BROOKHAVEN BULLETIN
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BROOKHAVEN NATIONAL LABORATORY

Mammoth Magnet to Give Minute Muon Measurement

A super-big superconducting coil — at 14 meters in diameter, the largest ever made — was completed last spring by engineers and technicians of the Alternating Gradient Synchrotron (AGS) Department and the Central Shops Division. The first of four similar coils, it will help power a gigantic magnet being built for a new experiment at the AGS on muon magnetism, expected to have its first run in December 1993.

For this AGS experiment, designated E821, scientists from BNL have joined others from Boston University; City College of New York; Cornell University; Fairfield University; Heidelberg University; the Institute of Nuclear Science, Novosibirsk, U.S.S.R.; KEK laboratory in Japan; Los Alamos National Laboratory; Riken University, Japan; Tokyo University; and Yale University.

Incredible Precision

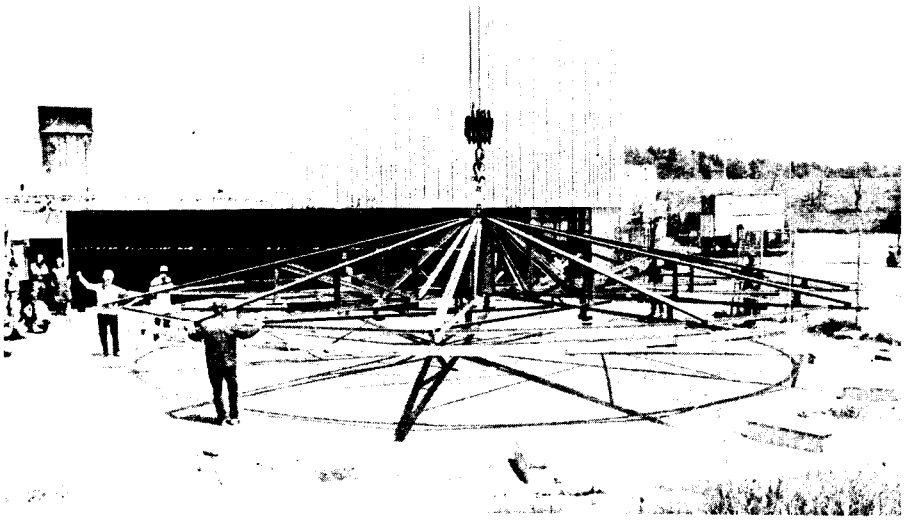
"Muons, which are formed when pion particles decay, are electrically charged particles that spin on their own axis and act like tiny magnets," said Physicist Gerry Bunce, AGS Department, who is Project Manager for E821. "The experiment will measure g minus 2 [g-2], the minute effect that particles such as the W and the photon, which carry the weak and electromagnetic forces, have on muon magnetism when the muons travel in a magnetic field. Because g-2 is just 0.1 percent of a muon's magnetism, the measurements have to be incredibly precise."

Bunce explained that g-2 had already been measured to a precision of 7.2 parts per million (ppm) of itself during the 1960s and 70s, in a series of experiments at CERN, the European high energy physics laboratory. Results of these experiments had helped establish muon behavior and the validity of quantum electrodynamics.

"Now, however," continued Bunce, "a number of refinements are possible. First, with the Booster on line, a greater intensity of muons will be available from the AGS. Also, we now have a technique that injects muons from pions which decay in an external beam line right into the storage ring. This is more efficient by a factor of seven than the previous method of introducing pions into the storage ring, where some decayed to give trapped muons."

Roger Stoutenburgh

The coil winding facility for the muon g-2 experiment is located in the high-bay area of Bldg. 919, which will be the future location of the experiment itself. Shown there are: (clockwise from center front) Joe Domiano, Zion Armoza, John Benante, Lou Snydstrup, Chien Pai, Irving Polk, Zygmunt Twardowski, Steve Kochis, Mike Tartakovsky, Jim Cullen and Gerry Bunce.



Peter Horton

Personnel from the Alternating Gradient Synchrotron (AGS) Department and the Plant Engineering Division place the first completed superconducting coil of the muon g-2 storage ring for AGS Experiment 821 on blocks, awaiting completion of its three other similar coils.

The new experiment will use a nuclear magnetic-resonance probe system, now being built at Heidelberg and Yale, to measure the field inside the storage ring. On a trolley, it will be able to be moved without turning the field off, measuring the field to one in ten million. These and other refinements to make a more uniform field are expected to improve on the previous result by a factor of 20.

"This level of sensitivity will give the necessary one-third ppm of g-2 that may reveal new information about the W and the photon," added Bunce.

Magnet Without End

The most visually spectacular of the new refinements will be the continuous, 14-meters-in-diameter, superconducting magnet — for which one coil is completed — to be used as the muon storage ring. It will replace the 40 separate non-superconducting magnets used at CERN and help make the magnetic field more uniform. Not only will the field be smoother because the magnet will have no ends, but also the lack of resistance in the superconducting coils will reduce heat and cycling problems.

"Making the first coil was an experiment in itself," said Project Engineer Jim Cullen, AGS, who heads E821's engineering effort and works with AGS engineers Chien-Ih Pai and Louis Snydstrup, and consultant Irving Polk. Designers for the

(continued on page 2)

After the Cruise: Analyzing Data and Sharing CTA Technology

Last February and March, Kenneth Johnson, Douglas Wallace and Richard Wilke, all of the Oceanographic & Atmospheric Sciences Division (OASD) of the Department of Applied Science, participated in a five-week research cruise across the Atlantic Ocean, from Brazil to the Congo. The cruise was part of a global survey of inorganic carbon in the ocean, funded by the U.S. Department of Energy (DOE) and taking place during the World Ocean Circulation Experiment (WOCE).

While still preliminary, the data collected during the cruise are already proving interesting — and proving the worth of the Coulometric Titration Analyzer (CTA). Designed by Johnson for measuring the total amount of dissolved inorganic carbon in sea water, the CTA accompanied the BNLers on the research vessel *Meteor*.

This was the first time the CTA was used at sea for WOCE, and it performed well — more than 800 samples were analyzed with the CTA. Though the researchers have not yet completed their analyses of carbon dioxide (CO_2) buildup in the ocean, Wallace reports that the CTA's accuracy "approached the DOE goal of one part in 2,000, which will allow us to examine differences in CO_2 levels between the deep ocean basins off Brazil and Angola. Very high CO_2 levels were found in the surface ocean off Angola, indicating that a coastal upwelling region there is a large source of CO_2 for the atmosphere."

Roger Stoutenburgh

Helping Kenneth Johnson (center back), of DAS's Oceanographic & Atmospheric Sciences Division (OASD), train researchers from other institutions to use the Coulometric Titration Analyzer he designed are Richard Wilke (to Johnson's left) and Bob Ramirez (in front of Johnson), both also of OASD, and consultant Kevin Wills (far left).

The team's measurements of the seawater's content of halocarbon compounds "also showed some interesting things," added Wallace. For example, carbon tetrachloride, a manmade compound that has been added to the atmosphere only since the early 1900s, was found throughout the Brazil basin, but was found only near the boundaries of the much more isolated Angola basin.

Since returning from this cruise, the BNL team has not only been analyzing its data, but also sharing the CTA technology with others. A week-long program in May was devoted to training researchers from other institutions to use the CTA. Some will be using their training very soon: Five instruments, built by the University of Rhode Island and certified at BNL, will be shipped from the Lab within a few weeks.

Attending the training session were scientists from: the Bermuda Biological Station; Horn Point Laboratories, University of Maryland; Lamont-Doherty Geological Observatory, Columbia University; National Oceanic & Atmospheric Administration's (NOAA) Atlantic Oceanographic & Meteorological Laboratory; NOAA's Pacific Marine Environmental Laboratory; Pacific Northwest Laboratory's Marine Science Laboratory; and Scripps Institution of Oceanography, University of California at San Diego.

Home Away From Home For Summer Apprentices

For the past five summers, April Donegain, an executive secretary in the Fiscal Division, has been an official BNL housemother to a total of 19 high school students from New York City. And, for the last three summers, she has been the Lab's *only* housemother — taking in all the city kids who have participated in BNL's annual Minority High School Summer Apprentice Program.

For over a decade, this program has been offering an intensive introduction to modern science to ninth and tenth grade minority students who have a demonstrated potential or ability in science. This year, during three overlapping sessions of four weeks each, 41 high school students are being introduced to one new science subject per week.

Every year, most of the apprentices come from Suffolk County, but some also come from the five New York City high schools that participate in the inner-city outreach arm of the program. This year, in fact, there is one apprentice from each of those five schools.

Since New York is too far from the Lab for the outreach apprentices to commute, at the end of their day, they go home to Donegain's five-bedroom house in Medford. In addition to transportation, Donegain provides them with food and lodging, as well as "advice and encouragement, and discipline and hugs."

"I enjoy taking them in because they are at the age that I love the most," says Donegain, who has three children of her own: Tanya, 21, a physical therapy major at the University of Maryland, Baltimore; Carla, 18, who will enroll at the State University of New York at Farmingdale this fall; and John, a second-grader, age 7.

"I also thought that having the city students in my home would be a good cultural experience for Tanya and Carla, who were both still at home when I started, and fun for John because boys especially love playing big brother to my son," says Donegain. "At first, I was terrified of the idea of taking in teenage boys because I'd only raised girls through adolescence. But I learned how to handle them and will use the experience in raising my son."

Continues Donegain, "My houseguests are at an age where they need positive role models and reinforcement — and I try with all my heart to provide them with those. They are still young enough to be steered in the right direction in many areas, including education. The Lab is a good place to show them the rewards of having a good education, so I encourage them to make the most of their opportunities here and in school through higher education."

Roger Stoutenburgh

With April Donegain (second from right) at her Medford home-away-from-home for the city kids participating in BNL's annual Minority High School Summer Apprentice Program are her houseguests: (from left) Kimi Damassia, Katherine Munet and Tamia Steele.

As organized by the Office of Educational Programs, the Minority High School Summer Apprentice Program introduces the students to biology, taught by Arthur Pitschi of Patchogue-Medford High School; chemistry, given by Clayton Hudson of Central Islip High School; environmental science, offered by Pitschi and Jean Clark, also of Patchogue-Medford; and physics, instructed by Barbara Riess of Baldwin High School. The teachers are aided by teaching assistants Nita Webb of Bellport High School and Duane Hinds, a June graduate of the State University of New York at Stony Brook.

Donegain's charges during this year's first session, June 24-July 26, are: Kimi Damassia from Erasmus Hall High School in Brooklyn; Katherine Munet, John F. Kennedy High School in the Bronx; and Tamia Steele, Jamaica High School in Queens. For the third session, July 29-August 23, Donegain will have two houseguests: Loncey Mills from Port Richmond High School, Staten Island; and Richard Sevilla, Brooklyn Technical High School.

After their mornings of classwork and their afternoons doing experiments, seeing demonstrations or going on field trips to the likes of the Cold Spring Harbor Fish Hatchery or Sunken Forest on Fire Island, the three young women show up in Donegain's office in Bldg. 134 at a few minutes before 5 p.m. "We then march like a mother hen and her chicks to the parking lot," reports Donegain.

During the 15-minute car ride, Donegain hears reports of their day and drops off another summer apprentice, Oneill Soto, who lives in Donegain's neighborhood and attends Patchogue-Medford.

Once home, Donegain cooks supper "while the girls are 'ladies of leisure' — giggling as they relax by the pool or downstairs watching TV."

Donegain does cater to medically prescribed diets, such as those for diabetics and food allergies, and cooks around religiously proscribed foods, such as pork. "The kids have come from many different nationalities," she says, "but I don't cook all those different cuisines — so I ask them to just try what I make and to show me how to cook their specialty dishes."

After helping to clean up, Donegain's girls do their homework and then spend most of their unstructured time talking. "We talk about everything and anything, including their favorite topic — boys. While I do answer their questions, I also encourage them to talk to their parents."

When they make an after-supper outing, it is to the movies, the mall, a softball game or the like.

Donegain asks that her houseguests take their showers in the evening because "I have one and a half baths, so, at 6:15 in the morning after I come back from my three-mile walk, the full bath is mine — and if someone is in there, I get mean," she admits. The houseguests also know to make their beds, fix their own breakfast and be ready to leave at 7:30 so Donegain can be at her desk early.

On Fridays, the city kids take the 3:45 p.m. Lab car to the Mastic-Shirley station and get on-board the 4:17 p.m. train to New York. "I am concerned, so I ask that they call me to let me know that they got home safely. But, by the end of the week, I must say that I honestly look forward to having the weekend to myself," says Donegain.

As for her houseguests' return trip, Donegain asks that they travel by the train that stops at Patchogue at 7:35 p.m. on Sunday, "so I only have to make one stop at the railroad station on Sunday."

Concludes Donegain, "I wouldn't have done it for so long if all these kids interfered with my life. I still work everything in — except taking a summer vacation, but then I don't mind getting away to a warmer climate for a couple of weeks in winter. By the end of the summer, I do feel worn out from all the company, but rewarded as well because I could help make it possible for them to be at the Lab." — Marsha Belford

Addled Addresses

- BNL
  Building Side
  Upton, NY
- Brookhaven National Laboratory
  Upont, Long Isl, NY

Catch a glimpse of
GLANCE
playing in Berkner Hall
weekdays, 11:30 a.m. to 1:30 p.m.
Show changes every Tuesday.

Volunteers Needed

Male volunteers, ages 20 to 50 and in good health, are needed to participate in brain and heart imaging studies being conducted by BNL. A fee will be paid. For more information, call Naomi Pappas, Ext. 2694.

Muon g-2 (cont'd)

project are Zion Armoza and Mike Tartakovsky, both AGS, and contract designers Zygmunt Twardowski and Ulysses Othon.

"First we designed and built a special winding machine, which doubles as a milling machine," said Cullen. "Then, Central Shops built 12 curved aluminum sections, each 12 feet long, placed them end to end and welded them to form a ring. We added a cooling tube and machined the result, called a mandrel, to very tight tolerances." AGS technicians John Benante, Joseph Domiano and Stephen Kochis built the special winder and are in the process of constructing the coils.

Cullen described how, after ground insulation was applied to the mandrel, the winding machine came into its own. Slowly rotating, the winder uncoiled conductor material from a central spool, wrapped it in epoxy-laden insulation and fed it into the inside diameter of the mandrel. There it was held by air-activated clamps that rose and fell automatically as the next of the 24 layers was added. After winding came more insulation, coil covers, more clamps and a 90-minute period at 250°F to cure the epoxy.

"Extra care in the welding, as well as the advantage of machining everything in situ, resulted in variations of only 0.012 of an inch over the 7-meter ring radius," said Cullen. "With such good results on the first coil, it will be interesting to see how the second one goes. The third and fourth coils are designed to be wound together in a common mandrel, so they'll present a different situation. Then we'll be finished with this step — with no time to get bored!"

Much More to Get Ready

Once the coils are finished, part of the experimental team will make the cryostats to keep the superconducting magnet cooled to 4.5 kelvins, which is just above absolute zero. Others will begin assembling the huge iron magnet yoke to the specifications needed for the all-important uniformity in the magnetic field.

By December 1992, the magnet itself is expected to be complete, with its magnetic field uniform to one part in 10,000. After that, the magnet will be studied and adjusted so that the magnetic field is ultimately uniform to one part in a million.

"Apart from the magnet, there's a tremendous amount more to get ready," said Bunce. "Scientists from Brookhaven are working on a number of other systems that are needed for the experiment, and our collaborators are busy too. For example, Boston and Yale are designing the detector system, KEK is building a superconducting nonferrous magnet to bring the muons into the ring, and Novosibirsk is building some beam transport components and has an experiment to improve g-2's theoretical precision to compare to the BNL goal. And collectively, we're all looking forward to the first run!"

— Liz Seubert

Arrivals & Departures

Arrivals

John R. Becan.....S&EP
Lisa L. Blevins.....Plant Eng.
Kevin O. Byrne.....P&GA
Maureen C. McDonnell.....Fiscal
Edward C. Quimby.....Accel. Dev.

Departures

This list includes all employees who have terminated from the Lab, including retirees:

Wuu-Jyh Lin.....Chemistry

Scoop of the Week

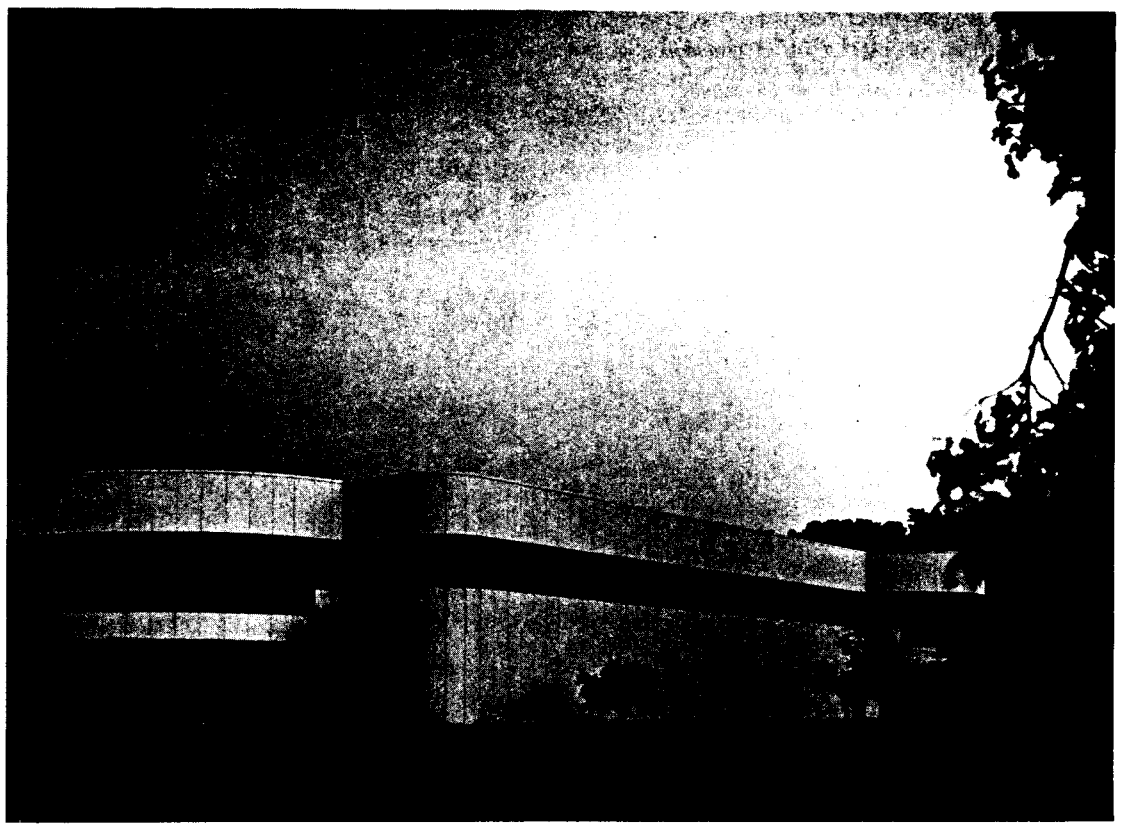
SCOOP of the Week

For week five of the Scoop of the Week contest, Mary Durham, Plant Engineering, wins a scoop for informing the Bulletin that April Donegain is housemother for the annual Minority High School Summer Apprentice Program.

Until summer's end, if you scoop the Bulletin's informed sources and a story based on your idea is published, you too can win a Scoop of the Week — an official certificate for a scoop of your favorite cold dessert, compliments of Service America Corporation and redeemable at the Cafeteria or ice cream truck.

So, rush your hot news and feature ideas to the Bulletin, Bldg. 134, or call Ext. 5053.

Lightning Lights Up BNL Sky



Photographer Roger Stoutenburgh strikes again, as he captures lightning from another source striking behind the National Synchrotron Light Source during Wednesday's fierce afternoon thunderstorm.

Leaving the Lab — After 35 Years or More

In coming to work at the Lab on November 29, 1954, Peter Montemurro went from vacuum cleaners to accelerators.

"I had been working for the defense products division of Electrolux in Greenwich, Connecticut, when I saw an ad for Brookhaven in The New York Times," recalls Montemurro, a senior physics associate in the Alternating Gradient Synchrotron (AGS) Department.

"I went for an interview at the AUI office, then in the Empire State Building, and was invited to work either at the Cosmotron or on the project to build the AGS. I drove out to BNL in July, and, after hearing about the alternating gradient principle, I decided to join the AGS project. In those days, accelerator physics was classified, so I had to wait until I got my clearance after Thanksgiving of that year to start work."

After almost 37 years of service to BNL, all at the AGS, Peter Montemurro is retiring today as Leader of the External Beam Section in the AGS Power Supply Group and as Operations Engineer for the 200-million-electron-volt (MeV) linac.

He explains, "I just decided that a two-day weekend once a week is not enough time to get all my personal work done — so my only choice was retirement."

As a newly hired technician in 1954, Montemurro joined the group that built a 50-MeV linear accelerator, the first linac to inject proton beam into the AGS. He was involved in building and testing the quadrupole magnets, which focus the beam.

Montemurro was promoted to senior technician in 1959. "While I had my associate's degree which had enabled me to be an assistant engineer at Electrolux, around here, with all the Ph.D.'s, I felt I needed a broader background," explains Montemurro. So from the late 50s until he earned his B.S. in 1966, Montemurro completed coursework in applied physics at Hofstra University, under the Lab's tuition-refund program.

When the AGS and the 50-MeV linac came on line in July 1960, Montemurro switched his focus to the engineering of pulsed power supplies, which supply the proper electric voltages and currents for the operation of the magnets that focus and bend the AGS proton beam.

Roger Stoutenburgh

Peter Montemurro

By the early 1960s, Montemurro began working on his first particle separator — a radio-frequency (rf) device used to select the highest energy particles from the beam to be used within BNL's 80-inch Bubble Chamber, which was at one time the world's largest physics detector of that type. He was promoted to technical specialist in 1963.

In 1966, when the rf separator was commissioned, Montemurro moved up to physics associate, and he was charged with making sure that the rf separator did its job. From 1972-77, he was responsible for direct-current (dc) separators used in conjunction with other AGS experiments requiring separated beams.

Montemurro turned his attention to solar energy during 1977-81, when he collaborated on the development of a heliostat prototype: a solar energy concentrator that tracked the sun and redirected its thermal energy for direct use by a target, which, in this case, was a boiler.

Then, "I went back to making magnet measurements on quadrupoles," says Montemurro of his 1981-83 stint developing a line to transfer the proton beam from the AGS to what was then to be the CBA ring and is now BNL's Relativistic Heavy Ion Collider.

He was next involved as a team leader in the AGS project that first accelerated polarized protons, then accelerated those particles to higher energies than any other accelerator in the world.

After two more promotions, Montemurro was given his present title in 1983. Becoming 200-MeV linac Operations Engineer in 1985, Montemurro oversaw the AGS's transition from using the giant Cockcroft-Walton preaccelerator, to employing two rf quadrupoles to accelerate protons before they enter the linac.

Finally, Montemurro engineered his last dc separator, for AGS experiment 813, which came on line this spring. This device separates pions from kaons for E813's search for the doubly-strange dibaryon called the H particle.

"It worked successfully, but we wanted to get to higher voltages. Now that I'm retiring, other people are going to have make it work better because I look forward to doing nothing for the next six months," admits Montemurro.

Doing "nothing" includes leaving for Copenhagen on the 30th of this month. Later, to get in touch with his ethnic heritage, Montemurro plans a visit to a village south of Naples where his grandparents came from, but not until he completes a few Italian language courses and classes in color photography.

In addition, continuing to care for an aged aunt and uncle, visiting more often with his four grown children and five grandchildren, and remaining active in his church will keep Montemurro busy.

"I have talked with my wife about retiring for over a year, he concludes," Now that I'm certain about my future, I'm going to make it my business to enjoy my retirement."

— Marsha Belford

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Addition

In last week's story on round life number 20000, the Bulletin incorrectly stated that the first BNL life number was 100. According to Personnel Records, BNL life numbers began at 1 to 40, next went from 51-65, and then started at 101 and continued from there through the present. So, with life number 20000, Karen Cordaro, Medical Department, is actually the 19,955th employee to be issued a BNL life number.

BNL trivia question: Who was issued BNL life number 1? Send your guess to the Bulletin, Bldg. 134, by Wednesday, July 31. The first three correct answers received will win a Scoop of the Week.

Cafeteria Menu

Monday, July 29	
Soup: Cream of mushroom	.75/.95
Entree: Sausage & peppers over linguine	3.10
Entree: Pizza	3.50
Fitness: Vegetable lasagna w/1 veg.	3.10
Carvery: Hot pastrami sandwich	2.85
Grill: 3-cheese melt	2.85
Tuesday, July 30	
Soup: Country pepper corn chowder	.75/.95
Entree: Flounder plate	3.10
Entree: Pasta & meat sauce	3.10
Fitness: Chicken w/herbs & 1 veg.	3.10
Carvery: Hot roast beef sandwich	2.85
Grill: Cheese steak sandwich	2.85
Wednesday, July 31	
Soup: French onion	.75/.95
Entree: Pasta carbonara	3.10
Entree: Chicken fajitas	3.10
Fitness: Spinach & mushroom quiche	3.10
Carvery: Hot Black Forest ham sandwich	2.85
Grill: Tuna melt w/French fries	2.85
Thursday, August 1	
Soup: Minestrone	.75/.95
Entree: Vegetable plate w/5 vegetables	2.25
Entree: Chef's choice	3.10
Fitness: Baked fish w/1 veg.	3.10
Carvery: Hot corned beef sandwich	2.85
Friday, August 2	
Soup: Manhattan clam chowder	.75/.95
Entree: Chicken classica & 1 veg.	3.10
Entree: Chef's choice	3.10
Fitness: Flounder w/lemon pepper, veg.	3.10
Carvery: Hot turkey sandwich	2.85

Classified Advertisements

Placement Notices

The Laboratory's placement policy is to select the best-qualified candidate for an available position. Consideration is given to candidates in the following order: (1) present employees within the department/division and/or appropriate bargaining unit, with preference for those within the immediate work group; (2) present employees within the Laboratory; and (3) outside applicants. In keeping with the Affirmative Action plan, selections are made without regard to age, race, color, religion, national origin, sex, handicap or veteran status.

Each week, the Personnel Division lists new placement notices. The purpose of these listings is, first, to give employees an opportunity to request consideration for themselves through Personnel, and, second, for general recruiting under open recruitment. Because of the priority policy stated above, each listing does not necessarily represent an opportunity for all people.

Except when operational needs require otherwise, positions will be open for one week after publication.

For more information, contact the Employment Manager, Ext. 2882, or call the JOBLINE, Ext. 7744 (282-7744), for a complete listing of all openings.

The vacancies listed below have been exempted by the Director's Office from the current freeze on open requisitions.

OPEN RECRUITMENT - Opportunities for Laboratory employees and outside applicants.

DD 8709. OFFICE SERVICES POSITION - (temporary, part-time) Will act as night clerk in the Housing Office. Responsibilities will include distributing keys to guests, collecting money and maintaining records of transactions on database. Additional duties will include typing housing agreements, transmittals, monthly bills and invoices; and handling service and emergency repair calls. Previous data-entry experience and accurate typing skills required. Will work three evenings each week, 1600-2400, after one month's training on day shift. Staff Services Division.

LL 8816. HOSPITAL SERVICES POSITION - Experience as a nurse's aide or a practical nurse is highly desirable. Responsibilities will include assisting with patient care in the Radiation Therapy Facility. Duties also will consist of patient

(continued on page 4)

Classified Ads (cont'd)

escort as well as keeping track of supplies on a daily basis. Medical Department.

MK 0964. ENGINEERING POSITION - Requires BSME and minimum of five years' experience including high vacuum systems. Will be responsible for the design, procurement, testing and installation of vacuum systems for beam transfer lines from AGS to RHIC facility. RHIC Project, Accelerator Development Department.

NS 0634. PLANNING/SCHEDULING POSITION - Requires BS in engineering or seven to ten years' extensive experience in facility maintenance. Will plan, schedule and coordinate preventive and corrective maintenance, implement facility modifications and develop procedures. Requires excellent communication skills and familiarity with computers. Must be able to obtain and maintain a security clearance. (reposting) Reactor Division.

NS 0636. COMPUTING POSITION - Requires AAS in computer programming or a related field, or extensive experience with RBase or a similiar database-management software. Familiarity with LANs strongly preferred. Will provide computer services in support of maintenance activities. Responsibilities include the administration of assigned computer-based programs related to management of corrective and preventive maintenance. Must be able to obtain and maintain a security clearance. Reactor Division.

NS 0958. ENGINEERING POSITION - Requires BS degree in mechanical or manufacturing engineering and approximately twenty years' experience in manufacturing engineering. Background in the design and manufacturing of complex, precision assemblies, including experience in the use of optical tooling as it relates to the alignment of precision equipment, is required. RHIC Project, Accelerator Development Department.

NS 0960. ENGINEERING POSITION - Requires BSEE and minimum of five years' experience in pulsed high voltage and high current power supply technology. Will be responsible for the development, design, procurement or construction, testing and installation of major pulsed power equipment for fast kicker magnets and other fast-pulsed magnets for beam injection into and beam extraction from the RHIC facility. RHIC Project, Accelerator Development Department.

NS 0961. ENGINEERING POSITION - Requires BSEE and a minimum of five years' experience in high current dc power supply technology. Initial responsibility will include the planning, specification, procurement, testing and installation of major dc power equipment for magnets transferring beam from the AGS to the RHIC facility. RHIC Project, Accelerator Development Department.

NS 0962. ENGINEERING POSITION - Requires BSME and minimum of five years' experience, including pulsed high voltage and high current magnet systems. Will be responsible for the development, design, procurement, construction, testing and installation of major pulsed kicker magnet systems and other fast-pulsed magnets for beam injection into and beam extraction from the RHIC facility. RHIC Project, Accelerator Development Department.

NS 0963. ENGINEERING POSITION - Requires BSME and minimum of five years' experience, including high current conventional magnet systems. Will be responsible for the design, procurement, testing and installation of beam transport magnets transferring beam from the AGS to the RHIC facility. RHIC Project, Accelerator Development Department.

NS 0965. ENGINEERING POSITION - Requires BSME and minimum of five years' experience, including high frequency rf structures. Initial responsibility will include development of rf cavity and related equipment, possibly superconducting, for the RHIC storage rf system. RHIC Project, Accelerator Development Department.

Motor Vehicles & Supplies

87 TOYOTA COROLLA GTS - twin cam, new brakes, exhaust, am/fm cass., 5-spd., ac, p/b, p/s, excel. cond., $5,600. Marie, Ext. 2907 or 399-3401.

87 CHEVY CAPRICE - s/w, 9-pass., full power, 44k mi., $4,700; '87 Olds Cutlass, p/b, p/s, ac, stereo, orig. owner, 49k mi., $4,500. 366-3720.

87 CHEVY SUBURBAN 4x4 - Silverado & trailer pkg., p/s, p/b, 56k mi., black/silver, am/fm cass., 9-pass., $12,500. Anthony, Ext. 2138 or 286-1467.

87 YAMAHA YZ125 DIRT BIKE - new front & rear sprockets, new chain & rear tire, great cond., $1,200. Danny, Ext. 4988 or 286-8541.

87 FIREBIRD - a/t, V-6, T-top, white, 39k mi., excel. cond., $7,700. Ext. 5768.

86 ISUZU PICKUP - 4wd, 77k mi., 38k mi. on the eng., LS pkg., excel. cond., $4,500. Lloyd, Ext. 3163 or 286-1024 after 6 p.m.

85 PEUGEOT 505 S.T.I. - ac, sunroof, stereo, 29 mpg, excel. cond., silver, shop maintained, high mi., $3,200 or best offer. Ted, 821-4457.

85 TRANS AM - T-top, loaded, new tires & brakes, $6,000 neg.; '78 Cutlass, needs eng. work, ac, a/t, $400 or best offer Sharon or Wayne, 698-2798.

84 BUICK REGAL - 40k mi. on new Goodwrench engine, new trans. & exhaust, ac, all power, $2,000. Frank, Ext. 4284 or 698-1176.

84 OLDS CUTLASS SUPREME - 2-dr., full power, excel. cond., $2,700. Forsyth, Ext. 4676.

84 MERCURY MARQUIS - a/t, p/s, p/b, ac, am/fm, good cond., $1,600; French L.W. motorcycle, needs cleaning, $150. Ext. 3232 after 5 p.m.

84 SUBARU GL - a/t, 4-dr., 62k mi., some rear damage, 30 mpg hwy., make offer. Ext. 3784 or 582-3163 after 7 p.m.

83 FORD RANGER - runs well, very clean, asking $1,100. John, Ext. 2075 or 924-3915.

83 NISSAN SENTRA - 4-dr., 5-spd., 89k mi., 35 mpg, v.g. cond., $1,400. Ext. 7505 or 689-8605.

82 YAMAHA - XS400HS street motorcycle, 6k mi., many accessories, classy, $800 neg. 878-2702 after 6 p.m.

81 FORD E-150 VAN - reblt. eng., 6-cyl., new clutch, radiator & starter, ask. $800. Pete, 399-2813.

81 BUICK CENTURY - s/w, p/s, p/b, a/t, cass., ac, good exhaust, brakes, tires, batt., radiator, some oil drip, $1,000 neg. Ext. 5080 or 751-1884.

81 SUBARU - s/w, 5-spd., am/fm stereo, 32 mpg, runs well, $350. Mark, Ext. 4289.

80 GMC JIMMY 4x4 - loaded, new tires, tilt, ac, $3,000. Danny, Ext. 4988 or 286-8541.

80 MERCURY MARQUIS - burgundy/gray, 2-dr., full-size, reliable, recently rebuilt eng. & trans., $750. Ext. 2949 or 427-2435.

78 CHEVY BLAZER K-5 - 350, ac, new carb., tilt, cruise, trailer hitch, body good cond., asking $3,000. Richard, Ext. 2238.

78 MONTE CARLO - V-8, runs well, $300. 286-1097.

75 FORD LTD - a/t, p/s, p/b, many new parts, good cond., $500. Mitch, Ext. 4212, 928-8637 or 928-7732.

73 CHEVY MALIBU - 2-dr., a/t, p/s, p/b, am/fm cass., 70k mi., reliable, needs muffler, asking $500 or best offer. Bawa, Ext. 3499 or 331-8128.

72 CHEVY CORVETTE - convertible, restoration project incomplete, $3,500. George, Ext. 4769.

71 FORD F250 4x4 - runs well, great work or beach truck, little body rust, $500. Chris, 447-6641.

69 CAMARO RALLY SPORT - classic car, $3,400. Jim, Ext. 3372 or 821-0250.

69 FORD MUSTANG - needs motor work, $900. Dan, Ext. 4289.

HONDA MOTORCYCLE - 90cc, incl. helmet, $250 or best offer. Mike, Ext. 2052.

TRANSMISSIONS - two, for 1949-53 Fords, 1 reblt., $50/both; rear towing/step bumper for Ford pickup, $35. Tom, Ext. 4507 or 878-1060.

TRAILER HITCH - for 1980-88 Dodge van; JVC am/fm cass. w/Pioneer speakers, $100 ea. 369-0432.

TIRES - Mohank, P195-75D14, new Roncho RS5000 shocks, Grant steering wheel, Crane dbl. springs, small block Ford. Wayne, Ext. 3084.

HITCH — Drawtite, good for 1983-88 Cougar or T-Bird, like new, $45. Ext. 7188 or 744-2060.

Boats & Marine Supplies

21' BAYLINER TROPHY - 1988, canvas, radios, DF, 125-h.p. ob., trailer, many extras, $10,500 firm. Ext. 2015 or 929-5911.

20' CHRIS CRAFT 205 LTD - 1988, Bowrider, 6-cyl., i/o, 8' beam, am/fm radio, shore trailer, many extras, $15,500. Bill, 732-8793.

20' CLAM BOAT - w/cabin, self-bailing, teleflex steering, fiberglass over wood, excel. cond., $750. 563-6680.

16' BOWRIDER - fiberglass, 65-h.p. Evin., tilt trailer, p/winch, $1,700. Jim, Ext. 3372 or 821-0250.

16' MARQUE BOWRIDER - 1978, 70-h.p. Johnson, full covers, EZ-Loader trailer, p/winch, many extras, $2,300. Joe, Ext. 2575 or 281-2767 eves.

14' HOBIE CATAMARAN - roller reefing jib, trailer, v.g. cond., $1,400 or best offer; kayak, Klepper double, f/g, $500. Ext. 7657 or 298-9560.

12' ALUMINUM CRESTLINER - $300; AMF Sunfish, all new except hull, used one season, $700. 286-1097.

12' ALUMINUM BOAT - good cond., $350; 2.5 Marine motor, less than 20 hrs., like new, $350. Bobby, 751-4199.

9' BASS TRACKER BOAT - ABS plastic, w/motor, batt., DF, 2-seats, good cond., $275. 821-4457.

8' NORLANTIC - inflatable, used one season, like new cond., no engine, $650. Barbara, Ext. 4956.

YAMAHA WAVE RUNNER - 1988, w/trailer, needs work, $1,900. George, Ext. 4769.

SAIL - 3.9m² Energy Wave for windsurfer, mint cond., $100. Joe, 282-4139.

BOAT TRAILER - for 16' or smaller boat, asking $200. Pete, Ext. 5105 or 399-2813 after 5 P.m.

OUTBOARD MOTOR - 4-h.p. Johnson, 12 years old, seldom used, $300. E. Willen, 744-6423.

Furnishings & Appliances

BOOKCASE - solid teak, brand-new, orig. $375, sell for $185; fireplace mantle set; china, service for 8; outdoor chairs, more. Lisa, Ext. 5867.

CHANDELIER - wagon wheel, 5 chimney lights w/individual brass shades, use shag chain or regular hookup, $50. Ann, Ext. 2114.

CRIB - full size, mattress, bumpers, sheets, blanket, used 5 times, like new, $25. Bill, Ext. 2906.

DINING ROOM - table w/6 chairs, $800 or best offer; microwave, 1.25 cu. ft., w/cart, light oak, $400 or best offer. Ext. 5265 or 736-1525.

FUTON - queen size, $125; black wood desk; black wood bedside chest of drawers. 758-0930.

KITCHEN SET - 48" round walnut/formica table, 4 swivel contoured chairs, good cond., you pick up, $99.95. Bob, Ext. 4656.

LIVING ROOM, BEDROOM & DEN FURNITURE - moving, excel. cond. 862-9373.

PORCH CHAIRS - 2, rattan, w/new cushions, excel. cond. Pat, Ext. 2452.

WASHER & DRYER - portable, $60 & $50; child's car seat, $25; children's Ninja Turtles bike, 10", $35; fan, $8; baby's tub, $5. Ext. 3076 or 821-6856.

REFRIGERATOR/STOVE/SINK UNIT - 3 in 1, excel. for apt., great cond., $450. Marie, 589-3020.

SOFA - rust/brown tweed, arm covers, new cushions, good cond., best offer, you pick up. Ext. 4538 before noon, or 924-2012, leave message.

SOFA BED - 1 yr. old, multicolored neutrals, tweed-like material, orig. $800, asking $500. Maryellen, Ext. 2979.

WATERBED - super king size, waveless, $350 or best offer. Mike, Ext. 2052.

Tools, House & Garden

DEHUMIDIFIER - Delongh, 40 pint, auto shut-off, used 1 mo., $100. 924-0972 eves.

DEHUMIDIFIER - works well, $60; 12'x13' rug, rust, best offer. 331-4768.

FAN - overhead, new, w/light, $25. 924-6751.

GENERATOR - 4,000 watt, never used, 8-h.p. Briggs & Stratton eng., recoil start, $450. Roy, Ext. 7357 or 724-9027.

KITCHEN BASE CABINET - w/sink & faucet, excel. cond. Tony, 698-9274.

LAWN MOWER - hand push, $8; alum. storm door, 35"x82", excel., $35; wrought iron railings, $20/pair. 878-6637.

SANDPAPER - #180, 800 sheet boxes, Carbonundum brand, $40/box. 744-2060.

SHOWER BASE - corner, 38", white, never installed, orig. $200, sell for $100. Sue, Ext. 3492 or 289-6844 eves.

STORM DOOR - new, cross buck, bronze, metal industries, heavy-duty, 30", orig. $150, sell for $120. Janet, Ext. 4049.

WATER CLOSET - Kohler Rochelle model, Mexican sand color, $300. Nancy, Ext. 5274 or 281-2767.

WINDOW - vinyl, double hung, full screen, 32"x37½". Tony, 698-9274.

Sports, Hobbies & Pets

BICYCLE - Vista, 24", girl's, blue, single speed, $25. Joe, pager 0925 or Ext. 2898.

BICYCLE - Raleigh, 10-speed, unisex frame, good cond., $100. Ext. 4447.

BICYCLE - Ross, 10-speed, 26" tires, excel. for young girl, light blue, good cond., $50. Ext. 7870 or 758-0681.

CAMERAS - various, 35 mm, Miranda, Minolta, Spirit, prices to $50. Mike, Ext. 2052.

FISH TANK - 125 gal., complete, lights, gravel, decorations, filter, heater & fish, $450. Roy, Ext. 7357 or 724-9027.

GOLF CLUBS - women's, 3-PW, 1,3,5, wood, w/bag, orig. $250, asking $100. Ernie, Ext. 2677.

GOLF CLUBS - w/bag, $50; golf cart, $7; canning jars, 5 dozen, $8; old metal musical doll crib, $35; bottle capper, $10; meat slicer, $3. 878-6637.

LIGHT TABLE - Bishop Graphics model #3201, self-standing, 25½"x37½" surface area, $100. Bob McCarthy, Ext. 5265.

PIANO/ORGAN - Yamaha model PSS160, $65; 8mm Bell & Howell and 8mm Kodak projector, both v.g. cond., make offer. Tom, Ext. 4563.

SLEEPING BAG - junior size, used twice, $5; ski boots, woman's size 8, $5. Sue, Ext. 3492.

TELESCOPE - 6" reflector, 3 eyepieces, equitorial mount, $150. Jim, Ext. 7669.

Audio, Video & Computers

ANSWERING MACHINE - Bell South Memento, 3 mo. old, $30; Viewlex slide projector, $40. Tom, Ext. 4563.

CASSETTE DECK - Teac double, HX-Pro, brand-new, still in box, asking $170. Richard, Ext. 2238.

CORDLESS PHONE - $20; Sears 19" color TV, remote control, needs work, $45. 472-3254.

COMPUTER - IBM XT compatible, 20mb hard disk, dual floppy, color monitor, modem, 640k ram, software, $800 neg. Diane, 821-1675.

COMPUTER - IBM compatible, 20 meg hard disc, 5¼" drive, 640k, EGA monitor, excel. cond., $750. Chris, Ext. 3541.

COMPUTER DESK - w/hutch & mobile printer cart, oak finish, $50. 654-4661 eves.

DUAL PROCESSOR - Radio Shack Model II, runs CPM or TRSDOS, external disk drive, daisywheel printer, software, make offer. Jim, Ext. 7669.

MONITOR - Monochrom amber w/Hercules monographics card, $100. Jack, Ext. 2012.

PIANO - circa 1943, console, upright, new strings, felts, sounding board & finish in excel. cond., w/stool. Ballard, Ext. 7060 or 4206.

REVERBERATION AMP - Pioneer model SR-202W, $30; Epson RS 232 card, for Epson printers, $30. Chris, Ext. 2326.

WORD PROCESSOR - Amstrod, like new, complete unit, monitor & printer, ideal for student, $350 or best offer. Mike, Ext. 2052.

Miscellaneous

ENGAGEMENT RING - 0.82 carat diamond solitaire, new, $900. Dorothy, 281-7654 anytime.

SNEAKERS - men's, Rockports, size 10 wide, worn once, orig. $70, sell $35. Bob, Ext. 4656.

SHOES - women's, sizes 8½-9, varied styles, colors & widths, all excel. cond., $5-$10. Ext. 4538 or 924-2012, leave message.

TYPEWRITER - Royal Administrator, elect., office size, good cond. Ernie, Ext. 7632 or 281-7873.

Lost & Found

LOST - on 7/11 at BNL, gray cat w/white collar, hanging stomach, answers to Meeten, reward. 878-2421.

Yard & Garage Sales

MILLER PLACE - 7/27-28, 8/3-4, 10 a.m.-7 p.m., 22 Miller Place Rd., children's clothes, toys, stove, kit. cabinets, more. Mitch, Ext. 4212 or 928-7732.

RIDGE - wide variety of items, Sunday, 7/28, 10 a.m.-4 p.m., 3 Ridgehaven Drive, just off William Floyd Pkwy. Ernie, Ext. 2677.

WADING RIVER - Sat., 7/27, 9 a.m.-2 p.m., 479 Oakwood Drive, Lewin Hills, children's clothing & misc. household items. 929-3759.

Car Pools

RIVERHEAD/AQUEBOGUE - join or establish carpool. Pat, Ext. 2452.

Real Estate

Real Estate advertised for sale or rent is available without regard for the race, color, creed, sex or national origin of the applicant.

For Rent

BROOKHAVEN HAMLET - 3-bdrm. house, country lane, 2 baths, lg. kit., avail. immed., $900/mo. + util. & sec. Jeb, Ext. 7607, page 0830, 286-0204.

E. PATCHOGUE - S. of S. Country Rd., 3 bdrms., gar., full bsmt., w/d, no pets, nonsmokers, walk to Bellport village, $900/mo. + util., sec. & refs. Ext. 3291 or 589-3020.

EASTPORT - 3-bdrm. house, 2 baths, lg. fam. rm., 2-car gar., 5 appl., furn., lawn & grounds maintained, excel. street, $950/mo. Roy, Ext. 2012 or 325-0928.

MATTITUCK - 2-bdrm. ranch, fam. rm., l/r, d/r, deck, full bsmt., garage, w/d, $800/mo. + util. & sec. Dave, Ext. 5460.

MORICHES - 2-bdrm. Pine Hills apt., sublet, free golf, w/w, ac, $845/mo., gar. optional for $50. Cheryl, 874-9018.

N. SHIRLEY - 1-bdrm. unfurn. apt., w/w, full bath, l/r-kit. combo., 3 mi. from Lab, $575/mo., incl. util. & cable. 395-9112.

PORT JEFFERSON - spacious 3-bdrm. ranch, eik, l/r, d/r, fam. rm. w/fp, all appl., fin. bsmt., 2-car gar., avail. Sept., no pets, $1,100/mo. + util. Ext. 2920 or 473-5092 after 5 p.m.

ROCKY POINT - 1-bdrm. apt., large, new, sunny, eik, l/r, full bath, priv. ent., no pets, single pref., $550/all. 744-6386.

RONKONKOMA - 2-bdrm. condo, Nob Hill, tennis, pool, clubhouse, w/w, patio, all appl., ac, $900/mo., incl. heat. Bill, 878-6016.

SHIRLEY - 2½-rm. apt., 1 employed, mature, nonsmoker pref., priv. drive. & ent., 1 block east off William Floyd Pkwy., $450. 281-6263.

WADING RIVER - 3-bdrm. house, kit., d/r, large l/r w/fp, 2 full baths, full bsmt., gar., large yard, very secluded, 15 acres of woodland, $1,100/mo. Charlie, 929-6755.

PALM HARBOR, FL - 3-bdrm. townhouse, 2½ baths, carpeted, 5 appl., cac, screened patio, lake view, gar., pool use, no pets, lease. Ext. 3558.

CLAREMONT, NH - 2-bdrm. condo, located between VT and NH factory outlets, 10 min. to Lake Sunapee, 1 hr. to Lake Winnipesaukee, $300/wk, $225/wkend. Frank, Ext. 7749.

HILTON HEAD, SC - 2-bdrm. condo, sleeps 6, fully furn., 2 baths, pool, beach, golf nearby, May-Sept., $450/wk. Guy, Ext. 3147 or 689-5378.

For Sale

EAST MARION - beautiful 1 acre bldg. lot, adjacent to Greenbelt, walk to Sound. 325-0447.

MEDFORD - Blue Ridge, 3-bdrm. condo, l/r, d/r, galley kit., util. rm., 1½ baths, rec., in/out pool, tennis, golf, price neg. Ext. 4853 or 698-4372.

MIDDLE ISLAND - 1-bdrm. condo, upstairs, courtyard view, newly decorated, new stove, washer, dw, cac, gas heat incl., pool, tennis, must see, $675/mo., buy $75,000. Kath, 924-9464.

N. SHIRLEY - 3-bdrm. ranch, l/r w/cathedral ceil., den, new eik, new vinyl windows, sunroom w/French doors, beautiful grounds, fenced, 0.4 acres, new well, $105,000. Ext. 3403.

RIDGE - 3-bdrm. townhouse, 1½ baths, cac, w/w, all appl., encl. redwood patio, storage rm., attic, low monthly maint., 5 min. to BNL, $80's. Mary, 924-4328.

RIDGE - 4-bdrm. high ranch, 2 yrs. old, 2 baths, extra-large master bdrm., skylights, ceramic tile, deck, possible mother/daughter, 1 acre, 5 min. from Lab., $168,000. 924-9049.

RIDGE - 3-4 bdrm. ranch, eik, d/r, l/r, fam. rm., skylight, oak floors, full bsmt., Andersen windows, 24'x24' deck, shed, carport, 1½ wooded acres, 5 min. to Lab, $159,000, by owner. Gerri, 924-0287.

RIDGE - Leisure Knoll, 1-bdrm duplex, ac, all appl., taxes $1,800, very close to clubhouse, pool, etc., immed. occup., over 55 only, $75,000. Ted, Ext. 4589 or 475-8581 eves/wknds.

SHIRLEY - 3-bdrm. ranch, designer bath w/skylight, full bsmt. w/laundry rm., all oak floors, d/r, l/r, security lights, full fenced 100'x100' lot, $110,000. Ext. 3531 or 281-7578.

SHOREHAM - 3-bdrm. ranch, ½ acre, SWR SD, low taxes, large eik, d/r-l/r, den, 2 baths, lg. storage, cent. ac & gas heat, all appl., prof. landscaping, $145,000. Ext. 2833 or 744-7172.

SHOREHAM - N25A, SWR SD, low taxes, 4-bdrm. Col., 2½ baths, 2-car gar., energy eff., encl. porch, fenced yard, close to schools, shopping, 10-min. to Lab., $165,000. Rich, 744-0960.

SHOREHAM - 3-bdrm. brick Cape, eik, den, playroom, gar., full bsmt., 1½ baths, remodeled, conven. loc., SWR SD, $135,000. Carol, Ext. 3315 or 744-7493; or Janet, Ext. 2345 or 929-3910.

SHOREHAM - N25A, 4 bdrm., large living area, 2 baths, bsmt., gar., porch, 10 min. to Lab, beach access, for sale or rent. Hans, Ext. 3737.

SPEONK/WESTHAMPTON - 2-bdrm. mobile home, 14'x60', fam. park, w/d, shed, bay window in l/r, $38,500, assumable mortgage. Dave, Ext. 5460.

YAPHANK - Col. Woods, 3-bdrm. condo, ac, 2½ baths, fin. bsmt., wood floors, $98,000. Krystyna, 716-831-3575 days or 716-885-0497 eves.

MERRIT ISLANDS, FL - Indian Bay Estates, 1/3 acre, close to Cocoa Beach, Cape Canaveral, lowest priced land in area at $29,000. Ted, 821-4457.

HUBBARDTON, VT - 38 deeded acres situated on town-maintained road w/power, telephone, largely wooded w/view of Lake Bomoseen, asking $34,000 neg., terms avail. Tom, Ext. 2823.

Wanted

BOOKS - European visitor is looking for free paperbacks, fiction, suspense, Twilight Zone, etc. Sonja, Ext. 4872.

HEDGE TRIMMER - large comm. grade, in working cond., gas or electric. Ray, Ext. 2012.

HOUSEMATES - Ridge-Scenic Hill, close to Lab, separated, 2 unfurn. rooms, $300/mo. or $265/mo., share util. Fu, Ext. 3156 or 924-2865.

HOUSE TO SIT - free, exp., reliable, any period after Aug. 3. J. Allentuck, Ext. 2412.

PRESCHOOL TEACHER - of 3 & 4 yr. olds for Upton Nursery School, minimum 1 yr. exp., start in Sept. Kathy, 924-2205.

RACE WALKER - someone to teach me. Nick, Ext. 2490.

ROOMMATE - female, nonsmoker, to share 2-bdrm. furn. apt., 2 baths, in Pine Hills South, no pets, no children. Cheryl, 874-9018.

VACUUM ADAPTOR - for powerteam access., for Regina, tan, willing to buy complete access. set. Fran, Ext. 4215 or 924-6935.

WET SAW - for cutting bricks, rent or buy. Tony, 698-9274.

Classified Ad deadline is 4:30 p.m. Friday for publication Friday of the next week.