blown cherrywood flute. The instrument has a copper reed which gives it a hint of a wail. Mr. Nakai performs in authentic dress and plays traditional American-Indian music as well as more contemporary works in which he combines traditional melodies with his own improvisations.

Tim Liu is a graduate of the College of Chinese Culture in Taipei where he was winner of the Golden Lion Bamboo Flute Solo Contest. He has been a member of the Chinese Music Ensemble of New York since



Carol Wincenc

1983. Mr. Liu performs on the di-zi, a lacquered transverse bamboo flute featuring six finger-holes plus one hole covered with a thin membrane. The di-zi was first introduced in 140 B.C. during the Han Dynasty of Emperor Wu.

Admission to the Flute Showcase is \$7; you might call it an evening of "cheap trills"! Tickets are available at the Information Desk in the Atrium of Wilson Hall, ext. 3353, from 10:00 a.m. to noon or from 1:00 p.m. to 4:00 p.m.

- Jane Green

*The following articles of current interest and relevance can be found in the Fermilab Library, WH 3E:*

"Decision Time for the Supercollider" by M. Mitchell Waldrop in the July 25, 1986, issue of *Science*.

"Panel reaffirms high-field magnet choice for Supercollider" by Bertram Schwarzschild in the July *Physics Today*.

Percentage of Iowans who say they would like to be reincarnated as themselves: 64

Percentage of Iowans who say that music videos are one of the "least useful changes" in modern life: 67

Percentage of Iowans who say that front-porch swings "should be brought back": 57

Percentage of Iowans who say they did not try to see Halley's comet: 74

Percentage of Americans who say they have never heard the word "yuppie": 39

- from *Harper's Index*



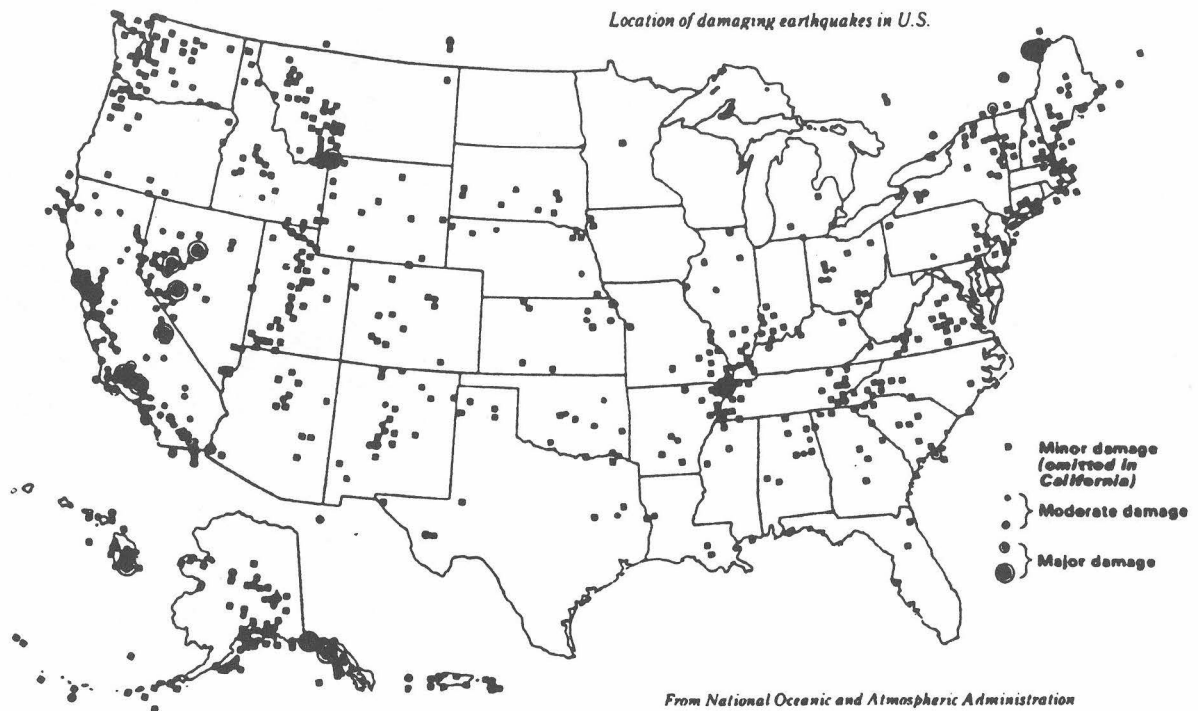
# Earthquakes Are an Illinois Reality and Preparedness Pays

Geologists and seismologists are predicting a threat of earthquakes in the Central United States Seismic Zone before the turn of the century.

Many Illinois residents are surprised to find that earthquakes are a potential threat to the entire state, and especially to the counties of the southern third. Earthquakes have occurred within Illinois numerous times in the past. These occur-

with the peculiarities common to earthquakes and take precautions for coping with the possible disasters that may take place in our area.

The most frightening thing about an earthquake is not knowing what to do. The next most frightening thing is to believe there is nothing you *can* do. How do you turn the tendency to panic into life-saving action? By planning and practicing what to



*Location of damaging earthquakes in the United States. (Reproduced from "Quake Codes," Christopher Arnold, Architectural Technology, Spring, 1984.)*

rences are, in part, due to the active New Madrid fault system that runs into the extreme southern part of the state, and are also due to numerous other fault systems scattered throughout the entire state. Because of these fault systems, the probability of future earthquakes is high.

An earthquake that occurred in north-eastern Illinois in 1909 caused damage at Rockford and at a point on the Illinois-Wisconsin border, near Beloit.

In the winter of 1811-1812 the New Madrid fault produced five great earthquakes, each of which would cause damage in Chicago if they were to occur today.

In view of these observations, it would seem prudent that we become familiar

do before an earthquake occurs, you and your colleagues can learn to react correctly and automatically when the first jolt or shaking begins.

The greatest danger in an earthquake is being hit by falling objects. First, stay calm. If you are inside, stay inside. Don't run out of doors. Stand or crouch in a strong, supported doorway, get under a sturdy table or desk, or brace yourself in an inside corner of the building. Secondly, know how to get as far as possible from identified hazards such as windows and other glass that might shatter. Stay clear of bookcases, cabinets, and other furniture that may topple or slide. Stay clear of heating and air conditioning units and stay

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# Field Trip Educates Summer Institute Science Teachers

It was hard to believe that we were less than two hours from Fermilab. 45 science teachers, along with several staff members, participated in a field trip to explore the Forest Beach Campsite in Michigan, an important part of this year's Friends of Fermilab Association-sponsored Summer Institute for Science Teachers (SIST).

The teachers participating in this year's SIST came from various local high schools and represented the subject areas of physics, chemistry, and biology (15 teachers from each of the three disciplines). The SIST staff members on the trip formed a most distinguished group: Dr. Jim Sweitzer, Assistant Director of the Adler Planetarium; Dr. Jim Seevers, Director of the Adler Planetarium's Doane Observatory; and two botanists, Professor Terry Marsh of North Central College and Professor Herbert Lamp of the University of Chicago. We were all impressed with the quality, intensity, and depth of the instruction that took place.

The campsite proved to be in excellent shape as far as dune ecology is concerned. The beach erosion, although quite severe, is thought to have ended now that, according to Professor Lamp, the level of Lake Michigan will begin to recede. The variety of plant species growing inward from the shore to stabilize a "blow-out" had the biology teachers crawling all over the sand with excitement over every new species they "discovered" and had never seen before.

That evening, with the aid of refracting and reflecting telescopes furnished by the Adler Planetarium astronomers and several teachers, we were able to observe Saturn and its rings. Now the physics teachers had their turn to exclaim with excitement while viewing for the first time planets, double stars, and galaxies.

We also had the unique opportunity to observe insects under a "black light." Professor Marsh had set up a large frame upon which he stretched a white sheet. This was illuminated with ultraviolet light. By midnight the sheet was covered with literally hundreds of insects I never knew existed. A short lecture by Professor Marsh kept us mesmerized even at that late hour.

Of course, there was time for laughter (provided by all), good food (provided by the camp), and junk food (brought by the teachers and staff.) Especially appreciated while we were in the field were lots of soft drinks. Several hardy souls went for a late afternoon swim in the icy lake waters. Others looked for prehistoric fossils from the times when salt water seas covered the Midwest.

The Forest Beach Camp, the Indiana Dunes and Stevensville Bog hikes, our Mudlake Bog hike, and the new insights and knowledge we gained along the way made this year's SIST field trip an unforgettable, and educational, experience which will be shared by the teachers with their students during the coming school year. We expect that many will take their classes for a trip to the camp for a firsthand glimpse of the natural wonders which we saw.



*SIST teachers and staff explore the Michigan dunes.*

The Forest Beach Camp is part of the YWCA of metropolitan Chicago, and is open year-round for public use. For information you can call Mel Chandler, the camp manager, at (616) 469-1660 or the YWCA in Chicago at (312) 372-6600.

The Summer Institute for Science Teachers is sponsored by the Friends of Fermilab Association and funded by grants from the National Science Foundation, Abbott Laboratories, Furnas Foundation, Inc., the Forest Fund, the Grainger Foundation, the H. Earl Hoover Foundation, and the Robert R. McCormick Foundation.

*(Pete Rapinchuk, author of this article, is a physics teacher at Victor J. Andrew High School in Chicago).*



## Benefits Notes . . .

### Connecticut General - New I.D. Cards

On July 23, 1986, new Connecticut General I.D. cards were mailed to participants in the Connecticut General medical plan. The new I.D. cards included the pre-certification procedures. If you did not receive the card at your mail station, call extensions 3395 or 4361 and a new card will be mailed to you.

## Bowling League Set to Roll

Next thing you know it will be time to pack up your fishing rods and golf clubs and dust off your bowling ball.

The Fermilab Wednesday Night Mixed League is looking for new bowlers as well as those who want to try it again. Pre-formed teams (five bowlers, at least one of whom is female) as well as individuals are welcome.

Sign-up will be Monday through Wednesday, August 11-13, 1986, 11:30 a.m. to 1:00 p.m. on the 2nd Floor Lounge, Wilson Hall. Watch the bulletin boards or call a League officer for more details. League officers are President Gene Dentino, ext. 3838; Vice President Terry O'Brien, ext. 4851; Treasurer Pat LaVallie, ext. 4365; and Secretary Nancy Shanahan, ext. 3494.

## Film Society

On Friday, August 8, 1986, the Fermilab International Film Society will present *The Atomic Cafe* in Ramsey Auditorium.

"The 'Beaver Cleaver generation's' optimistic outlook on nuclear war, or 'How I learned to love radioactive fallout', the archival footage has to be seen to be believed."

On Friday, August 22, 1986, the Film Society will present *Monty Python's Life of Brian*, a not-so-reverent account of the life and times of Brian, born in a manger a short distance from, and about the same time, as Jesus Christ."

Tickets for both shows are \$2 for adults; children 12 and under are admitted for 50¢. Tickets are available at the door.

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Editor: R. Fenner; Assoc. editor: S. Winchester  
Photography: Fermilab Photo Unit

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Fermilab is operated by Universities Research Association, Inc. under contract with the U. S. Department of Energy. Fermilab news is published by the Publications Office, P. O. Box 500, Batavia, IL 60510, phone (312) 840-3278.

## ..."Earthquakes" cont'd from pg. 4

clear of spaces that could be blocked by falling debris.

Finally, consider what you may experience after a major earthquake, and what the first action should be. Emergency personnel may not be available.

You should be prepared for aftershock; this may be nearly as strong as the initial earthquake. If shaking begins again, be prepared to take cover in the nearest safe place.

If you smell gas, get to gas and water mains and turn them off. Do not light matches or candles to look for damage.

Be prepared to take care of each other and practice emergency first aid. Be prepared to deal with the emotional needs of others. Remember to stay close enough to touch and comfort others. Talk about what happened and let people talk about their feelings about the earthquake, if they are afraid or if they're not.

It is normal and natural to be afraid of earthquakes. Fears and anxieties can be lessened if we anticipate emergencies and learn how to react correctly.

Beginning in August, the Business Section Safety Office will inaugurate a monthly *Emergency Preparedness Newsletter*. The first issue will be entitled "Safety Tips for Earthquakes" and will provide specific information on the Lab's earthquake preparedness program. Copies will be sent to departments for posting. If you would like your own copy of this newsletter, or if you have any questions on any area of emergency preparedness, contact Bob Adams on ext. 3763, or at MS 338.

- Bob Adams  
Fermilab Emergency Preparedness Manager

## Congratulations To . . .



FOR SALE:

**AUTOS:**

1984 FIERO SPORT COUPE. Black, P/B, A/C, AM/FM stereo, spt. wheels, rear defog, gray velour interior, excellent cond.; \$7300. Call Bryan, ext. 3555 or (815) 496-9220.

1982 AMC CONCORD. Good condition, low mileage; \$2800. Call Joe, ext. 3810.

1980 CHEVY CITATION. 4-dr. hatchback, 6 cylinder, auto. transmission (completely rebuilt March '86), A/C, P/S, P/B, tilt wheel, well maintained, looks and runs excellent; \$2450 or best offer. Call Larry, ext. 3523 or 859-0515.

1979 MGB. New motor, balanced, new tires, new top; \$4200. Call Ron Norton, ext. 3445.

1978 DATSUN B210. White, mechanically excellent, recent complete brake job; \$900. Call Roy, ext. 3144 or 665-3773.

1977 MERCURY GRAND MARQUIS. 2-dr. Call Chuck, ext. 4116 or 879-0394 evenings.

1976 CHEVY IMPALA. 350 V8, 2 brl., auto., good tires and brakes, good work car; \$500. Call Dennis, ext. 4596.

1976 CHEVY VEGA STATION WAGON. Needs body work, has good motor, also has Sears Sprint aluminum slotted rims, 2 good tires, must sell!; asking \$200, will take best offer. Call ext. 3259 or 896-1158 after 5 p.m.

1976 DODGE ASPEN. 6-cyl., auto., 2-dr. Call Chuck, ext. 4116 or 879-0394 evenings.

**REAL ESTATE:**

HOUSE FOR SALE. Aluminum sided, 2-bdrm, remodelled kitchen and bathroom, panelled recreation room in full basement, newer carpeting throughout, garage, near Garfield Park in Aurora; \$49,900. Call Larry, ext. 3523 or 859-0515 evenings.

**MISC.:**

1972 18' WELLCRAFT BOAT. Air slot, 165 HP I/O Mercruiser, cuddy cabin sleeps 2, portapotty, skis, Calkins trailer, low hours; \$3800. Call Bryan, ext. 3555 or (815) 496-9220.

For the following items, call Millie, ext. 3351 or Joe, ext. 3810: Think snow! Think Christmas! Think snowmobile! (John Deere 74-300, \$300); Think mink! (jacket, dark ranch, \$300); Kimball piano, \$995; solid walnut antique dining room round table, 4 oak chairs, library table, \$500.

continued on reverse

BALDWIN ELECTRONIC FUN MACHINE. Play piano, organ, violin, trumpet, country, jazz, etc., sit and play immediately with all music books and instructions included; sale price: \$500. Call Hope, ext. 3244.

WESTINGHOUSE DEHUMIDIFIER. White, 30-pint capacity; \$50. Call R. West, ext. 3817 or 584-1429.

ENGINE, LATHE-VICTOR 1640. Swings 16" w/40" bed, excellent condition, includes Trava-Dial, 3 and 4 jaw chucks, steady-rest, front and rear tool post holders, cooling system and many other accessories; \$5000. Call Ron Cypret, ext. 3839 or 894-0567.

For the following items, call Larry, ext. 3523 or 859-0515: (4) BF Goodrich 225/70-14 radial tires, used only 3000 miles, on 7" Chevy rims, \$150; Zenith 23" color console TV, good picture and cabinet, \$125; seed/fertilizer spreader, \$20; Philco AM car radio, \$10; Audiovox AM/FM car radio, \$20.

2 AQUARIUMS. W/stand, 1-10 gal. aquarium, 1-15 gal. aquarium w/filter, pumps, lite, gravel, much more; \$55 for everything. Call Gary, ext. 3286.

17 FT. CATAMARAN. Taft Hobby Cat, large main sail, jib, all in very good condition, ready to sail; \$1600. Call Angela, ext. 3319 or 231-2514 evenings after 8 p.m.

For the following items, call Roy, ext. 3144 or 665-3773: Elegant Perego baby carriage/stroller/car bed in one, \$75; 5000 BTU 120V airconditioner, \$35; 15000 BTU 220V airconditioner, \$225 (both A/C's completely overhauled); dehumidifier used one season, \$40; room humidifier, large capacity belt type, \$18; steel crate for medium-sized dog, collapses flat, \$20.