BROOKHAVEN BULLETIN
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BROOKHAVEN NATIONAL LABORATORY

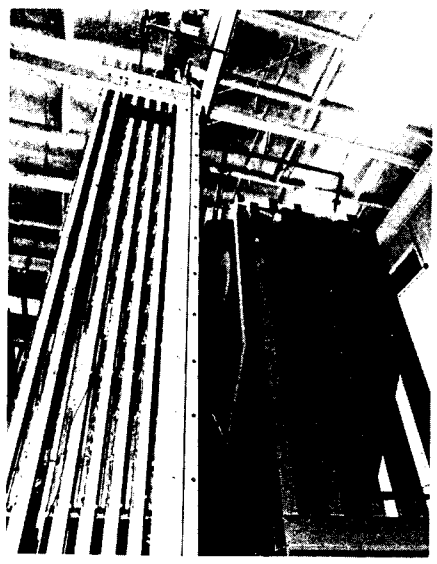
The Continuing Saga of Neutrino Research at BNL

Neutrinos have been around at least as long as our universe. But despite their age, their all-pervasiveness and their importance to the formation and the fate of the universe, they were not even postulated until some 50 years ago.

At BNL's Alternating Gradient Synchrotron (AGS), in the early 1960's, physicists began seeking these elusive particles with spark chambers. Just ten years ago last month, a first neutrino event was seen in the 7-foot bubble chamber at the AGS. Today, researchers at Brookhaven look for neutrinos with huge detectors composed of drift tubes and scintillation counters.

The neutrino is part of the weak interaction, the force associated with radioactivity and nuclear decay. As extra-nuclear particles, electrons and neutrinos constitute half of a family of fundamental building blocks of matter. Two nuclear components called quarks constitute the other half. For many years, the only family identified was one consisting of an up and a down quark, an electron and an electron-neutrino.

As high energy physics evolved, evidence began to mount for a second family of four fundamental particles. In 1938 came the muon, the new family's equivalent of the electron; then the s (strange) quark followed in the 1950's. The rest of the family was found at BNL. The muon-neutrino was discovered in a Columbia-Brookhaven experiment conducted at the AGS in 1962, and the November 1974 discovery of the J-psi particle by researchers at BNL and SLAC confirmed the existence of the c (charmed) quark.



Mort Rosen

Graduate student Ed O'Brien, University of Illinois, is atop 18-foot tall drift tube panels to conduct an inspection procedure for Experiment 776. At right are the toroid magnets used in the detector, painted to be what is probably the world's largest stop sign.

The muon-neutrino discovery was the first in a series of triumphs for physicists doing neutrino experimentation at the AGS. For that work, the experimental team, which included BNL physicist Gordon Danby, sent a beam of neutrinos through a spark chamber to see whether any would leave a trail of sparks associated with either an electron or a muon. The preponderance of muon events demonstrated conclusively the existence of the muon-neutrino.

In other studies with spark chambers and scintillation counters at the AGS neutrino beam, elastic scattering of neutrinos on protons was seen for the first time, which was primary evidence of neutral currents.

In 1974, neutrino experimentation at BNL moved from spark chambers to the 7-foot bubble chamber. Less than one year later, in March 1975, an experimental team led by Nicholas Samios (now BNL Lab Director) found the unusual neutrino event which later proved to be the first single charmed particle — the charmed baryon.

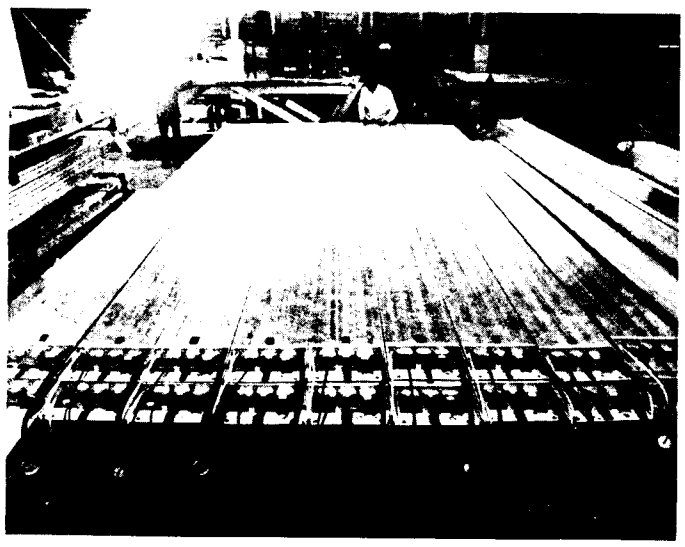
The bubble chamber was decommissioned in 1980, but analysis of the data it produced still continues. And so does neutrino experimentation at BNL, through two research teams. One of those collaborations is AGS Experiment 734, which involves researchers from BNL, Brown University, SUNY at Stony Brook, the University of Pennsylvania, Japan's Osaka University and its national laboratory, KEK. "This experiment is designed to test the Weinberg-Salam electroweak theory as stringently as we can manage," said Hywel White, BNL physicist.

Elastic Scattering

The Weinberg-Salem theory seeks to unite two interactions — weak and electromagetic — under the name "electroweak." To test this theory, the experimenters look for evidence of elastic scattering, where a neutrino collides with an electron, then bounces off it intact.

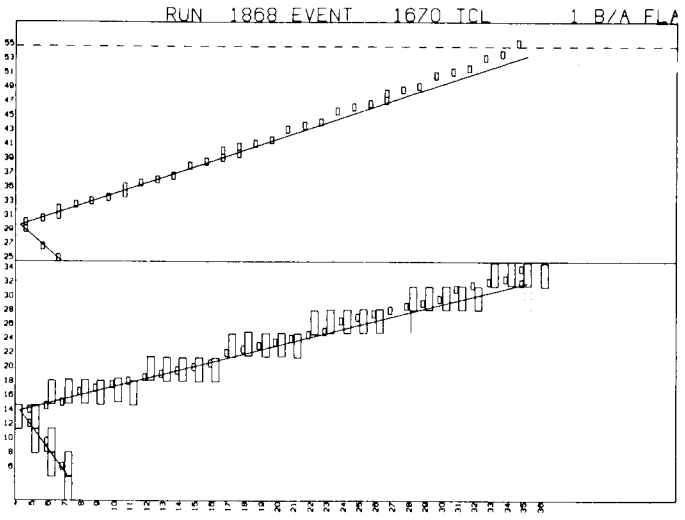
Elastic scattering of neutrinos, however, is a rare phenomenon. Because neutrinos interact so weakly, quadrillions of them must pass through a target in order for just one to collide with an electron. To collect sufficient data, the researchers have run their detector for nearly a year, in total, since 1981. Now, White said, "We have completed the program that we initially set out to do with muon-neutrino and electron scattering. We wanted to get more than 100 of those events and 100 with antineutrinos. Now we believe we have got those."

Under analysis along with those events, are data collected on elastic scattering of neutrinos from protons, to test the electroweak theory as applied to hadrons.



Mort Rosen

Sixteen parallel drift tubes form one 18-foot panel in experiment 776's detector. Here, Lee Leuken, graduate student from Johns Hopkins University, tests the electronics in an array of drift tubes.



This quasi-elastic neutrino event was recorded in the detector for AGS Experiment 734. The two views, top and side, show a muon-neutrino hitting a neutron and changing into an outgoing charged muon, the long track. The struck neutron is changed into a proton and recoils a short way. This is one of the most common kinds of events seen in the detector.

While AGS energies have remained essentially the same since bubble chamber days, its intensity has continued to increase. For example, said White, "In the bubble chamber, they probably got about 10 billion neutrinos in every AGS pulse and now we get two or three times that amount." But the big difference in this neutrino experiment is the huge detector that replaced the bubble chamber. "The bubble chamber contained about a half of a ton of liquid," White said, "and now we have a 200-ton detector, so we've gained a little in intensity and a lot in mass." Those gains have made a difference. While bubble chamber researchers saw only about ten neutrino/electron elastic scattering events over many years' time, White's collaboration saw over 150 such events in just over two years. As for antineutrino events, White said, "Bubble chamber people were never able to look at those and we have about 100 events."

To add to these nice numbers, the team would like to study more events and has just submitted a proposal to continue the experiment for several more years.

Neutrino Oscillation

While Experiment 734 concentrates on elastic scattering, the newest neutrino experiment, 776, will focus on neutrino oscillation. "This is a very singleminded experiment," said physicist Wonyong Lee who heads a contingent from Columbia University. Other collaborators on Experiment 776 are the University of Illinois, led by Tom O'Halloran, and Johns Hopkins University, headed by Aihud Pevsner.

Located about one kilometer north of the AGS, the detector for Experiment 776 weighs over 300 tons, making it even more massive than the one used in Experiment 734. And that big detector will help answer a big question: Do neutrinos have mass?

The neutrino is conventionally defined as a massless particle. But in recent years, physicists have begun to rethink that definition. Explained Lee, "There is strong evidence right now that there are lots of invisible masses in the universe. The neutrino is one of the most attractive candidates for the invisible masses."

Even if the neutrino has a mass, that mass would be extremely small. But since there are many, many neutrinos, the total of those masses would be extremely significant and could tip the balance in favor of a contracting, rather than an expanding, universe.

If the neutrino has mass, theory says, it should be able to oscillate; i.e., cycle back and forth between being an electron-neutrino and a muon-neutrino. "The AGS is uniquely suited to studying oscillations in this mass range," said Lee.

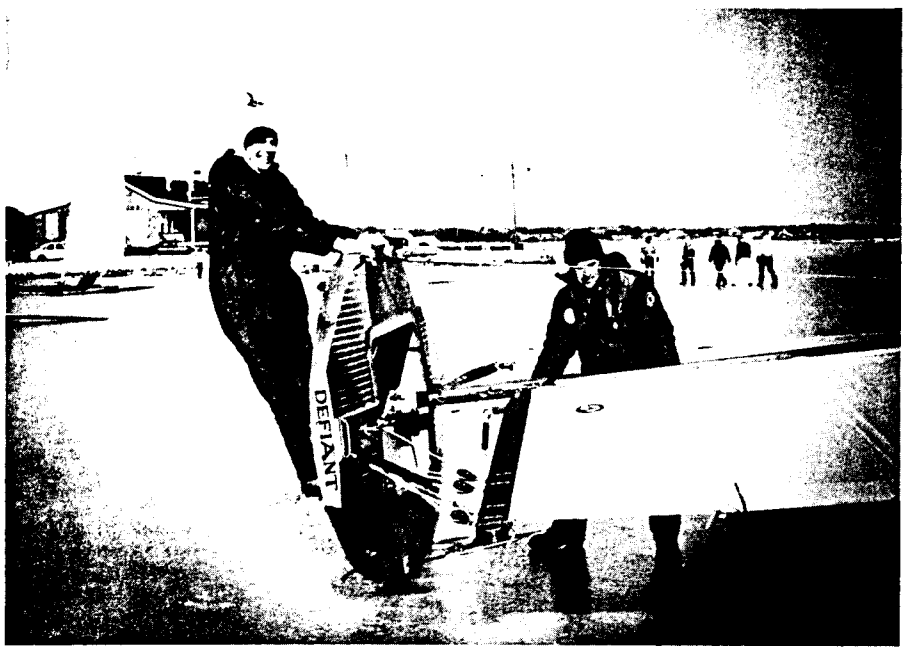
When this event was observed in the 7-foot bubble chamber in January 1974, it was the highest energy neutrino event ever seen in a hydrogen chamber.

In designing the experiment, the research teams paid particular attention to eliminating background. "It's very easy to see background in a detector and call it the wrong thing," Lee said. A new focusing horn, which will also service experiment 734, and a location far from the AGS should resolve that concern.

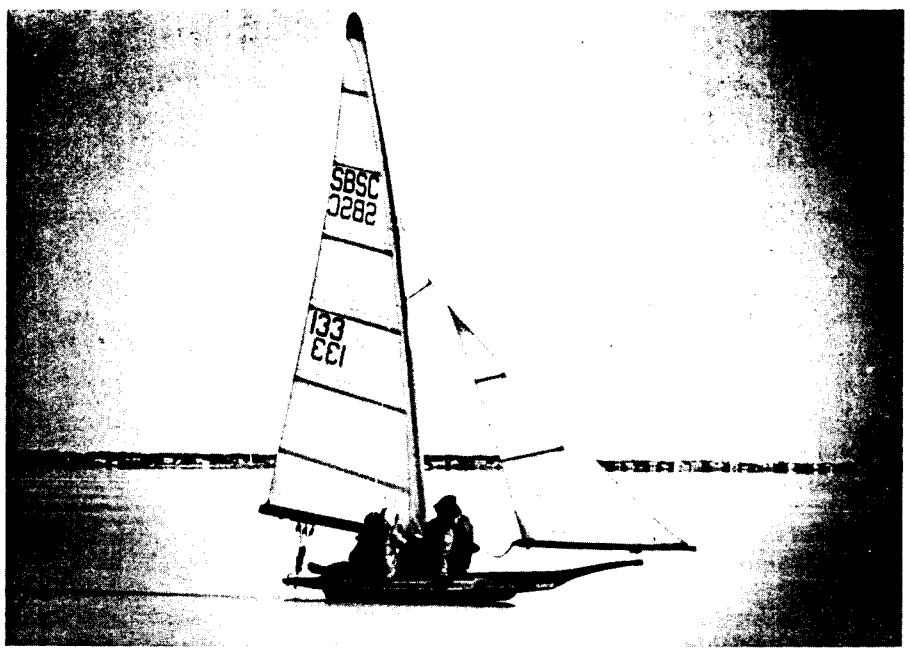
Late last year, the experiment was tested at about 10% of its capacity. "We saw about 100 events which we were supposed to see," said Lee, "so we know the detector is O.K." That encouraging news has kept the research teams going at an ambitious pace to complete the detector for its first real run in September. "There are lots of very good people supporting this experiment," Lee said.

The September startup will be only the beginning. "To do all possible oscillations will take another four or five years," said Lee. "and if we get positive results, if a neutrino oscillates, it will go on a very long time."

There are other neutrino oscillation experiments now under way — at CERN, Fermilab and elsewhere. Even Experiment 734, deviated along the way to see if the muon-neutrinos in the beam oscillated to electron-neutrinos. So far all experimental results have been negative. But, said Lee, "I think ours is the only one designed to do neutrino oscillations. One can be optimistic that we may be sitting in a very sensitive parameter range where we may see oscillations. If it's there, we will find it. We are really well set up to do that. And if we see it, it would be a really profound discovery in high energy physics." —Anita Cohen



On the ice off the Bellport dock, Harvey Lotko stands on the Defiant's steel runners while Dick Richardson pushes up on the mast to put the scooter in an upright positon.



Skipper Howard Farrell (front right) and crew sail their scooter past the Bellport-Brookhaven shoreline.

Under Sail on the Ice

Until the recent thaw, this was a good year for scooter enthusiasts. Ice had covered the Great South Bay since just before Christmas, and scooters had covered the ice just as long. And on weekends and vacation days, BNL'ers who own these craft covered themselves up against frigid temperatures to scoot across the ice.

One of those is Harvey Lotko (Accelerator), who is an ex-commodore of the South Bay Scooter Club, an organization headquartered on the dock of the village of Bellport, known as "The Home of the Scooter." Says Lotko of scootering, "It's a sport that's unique to this area — sort of like our own little sport."

This "little sport" revolves around the scooter — an amphibious craft which skims over ice like an iceboat, catches the wind like a sailboat and jumps open water like a flying fish. According to one story, the forerunner of today's scooter was built during a late 1800's winter, by members of the U.S. Lifesaving Service stationed on Fire Island. Running low on supplies and social life, they yearned to cross the largely frozen bay to Bellport. As Howard Farrell (Accelerator) explains it, "some inventive guy put runners on the bottom of his sailboat. Soon this evolved to a hunting boat, to bring decoys out of open water. When duck hunting season was over, it became natural to begin racing."

Today, scooter owners race wherever the ice is, but most scooter skippers prefer to sail out of Bellport. Though scootering combines the best of two worlds — sailing and iceboating — it has not become a common sport anywhere but on the Great South Bay. That's probably because, unlike other iceboats, the high resistance of the scooter's long shallow runners demands ice that is clear of snow.

Among this year's racing scooters is Lotko's Westwind, which, he says, "is not doing too much," in terms of winning. On the other hand, the Breakwind, according to owner Dean Ince (Accelerator), "is doing fine this year." The Defiant is skippered by Dick Richardson (Instrumentation) who allows to doing "pretty well, considering that this is a new boat. It's only the second season and like most boats, we're always making modifications."

Farrell's unnamed craft is even newer. It was not purchased from a boatyard, where it could have cost up to $8000. He and his son David built it at home for less than $2000. Their investment and two years of effort have paid off this winter since, Farrell says, "we may take second this year."

Farrell grew up with scooters, in East Patchogue, where, he says, "When I was eight years old, my father would put me in the hull of his scooter. In those days I was terrified." Now an East Patchogue resident, Ince grew up in Bellport. "I started scootering when I was about ten," he says. "My father did it for a while, then my brother and I started. Now we've each got two boats — more scooters than we can handle."

Richardson too comes from Bellport, where, as a boy, he first sailed the frozen Bay by putting his sail on a "shingle," a 4'x8' deck with backbone and runners which he calls "a quick and dirty way to get going." Lotko, also a Bellport resident, began scootering about 20 years ago as a way to enjoy Long Island waters year round. In the summer, Lotko is a captain for the Bellport ferry.

What is it that turns one into a scooter devotee? According to Ince, "It's a good answer for cabin fever." But beyond that he says, "The best way to explain it is to experience it yourself." So join us for a scooter ride, on a day that dawns clear, cold and crisp.

Very early, the ice near the dock is already covered with scooters. The typical scooter has a mahogany or walnut deck on a hull 13 feet long, 17 feet with the bowsprit. Its 23-foot mast supports 150 square feet of sail, including a mainsail and a jib. When a scooter stands erect and still, it can sail away on its own. So until race time, or a joy ride, the scooters are tipped over, on their sides.

As the racers right their scooters, the wind gusts in ideal fashion, from 10 to 15 miles per hour. But with their mainsails set into the wind, the scooters are perfect weather vanes, standing still as the crew gets ready.

Though a scooter can carry from one to five people, depending on wind and ice conditions, two are essential in a race. The skipper sets the course and tends the jib. Scooters have no rudders or tillers; the skipper controls the scooter by moving the jib, alternately filling it with air, then dumping the air. The sheet tender trims and lets go of the main sheet, alternating to keep the boat just skipping along the ice on its outer and main runners. Striking the proper balance is tricky and, says Farrell, "A good racing team must work together to get the best speeds."

On this day, there's a north wind. With their bowsprits pointed east towards the Smith Point Bridge, the skippers jibe and the race begins. As the scooters pick up speed, a low rumble increases to a rolling roar — the sound of steel runners racing over the ice. Snow free and glazed by raindrops, the 7-inch thick ice is about as perfectly frozen for scootering as the Bay can be, although four inches would safely support a scooter.

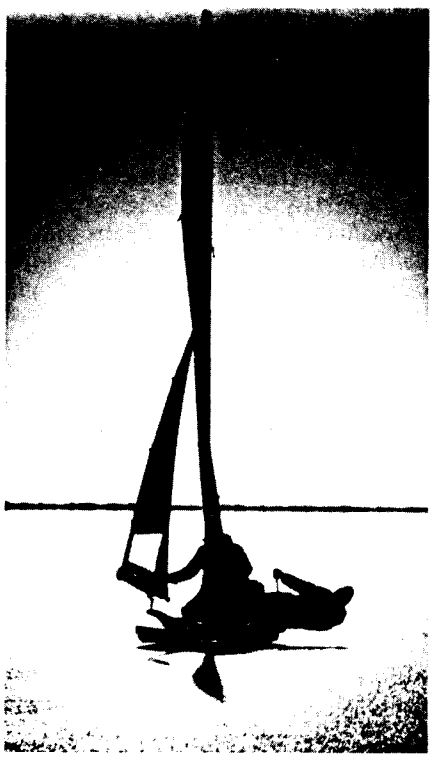
The three mile course takes the scooters and their crews on a circular path to the mouth of Carmans River and back to the Bellport dock. During their three laps around the course, at speeds to 60 miles per hour, the scooters skim past the Scooter Club's markers — Christmas trees anchored into the ice. The crew is so busy tending the sails and shifting their weight, and so bundled in quilted jumpsuits and masks, that wind chill factors around ten below zero make little impression. And if they do, it's nothing that a little scooter oil (blackberry brandy) won't cure.

Their layers of clothing also offer protection should an upset occur. "They do upset," says Farrell, "but no one has really been hurt because of an upset or falling off. Generally people just slide across the ice." And if the ice should give way, the scooter will float, although to prevent the boat from freezing a quick removal and bail out is essential.

It takes only about 20 minutes for a winner to complete the course and return to the dock. But even those that follow him in are considered winners by scooter aficionados. To them, the real prize is the sport itself. As Farrell sums it up, "It's the tremendous power of the boat itself. It's really overwhelming — probably like riding a wild stallion, or something of that nature."

One way to get started in scootering is to become a member of the Scooter Club. Only members can crew in club-sponsored races, and members also have access to the plans and expertise necessary to help them build their own scooters. Membership is open to all; the only requirement is a desire to scoot and the time to devote to it, forewarns Richardson, "You get hooked on it."

—Anita Cohen



Skipper Dick Richardson tends the Defiant's jib while Harvey Lotko leans out to balance the scooter as it skims along the Great South Bay. —photos by Horton

Pick a Student

Beginning on Tuesday, applications for the 1984 Summer Student Program will be available for review at the Office of Academic Relations, 2nd floor, Bldg. 460. Staff members are invited to select students to work under their supervision from June 4 to August 17. Selection guidelines have been distributed to department offices, and the deadline for review of applications is March 5.

Arrivals & Departures

Arrivals

Anthony Calligeros ..... Plant Eng.
Michael J. Colon ..... Ph. & Gr. Arts
Tatiana Kolubayev ..... DAS

Departures

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

Anthony D. Blackett ..... Biology
Kathy Henderson ..... Contr. & Proc.

Reports Available

The following reports are now available to the Laboratory staff and to affiliates of the DOE, AUI and NRC. Others may purchase the reports from the National Technical Information Service, U.S. Dept. of Commerce, 5285 Port Royal Rd., Springfield, VA 22161. Staff members should call Ext. 5068.

NUREG/CR-3091
BNL-NUREG-51630
Vol. 1
Review of Waste Package Verification Tests. Semiannual Report Covering the Period April - September 1982. G.T. Bida, D. Eastwood, H. Jain, B. Siskind, P. Soo.

NUREG/CR-3219
BNL-NUREG-51658
Vol. 1
Draft Technical Position Subtask 1.1: Waste Package Performance After Repository Closure. M.S. Davis, D.G. Schweitzer.

Vol. 2
Draft Technical Position Subtask 1.2: Post Emplacement Monitoring. S.V. Panno.

BNL-NCS-51684
An Annotated Bibliography Covering Generation and Use of Evaluated Cross Section Uncertainty Files. R.W. Peelle, T.W. Burrows.

BNL-51686
Chemical/Hydrogen Energy Systems Multi-Year R&D Plan. M. Beller, A. Mezzina.

NUREG/CR-3381
BNL-NUREG-51689
Evaluation of the Three-Mile Island Unit 2 Reactor Building Decontamination Process. D. Dougherty, J.W. Adams.

BNL-51692
Design and Operation of a LAMINAR Flow Electrostatic Quadrupole Focused Acceleration Column. A.W. Maschke.

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BERNICE PETERSEN, Editor
MONA S. ROWE, Assistant Editor
ANITA COHEN, Reporter
MARSHA BELFORD, Reporter

35 BROOKHAVEN AVE., UPTON, N.Y. 11973
Telephone (516)282-2345

Volunteers Wanted

Scientists in the Medical Department are involved in several programs investigating the characteristics of human blood cells and the bone marrow from which the blood cells originate. This study involves blood and bone marrow samples from patients with blood-related disorders, as well as blood and bone marrow samples from normal, healthy individuals.

To meet the latter need, a program was established several years ago whereby BNL employees may be compensated $10 for the withdrawal of up to 50 milliliters of blood, and $50 for up to 10 milliliters of bone marrow.

Volunteers must be BNL employees, at least 21 years of age and in good health. Samples will be taken during regular working hours, and absence from one's duties must be approved by the individual's supervisor. Blood samples take approximately 10 minutes, and bone marrow samples about 30 minutes.

Individuals will be called as the need for marrow and/or blood arises. Obtaining blood for laboratory studies is in no way a part of the blood donor program. Any employee interested in participating in these studies may obtain further information by calling Ext. 3672.

Vegetable List

The Cooperative Extension now has available the 1984 Recommended List of Vegetable Varieties for Home Garden Use. These vegetable varieties are well adapted to New York conditions, are of relatively high quality, are dependable, embody disease and insect resistance when possible, and have a fairly long harvest period. The list includes 37 vegetables. The list may be obtained from the Cooperative Extension Association, 246 Griffing Ave., Riverhead, N.Y. 11901 (727-7850).

Basketball

Boxscores 2/09/84

Game 1

Hollywood - 73		Longshots - 58	
B. Woodson	6	J. Gaffney	20
F. Johnson	6	B. Johnson	5
L. Walcott	12	I. Mackenzie	3
L. Lawrence	4	L. James	17
E. Meier	10	J. Garrison	8
G. Mack	24	M. Thomas	3
B. Kowaski	2	B. Danowski	2
D. Nostron	9		

Game 2

Coasters - 68		Runaway - 67	
B. Doty	22	T. Mooney	4
L. Smith	8	S. Gilbert	9
M. Williams	10	H. Bell	10
[illegible]. Jasper	2	G. Smith	14
K. Damico	9	R. Bank	10
L. Snead	2	T. James	20
M. Fulkeson	15		

Team Standings

Hollywood 4-0
Longshots 3-1
Coasters 1-3
Runaways 0-4

WIS Meeting

The subject of "Neurobehavioral Toxicology: Predicator to Impending Toxicity?" will be addressed at the next luncheon meeting of BNL Women in Science at noon on February 3, in Room A, Berkner Hall. The guest speaker is Sonja Haber, Associate Scientist at BNL's Inhalation Toxicology Facility.

Haber holds a Ph.D. in psychology from Miami University, Ohio. Except for a year at N.I.H. as Health Scientist Administrator for the Behavioral Medicine Branch of the National Heart, Lung and Blood Institute, she has been with the Medical Department since 1976. Currently, she is studying the neurobehavioral and neuromorphological changes occurring in laboratory animals exposed to toxic agents, and looking at the functional structural relationships of behavior to nervous system physiology.

The meeting is open to all interested employees. For information call Martine O'Connor Ext. 5271.

Toll-Free Hotlines

An organization called Public Citizen has compiled a list of 34 "Toll-Free Hotlines." For a copy of this list, send a large, self-addressed, stamped envelope and $1 for each copy to Public Citizen Hotlines, P.O. Box 19404, Washington, D.C. 20036. Some examples:

Better Hearing Institute
Provides information about hearing loss and help available in caller's local area regarding doctors, hearing aid specialists, noise pollution, etc.
800-424-8576

Cancer Information Service
Offers information about all aspects of cancer to the general public, cancer patients, and their families. All calls confidential.
800-4-CANCER

Consumer Product Safety Commission
Receives reports on injuries/deaths relating to hazardous manufactured products; assists consumers in evaluating safety of products on sale to the public.
800-638-2772

Fair Housing and Equal Opportunity Hotline
Accepts complaints on discrimination in housing, based on race, color, religion, sex, or national origin.
800-424-8590

Federal Tax Information
Internal Revenue Service offers free assistance on federal tax questions.
800-424-1040

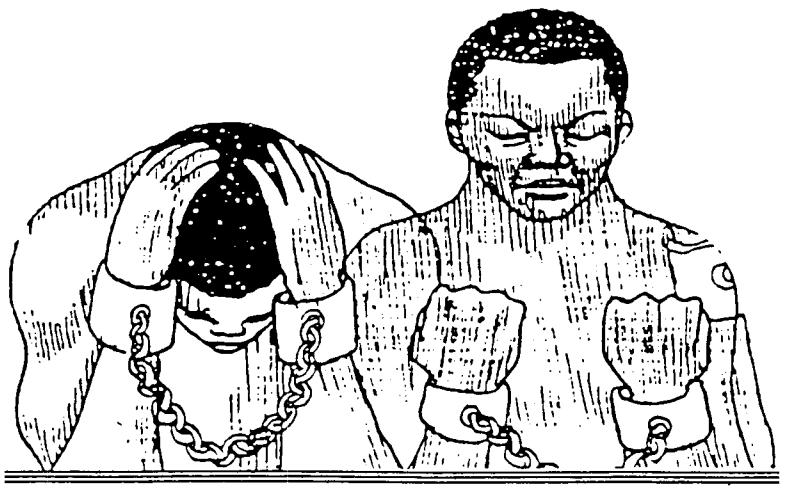
National Highway Traffic Safety Administration
Receives reports on auto safety problems; provides information on autos recalled and complaints received about specific makes and models.
800-424-9393

Second Opinion for Non-Emergency Surgery
Provides referrals to specialists to double-check advice before an operation. For free brochure, "Thinking of Having Surgery?" write to: Surgery, HHS, Washington, D.C. 20201.
800-638-6833

Water Safety
United States Coast Guard 2nd District answers questions about boating safety and related federal laws.
800-325-7376

Camera Club

The February 23 Camera Club meeting will feature a discussion on Stero or Three Dimensional Photography, beginning at 5:30 p.m. at the Recreation Building. Richard Carlsen, a Camera Club member who is experienced in the various techniques involved, will be the speaker. Nonmembers, as well as members, are encouraged to attend.



Play Climaxes Black History Month

The Adelphia Repertory Touring Company of Philadelphia will perform the one act play "Sizwe Bansi is Dead," a story about a black man's struggle to survive within South Africa's apartheid system, on Saturday, February 25 at 8 p.m. in Berkner Hall. The one and a half hour drama by Athol Fugard is presented by the Afro-American Culture Club as the final event of Black History Month at BNL.

The play tells the story of Sizwe Bansi, a black South African working illegally in the city who faces deportation to his tribal village because he does not have official working papers. Bansi, while walking with his friend Buntu one night, stumbles upon a dead man who has a passcard, and, out of desperation, Bansi switches personal papers with the dead man. By possessing the deadman's passcard, Sizwe can now legally work in Port Elizabeth to support his impoverished family living in a rural village. Though he has only changed his identification papers, Sizwe Bansi is dead in the view of the apartheid government of South Africa.

"This touching and often comical drama explores how black South Africans contend with and resolve the problems of everyday living in a racist society," says Maurice Henderson, artistic director of ARTC who will play Sizwe Bansi. "It explores the degradation of human beings by their being segregated into a non-person category and discriminated against. And the play focuses on the extremes to which people will go in order to survive."

Tickets are $5 per person, and may be purchased at the BERA Sales Office in Berkner Hall, from Kay Hunt in Personnel, and at the Affirmative Action Office. Or you may purchase your tickets through the mail by sending check made out to BERA, and a self-addressed envelope to AACC, Box 441, BNL, Upton, New York 11973.

Hispanic-American Society

A meeting of the newly-organized BNL Hispanic-American Society is scheduled for noon on Wednesday, February 22, in Room C, Berkner Hall. Plans for a club social, to be held early in March, will be the main topic of discussion.

Cooking Exchange

In honor of Black History Month, the Cooking Exchange is pleased to announce that the next meeting will be hosted by members of the BNL Afro-American Culture Club. Recipes such as Mississippi cornbread, hoppin johns, southern fried chicken, and other delicious dishes will be demonstrated and sampled.

The meeting will be held on Wednesday, February 22, beginning at 12:30 p.m. in the Recreation Building. Admission is $1 and babysitting is provided at 50¢ per child. Employees, family members and guests are invited.

Dee Polychronakos is the Cooking Exchange chairperson. She may be reached at 744-3578.

Bowling

Scotch Doubles Reminder
The tournament is scheduled for Sunday, March 4 at 2 p.m. at Port Jeff Bowl. Entries are available at the BERA Sales Office.

Red/Green League
J. Connelly rolled a 224, D. Jesaitis 205/200, T. Prach 202, C. Neuls 201, E. Sperry 201, W. Kristiansen 201.

White League
High games were bowled by R. Eggert 256 for a 619 scratch series, B. Sells 222, K. Riker 223, J. Griffin 216, N. Erickson 191, P. Manzella 178/178, K. Griffin 175.

Purple League
E. MacDougall rolled a 236, B. Jones 223, D. Adams 222, C. MacDougall 210, J. Ferrante 205, J. Vogel 200.

Cast Call

The Theater Group is planning a late spring production of William Inge's "Bus Stop." The cast includes five men and three women, ranging in age from 18 to 50. Auditions will be held in the Dining Room (South Room) of the Center on Tuesday, February 21 from 5:30 p.m., and on Wednesday, February 22 from 7:30 p.m.

All are welcome to read for these parts. Plenty of help is also needed for other aspects of the production, such as sets, costumes, props, and special effects. Putting on a play is fun; if you think you might enjoy it, don't be shy. Karl Swyler is directing this production and would welcome any questions, at Ext. 7171.

Cafeteria Menu

Week Ending February 24

Monday, February 20		
Snack Bar Service — 9 a.m. to 2 p.m.		
Tuesday, February 21		
Beef barley soup	(cup)	.65
	(bowl)	.75
Baked turbot Florentine & 1 veg.		1.95
Beef chow mein on rice		1.90
Hot Deli: Italian burger	(bread)	1.90
	(roll)	2.05
Wednesday, February 22		
Navy bean soup	(cup)	.65
	(bowl)	.75
Corned beef & cabbage		1.95
Stuffed pepper & 1 veg.		1.90
or w/spaghetti		2.20
Hot Deli: French toasted ham & cheese		1.80
Thursday, February 23		
Chicken vegetable soup	(cup)	.65
	(bowl)	.75
Cheddar steak & 1 veg.		1.85
Seafood platter		2.20
Hot Deli: Italian style meatball hero		2.00
Friday, February 24		
Seafood chowder	(cup)	.65
	(bowl)	.75
Tuna noodle casserole & 1 veg.		1.85
Veal patty Parmesan & 1 veg.		2.00
Hot Deli: Top round of beef	(bread)	1.95
	(roll)	2.10

Classified Advertisements

Placement Notices

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

Each week, the Personnel Office lists new personnel placement requisitions. The purpose of these listings is, first, to provide open placement information on all non-scientific staff positions; second, to give employees an opportunity to request consideration for themselves through Personnel; and, finally, for general recruiting purposes. Because of the priority preference policy stated above, each listing does not necessarily represent an opportunity for all candidates. As a guide to readers, the listings are grouped according to the anticipated area of recruitment.

Except when operational needs require otherwise, positions will remain open for one week following publication date.

For further information regarding a placement listing, contact the Personnel Placement Supervisor, Ext. 2882.

LABORATORY RECRUITMENT: Opportunities for present Laboratory employees.

2014. SECRETARIAL POSITION - Requires AAS degree in secretarial science or equivalent, the ability to take shorthand and knowledge of general office procedures. Some experience in word processing helpful. Division of Contracts and Procurement.

Open Recruitment: Opportunities for Laboratory employees and outside applicants.

2015. TECHNICAL POSITION - Requires AAS degree in electrical technology or equivalent experience. Background in high voltage, high power, rf and analog and digital circuits necessary. Will work at 200 MeV Linac. Accelerator Department.

2016. PROJECT ENGINEER - Requires a BSEE plus substantial experience in the layout of lighting, power, alarms, industrial instrumentation and controls and computer analysis of both energy consumption and power distribution systems. Will be responsible for preparing preliminary sketches, working diagrams, specifications and estimates for commercial and industrial building electrical systems. Plant Engineering Division.

Autos & Auto Supplies

GERMAN AUTO PARTS - wholesale prices on new parts for VW, Porsche, Audi, BMW, & MB. Augie, 289-4211.

72 FORD MAVERICK - 6 cyl., standard shift, running, $100. Wally, Ext. 2468.

70 PLYMOUTH - drive it away, $200 or barter. Pete, Ext. 4819 or 289-7218.

TIRES - 2 x 165 R15 Sears Roadhandler sport radials on Volvo rims, $20 ea. or 2/$35; 2 x 6.95/14, 1 x 7.35/14, 1 x 7.00/13, $10/ea. Ext. 2965.

75 VW BUG - new engine, reasonable cond., honest answers to your questions. Page Bill at 351.

72 DUSTER - 6 cyl., 3 spd., engine and clutch need work, AM radio, many new parts, $500. Bill, 246-7110, days.

76 PONTIAC SUNBIRD - 80,000 miles, good cond., $1,600. 732-2754 after 5 p.m.

64 CHEVY PICKUP - runs well, signal doesn't work. 288-6213 after 6 p.m.

74 260Z DATSUN - auto., good cond. Ext. 2537 or 473-1658 after 5:30 p.m.

15" RIM - white, for Dodge van, $5. Al, Ext. 7588.

TIRES - (2) Bridgestone steel belted radials, 175R-14, excel. cond., $40/pr. Ext. 4758.

75 OLDS CUTLASS - 4 dr., p/s, p/b, r/d, good cond. 286-4572 eves.

SHOP MANUALS - 73 Honda, $10; 73 Pontiac, $10; 69 Chevrolet, $10. Ext. 4986.

72 HILLTOP CAMPER - sleeps 7, stove, ice box, sink, closet, $900; Honda Chopper, 750 cc, customized, $1000. Ext. 2309 or 473-9180 after 4.

B.B. CHEVY - Edelbrock C454, dominator manfld. chrome valve covers, clutch, p. plate, factory mags., trade for hunting equip. Ext. 3869 or 744-3577.

69 BLUE V.W. - 1970 rebuilt engine, standard shift, am/fm cassette, new tires, $550. 698-2546.

63 CHEV. CORVETTE - British racing green, tan leather interior, 2 tops, 327-300 h.p., 4 spd. trans., $8750. H. Sauter, Ext. 3783 or 732-0267.

79 TURBO BUICK REGAL - full pwr., Landau, air, am/fm cas., 43K orig. mi., mint showroom cond., always garaged, $5,700. Ext. 7130 or 929-8323.

72 VW SQUAREBACK - runs well, good transportation, $750. Ext. 4363, 286-1183 or 924-7238.

71 CHRYSLER NEWPORT - runs, good shape, best offer. Ext. 4363 or 924-7238.

76 DATSUN B210 - 4 spd., radials, am/fm, cassette stereo, sports package, excel. in and out, $1675. Call 586-2353.

74 CADDY COUPE - garaged, fully loaded, excel. cond., asking $2000. Otto, Ext. 4248 or 331-1907 eves.

84 MUSTANG - 2DSD, T roof, alum wheels, 4 spd., Michelin tires. 289-6785 after 6 p.m.

TIRES - (2) Tiempo steel-belted radials, P195/75R14, $10 each. Ext. 3919.

81 KAWASAKI LTD 440 - black, $1295. Greg, 289-6519.

72 VW SQBK - yellow, low mileage, good buy, $700. Ext. 4388 or 286-9256.

73 VW BUG - excel. running cond., new front end, brakes, muffler sys., $1000. Carol Sokolow, Ext. 2907.

75 DODGE DART SPORT - -340 c.i. 4 spd., Cragers Dunlop radials, new clutch, stereo, asking $1700. 732-7288.

78 DATSUN B210 - 46,000 orig. mi., new tires and brakes, Service manual, good cond. 473-1067.

70 VOLVO SEDAN - needs some repairs but runs well, price negotiable. Ext. 3622 or 744-2905.

CORVAN - 74 VW with warrantied Corvair eng., new radials, clutch, pb, am/fm cassette stereo. Rich, Ext. 2965 or 744-0960.

65 MUSTANG - 6 cyl., auto. trans., am/fm stereo, fair cond., asking $625. 589-0381 after 5.

63 CHEVY BELAIR - 2 dr., good running cond., new tires, clutch, battery, $400. Mark 286-4150 or John, Ext. 3292.

74 CHRYSLER NEWPORT - $300. J. Guthy, Ext. 4411/5231 or 929-8287.

74 CHEVY WAGON - p/s, p/b, auto., runs well, reg. gas $500. Jerry, Ext. 7427 or 475-5591 after 6 p.m.

Boats & Marine Supplies

16 FT. GRADY - white, wood hull, with trailer and 35 HP Evinrude, $300 or best offer. Dave, 363-6745 after 6 p.m.

CATALINA-25 - 4 sails, pop-top, Honda 9.9 o/b, VHF, compass, extras, $14,500. 473-2473 or 744-7127.

27' OWENS CABIN CRUISER - sleeps 6, fully equipped, $950. Ext. 3698, 7562 or 421-4891.

31' C+C CORVETTE - keel/centerboard, awl gripped, superb cruising boat. Joe, Ext. 7961, 722-3957 eves.

Miscellaneous

ROSS 5-SPEED TOURING BIKE - women's 26", have owner's manual, used sparingly, asking $65. Theresa, Ext. 2907.

COLONIAL LIVING ROOM SET - couch and chair, earth tones, excel. cond., must see, $350. Deb, 286-4652 after 6 p.m.

QUARTZ HEATER - like new, $25. 744-6874.

KITCHEN RANGE - 30" electric, immaculate exterior, good cond., harvest gold, $75. Tom, Ext. 4084 or 878-1060.

ELECTRIC STOVE - Bradford, 2 ovens, good cond., $35. Roger, Ext. 5212 or 878-8847.

SKI BOOTS - men's size 14 and women's size 8, binders, poles, carrier, brand new, $100 ea.; Walt C., Ext. 5316, or 325-0567.

BDRM SET - full size bed, 2 nightstands, dresser, trpl. dresser, mattress, box spring, $400. 929-4886 after 5 p.m.

TOWER SLIDE PROJECTOR - Argus, rarely used by one owner, excel. cond. 475-6717 eves.

ELECTRIC HOT WATER HEATER - 52 gal., Sears Power Miser, like new, $120. John, 924-5012.

25" ADMIRAL CONSOLE - must be seen, best offer; 1 HP deep well pump, $95. Fred, 924-3565.

UPRIGHT FREEZER - Sears 15.9 cubic ft., under maintenance agreement, excel. cond., $125. 924-5418.

RECLINER - brown tweed Herculon, like new, $150. Karen, Ext. 2950.

ANTIQUE DRESSER - 4 drawer, with good mirror, 36"H x 39"W x 19"D, $80. Walt, Ext. 7154, 759-1392 eves.

BATHRM FAUCET - gold decor, S/handle touch control w/waste assy., new, $60. Lola, Ext. 2265.

DARK MINK STOLE - size 12. 325-0191.

ORGAN - Gulbransen spinet, two manuals, 13 pedals, Leslie spkr., excel., $350. R. Hildenbrand, Ext. 3273, 732-5071.

HAMS - Heath C.W. transceiver HW-16, w/V.F.O., ant. tuner, SWR meter, coax switch, complete, $200. P. Oster, Ext. 589-2648.

CEILING LIGHT - black wrought iron, 3-way, $30. E. Williams, Ext. 3338.

WURLITZER ORGAN - double keyboard, mint cond. 821-0080 after 5 p.m.

DRESSER - young child's, $50; and headboard, white, $20. Les, Ext. 2920.

SULKY - for Gravely tractor; antique stone grinder, excel. cond. Ext. 3688.

30" MAGIC CHEF ELECTRIC RANGE - large Hotpoint washing machine, both good cond., $50/ea. Mike, 281-6070.

CROSS COUNTRY SKIS - 170 cm poles, boots, size 8, like new, $40. 467-2484.

JACKET - misses size 6, red wool, elegant, never worn, orig. price $160, best reasonable offer. Janet, Ext. 2345.

BRIDAL HAT - w/long veil, excel. cond., custom made, cost $350, sell $100. 473-9180 after 4.

DISHWASHER - Sears, undercounter, coppertone, excel. cond., $75. 924-7454.

TYPEWRITER - Smith-Corona, elec. portable, cartridge cornet, 12 brand. w/cartridges incl., carrying case, like new, $185. 654-3929.

14K GOLD RING - with 1 pt. diamond, very pretty, size 4½, $75. Ext. 2733.

CRAFTSMAN RADIAL ARM SAW - 8", good cond., $75. Dan, 286-0745.

TICKETS - (2) Stuttgart Chamber Orchestra, Stony Brook University, March 10, $10 ea. Dave, Ext. 2694 or 941-9022.

CAST IRON WAGNER 6 QT. POT - $28; old library table, 20W x 53L x 30H opens up, $35 3 storage shelves, $20 for all 3. 878-6637.

BABY GRAND PIANO - Older Koehler and Campbell with bench, good cond., ivory keys, $950. 727-6214.

SIGNOR CAPUCCINO - hardly used, up to 12 cups capacity, $60. Ext. 3701.

BOXSPRING FOR FULL BED - $20; twin bed headboard and footboard, $25. Lloyd Davis, Ext. 3952, 325-0389.

BENJI LOOK ALIKE - spayed female, very affectionate, needs loving home, good with children. Ext. 2896.

ETHAN ALLEN CANOPY BED - excel. cond, $300. 281-8916.

COLONIAL LIVING ROOM SET - large 2-piece sectional, chair, $300. J. Guthy, 929-8287.

NATIONAL CASH REGISTER - including rolls of paper, $125; Fisher table model am/fm stereo, eight track, 2 speakers, $100. Ext. 2896, 475-8640.

TAKUMAN LENSES - Pentax screw mount, f3.5/28mm, f1.4/50mm, f3.5/135mm, filters accessories, free; spotmatic body, $120. 929-3566.

SEARS BATTERY - 6 volt, never used, $25. Tom, Ext. 4662 or 929-3566.

SKI BOOTS - Nordica men's, size 10, excel. cond.; women's, size 8, good cond. 286-1076 after 3.

BMX DIAMOND BACK PRO - used 6 mo., never raced, loaded with options. 286-1076 after 3 p.m.

DISHWASHER - Caloric Model 208, used 6x, was $369, now $230; Whirlpool upright freezer, like new, was $399, now $225. Bob, Ext. 3145.

2-PIECE CUSTOM SECTIONAL - good cond., matching tables, $350; or couch, $200, tables $100 each. 473-9180 after 4.

REFRIGERATORS - GE, white, 13.5 cu. ft., $100, small white Norge, $25. 286-3903.

CALCULATOR TI58C - programmable, 480 steps, constant memory, library module, optional software, $40. Ext. 3242 or 7192.

RUG - Karastan, with padding, 100% wool, 9 x 12, light gold, rug, dark green, 8 x 10, blend, one owner and user. 475-6717 after 8 p.m.

SKI PANTS - men's 34R, dk. blue wool and poly. stretch, never worn, $75. Ext. 4727.

81 FORD FAIRMONT WAGON - pb/ps, a/c, am/fm, stereo, 6 cyl., runs well, $3795. 821-9280.

2 PROVINCIAL CANE CHAIRS - custom made seats, need repair, $50 ea., originally $250 ea. 473-9180 after 4.

8 YR. OLD BUNDY - beginner model trombone, best offer over $125, good cond. Bob, 475-4382.

DINING ROOM - Thomasville, traditional, pecan, oval table, 3 leaves, pads extra glass top, 6 chairs, 6' buffet, $500. Nancy, Ext. 7996.

MAYTAG WASHER - needs work, best offer, RCA XL-100 color TV, works well, offer. Anne, 751-6781.

2 TICKETS - Arabella, March 2, Lincoln Center, $13 each. R. Brill, Ext. 3240, 744-7127.

Car Pools

NORTHPORT - Ft. Salonga, 8:30 - 5:00, need a ride. Walt, Ext. 7154.

HUNTINGTON STATION - Melville, 3 person car pool, looking for fourth. Joe, Ext. 4259.

RONKONKOMA - drivers to join 2-driver pool, near LIE Exit 59, 8:30 - 5 p.m. Victor, Ext. 2395.

BELLPORT - need individual to complete 4-person car pool, 8:30 - 5:00. George, Ext. 7654.

ELMHURST QUEENS - wishing to join or start car pool. Frank, Ext. 7915.

SEACLIFF OR EXIT 39 - need to join car pool. Rick, Ext. 4367.

Real Estate

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

For Sale

BLUE POINT - 2.3 acre, mini farm, large barn, large renovated farm house, much more, $159,000. Ext. 3688 or 363-7032.

E. NORTHPORT - charming cape, 3 bdrms, 1½ baths, living room with fireplace, EIK, sunroom, pantry, 1/3 acre, SD #4, minutes from parkway and train, $1200 taxes, $129,900, evenings 261-7280.

For Rent

MASTIC PARK - 1 bdrm. apt., small, private entrance, security, references, $275. 281-7844.

N. SHIRLEY - large furn. studio apt. w/kit., util. incl., priv. ent., prime area, 1 person, $350 all. 281-8044.

BELLPORT - 2 room apt. in priv. house, light cooking, separate ent., single person only. Call 286-8740.

EASTHAM, CAPE COD - June - Sept.; 4 bdrm. house, sleeps 8, 2 baths, washer-dryer, dishwasher, deck, near beaches, $575 wk. Ext. 2384.

Lost & Found

FOUND - earring in cafeteria. Bill, Ext. 7229.

Free

PUPPIES - chubby, mostly black, all American. John, Ext. 3675, 924-3528.

TV - 25" color, table model, plays but needs tuner work. Duke, Ext. 2957.

73 WHITE TOYOTA - good for parts, yours for towing away. Kay, Ext. 3592.

Wanted

ARIENS SNOWBLOWER - 5 hp or up. Walter, 878-8967.

TRAINS - Lionel, American Flyer, accessories, any cond., brings good price. Carole, Ext. 3362 or 924-4097 eves.

ROOMMATE - share large 4 bdrm. house, 5 min. to Lab, wash./dryer, etc., $200+. Bill, Ext. 2378.

HOME - for mixed lab., excel. inhouse, excel. disposition, golden in color, 35 lb., young, full grown. SE2-2754.

"ABNER READ" - survivors reunion, were you there in 44? Al Gill, 724-4514.

DONATION - for needy elderly invalid, comfortable chair, not too large, St. Anthony's. Linda, 821-9450.

CAR - good cond., reasonable, Jon, 744-7242 after 2 p.m. or Russ, Ext. 3959.

DINGHY OR ROWBOAT - any cond. Tim, 588-0154.

PEOPLE FOR RAFTING - anyone interested in rafting, people getting together for group rates. Nolan, Ext. 3084 or 744-1234.

BALLET SLIPPERS - for a three-year old girl, size 6½-7½, tap dance shoes also needed same size. Sandra, Ext. 4933.

AUTO LUGGAGE CARRIER - closed type and camping gear. Brian, Ext. 4383 or 3106.

WORLD GLOBE - children's wooden chairs for 6-yr.-olds; old Lego special pieces. Anne, 751-6781.

BABYSITTER - for 2-mo.-old in Stony Brook area, prefer near M section, 3 days/2 wks. Ext. 7505, 689-8605.

CRIB - 878-2233 eves.

CHILDREN - to watch in my home weekdays. I have had professional early childhood training. 928-9045.

20" GAS RANGE - in good cond. Ext. 2964.

CAMPBELLS SOUP LABELS - send to F. Chandler, Bldg. T-89. (For St. Mary School, East Islip.)

WOOD CARVING TOOLS - knives, chisels, etc. George Hrabak, 589-0819.

USED CLARINET - must be good make and cond. Bob, Ext. 4204.

WHOLESALE REP. - part time only, call for appointment. 732-6647.

Classified Ad Policy

Deadline is 4:30 p.m. Friday for publication Friday of the following week.

1. The Brookhaven Bulletin's classified section may be used only by active and retired Laboratory employees.
2. All items for sale or rent must be the advertiser's property.
3. Ads for material acquired for resale in association with a full or part-time business cannot be accepted.
4. Ads for the sale or trade of firearms will not be accepted.
5. Ads not carried because of space restrictions will be held for publication in the next issue.
6. Ads are run only once and must be resubmitted if they are to be repeated. One ad per person per week.
7. **Property for sale or rent cannot be accepted on this form. Special Real Estate Ad Forms are available at the office of the Brookhaven Bulletin, Building 134.**

☐ For Sale: Autos & Auto Supplies
☐ For Sale: Boats & Marine Supplies
☐ For Sale: Miscellaneous
☐ Car Pools
☐ Wanted
☐ Free
☐ Lost & Found

Please print your ad below in 15 words or less using one word per block. Include name and phone number to call.

Note: The following must be completed for your ad to appear.

NAME (Please Print) .....

Employee's Signature ..... Life No. ..... Ext. .....

Send to: Brookhaven Bulletin, Building 134 (Ext. 2345).

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