BROOKHAVEN BULLETIN
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BROOKHAVEN NATIONAL LABORATORY

'One-Spin' Physics at AGS Yields Unexpected Effects

Experiment 748, designed as a precursor to experiments with polarized proton beams at the Alternating Gradient Synchrotron (AGS), concluded its final run on Friday, May 11, with the observation of some very unexpected effects.

In a polarized proton beam or target, all the protons spin in the same direction. To prepare for upcoming experimentation with such a beam, the researchers made what Alan Krisch, who heads Exp. 748, called a "low-priority" measurement of spin effects. They looked at how the particles scattered in a "one-spin" experiment, when an unpolarized proton beam hit the group's polarized proton target and bounced off at very large angles. And the results surprised them.

Contrary to the predictions of the theory of Quantum Chromodynamics (QCD), Krisch said, "The spin-orbit effects in proton-proton scattering appear huge. Even with only a polarized proton target we see very big spin effects in large angle scattering. The protons have these violent head-on collisions three times more often when their spin direction is up."

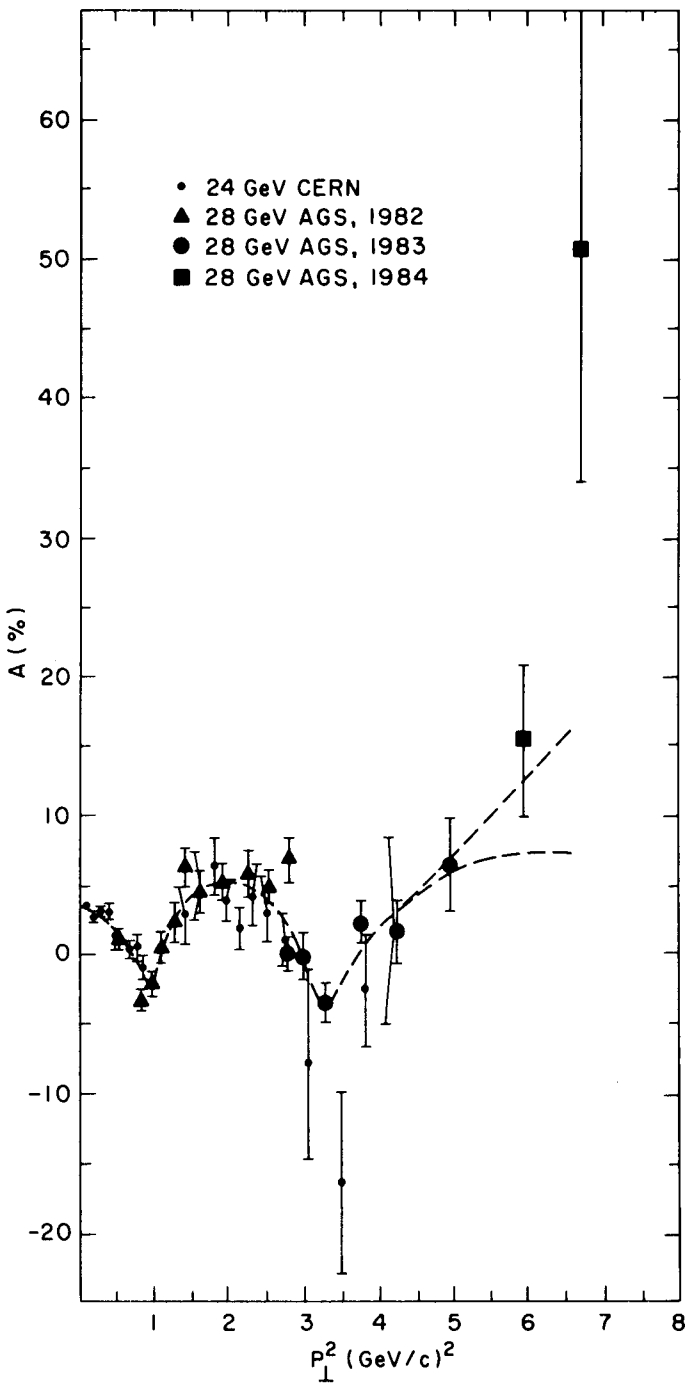
Krisch, a University of Michigan professor who also heads Brookhaven's effort to commission the polarized proton beam at the AGS, began experimenting with polarized protons at Argonne National Laboratory's 12 GeV Zero Gradient Synchrotron (ZGS) in 1972. In 1977, he and his colleagues found, at the ZGS, that when a polarized proton beam hits a polarized proton target — a "two-spin" situation — violent collisions hardly ever occur unless both protons spin in the same direction. When the beam and the target protons spin in opposite directions, the protons just want to pass through each other, also in contradiction to QCD. Krisch came to BNL in 1978 to work with a Michigan/BNL/Maryland/Miami/Notre Dame/Rice/Texas A&M/ETH Zurich collaboration, to determine whether or not these spin effects continue to increase at the AGS' higher energies of up to 30 GeV.

While "two-spin" tests were an important item on their agenda, there was only secondary interest in seeing what would happen in the "one-spin" case. The experimenters' primary purpose in this final run was to see that all their equipment was in working order for the advent of physics with polarized proton beams, expected to commence in mid-June.

The reason they were not optimistic about finding anything exciting with only a polarized target was, Krisch said, "because the physics community, even us, didn't expect any large 'one-spin' effects." And in fact, that's what similar experiments at Fermilab and CERN had shown, at even higher energies, but at lower transverse momenta.

Exp. 748 was considerably different from those experiments, using what Krisch termed "various kinds of polarized proton target 'black magic.'" The magical ingredients included a special helium mixture in the cryogenic system used to cool the target to 0.5 K (about -459°F), and pure ammonia beads radiation-doped here at the National Synchrotron Light Source. This combination enabled them to run with a beam intensity of almost 10^{11} (100 billion) protons per pulse and to measure spin effects in the very rare collisions at a transverse momentum squared of up to 6.6 $(GeV/c)^2$, which was "considerably larger than ever before tried anywhere," Krisch said.

And when the data came in, they showed that these violent collisions occurred three times more often when the spin is up, as opposed to when the spin is down. "These results seem especially interesting," said Krisch, "since most physicists believe that violent large angle scattering events are caused by direct collisions between the protons' constituents, which are called quarks. It is so far impossible to understand why the quarks are only willing to scatter when the protons are spinning in certain ways."



As these results from Exp. 748 show, spin effects increase when an unpolarized beam collides with a polarized target at 28 GeV. Note how the analyzing power (A) rises dramatically to about 50% when the transverse momentum squared is near $P_\perp^2 = 6.6$ $(GeV/c)^2$.

Richard Raymond, a research associate at Michigan, presents these unanticipated observations this week at the Conference on Intersections Between Particle and Nuclear Physics in Steamboat Springs, Colorado. But he may not go beyond reporting this "inexplicable mystery." As Krisch said, "We're not too eager to make any predictions about what we will find when we have both a polarized target and a polarized beam, since all our predictions about spin seem to be wrong. But we'll find out pretty soon anyway."

— Anita Cohen

A Visitor's View

Richard Peto, Epidemiologist

"There is an epidemic of fear of cancer," says Richard Peto, an epidemiologist from the Radcliff Infirmary, Oxford, England, and a lecturer in cancer studies at the University of Oxford. Though people are living longer and longer, they are feeling worse about it. Because there are far fewer deaths from other causes, people fear dying of cancer."

Roger Stoutenburgh

Richard Peto

Peto asserts that the majority of cancers is largely avoidable; that, with the exception of lung cancer, the cancer rates have not increased in the U.S.; and that epidemiologically-based studies are better than laboratory tests to discover the major causes and correlates of cancer.

Peto studies the statistical aspects of epidemic diseases such as cancer, and is particularly interested in the relationship between laboratory and animal studies. He works with Richard Doll, an Oxford emeritus Professor of Medicine who discovered, or helped document, the health effects of tobacco, asbestos, radiation and oral contraceptives. They have written The Causes of Cancer, a book for non-epidemiologists, which provides an overview of what is known and not known about practicable means of avoiding cancer, and where knowledge should be sought. The material in the book was commissioned by the Office of Technology Assessment of the U.S. Congress to review the relative importance of different causes of cancer.

At an international workshop held this week at BNL on the assessment of risk from low-level radiation and chemical exposure which was sponsored by DOE and the National Cancer Institute, Peto presented a symposium lecture during which he questioned the importance of conventional risk assessment in the control of human cancer.

"Obviously, you should use the information you have from animal studies to make prudent restrictions before you have human evidence," says Peto. "At the moment, we are basing all of our anti-cancer campaigns on animal research and on controlling causal agents of a relatively small number of cancers. I suspect that the really important determinants of human cancers will be discovered by observing humans and finding out what is special about humans who get cancer rather than by testing animals. Animals are not good as models: they don't naturally smoke cigarettes, or do a lot of things that affect humans.

"I'm not trying to say that animal studies are irrelevant," he continues, "but I think if you base too much on laboratory tests, you may miss finding the important cause of human cancer. The epidemiological approach has yielded the most important findings which would have been missed by routine animal studies."

"We know that there are non-genetic causes of cancer because cancer rates follow certain trends," says Peto. "The onset rates of some cancers, like that of the lung, are changing. Second, there are big differences in cancer onset among different countries and within one country. There is no cancer that is common everywhere, though there are some that are rare everywhere.

"Third, if you look at migrants from an area of low cancer incidence to one of high cancer incidence, after they have been living in their new region for some time, they end up with about the same cancer risks as natives in

(Continued on page 2)

Roger Stoutenburgh

Representatives from the nuclear industry — utilities; plant manufacturers and vendors of training simulators — crowded into a conference room in Building 515 on May 9 to hear Wolfgang Wulff (standing at left), DNE, describe and demonstrate the BNL plant analyzer. Stanley Lekach (seated, rear right), DNE, operated the video displays by personal computer and local network. Lekach communicated via telephone to Hsiang-Shou Cheng and Alexander Mallen, both in DNE, who were operating the plant analyzer on another floor of the building. Doug Humphrey, P&GA, provided a video transmission of the plant analyzer's output to the conference room so that results could be presented during the simulation. Wulff's presentation was part of an all-day workshop on the plant analyzer, a computer system that models the workings of a nuclear power plant and predicts what will happen in transients (events in progress). The plant analyzer was developed as a supplement to the large and cumbersome computer systems now in use by nuclear plant operators, operators in training and the U.S. Nuclear Regulatory Commission acting in its capacity of licensing and regulating. Compared to the large systems, BNL's plant analyzer is a hundred times faster. Because of that speed, for example, a plant operator can compute in advance the results of various actions he or she might take in response to a particular event.

Cancer

(Cont'd)

their new area."

Peto uses the example of cancer of the large intestine in American black people compared to West African blacks. "At any given age, cancer of the large intestine is approximately equally common among American whites and blacks, yet is only one-tenth as common among West African blacks."

From this evidence, Peto concludes that "at least 75% and perhaps as much as 90% of all cancer deaths might be avoidable by adopting whatever habits give you low risk for each type of cancer. This may not be acceptible or practicable," he concedes.

"Obviously, there are many aspects of the life style in poor countries that no one in developed countries would willingly adopt even if it meant lower risk of cancer," he continues. "But there may be only minor changes necessary, or there may be some things that can be done that are analogous to the life style changes."

To avoid the most cancer deaths, Peto feels that government and research should concentrate on the predominate cancers: lung, breast, large intestine, and stomach because "a moderate effect on a big cause of cancer is much more effective than a total effect on a small cause, but that doesn't mean you forget the small causes." And the biggest cause of American cancer is cigarette smoking.

"Cigarette smoking causes 30% of all cancer deaths in the U.S.," says Peto, "and kills even more people by respiratory and heart disease than by cancer. About 300,000 deaths per year, or 15% of all American deaths, are caused by tobacco. Cigarette smoking is three times as important as all the other known causes of cancer and ten times as important as the next biggest known cause, alcohol.

"But how many people know that? According to public opinion polls, they believe that radiation and chemicals in the workplace and environment are more important causes of cancer than cigarette smoking. The media coverage on carcinogens has been diversionary. As a result, the degree of misinformation makes serious cancer prevention difficult."

Peto suggests putting a stronger wording on cigarette packages, like "Warning: about a quarter of the people who smoke cigarettes regularly will be killed before their time by it." He also suggests decreasing tar levels in a more scientific manner and increasing the cigarette prices. "Those who stop smoking before they have cancer, or heart or lung disease, avoid nearly all risk of dying from tobacco-induced diseases," says Peto, "but since smoking is something people do to themselves, there is much less interest in stopping it."

"The control of cancer chiefly involves the avoidance of smoking and finding out the causes of other cancers," adds Peto. "We don't see catastrophic increases in cancer, and we do see that currently common cancers are avoidable."

— Marsha Belford

Sunday Tours

BNL's summer tour season will begin on Sunday, June 3. The public is invited to visit the Lab any Sunday, except Labor Day weekend, until the end of September. The free Sunday tours run continuously between 10 a.m. and 3 p.m. and include a guided bus ride around the site and a guided walking tour of the Exhibit Center where dozens of displays describe the Lab's research. The complete program takes about two-and-a-half hours. No reservations are necessary.

NYC Train Trip

The Hospitality Committee is planning a group railroad trip to New York City on Wednesday, June 6. Departure will be at 7:55 a.m. from the Patchogue LIRR station. Round-trip fare for adults is $5.00; children under five years ride free.

Reserve a ticket by sending your fare through the U.S. mail to BNL, P.O. Box 322, Upton, New York 11973. Please do not send cash. Checks or money orders, payable to BNL, must be received by Thursday, May 31. Put the date of the trip, your BNL life number and your phone number on the back of your check or money order. Your tickets will be given to you at the railroad station on the day of the trip. Refunds will be made only if cancellations are received by the Monday morning preceding the trip.

The Thirteenth Edition of the G. E. Chart of the Nuclides, Revised 1983, is now available at the Library. To obtain a copy, call Ext. 5068.

Lunchtime Eclipse

On Wednesday, May 30th, a thin, broken ring of dazzling sunlight will appear around the moon as it obscures the sun during an unusual solar eclipse over the Western Hemisphere. As the moon passes between the sun and the earth, it will appear to be almost as big as the sun, and will hide almost all of the sun from the earth during what is known as an annular eclipse.

The center path of this partial eclipse will pass across a narrow region of the southeastern U.S., where observers should see the annulus, or ring. Since we are not in the central path, Long Islanders should be able to observe a thin crescent of the sun as it is hidden by the moon at about 12:55 p.m. Eastern daylight time if the day isn't cloudy. Around the time of maximum eclipse, the midday sky will dim, the temperature will drop, and animals will behave oddly.

To allow employees on their lunch break to safely watch this astronomical phenomenon, two groups at the Lab will establish observation posts.

The Astronomy Society invites on-site eclipse watchers to their observatory by the ecology field near the eastern site boundary; there the 8-inch Newtonian telescope will be used to project the eclipse on a screen. In addition, Cesar Sastre, DNE, president of the club, will try to focus a television camera on the sun and display the eclipse on a monitor.

Peter Takacs and Gene Von Achen, Instrumentation, have put together a heliostat and will set it up in the parking lot on the north side of Bldg. 535. The heliostat also will project the image of the sun onto a screen, and is similar to a telescope, says Takacs.

Though the sun moves in the sky, the heliostat appears to make the sun stand still; a mirror mounted on the device is used to track the sun's movement and to hold its image on the screen. The axis of the heliostat is lined up with a compass to point north-south, and the axis of the mirror points towards the North Star.

"We assembled the heliostat over several lunchtimes from stuff we had around our lab: aluminum rods, clamps, two lenses and a mirror," explains Takacs. "We'll mount it on a cast iron bench so that it won't be affected by vibration." Takacs and Von Achen became interested in this project after Von Achen built a pinhole camera for his children so they could safely observe the eclipse. "We thought it would be nice for employees to be able to watch the eclipse without damaging their eyes," says Von Achen.

For those who wish to safely gaze directly at the eclipse, Von Achen and Takacs will have 12 special filters available. "They were made in our coating shop by coating glass with a thin film of chromium," explains Takacs. "They act as neutral density filters for infrared and visible light by reducing the intensity of the radiation so that it will not injure your eyes."

According to Sky & Telescope, a magazine for amateur astronomers, the damage the sun can do to the eye during a partial eclipse is just as severe as at any other time. However, observers may think they can observe the sun directly during the partial phases without harm because less visible light enters their eyes. But the image of the exposed sun remains on their retinas for longer than usual because they are less likely to blink or move their eyes as the sun becomes covered. As a result of the sun's brilliance being focused on the retina, severe and permanent heat damage to the eye may occur.

After the eclipse of March 1970, 145 cases of eye injury were reported in the U.S. among people who watched the sun either directly, or through inadequate filters. Unsafe filters include over-exposed film, gelatin filters, color film, photographic neutral-density filters, crossed polarized filters and smoked glass. Although these filters appear dark at visible wavelengths, they are transparent to the infrared where most of the light from the sun occurs.

— Marsha Belford

Roger Stoutenburgh

Mrs. Warren Winsche and her daughter, Barbara Mitarotondo, were present at ceremonies on May 14 at BNL honoring the late Warren Winsche and Clarke Williams who had both served as deputy directors of the Lab. Two cherry trees and a plaque in front of Berkner Hall were dedicated to their memory. The plaque reads: "Clarke Williams and Warren Winsche — their leadership was important in making Brookhaven a great laboratory." The trees and plaque were made possible by donations from their Brookhaven friends and colleagues. Mrs. Clarke Williams was unable to attend because of illness.

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IBEW Meeting

Local 2230, IBEW, will hold its regular monthly meeting on May 30 at 6 p.m. in the Knights of Columbus Hall, Railroad Ave., Patchogue. There will also be an afternoon meeting at 2 p.m. for shift workers in the Union office at 31 Oak Street, Patchogue. On the agenda will be regular business, committee reports, the president's report and nominations for officers.

Diners Note

The Center Club will be closed on Sunday, May 27, the day preceding Memorial Day. It will reopen on Monday evening, May 28.

The Cafeteria will be open from 9 a.m. until 2 p.m. on Saturday, Sunday and Monday, May 26, 27 and 28.

The Vended Food Service in Bldg. 912 will be in continuous operation.

Cafeteria Menu

Week Ending June 1

Monday, May 28
Snack Bar Service 9 a.m. - 2 p.m.

Tuesday, May 29

Beef barley soup	(cup)	.65
	(bowl)	.85
Country fried steak & 1 veg.		1.95
Ham & noodle au gratin & 1 veg.		1.85
Hot Deli: Knockwurst & sauerkraut	(bread)	1.85
	(roll)	2.00

Wednesday, May 30

Split pea soup	(cup)	.65
	(bowl)	.85
Beef & broccoli stir fry on rice		2.05
Baked Italian lasagna & 1 veg.		2.05

Memorial Day Special
Prime Ribs of Beef
w/choice of baked potato w/sour cream or rice pilaf
w/choice of cauliflower au gratin or peas and pearl onions 3.60

Thursday, May 31

Minestrone soup	(cup)	.65
	(bowl)	.85
Beef liver & onions w/1 veg.		1.80
Barbecue spareribs w/1 veg.		1.95
Hot Deli: breaded chicken cutlet	(bread)	2.00
	(roll)	2.15

Friday, June 1

Seafood chowder	(cup)	.65
	(bowl)	.85
Beef stroganoff on noodles		2.00
Broiled fish fillet & 1 veg.		1.85
Hot Deli: Baked ham	(bread)	1.85
	(roll)	2.00

Fishing Camp

The Cooperative Extension and The Fisherman magazine will hold an overnight Youth Sport-fishing Camp at the 4-H Camp in Riverhead. The program is for boys and girls between the ages of 12 and 14 who want to learn saltwater fishing skills and become better anglers.

The cost for the overnight program is $25, which includes meals and instructional supplies. The program will feature both classroom instruction and time for fishing in Long Island Sound. For additional information and registration forms, contact Robert Kent, Cooperative Extension Agent, 727-7850.

BERA News

Roger Stoutenburgh

1983-84 BADMINTON CHAMPS: In the ladder tournament, 1st place was won by Naresh Bhagat; 2nd place, John Elmore; top place female, Gail Williams; most weeks in 1st place, John Elmore; most matches played, Ken Perkins; best left-handed, John Guthy. In the elimination tournament, Om Singh took 1st place and John Elmore, 2nd place. Above, from left, are Om Singh, Naresh Bhagat, Gail Williams, Ken Perkins, John Elmore and John Guthy.

Tennis

Court Reservations

Two tennis court reservation systems will go into effect on Monday, June 11. The rules for court use are posted at courtside and in the BERA Sales Office, Berkner Hall.

Tennis Ladder

Men and women are invited to compete in the Tennis Ladder which will begin on Monday, June 4. Sign-up sheets and ladder rules are now posted at the BERA Sales Office. Player rankings will be posted by Friday, June 1 and will be according to the order of sign-up. Players will be allowed one free challenge until June 15. Thereafter, the posted rules will apply. The ladder will be run this summer by Tennis Committee member George Oldham. Other members of the Committee are Eena-mai Franz (chairman), Naresh Bhagat, John Elmore, Andy Kevey, Marilyn McKeown, Steve Shapiro, Niels Schumburg, Paul Valli and Gail Williams.

Annual Tournament

The tournament will get under way on Saturday, July 21 and players can sign up at th BERA Sales Office beginning June 25. Further details will be given in a later issue of the Bulletin.

Note: It is against Laboratory policy for anyone to use Lab facilities for profit. This includes use of the tennis courts for conducting paid, private tennis lessons.

Softball

League I
Games of 5/15/84
Blue Jays 19 — Moles 0
Six Pax 9 — Ice Pops 8
Phoubars 16 — Renames 10
Ravens 12 — Big Sticks 5

League II
Games of 5/16/84
Dirty Sox 20 — Titans 6
Faze II 20 — Random Errors 8
Medical 10 — Scram 9
Magnuts 15 — Lights Out 8

League III
Game of 5/14/84
E-Z Riders 13 — Nads 9
Games of 5/17/84
Farm Team 13 — Source 8
Survivors 6 — No Names 5

League IV
Game of 5/10/84
Mole-Esters 18 — Underalls 0
Kidz-R-Us vs. Turkeys
Game postponed
Game of 5/14/84
Septembers 4 — Mole-Esters 3
Games of 5/17/84
Kidz-R-Us 15 — Underalls 9
TNT vs. Turkeys
No score reported

League V
Game of 5/10/84
Foul Ups 11 — Space Kadets 10
Game of 5/14/84
Who Cares 12 — No Feedback 8
Games of 5/17/84
Mudville Sluggers 10 — Space Kadets 3
Foul Ups 21 — Erasers 7

PSI News

The Upton Chapter of PSI elected officers for the coming year at its May meeting. They are:

President — Mary Cooper
Vice President — Patricia Durcan
Recording Secretary — Susan Carlsen
Corresponding Secretary — Geraldine Callister
Treasurer — Wendy Westfall

The installation of officers and new members will take place on June 18 at Berkner Hall. Details will be made available shortly.

Microcomputer Club

A short course on CPM (a popular micro-operating system) will start on Thursday, May 31, and continue for several weeks. Meetings are held in the small conference room of Biology (Bldg. 463) from noon to 1 p.m. For further information, contact Jim Hainfeld, Ext. 3372.

Arrivals & Departures

Arrivals

None

Departures

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

William C. Metz ..... DAS
Roger C. Newman ..... DAS
Walter A. Sevian ..... DAS
Janet Woodward ..... DNE

Rifle & Pistol Club

The BNL Rifle & Pistol Club will begin a new season of outdoor pistol matches on Thursday, May 31. A total of twelve matches will take place each Thursday, except on Lab holidays, at 1715 hours on the BNL outdoor range. For information call Joe Gatz, Ext. 3582, or Otto Jacobi, Ext. 4428.

Pool/Gym

The pool and gym will be closed on the Lab holiday May 28.

Starting on May 26 and continuing through September 2, the gym will be closed on Saturdays and Sundays.

On the Aisle

When a 20-minute rest stop becomes a four-hour encounter among the passengers and driver of the bus from Kansas City, and the waitresses and patron of a small town greasy-spoon, the amusing yet disconcerting ordeal moves nearly everyone — including those in the audience of Bus Stop, William Inge's 1955 three-act play being presented by the BNL Theater Group in Berkner Hall.

The plot primarily explores how three pairs of men and women manifest their different forms of love for one another.

The most undiplomatic lover of the three men is Bo Decker, a young rancher and cowboy played with earnest brashness by Neil Baggett. Bo owns his own ranch in Montana, to which he is returning from a rodeo in Kansas City where he claims he "'bout won ev'ry prize there was."

One night during rodeo week, Bo wandered into the Blue Dragon, a local night club, where he fell in love with the chanteuse Cherie, a young woman who escaped from a hillybilly life in the Ozarks. She is portrayed with pseudo-sophistication and sweetness by Peggie Woody. After that night, Bo won't take no for an answer. He can't understand why she won't marry him and go back with him to Montana.

Two father figures teach Bo that "a gal might not love him," and that "some people have their own reasons" for not wanting to go with him. These gentlemen have major impact and are wonderfully understated. Bill Love plays ranch hand Virgil Blessing with stoic fortitude, and Karl Swyler portrays the local sheriff Will Masters with compassion and integrity.

The other couples, while they do not advance the action, enhance the plot and provide variations on the love theme. The most romantic and idealistic pair is the mismatch of Dr. Gerald Lyman and Elma Duckworth. He is a former college professor, played with witty insight and existential despair by Kurt Fuchel, and she is a waitress and high school student, portrayed by Rose Milone with wide-eyed innocence and clear-headed intelligence.

Grace Hoylard, the owner of the restaurant, is acted by Jane Love with earthy pizzaz, and Carl, the bus driver, is performed by Bob Kinsey. The pair, while wishing to be discreet, is the most bawdy.

The last two performances of Bus Stop will be tonight and tomorrow night, at 8:30 p.m. in Berkner Hall. Tickets are on sale at the BERA Sales Office for $3 general admission, and $2 for students under 18 and senior citizens. Tickets will also be sold at the door for $4 and $3 respectively.

—Marsha Belford

Bowling

Championship Games

Pink League

The Survivors took first place by defeating the Squealers in the roll-offs. Good games were bowled by Betty Jellett 172 and Ellie Kristiansen who had a 173 and converted the 4-7-10.

White League

No Cigar took first place by defeating the Draftecs. High games were bowled by A. Pinelli 201, K. Griffin 174 & 191, K. Conkling 187.

Purple League

The Pen Macs defeated the Pinsplitters for first place. High games were bowled by J. Ferrante 201, 201 and 202, C. MacDougall 185 and 222, J. Penoyar 171, D. Penoyar 175, G. Fales 173.

Red/Green League

The Designers beat the 76'ers for the championship.

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 Laboratory employees.

2062. ELECTRICAL ENGINEER - Requires MS in electrical engineering or equivalent degree, with a broad background in analog circuit engineering, controls and computer interfacing. Position involves controls and interfacing of electronics with experimenters in the external beam lines of the NSLS. Experience with highly regulated power supplies for magnet loads would be an asset. National Synchrotron Light Source Department.

2063. INDUSTRIAL ENGINEER - Requires a BS in science or engineering to handle Source and Special Nuclear Materials Accountability to work in the Isotopes and Special Materials Group. A strong background in mathematics and physics is required to perform calculations involved with half-life shielding, self absorption and gamma spectroscopy. Basic computer programming is essential. The ability to obtain a "Q" clearance is mandatory. Safeguards and Emergency Services Division.

2064. TECHNICAL POSITION - Requires AAS in electronic technology or equivalent and a minimum of 3 years' experience in the installation, maintenance and operation of complex logic systems. Background in safety systems and their interactions with vacuum, pneumatic and security systems desirable. Knowledge of machine shop practices necessary. National Synchrotron Light Source Department.

2065. TECHNICAL POSITION - Requires AAS in a technical field or equivalent experience or knowledge of precision instrumentation, ultra-high vacuum techniques and machine shop practices. Ability to do basic electronic troubleshooting and experience with test equipment necessary. Will provide beam line technical support. National Synchrotron Light Source Department.

2066. TECHNICAL POSITION - Requires AAS in technical field or equivalent. Will be primarily responsible for experimental safety operations. Duties include safety systems checkout, beam line documentation and liaison between control room and experimenters. Additional responsibilities will include the electromechanical technical support of beam lines. National Synchrotron Light Source Department.

OPEN RECRUITMENT - Opportunities for Laboratory employees and outside applicants.

2067. HEAVY EQUIPMENT MECHANIC OPERATOR - Requires demonstrated ability to maintain, repair and operate all material handling, earthmoving, road and ground maintenance and related equipment. Plant Engineering Division.

2068. REFRIGERATION AND A/C ENGINEER -Requires substantial experience troubleshooting, repairing, installing and operating commercial/industrial air-conditioning and refrigeration equipment including steam absorption, centrifugal and helical screw refrigeration machines. Successful completion of refrigeration and A/C apprenticeship program or related course work is highly desirable. Must be available to work shifts as required. Plant Engineering Division.

2069. ASSISTANT MANAGER - ENGINEERING OPERATIONS AND MAINTENANCE -Requires a BS in mechanical engineering and an in-depth knowledge of plant utilities including mechanical, electrical and all related systems. Will be responsible for all technical aspects as well as the overall responsibility for the proper operation and maintenance of the physical plant and related systems. A PE license is desirable. Plant Engineering Division.

Autos & Auto Supplies

78 FORD THUNDERBIRD - 302-V8, Town Landau, all power, auto., stereo, mags, new radials, brakes, battery, etc., $3,500. Ext. 2492 or 475-8658.

79 HONDAMATIC CM - 400A, 3,700 mi., $1,100. 732-2668 after 6 p.m.

73 PONTIAC - station wagon, good cond., trailer hitch, roof rack, p/s, p/b, $1,100. Pat, Ext. 3376.

SNOW TIRES - (2) for 78 Honda Civic, good; a few regular tires, all for $40. Divadeenam, Ext. 5076.

71 VW SUPER BEETLE - runs well, good transp. new muffler, $400. Ext. 4238 or 286-3509.

81 HONDA ACCORD - LX, excel. cond., 5 spd. am/fm stereo. 589-6151.

81 PLYMOUTH HORIZON - a/t, 4 door; 74 Volvo wagon, very good cond. Ext. 4360 or 689-9644 after 4:30 p.m.

76 DATSUN B-210 - hatchback, a/c, 4 spd., very clean, orig. owner, $1,400. George, Ext. 4460.

74 MAZDA PICKUP - w/cap, $1,000. 744-9812 after 6 p.m.

75 BUICK REGAL - 4 dr., auto., p/s, p/b, a/c, stereo, many new parts, good cond., $1,000. 878-8967 after 5 p.m.

81 HARLEY DAVIDSON - 1000 CC, Sportster, low mi., top cond. 929-3455.

82 KAWASAKI - KDK 175, dirt bike, excel. cond., $950. 821-1042.

76 MAZDA - 4 cyl., 4 spd., excel. mech., $1,200. Ext. 4482 or 277-1129 eves.

73 VW - wrecked, but good for parts, rebult engine, $150. 744-3552 after 5 p.m.

69 CHARGER - needs work, $400; 73 Fiat engine, excel. cond., $150. 924-0960.

TIRES - (4) ER78-14, (1) G78-14, good for spares, $5 ea. Ext. 7505 or 689-8605.

76 MERCURY MONARCH - excel. running cond., many extras, $1,700. 744-6423.

82 SUZUKI - 6S750, excel. cond., 3,500 mi., must sell. Bill, 281-6022.

81 TRANS AM - special edition, turbo, black & gold, 1,100 mi., a/c, p/s, p/b, p/w, power locks, $2000 stereo, alarm, cruise, T-roof, more, better than new, $10,500. Dick, Ext. 2911.

79 CHEVETTE - good cond., very reliable, snow tires, new brakes, $1,750. Richard, Ext. 4332 or 3079.

80 MERCURY CAPRI - all power loaded, excel. Lisa, 924-3281 or 369-1844.

81 HORIZON - 4 dr. auto.; 74 Volvo wagon, very good cond. Ext. 4360 or 689-9644 after 4:30.

73 SUPERBEETLE - rebuilt engine, new muffler, radials, asking $800. Kim, 261-2600 days or 754-3352 eves.

79 CHEVY MONZA - 4 spd., p/b, p/s, runs great, am/fm, stereo, asking $1850. 744-6049.

79 CHEVY VAN - p/b, p/s, 6 cyl., runs excel., 53,000 mi., asking $3,200. 821-9280.

71 TOYOTA JEEP - needs work, runs good, new parts, extras, $1,350. 281-4871 eves.

80 CHEVY CITATION - p/b, p/s, a/c, hatchback, am/fm stereo, many extras, $2,275. 821-9280.

72 FORD STATION WAGON - runs good, needs work, $225. 924-0277.

82 HONDA MOTORCYCLE - CM-250, custom, 1,000 mi., windshield, luggage rack, saddle bags, helmet incl., $1,000. John, Ext. 4417 or 929-8748.

78 KZ400 - new chain & sprockets, recent tires & Diehard, dealer serviced & maintained, 14K, asking $950. Ext. 7148.

71 COMET - 302 cu., auto., needs muffler & alternator, $225. Jim, 878-8984 after 2:30 p.m.

MAG WHEELS - (4) w/P185R70x13 Eagle NCT's mounted, $300. Eric, Ext. 2973 after 5 p.m. or 289-2352.

70 TORINO - auto., p/s, p/b, new battery, starter, regulator, excel. running cond., reliable, body damage, $350. Divadeenam, Ext. 5076.

76 AUDI/FOX - 2 dr., std., 30,000 mi. on new engine, many new parts, 30 mpg, regular, $2,650. Ext. 2435 or 473-6183.

80 HONDA ACCORD - hatchback, am/fm, 8-track, good cond., brown, $3,800 firm; 83 Honda Accord, hatchback, am/fm, 8-track, mint cond., blue, low mi., $7,800. 929-4268.

74 VW SUPERBEETLE - good cond., rebuilt eng., radio, snow tires, $1,100. Ext. 7311 or 286-0918 eves.

78 CHEVY IMPALA WAGON - excel. cond., 48K mi., a/c, $3,200. 331-5439.

74 MUSTANG - 4 spd., 6 cyl., am/fm. 744-6668 after 6 p.m.

MOTORCYCLE HELMET - w/flip-up face shield, orange w/black trim, new, $15. 473-1456.

78 DODGE VAN - 6 cyl., a/c, 3 spd. on column, 67K mi., asking $3,000. Helen, Ext. 7791.

77 TOYOTA COROLLA - good running cond., $1,500. 472-4871 after 6 p.m.

81 HONDA MOTORCYCLE - CM400E, low mi., excel. cond., $900. Ext. 4581 or 924-8634.

TIRES - set of 4, 14/35-16-5, excel. cond., Dick Cepek Off Roaders. Paul, 281-6022.

Boat & Marine Supplies

12' SEARS SUPER GAME FISHER - excel. cond., $300; 6-1/2' fiberglass dinghy, very good cond., $125. Greg, 286-0065.

13' AMF PUFFER - main, jib, spinnaker, great beginning & fun sailboat, $1,500. Joe, Ext. 7961 or 369-0432.

78 HIGHLANDER BOAT TRAILER - 900 lb. capacity, good cond., $150. Ext. 3604 or 878-0516 after 6 p.m.

18' STARCRAFT - alum., cuddy cabin, 100 HP Johnson, hyd. lift trailer, elec. winch, $2,800. 928-0848.

18' STARCRAFT - Chieftain, alum., cruiser, needs paint, very good cond., boat only, $600. Sanchez, Ext. 3848 or 281-6498.

18' FIBERGLASS BOAT - & trailer, no motor, $600. Bill, 281-6022.

19' CAPE DORY DAYSAILER - many other used sailboats. Joe, Ext. 7961 or 369-0432 eves.

79 O'DAY DAYSAILOR - galvanized shoreline trailer, tiller extension, other extras, low use, excel. cond., $3,600. Marty, Ext. 3563 or 286-0478.

23' SEASPRITE - fiberglass, 6 HP Evinrude, 4 sails, VHF radio, dinghy w/oars, sleeps 4, extras galore, $7,000. 286-1390.

21' RENKEN - 1980, w/cuddy, all new canvas, 120 HP Volvo I/O under 100 hrs., water ready, excel. cond., $7,500. 281-4242 between 10:30 & 5:30 p.m.

19' SAILBOAT - 1978, tangerine, galvanized trailer, 1982 Mercury outboard, 4 sails, fully equipped, $4,500. Tom, 467-2753.

23' CABIN CRUISER - broad wood, inboard, needs painting, $600. Tony, 281-0350.

17' LYMON - 1960, runabout, 50 HP Evinrude, excel. cond., $1,000. 878-8847.

79 HIGHLANDER - galvanized trailer, 2,000 lb. capacity, good cond., asking $225. 929-8105 or 929-4701.

SNARK SAILBOAT - $150; surfboard, large beginners board, $15. 757-5478 after 6 p.m.

Miscellaneous

VIOLIN - made in Markneukirchen, Germany, 1935, by H.T. Heberlein, Jr., $900. 744-3744.

MEN'S BICYCLES - (2), 27" and 28", 10 spd., both $50. Ext. 4531 or 331-3785.

RUG - solid gray, 9 x 12 with under pad, 6 mo. old, $100. 286-1062.

BICYCLE - 10 spd., Ross, 26" wheel, special low frame, excel. cond., $100. Greg, 286-0065.

DRY SINK - antique, excel. cond., $200; 10 spd. bicycle, 27" wheels, $50 firm. Ext. 2705 or 286-1062.

UPHOLSTERED CHAIRS - w/slipcovers, $100 pr.; swivel rockers, like new, $300 pr; maple coffee table, $40; oil drums. 325-1961.

ATARI GAME CARTRIDGES - $4-$14 ea./pkg. deal; boy's 3 spd. bicycle, almost new, $65; girl's bicycle, $10. Divadeenam, Ext. 5076.

UPHOLSTERED CHAIR - French Provincial, $250; pair cane back chairs, $250. 475-5820 eves.

LIVING ROOM SET - colonial sofa, chair & loveseat, make offer. 744-9677.

BEDSPREADS - twin size, red, white and blue; king size, gold and beige, $15 ea. Les, Ext. 2920.

BED - twin, "Eclipse" mattress, box spring, frame, excel., $50. 234-8229.

KEROSENE DRUMS - 55 gallon, $10 ea. Ext. 7505 or 689-8605.

VIOLIN - size, Suzuki made, w/case & bow, $155. Ext. 3828 or 751-7250.

TEA CART - Colonial, Maple, excel. cond., $30. Judy, Ext. 2590.

19" COLOR TV - Sylvania, $100; ladies bicyle, 3 spd., Raleigh, mint cond., $80; Compute's First Book of Vic, $6. Ext. 3105.

BABY ITEMS - play pen, $15; walker, $5; potty chair, $8; horse, $40; car seat, $30; swing, $5. 298-4854.

BOX SPRING/MATTRESS - double size, Sears, good cond., $40; brown vinyl recliner, good cond., $15. Marty, Ext. 3563 or 286-0478.

HERBS - culinary & old-time, over 40 varieties, for delivery June 1 or 8. 924-0092 or 751-8278.

ALUMINUM STORM DOOR - 32' w, complete w/screens, frame, & all hardware, $20. Roman, Ext. 3751.

19' COLOR TV - w/extras, asking $375. Lou, 698-6585 after 5 p.m.

STUDENT VIOLINS - full size, $200; 3/8 size, $150, German make. 472-1585.

BICYCLE - 12 spd., Fuji S12-S, 27" wheels, 24" frame, $100 firm. Paul, Ext. 4045 or 289-5770 after 6 p.m.

ATARI 2600 - plus 9 cartridges, excel. cond., $100 for all. Ellen, Ext. 4486 or 878-0480.

TENT - 10 x 13, like new, $130; 2 cots, $15 ea.; 3 piece Colonial living room set, make offer. 744-9677.

RADIO SHACK ANTENNA - top of the line with rotor & mast, like new, $40. 281-4871 eves.

ADULT TRICYCLE - Sears best, excel. cond. w/large basket, asking $150. 281-7720.

DESK - office size; wooden swivel chair, Coleman; lantern; canning jars; freezer containers; garden sprayer; heavy duty bumper jack. Ext. 7509.

SKI RACK - for VW Bug, holds 2 pr. skiis, $15. Bill, Ext. 2906.

GARAGE DOOR - wood w/some glass, 8' wide x 6'7" tall, low ht. hardware, excel. cond., $50. Tom, Ext. 4084 or 878-1060.

BOYS BICYCLE - Columbia, 20", 3 spd., like new, $49. Divadeenam, Ext. 5076.

BUMPER POOL TABLE/GAME TABLE - excel. cond., $125; dishwasher, Hotpoint, coppertone w/butcher block top, 1 yr. old, excel. cond., $125, moving out of state. Sauter, 732-0267 after 4 p.m.

DRILL PRESS - 5/16 capacity, variable speed, table model, all cast iron, $75. 475-0831.

DINING ROOM SET - traditional oval table w/leaf, breakfront, 6 chairs, $600; couch & loveseat, $250. 654-5781 after 5 p.m.

DINETTE SET - 4 chairs, very good cond.; kitchen curtains, beige tiers & valances. Ext. 3565 or 924-8594.

MENS DRESS SHIRTS - size 16 or 16, long, scarcely worn, $3 ea. Marian, Ext. 3552.

ZENITH STEREO - Solid State, fruitwood finish, excel. cond., $350 neg. Bobby Allen, Ext. 3254.

STEREO AMPLIFIER - receiver, Pioneer SX-636, $75. Ext. 2041.

WOOD - approx. 2 cords, split, $175; Sears toaster oven, $35; G.E. dryer, $50; 19" RCA color TV set, needs some work, $30. Bill, Ext. 2022.

MACRAME SUPPLIES - and gifts, beads, rings, books, many extras. Anette, 744-8581.

CANOPY BED - mint cond., childs, single, $50; yellow print bedspread, top & curtain, matches bed, $15. Ext. 2969.

REFRIGERATOR - white, 6', apt. size with freezer comp. Roy, Ext. 4664 or 331-2401.

CASEMENT WINDOWS - heavy duty, alum., screens incl., various sizes, $20 ea. Niels, Ext. 4124.

VANITY BENCH - wood, $5; accent table, round top, pedestal base, mahogany, $15. Nancy, Ext. 5274.

FINE BONE CHINA - buffet service, 16 dinners, 24 desserts, 16 ftd c/s teapot, 2 creamers, 2 sugars, 2 platters, 2 gravy bowls. 472-1585.

STRAUBE SPINET PIANO - excel. cond., $500. Alan Rosenberg, Ext. 2671.

AMPLIFIER - Guild model, 2 for use with elec. guitars, hardly used. 472-1922.

EUONYMUS BUSHES - excel. quality, small, 12 avail., $2.50/ea. Tom, Ext. 4084 or 878-1060.

ORIENTAL RUG - pale green, 12'x18', excel. cond., asking $800. 475-5820 eves.

LOBSTER POTS - standard size. 6/$65. 286-8517.

FIBERGLASS GARAGE DOOR - 8x7, complete w/tracks, excel. cond., $50. Carol, Ext. 2895 or 475-8640.

BICYCLES - ladies Raleigh Sprite, excel. cond., $100; Ross compact, $60. Ext. 7587 or 399-5808.

AIR CONDITIONER - used, 11,000 BTU, 220V, $30. Paul, Ext. 4045 or 289-5770 after 6 p.m.

BUNK BEDS - $60; double size bed w/o mattress, $20. Ext. 3180.

NATIONAL GEOGRAPHIC - 1964-1984 complete & others, best offer. 929-4701.

TV - 6' Advent projection TV, perfect, $2,300 or best offer. 929-4701 or 929-8105.

WATER TANK - 40 gal., galvanized, $10. Duke, Ext. 2957.

VAN SEAT - hi-back, tan naugahyde w/swivel base, never used, $75. 473-1456.

PANASONIC COMPACT RECORDER - am/fm radio, cassette, battery & ac, 120 or 240 volts, suitable for Europe, $65. 727-3608 after 5 p.m.

Yard Sales

DIXHILLS - 5/26 & 27, 41 Kessele Road. 586-6983.

BELLPORT - 2 family, 10-3 p.m., 5/26, Bell St. next to village parking lot.

YARD SALE - moving, motors; double, bed headboard, $10; Oliver No. 9 typewriter, excel. cond., $80; depth recorder; Danforth Express compass, $80, 5/26-5/27. 286-0436.

Free

FIREWOOD - you cut, you take. 281-7844.

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

EASTPORT - raised ranch, mother/daughter, maintenance free, approx. 2/3 acre, phone for appt. 325-1961.

CUTCHOGUE - ranch, 3 bdrms., dining rm., 2 full baths, family room/stone fireplace, country kitchen/new appliances, 1/2 acre well landscaped, more. 734-7324.

LEISURE VILLAGE - "Greenbriar", 2 bdrm., good location. 744-7140.

CORAM - Birchwood at Bretton Woods, condo., Daltor, 3 bdrms., den, l/r, formal d/r, 1 baths, patio, gas heat, a/c, block to clubhouse. Ext. 7338.

SHOREHAM - split level, 3 bdrms., 1 baths, l/r, eik, family room, den, $68,000. 744-8609 eves.

CONNECTICUT - lake front 2 bdrm. cottage, overlooking lake, $24,000, will hold mortgage. 757-1380 after 6 p.m.

MILLER PLACE - 3 bdrm. ranch, full finished basement, garage, d/r, l/r, oak floors, fireplace, $75,900. 821-9126.

For Rent

PATCHOGUE - 3 bdrms., lr, dr, den, full kitchen, 1-1/2 bath, detatched garage, no pets, security, avail. July 1st, $700/mo., does not include utilities. Ext. 7264.

VERMONT CHALET - on large pond, beautifully furn., stone fpl., pond and lake swimming, boating, fishing; nearby Alpine slide, tennis, golf, antiqueing, music and summer stock, wkly. rentals. 757-5599.

SHIRLEY - 2 bdrm. apt., avail. immed., working couple or single only, no pets, $575 & cooking gas, 1 mo. security. 399-1678.

VERMONT - house, reasonable vacation, 3 bdrms., 2 baths, fireplace, fully equipped, woodland trails, Alpine slide, golf, summer theater, boating, fishing, etc., family oriented, avail. weekly. 732-6499 after 6 p.m.

Carpools

BABYLON/W. ISLIP - driver needed for on-time car pool, 8:30-5:00 p.m. M. Tesla, Ext. 2705.

RONKONKOMA - 2 drivers to join existing pool, meet at LIE Exit 59, 8:30-5:00 p.m. Victor, Ext. 2395.

Lost & Found

LOST - baseball glove on Field 4, 4/26. Susan, Ext. 4267.

LOST - kid's play rifles at swings near ball field, 5/17. Gerry Vanderlaske, Ext. 7527.

Wanted

13" COLOR TV - resaonable. Ext. 4933 or 928-5737 after 5 p.m.

HOUSE TO SIT - free, responsible, caring, any duration, any period, July 31 to Nov. 1. J. Allentuck, Ext. 2412.

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

HOME - for 2 yr. old black female Lab, good w/children, spayed. 929-4437.

MOPED - under 25 mph, for local use, reasonable please. Sanchez, Ext. 3848 or 281-6498.

DOCK SPACE - for small sailboat, Peconic, Moriches or Shinnecock Bay. Pete, Ext. 2193 or 369-1844.

TO RENT - small house or quiet apt., close to Lab, married couple, Ext. 7603 or 3091.

HAIR DRYER - Ext. 3126.

DRESSER - double w/mirror, full size bed w/frame, night table, lamps, reasonable. Ext. 3316 or 698-1362.

WINDOW AIR CONDITIONER - unit for home, 7,000-9,000 BTUs, good cond. Tom, Ext. 4662 or 929-3566.

SMALL EXCERCYCLE - good cond. 475-0831.

ELECTRIC TYPEWRITER - Les, Ext. 5180.

STEERING BOX - & auto. trans. for 1979 F250 4 wheel drive Ford truck. Dick, Ext. 3499 or 589-9103.

HOUSEMATE - someone to share spacious 5 room cond., 2 bdrm., carpeting, w/dryer, storage, kitchen, good location, must be a mature responsible female. Please write to: Housemate, P.O. Box 367, Ridge, NY 11961.

USED OUTBOARD MOTOR - 2-3 HP. Ext. 3057.

PIANO BENCH - adjustable height. Ext. 3828 or 751-7250.

Ads left out of this issue due to lack of space need not be re-submitted to appear in the next issue.

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