

INMM Honors Higinbotham

William A. (Willy) Higinbotham, senior scientist with DNE's Technical Support Organization, has received the first Distinguished Service Award of the Institute of Nuclear Materials Management (INMM), the foremost nuclear safeguards professional organization.

He was recognized for his dedication and many contributions to the field of nuclear

the "decoy" and, until the award ceremony, never realized that he was in fact the winner.

Higinbotham has been concerned with nuclear safeguards and proliferation since World War II, when he worked on the Manhattan District Project at Los Alamos. He was a member of a BNL *ad hoc* committee which, in 1967, proposed establishing a group here to provide technical advice and assistance to the AEC on safeguards for nuclear materials. The result was the formation of the Technical Support Organization (TSO) in 1968.

He served as associate head of the TSO from 1968 to 1972, and as head of the group from 1973 until 1975. His importance to the group has been recognized by a series of one-year post-retirement appointments which have allowed him to continue as an active TSO member. (In requesting Higinbotham's second post-retirement appointment, then-DAS chairman Joseph Hendrie noted that he was a "priceless fund of knowledge" for the new people in the group, and was "by way of being a unique national resource in the safeguards field.")

Higinbotham came to BNL in 1948 to work in the Instrumentation Division. He was associate head of the division until 1951, and division head from 1951 to 1968, when he transferred to the TSO in order to work full time on safeguards. His contributions to nuclear instrumentation were many - he received about 20 patents on electronic circuits, most notably the "bootstrap" sawtooth generator widely used in oscilloscopes, and the Higinbotham Scaler, which made it possible to reliably electronically count the random pulses from radiation detectors at high rates.

Active in the INMM since its founding, Higinbotham has been technical editor of the organization's journal, "Nuclear Materials Management," since 1975. He has also served as chairman of the Federation of American Scientists, and is a fellow of the American Physical Society, the AAAS, the American Nuclear Society and the Institute of Electrical and Electronics Engineers. In 1972 he received the first annual award for contributions to nuclear instrumentation from the IEEE's Nuclear Science Group.

He is a man of many talents, however, and has also achieved quite a reputation in another, more musical kind of "instrumentation" - playing the accordion. While at Los Alamos, he played for the Saturday night square dances, and after coming to BNL, was one of the "Fearsome Foursome" that played for square dancing for many years.



Willy Higinbotham

safeguards and for his service to INMM. The award was presented on Tuesday during the INMM's 20th annual meeting, held in Albuquerque and attended by some 400 nuclear safeguards and nuclear materials management experts from North America, Europe, and Japan.

Although the award came as a surprise to Higinbotham, it was not news to his co-workers. They had known since March about the honor and managed to keep it a secret from him until the award was presented during a buffet dinner at the INMM meeting.

Keeping the secret required some closed mouths at BNL and some pretty fast footwork on the part of INMM, explained Jack Cusack, head of the Technical Support Organization. INMM was eager to surprise Higinbotham with the award, but there were complications - Higinbotham himself was a member of the Awards Committee which was to select the winner. After privately deciding on Higinbotham, the other members of the Awards Committee threw him off the track by introducing (and appearing to support) a "decoy" nomination of another professional in the field. Higinbotham whole-heartedly supported

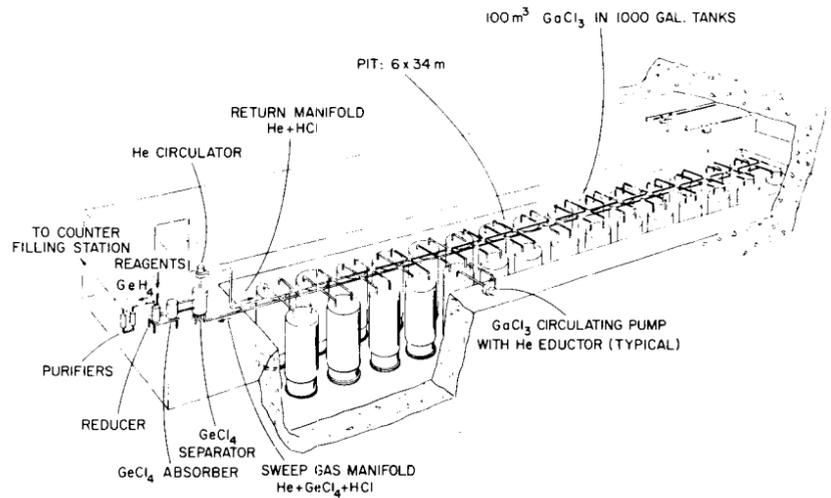
The Cable Convoy



To get a 61-foot cable from one building to another, members of the Power Transmission Project conserved automotive energy and relied on their own. In order to test the dielectrics under cryogenic conditions at

Bldg. 815, the cable had to be taken off the reel at Bldg. 820 and transported. So they picked it up and carried it.

—photo by Humphrey



Like the chlorine-based neutrino detector, the gallium apparatus pictured here will have to be situated about a mile underground to prevent cosmic ray muons and other radiation from skewing the results. The gallium metal will be converted into a liquid, gallium chloride, for the experiment.

Wanted: 50 Tons of Gallium

As our nation ponders its energy problems and we weigh the various alternatives available to us, there is one underlying principle which should not be forgotten; all terrestrial energy is ultimately solar energy. All common forms of energy derive from the thermonuclear fusion reactions taking place at the interior of the sun.

The implications of this vital fact have not been lost on Ray Davis, a senior chemist at BNL's Chemistry Department. Davis has devoted much of the past fifteen years to trying to develop a better understanding of the reactions taking place inside our star. It isn't easy. About the only clues concerning the internal reactions of the sun that manage to penetrate its fiery core and reach us here on earth are subatomic particles known as neutrinos. After obtaining some startling results from a previous experiment, Brookhaven is now embarking on a new idea to detect neutrinos by using an enormous quantity of the element gallium.

The Chlorine Experiment

The most effective neutrino detection method is to indirectly observe the particle by measuring its "capture" by other nuclei; an atom which is struck by a neutrino is converted into another element. Many neutrinos have already met such untimely deaths at the bottom of a gold mine in Lead, South Dakota, nearly a mile beneath the surface of the earth. This is where Ray Davis set up his first neutrino detector in the mid-1960's. The detector consisted of a 100,000 gallon tank of perchloroethylene, better known as dry cleaning fluid. Neutrinos which struck Chlorine³⁷ atoms in the tank would convert that atom into one

of Argon³⁷. The tank was purged monthly with inert helium gas and the atoms of Argon were counted to determine the neutrino capture rate.

The results of the chlorine experiment threw the field of astrophysics into an up-



Ray Davis

roar; while the prevailing solar model of the day predicted a capture rate of 30 SNU (Solar Neutrino Unit = 10⁻³⁶ captures per second per chlorine atom), the actual observed rate was less than 3 SNU. Several values which had determined the standard solar model were reexamined and revised so that the expected SNU decreased; current theory predicts a rate of 7.5 SNU.

Davis himself was unshaken by his controversial results, "My personal feeling was that I didn't have that much confidence in the solar models anyway. That's where you'd put the blame right away - on the models. Your first hunch is that that information is kind of hard to get at, we don't really understand the inner workings of the sun, and that's more likely an explanation than saying there's something wrong with neutrino theory." Davis is referring to the fact that the scientific community is split as to where they lay the source of the discrepancy. One theory is that the standard solar model is wrong in some fundamental respect. Within this category are many papers which question parameters such as the chemical composition of the sun, or the core temperature. For example, anything that would lower the core temperature would also lower the predicted rate of neutrino emissions. The other camp holds that there are some holes in neutrino theory, and that not all neutrinos generated by the sun are reaching the earth, at least not in the form in which we expect to see them. What is needed, then, is an experiment capable of unambiguously distinguishing between these two alternate possibilities, thereby clarifying our understanding of the sun.

Gallium: A Better Target

To understand why Brookhaven's proposed new experiment, using gallium as a detector, would accomplish this, it must

(Continued on page 2)

Gallium

(Cont'd)

first be explained why the last one failed to do so. Neutrinos vary with respect to their energies. For example, whereas neutrinos from the main energy-producing reaction of the sun are of low energy, other, peripheral solar reactions are thought to yield high energy neutrinos. As a target atom, chlorine has what is known as a high "threshold energy;" only high energy particles are captured by the chlorine nucleus. Thus, the chlorine experiment was not sensitive to the low energy neutrinos produced by the most important reaction at the center of the sun, that one in which four hydrogen nuclei fuse to form helium.

Gallium, on the other hand, has a relatively low threshold energy, and is therefore sensitive to neutrinos produced by the all-important thermonuclear fusion reaction. This particular part of the sun's internal workings is "not disputed," according to Davis. "Any solar model predicts it."

The gallium experiment would be based on simple, well-understood chemistry, very similar to the principles on which the chlorine detector was based. Gallium nuclei which are struck by low energy neutrinos from the main fusion reaction of the sun would be converted to atoms of germanium. Like the chlorine tank, the germanium tank would be periodically purged with helium gas and the atoms of germanium counted. The main obstacle to performing the experiment right now is that it requires 50 tons of gallium.

"That's a major problem," Davis concedes. But of course, it is not so major as to stop him from pursuing the idea. In an international effort, the BNL group is collaborating with scientists at the Institute for Advanced Study, the University of Pennsylvania, the Max Planck Institute in West Germany, and the Weizmann Institute in Israel, to develop a gallium-based neutrino detector.

Gallium is commonly found in bauxite ores from which aluminum is produced. Until a few years ago, aluminum manufacturers did not even bother to extract it from bauxite because there was simply no market for it. Today, however, gallium is used in the production of light-emitting diodes for the booming pocket calculator

and digital watch industries. Still, these applications demand relatively little gallium; the entire world's production is only about 10-12 tons per year.

The initial steps have already been taken, however. The Department of Energy and the Federal Republic of Germany have provided funding for one-and-a-half tons of gallium which may be ready for testing by the end of this year. The next step, says Davis, is to acquire another eight-and-a-half tons in order to build a ten-ton prototype detector, which could be tested with a known neutrino source, such as ⁶⁵Zn.

But even a ten-ton detector would be far too small for capturing solar neutrinos at a reasonable level; for that purpose, 50 tons is the minimum practical amount. "If you go by the standard solar model and use 50 tons of gallium," says Davis, "you get an average of about one capture per day." Because the germanium formed has a half-life of only 11.4 days, however, after one month, only about 15 radioactive atoms would be present amidst the approximately 10³⁰ gallium atoms. "See, that's not too many," laughs Davis, "One a day is not a very healthy rate, but it's the rate you have to compromise on. If we had more gallium we'd have a higher rate. One a day is very marginal. If we had only 25 tons it just wouldn't be practical anymore."

Although gallium currently sells for about half a million dollars per ton, the outright cost does not tell the whole story. The gallium itself would be unharmed by the experiment, and could be resold at its conclusion. "The perchloroethylene that we bought to fill up that tank is just like new," says Davis, "We can sell it for twice what we paid for it." Thus, the approximately \$25 million that would be required to purchase the gallium is more of an investment than an expense; an investment that is almost sure to be recovered. This may even be the first large-scale experiment to show a profit.

So do not be surprised if, in a decade or so, while you are skimming the *Bulletin* classified under "miscellaneous," you come across an ad that reads: "Gallium. 50 tons. Like new. Reasonable." It will just mean that Ray Davis has exhausted one more technique in stalking the elusive neutrino.

—Bradley Stolzer

Fencer Wins Medal At Pan Am Games

Stan Lekach, a nuclear engineer at DNE, and one of the nation's top fencers, has just come away from the Pan American Games with a silver medal. He was a member of the four-man U.S. team which placed second in sabre competition on July 8 in San Juan, P.R. In their duel with Cuba, the U.S. team just missed first place by two touches — a very narrow margin. In all, sabre teams from eight countries competed.

In match play, each person on a team fences each member of the opposing team, a total of 16 bouts. In order to win a bout, the fencer has to win five touches. After defeating the other teams in their respective groups, the U.S. and Cuban teams met in the finals, and their match ended in a tie. To resolve a tie, the touches are counted and the team with the fewest touches wins the match. As the Cuban team has two less than the Americans, they were declared the winner. Argentina was third.

The three other members of the U.S. team are from New York City. Lekach says the best fencers in the country are in New York because of the best coaching and the best competitions are available in the city.

Lekach, who has been fencing for the last 13 years, was chosen in April for the U.S. Pan American Games team. He had



Stan Lekach

accumulated a lot of points during the previous year's competitions; winning the 1978 national sabre championship was a big plus. Now, he has his eye on the big one — to make the U.S. team at the 1980 Summer Olympics in Moscow. To this end, he will be spending the rest of his vacation time in other national and international competitions trying to garner a point total large enough to ensure him a place.

Arrivals & Departures

Arrivals

- Richard A. DiFranco.....Accelerator
- Stephen M. Gill.....Accelerator
- Francine A. Hinton.....Plant Engrg.
- Robert E. Mills.....Safety & Env. Prot.
- Thomas E. O'Hare.....Energy & Env.

Departures

- Harriet D. Evans.....Director's Ofc.
- Yau Nam Chan.....Energy & Env.
- William J. Wetzel, Jr.....Contr. & Proc.

CREF Values

August	\$42.17	September	\$41.86
October	38.18	November	38.80
December	39.44	January	40.90
February	39.47	March	41.60
April	41.61	May	40.58
June		42.12	

IBEW Meeting

Local 2230, I.B.E.W. will hold its regular monthly meeting on July 26, 1979, at 8 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 the report of the Negotiation Committee.

Cafeteria Menu

Week Ending July 27, 1979

Monday, July 23	
Beef barley soup	(cup) .30 (bowl) .40
Batter fried steak w/1 veg.	1.45
Franks and beans	1.15
Hot Deli - Pastrami	(on bread) 1.30 (on roll) 1.40
Tuesday, July 24	
Cheese chowder	(cup) .40 (bowl) .50
Chopped steak w/1 veg.	1.25
Turkey tetrazzini	1.30
Hot Deli - Grilled Reuben	1.30
Wednesday, July 25	
Minestrone soup	(cup) .40 (bowl) .50
Homemade lasagne w/1 veg.	1.40
Fried rice and pork w/Chinese noodles	1.40
Hot Deli - Italian sausage and peppers hero	1.30
Thursday, July 26	
Chicken rice soup	(cup) .30 (bowl) .40
Chicken patty parmesan	1.45
Beef liver and onions w/1 veg.	1.20
Hot Deli - Barbequed beef	(on bread) 1.30 (on roll) 1.40
Friday, July 27	
Clam and celery soup	(cup) .40 (bowl) .50
Pot roast w/1 veg.	1.45
Seafood cakes and spaghetti	1.10
Hot Deli - Smoked tongue	(on bread) 1.30 (on roll) 1.40

- SAGA FOODS -

Service Awards

The following employees will receive service awards during the month of July, 1979:

Thirty Years

- Emil A. Bernatzky.....Accelerator
- Edward W. Dexter.....Accelerator
- Michael McKeown.....Physics
- Morris L. Perlman.....Chemistry
- Karl Rosenbaum.....Energy & Env.
- Vance L. Sailor.....Energy & Env.

Twenty-Five Years

- Roger D. Baker.....Accelerator
- Robert A. Dryden.....Accelerator
- Eleanor Grist.....Biology
- Carol S. Redvanly.....Chemistry

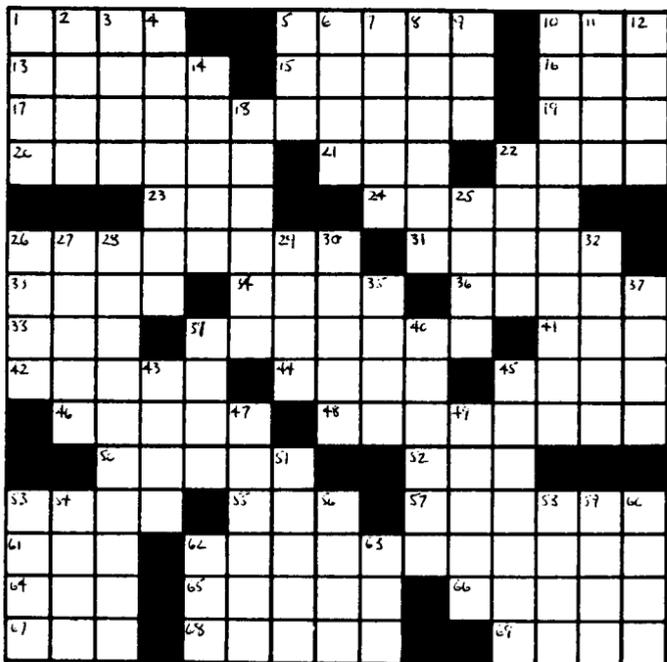
Twenty Years

- Charles Geonie, Jr.....Plant Engrg.
- Archer J. Post.....Accelerator
- Albert G. Prodell.....Accelerator
- Charles W. Zavesky, Jr.....Central Shops

Ten Years

- John D. Axe, Jr.....Physics
- Thomas Crews.....Plant Engrg.
- George R. Eleazer.....S & EP
- Frank G. Heimburger.....Accelerator
- Dorothy Marelli.....Personnel
- Irving Montanez.....Medical
- Masaki Suenaga.....Energy & Env.

Crossword Puzzle



Across

- 1 28 Down has a --- of 3.2 inches
- 5 "Life is just --- of cherries"
- 10 Pool carrier, so to speak
- 13 Regretful
- 15 Vacation island
- 16 Mouth: Comb. form
- 17 ISABELLE, of course
- 19 Office supply
- 20 Stick-in- --- (ultraconservative)
- 21 Prescribed actions
- 22 --- in a poke
- 23 Mendeleev's atomic number
- 24 --- Dame
- 26 Early arrival time at BNL
- 31 Mother-of-pearl
- 33 Greek vowels
- 34 Reputation
- 36 Switchblades
- 38 Getaway: Abbr.
- 39 Colliders in ISABELLE
- 41 Estuary
- 42 Tennis situation
- 44 City near Phoenix
- 45 Describing 3.8°K, in ISABELLE
- 46 Particle whose existence ISABELLE may verify
- 48 Any of many things to observe in ISABELLE
- 50 Subatomic particle
- 52 Dine
- 53 Kidd or Kirk, for short
- 55 Radiation unit
- 57 Electrical unit

Down

- 1 Enfant terrible
- 2 Hurt blurt
- 3 Beef chop suey on ---, a la BNL
- 4 Foemen
- 5 Swiss river
- 6 Actor Dillman, for short
- 7 --- a limb
- 8 Particle whose existence ISABELLE may verify
- 9 Household god
- 10 Type of magnet in ISABELLE's injection line
- 11 "Whose woods these --- think I know"
- 12 ISABELLE's most prominent feature
- 14 Particle whose existence ISABELLE may verify
- 18 Bernice Petersen, e.g.
- 22 St. Louis sight
- 25 Soviet agency
- 26 Idea, vis-a-vis a patent
- 27 And the following: Abbr.
- 28 Enclosure for 39 Across
- 29 Biblical kingdom
- 30 Attentive one
- 32 Banes
- 35 Woodson of Staff Services
- 37 Marquis de ---
- 39 J.S. Washburne's dept.
- 40 East of Queens
- 43 City on the Orne
- 45 Director of "The Godfather"
- 47 Czech coin
- 49 Gear in Building 704
- 51 --- foot oil
- 53 Good fishing weather
- 54 Concert selection, perhaps
- 56 1502, to Brutus
- 58 Dash
- 59 Part of the over-head
- 60 Punta del ---
- 62 "--- Vadis"
- 63 In medias ---

Tour Features MPS and New Displays

This weekend's mini tour will be conducted jointly by the Accelerator and Physics Departments, and will feature the Lab's Multi-Particle Spectrometer (MPS), an advanced and unique scientific instrument which allows physicists to observe what happens when a high energy subatomic particle collides with another particle. Visitors will see a variety of tracking devices and will be taken through the MPS control room.

In addition to this weekend's mini tour, visitors will view the 15-minute slide show entitled "Brookhaven's Quest" at Berkner Hall, take a guided bus tour of the Lab, and visit the Exhibit Center, where two interesting new displays have just been added. One is an actual Cerenkov counter; this is a particle sorter which played an instrumental role in the discovery of the J particle here at Brookhaven. The other display is a 31-inch bubble chamber, which is a particle tracking device.

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Rec Activities On-Site Program

Last week's Scavenger Hunt had children searching for such things as a green caterpillar, a pair of purple sneakers, a left handed monkey wrench, cups of pink steam, a pink banana and long underwear.

After an hour of hunting and finding, all were rewarded with ribbons and ice cold watermelon slices.

Coming Events:

This Week - Circus Day
Next Week - Treasure Hunt

Pool Special

At last Friday's special pool event over 150 young swimmers searched the bottom of the pool for pennies, nickels, dimes and quarters under close supervision of the life-guards. To cheers from parents and friends, the following youngsters surfaced with the most loot:

Four to six years olds:

1st - Nogah Engler, 68¢
2nd - Youal Arbel, 48¢
3rd - Tzachi Sharfman, 41¢

Seven to nine year olds:

1st - Glenn Bruno, 68¢
2nd - Greg Holden, 67¢
3rd - Megan Holden, 65¢

Ten year olds and over:

1st - Ben Kislinger, 89¢
2nd - Rajiu Jamuar, 77¢
3rd - Kristi Deld, 66¢

Coming Events:

This Week - Kickboard Races
Next Week - Diving Contest and
Paper Plate Race

July Bicycle Tours

On Sunday, July 29th the Long Island Bicycle Club will conduct 50- and 100-mile tours in several New Jersey and Pennsylvania counties in the vicinity of Princeton, New Jersey. This is a well-planned ride with sag-wagon backup and includes beautiful countryside and historic sites. The advance entry fee of \$4 includes a Tiger T-shirt for all finishers. The tour starts at 8 a.m. on Sunday and a Saturday evening dinner at the Treadwell Inn (tour headquarters) is planned. For info and registration forms contact Bob Monaghan, Bldg. 911A, Ext. 4824/4688, or at 744-5098.

The Suffolk Bicycle Riders Association schedule for the rest of the month is:

Saturday, July 21 - 18 to 20 miles. Meet 10 a.m. at George's Bicycle Shop, Nesconset Highway near Stony Brook Road (behind Howard Johnson's).

Sunday, July 22 - Ride to Hecksher State Park, 30 miles. Meet 10 a.m. at Century Theater, Smithaven Mall.

Saturday, July 28 - Same as July 21.

Sunday, July 29 - Option of 20, 40 or 60 miles. Meet at George's Bicycle Shop at 10 a.m. for a 20 mile ride to Wildwood State Park, or join the group at Wildwood for a 20 mile loop ride plus the ride back to George's if desired.

For additional info contact Bob Monaghan.

Microprocessor Group

A weekly discussion will be held on Tuesdays from noon to 1 p.m. in the Biology Department library to discuss hardware and software. Anyone interested is welcome to attend. Contact Jim Hainfeld, Ext. 3372 for further information.

Vaudeville - Tomorrow and Sunday



It's "Take Me Out To The Ballgame" time, and Bill Love (background), Matthew Basile and Daniel Love, will sing this old favorite at the Theatre Group's vaudeville show this weekend. Singing, dancing, instrumental numbers, light-hearted recitations and skits, will take your mind off the heat and the gas crisis at two performances; Saturday, July 21 at 8 p.m., and on Sunday, July 22, at 4 p.m.. It's cabaret style at the Brookhaven Center, and a cash bar is available. Tickets can be purchased at the door; \$2 general admission, \$1 for senior citizens and persons 18 or under.

—photo by Humphrey

R/C Aircraft Club

A meeting of "The R/C Model Aircraft Club" will be held Tuesday, July 24 at 5:15 at the flying field. Rain date will be Wednesday, July 25th.

Anyone with questions about the club is invited to attend. For more information contact Bob Larson, Ext. 4656 or Jim Durnan, Ext. 2485.

Block Island Fly In

Seventeen Aviation Club members and friends left Brookhaven airport on the morning of June 6 and headed to Block Island. Flying east over Long Island in ideal weather conditions, a beautiful aerial view of the bays and oceans to the south could be seen. Leaving Block Island Airport, club members toured the surrounding area and local sights by bike.

The group left town after lunch and rode by bike to the Island's Bluffs, a hilly scenic area. Bikers passed sites of historic Indian battles, quiet ponds, New England villages and picturesque marinas.

BNL personnel rode by and were particularly interested in a 200 kW wind generator recently constructed on Block Island. The giant windmill, expected to be in operation soon, is over 100 feet high and has 125 foot-long fins. (Wind generated energy will reduce the Island's electrical rate and will provide from 20 to 100% of the energy required by the Island's year-round population.)

After dinner in a relaxed atmosphere (since Flight Service had verified clear weather for the return flight), a beautiful sunset was a fitting end to a memorable day.

Aviation Club members who made the trip were Gene Rogers, Rod diGirolamo, Ed Schwaner, Herb Lutz, Lou and Jennie Addressi, Paul LeDoux, Kathy Canano, Ron Dobert, Audrey Karzenski, Bill Pressgrove, Len Chimienti, Steve Spencer, Ed Desmond, Tom and Manya Dickenson and a Japanese visitor from the NSLS, Shoji Okumura.

Call For Bowlers

You don't have to be a pro; in fact, it doesn't matter if you've never bowled before - all our leagues are run on a handicap basis. We realize it is early to think about bowling this fall, but it is necessary that a commitment be made with the various alleys by August 3. So don't delay, if you would like to bowl, even as a substitute, contact Dick Larsen Ext. 3464, Betty Jellett Ext. 3639 or Helen Keeley Ext. 4649.

New York Train Trip

The Hospitality Committee is planning a group railroad trip to the city on Wednesday, August 1. Departure will be at 7:55 a.m. from the Patchogue LIRR station. Round-trip fare for adults is \$2.45, children under six years ride free.

Reserve a ticket by sending your fare through the U.S. mail to P.O. Box 322, Upton, New York 11973, no later than Thursday, July 26. Make checks payable to "Brookhaven National Laboratory." Your tickets will be given to you on the train. Refunds will be made only if cancellations are received by the Friday preceding the scheduled trip. For any further information, call Dot Marelli, Ext. 4262.

Softball

Mixed League

Oh Kays - Balls & Strikes - Game Postponed
Turkeys 13 - Random Sample 6
TNT 32 - Confoozed 12
E-Z Riders 8 - Who's On First 4
Diamonds 10 - Thrids 5
Turkeys 6 - Random Sample 5 (Make-up Game)

League I

Ravens - Blue Jays - Game Postponed
Six Pax 12 - Phoubars 11
Strikers 16 - Old Timers 10
Sweathogs 6 - Source I 4
Sweathogs 16 - Source I 3

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.

The determination of the best-qualified candidate for available positions will be based upon education, experience and other job-related criteria. Such factors will be evaluated and measured against the demonstrable requirements of the available vacancy, as well as the Laboratory's Affirmative Action objectives.

The Laboratory is committed to a policy of Equal Opportunity in its selection and placement of personnel. Its objective is equality of opportunity in employment, training, and promotion without regard to race, color, religion, national origin, sex, age or handicap.

Each week, the Personnel Office lists new personnel placement requisitions. The purpose of these listings is, first, to provide open placement information on all nonscientific 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, as indicated below. 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.

POSITIONS OPEN: Scientific. The following staff positions are open. Candidates may apply directly to the department representative named, or through the Office of Scientific Personnel, Ext. 3338.

ENGINEER - Research and assessments in water resources. Contact: Dr. Peter M. Meier, National Center for Analysis of Energy Systems, Department of Energy and Environment.

ENGINEER - Research and assessments in electric utility systems. Contact: Dr. Peter M. Meier, National Center for Analysis of Energy Systems, Department of Energy and Environment.

PHYSICIST. Design and development of negative ion surface plasma sources. Contact: J.C. Burdick, Accelerator Dept.

LABORATORY RECRUITMENT: Opportunity for present Laboratory employees.

1044. NUCLEAR ENGINEERING ASSOCIATE (2 positions) - Requires BS/MS in nuclear or mechanical engineering or equivalent with significant experience in nuclear power plant design. Will develop large reactor transient computer codes. Department of Nuclear Energy.

1045. SENIOR STAFF ASSISTANT - Requires a BS/MS in accounting or equivalent experience with commercial and not-for-profit accounting practices, procedures, and policies. Candidate should have excellent analytical and communication skills. Will conduct cost and price analysis and audit reviews and close-outs according to various procurement regulations and standards. Contracts and Procurement Division.

1046. SECRETARY - Requires excellent secretarial, organizational and communications skills, broad office experience. Must be good at figures. Previous BNL experience desirable. Photography and Graphic Arts Division.

1047. SECRETARY - Group secretary position. Excellent typing, other secretarial skills essential, shorthand desirable. Position involves heavy technical typing. Physics Department.

1048. STORES CLERK - Supply and Materiel Division.

1049. GENERAL CLERK - Supply and Materiel Division.

Autos & Auto Supplies

69 BUICK SKYLARK - runs well. \$300. Patti, 281-8168 after 5:30.

78 PINTO HATCHBACK - a/t, AM/FM cassette, 16,000 mi, like new. Asking \$3400. 281-9211 eves.

78 CHEVY CAMARO - ps/pb, AM/FM stereo tape, a/c, tilt steering wheel, Rusty Jones undercoating, 8000 mi. \$6000. 981-5993 after 6.

76 KAWASAKI KE175 - 600 mi, excel cond. \$575. Ext. 3872, 472-0125 after 5.

70 HONDA - 450CB, low mi, excel cond. \$575. M. Kinney, Ext. 4316, 924-3783.

69 MUSTANG 302 - a/t, not running - needs cam, good for parts. \$175. 669-5181 after 6.

66 RAMBLER AMERICAN - 2 dr. \$275. Jahnig, 281-9298.

55 CHEVY - 2 dr, 46,000 orig mi, no rot, new paint, 6 cyl, M/T all orig. \$2200. 234-8229 after 6.

SNOW TIRES - w/rims, 6.50x14, fit VW bug or similar. \$20. Bill, Ext. 4100.

NEW FRONT GRILL - 1971/72 Camaro. \$30. Ext. 4592.

70 CHEVY SUBN - runs well, excel cond, clean inside & out. Make offer. Bill, Ext. 2378, 286-0243.

69 OLDS 88 - 4 dr sedan, ps/pb, runs well. \$300. Ext. 2041, 473-5376.

73 COUGAR - a/c, ps/pb, 351 cu in, 8 cyl. \$2200. 286-8356 eves.

CAR RADIO - AM/FM, fits Chevy. John, Ext. 3533.

HOODS - 70-73 Camaro, \$40; 72-74 Vega, \$20. S. Norton, Ext. 2050.

69 FORD LTD WGN - \$150. Neil, Ext. 2023.

76 VOLVO 265 - loaded, 20 mpg, excel cond. \$4800. 757-5599.

76 FORD GRANADA - a/t, 302 V8, ps/pb, AM/FM. \$3300. Neal, Ext. 4019.

72 FORD TORINO WGN - good running cond, 4 dr, p/s. \$700. Bob, Ext. 3497, 325-0609.

77 CHEVY CAMARO - a/c, ps/pb, AM/FM, low mi, sm V8, excel cond. 928-7619.

PLYM 440 ENG - with a/t, excel cond; Plym 318-383 trans, excel cond; 2 bckt seats for Plym. 924-0960.

5 WHEELS - wire type, 1 wk old, tires G78-15, fit all 15's. \$270 for all. 588-4703, 265-0540.

73 CHEVY ¾ TON PICKUP - C-20, rebuilt eng, new shocks, clutch, h.d. tires, w/cap. \$2200. Tom, Ext. 2959.

73 PLYMOUTH DUSTER - 6 cyl, a/t, p/s, a/c, electronic ignition, h.d. susp, new exhaust & brakes, Sears Road Handlers. \$1600. Rich, Ext. 3381, 924-5939.

62 FALCON - 6 cyl, excel ext, running, needs muff. \$195. J. Lynch, Ext. 4510, 744-0843.

73 FORD LTD WGN - excel cond, low mi, leaving country, must sell. \$1300. Ext. 7730, 286-8097.

CHEVY VAN - Beauville 8 psgr, a/t, ps/pb, V8, top cond, great for car pool. \$4200. Ext. 2364, 929-8944.

32 FORD COUPE HOT ROD - 396 Chevy eng, new paint, glass, disc brakes, 400 trans, chrome front end, 90% complete. \$5000. Mike, 289-5704.

74 MERCURY MONTEGO - a/t, ps/pdb, AM/FM stereo, excel cond, \$1500; 69 Ford, 6 cyl, a/t, p/s, good cond, \$425. G. Murdock, Ext. 4731.

72 VEGA - Ed, 924-9171.

66 NOVA - Dana rear, narrowed frame, extra fiberglass hood, race-ready. 929-6034 eves.

PSGR DOOR - 68 Firebird, Camaro, \$50; 2 Crager S/S 14x6 for sm 5-bolt GM, \$45. 744-7461 after 5.

TIRE - GR-70x15 radial on GM rim. \$15. Ken, Ext. 4514.

71 BUICK SKYLARK - 2 dr, a/c, a/t, p/s, good cond. Best offer. Ext. 2443, 751-0637.

69 FORD FAIRLANE - 6 cyl, new batt. \$150. Jack, Ext. 2485, 473-8060.

70 CHEVY SUBURBAN K-20 - 4 w/d, ps/pb, 350 ci, beach tires & mags, AM/FM 8-trk stereo. \$2700. John, 744-4386.

72 CAMARO Z-28 - all primed & ready for paint, excel running, must sell. Best offer. Bill, 654-8410 eves.

70 FORD GALAXIE - good on gas, exhaust may need work. Asking \$400. Sue, Ext. 2913, 751-5829 after 6.

CARBURETOR - for 74 Camaro, Roch 4 bbl. \$20. 588-5833.

TIRES - F78-15, (2) G78-15, (1) HR70-15, (2) GR50-15; a/c for Pontiac; Chrysler water pumps; more parts for Plym; from \$5 up. Ext. 3284.

78 PONTIAC PHOENIX - lt blue, V6, a/t, a/c, ps/pb, AM/FM 8-trk, tinted glass, more, good mpg, showrm cond. \$3990. Ext. 3860, 698-5298.

TURBO HYDRO - for full size Pontiac, excel, \$100; 3 spd std from 62 Dodge, \$40. 744-7461 after 5.

Boats & Marine Supplies

23' OWENS CABIN CRUISER 1958 - 283 ci Flagship eng, head, galley, good cond. \$1200, must sell. Bill, 654-8410 eves.

19' GLASPAR - 115 hp Evinrude eng, under warranty. Ext. 2913.

16' SKIFF - 25 hp Evinrude, little used, glassed seams, nice lines. \$650. 286-3509, 286-8542.

12' SKIFF - excel cond, good for sm eng, wood, glassed seams. \$150. 286-3509.

2 CLAM BOATS - 1 new 17' Garvey, 1-19' skiff. 286-8062.

23' CHARACTER SLOOP - Skip Jack, twin keel, Seagull outboard, head, galley, sleeps 2, main & working jib. Asking \$6500. Wes, HR2-1289.

19' O'DAY MARINER - 4 hp Evinrude, head, running lights, cover, etc. Asking \$3900 or rent at PJ Marina. 473-2473.

BOAT TRAILER AXLE - solid I-beam, leaf springs, 15" rims. G. Hrabak, Ext. 3536.

21' FIBERGLASS SAILBOAT - 68 Windward, 4 sails, 6 hp Evinrude, trailer, excel weekenders-daysailer. \$3150. Bill, Ext. 7604, 473-1813.

25' TROJAN - 1965 cruiser, 185 Gray rebuilt 1977, sleeps 4, legal head, best offer. 734-7527.

11' MOTH CLASS SAILBOAT - wood covered fiberglass, 1 main. Asking \$300. 289-0925.

Yard Sales

WADING RIVER - 400 ft north 25A, Manor Road, July 28-29, 9 a.m. - 5 p.m., antique/yard sale, 50 yr coll. Ext. 3303.

NO. PATCHOGUE - 122 Sharp St, off Rte 112, 7/21 - 7-22, contents of home. Ext. 7995.

SAYVILLE - 27 Marion St, Sat & Sun 7/21 - 7-22, 10 a.m. - 4 p.m. Ext. 4451.

Miscellaneous

RATCHET SETS - new 40-pc combo, std & metric, ¾" & ½" drive, 34 sockets. \$12.50. Jan, 286-3623.

CANNING JARS - glass top qts. Dolores, Ext. 2926.

POOL TABLE - 4'x7', good cond. \$95. Ext. 3688, 363-7032.

PANASONIC STEREO - AM/FM-8 trk, turntable & spkrs, very good cond. Asking \$150. Roseann, Ext. 7908, 475-6622.

FREE - 1 calico kitten, approx 6 wks, paper trained. Susan, Ext. 4207 days; Ext. 3116 eves.

LANGE SKIIS - 200 cm w/Marker bindings, size 12 Munari boots w/Jetsticks, \$50; attic fan, \$20. Chris, Ext. 4227.

BICYCLE - Schwinn single spd man's. \$20. J. Olson, 289-8629 before 3.

ORNATE SWAG/POLE LAMP - excel cond, \$10; blue outdoor sun-shade umbrella, \$10. Dalal, Ext. 7790.

POOL LADDER - 3 step stainless steel. \$50. Mike, Ext. 4728.

RANGE HOOD - 42" coppertone, 2 spd w/light, excel cond. \$15. Madeline, Ext. 4316, 924-3783.

DESK - 8 drawer wooden office desk & swivel chair. \$100. J. Lynch, 744-0843.

HEXAGONAL COFFEE TABLE - \$10; wooden library chair, \$10; vinyl swivel rocker, \$25; single bed, new matt, \$60; conv couch, queen size, \$80. Ext. 3593.

PORTABLE WASHER - Whirlpool 4900, new, used 2 mos. Asking \$200. Ext. 4829/3707, 744-0007.

79 DIESEL STATION GUIDE - of North America, purchased 2 by accident. Cost \$6.95, sell \$4. H. Pirozzi, Ext. 2384.

REFRIG - old & bulky, but runs well. Free. Tom, Ext. 2959.

ANTIQUE BATH TUB - cast iron w/legs, fixtures & fittings, excel cond. Ext. 4507, 878-1060.

MOVING OUT OF STATE - entire contents of house. Connie, 924-9171 after 6.

(2) 3-SPD BICYCLES - 1 man's, 1 woman's, \$35 ea; king size springs, matt & frame, used but good cond, \$75. Ext. 3570.

SEWING MACHINE - Morse portable, excel cond, \$90; captain's bed w/4 drawers, \$75; Gibson 12 cu ft refrig, \$40; Queen Anne wingback chair, \$40. 654-1044 eves.

10 SPD BICYCLE - Vista Esquire, very good cond. \$75. Ext. 4883.

SM PATIO TABLE - w/3 chairs, cast iron, sm couch, 2 tables, lamp. 286-2320.

3 SPD BICYCLE - ladies' traveling/fold-up, bell, light, rack, excel cond. \$45. K. Anderson, Ext. 3284, 281-8458.

COLOR PORTABLE TV - RCA 19", very good cond. \$100. J. Schirmer, Ext. 4851.

ENGLISH BIKE - men's 3 spd, very good cond, red w/white trim; matching ladies' 3 spd English bike w/child seat, very good cond, \$35. 744-5801.

PIANO - baby grand, Ludwig 1942, action adjusted recently, fine cond. \$800. Ian, Ext. 3785, 331-1292.

GOLD SOFA - 3 pc (1 section converts into dbl bed w/matt), matching end tables & lamps. Norma, Ext. 4019.

BX CABLE - 4 conductor, size 6, 40 ft, good for elec range feeder or for a sub panel. \$15. 727-3608.

METAL CHASSIS - heavy gage, 16"dx23"wx7" h w/opening top, \$10; General Radio synchrometer, GR-1103A, new cond, \$25. Ext. 4058, 286-0436.

SPKRS - pr JBL 100 Studio Monitor, hardly used, guaranteed mint cond, must be heard. \$340. Ext. 4701, 271-2877.

MOPED - Jawa, 700 mi, 100 mpg, excel cond. \$310. 281-8275.

GE DISHWASHER - built-in, avocado face, working order. \$25. Lawrence, Ext. 4107, 472-0721.

REFRIG - Norge Customatic, has sm leak but operable. \$10. Andy, Ext. 2424.

KITCHEN SET - 42" round w/leaf, white pattern, 5 chairs. Best offer. Ext. 2443, 751-0637.

MOVING TO S. AMERICA - selling contents of home. O. Kochman, 744-6482.

MEDICINE CHEST - (2) new sculptured oval frame mirrors. Cost \$59 ea, sell \$25 ea. Doris, Ext. 3488, 924-7832 after 5.

AMMETER/VOLTMETER - clamp-on, type AK1, 0-600 amps, DC; 0-600 volts AC; 0-150 volts AC. \$30. Al, 589-1368.

CONSOLE TV - b/w Magnavox, \$25; recliner frame, \$15; Schick hair dryer, \$10; Polaroid camera, \$15; ass'd items. Palais, 698-0576.

BED - white child's youth bed, Simmons vinyl covered matt & guard rails, very good cond. \$35. 581-7656.

FREE - friendly mice & rats, home raised. Ext. 7772.

FREE MALE PUPPIES - look like beagles. Bumstead, 286-1456 after 6 p.m.

FIREWOOD SPECIAL! - 6 stacks of 4'x8'x18", seasoned hardwood, split, delivered. \$250. 744-8387.

SPEAKERS AND TURNTABLE - Advent/1 spkrs, less than 6 mos old, \$160 pr; turntable, dual 1215S w/shure M 95ED cart, \$100. Mark, Ext. 4254.

TRIKE - \$5; 16" girl's 2-wheeler/training wheels, \$12; pedal tractor, \$8; wagon, \$7; 2-26" bikes, his & hers, \$10 ea. 744-0354.

2'x6' THERMOPANE WINDOW - wood frame, single light, 1 side translucent, new cond. \$50. 286-1855.

PATIO ROOF - 10'x30', sturdy alum "H" beam structure w/fiberglass covering. \$450. 475-1494 eves.

GOSLINGS - grey Toulouse, \$5 ea; blk wood window box, 6' long, \$5. 286-3679.

MARIGOLDS - mixed colors. 12 plants/\$1. W. Stars, Ext. 4278, 298-9648 eves.

CAMERA - Minolta Hi-Matic "E" 35 mm, case, flash unit, Consumer rated best buy, used once, perf. \$75. Ext. 4701.

BABY ITEMS - 3-drawer changing table, \$20; high chair, \$15; bicycle (seat) carrier, \$8; 3-compartment GE food warmer, \$5; walkers, \$6; others \$3-\$8. J. Arbeit, 928-5714.

HOTPACK LAB OVEN - Mod 35732, all stainless, controls 100°F-500°F, inside 12x12x14, outside 21x25x27. \$55. Ext. 4058, 286-0436.

20" BICYCLES - (3), good cond. \$25 ea. 286-0241.

SWIM FINNS - Voigt med, \$4; mask (sm) & snorkel, \$2. J. Olson, Ext. 3382.

HOT WATER HEATER - natural gas, 40 gal, \$25; old records, \$1 ea; table mats (oval w/2 leaves), \$25. Lawrence, Ext. 4107.

TANIA - an excel watch dog, beautiful, intelligent, protective, needs a home, Doberman-Shepherd spayed female. Ext. 4883.

32" EXT DOOR - 4 lite, 3 panels below, 1¾" thick, new; 24" round pool cover, new; 4-14" spinner wheel hub caps. Ext. 4702.

CARPETING - blue/blue, 11x15, excel cond; green & brown, 11x12½, indoor/outdoor, excel cond; orange shag, 12x15, fair cond. John, Ext. 7994, 473-7030.

MOVING TO S. AMERICA - selling contents of home. O. Kochman, 744-6482.

VIBRAPHONE - 3½ octave Jenco, needs foot pedal. \$200. 727-7268.

2 HARDWOOD ARMCHAIRS - w/red vinyl seats. \$95/pr. 473-5585.

KITCHEN CABINETS - elec stove top, wall oven, & s/s sink, good cond. 751-0923.

WEDDING GOWN - size 12, detachable train, satin, & lace, has never been worn. \$100. P. Barnes, 727-5486.

BIKE - 10 spd Mossberg, med wgt, good cond. \$100. P. Oster, 286-1248.

16" BICYCLE - Schwinn boy's or girl's, like new. \$25. HR2-1875 after 5:30.

DC VOLTMETER - GE, type DP-9, volts 0-150 & 0-300. \$20. Al, 589-1368.

BEDRM SET - headboard, dresser, chest, mirror, tables, light mod, \$100; sofa, colonial 90", beige & green plaid, like new, \$200. Ex. 2443, 751-0637.

ELEC STOVE - Philco, works well, white, 40". \$75. 473-6210.

FOOT LOCKER - 36x20x12, \$8; crib & high chair, \$20; hand meat slicer, \$3. Gus, 727-1617.

WINCHESTER MODEL 70 - target 308 free floating barrel, Redfield match sights, also target 308 Lee-loader, better than new. \$460. 744-2493.

REFRIG/FREEZER - good cond. 281-2002 after 5:30.

UPRIGHT FREEZER - 19 cu ft, lock, good cond. \$200. 281-4871.

2 PWR LAWNMOWERS - 1 rotary, \$35; 1 reel, \$40. Ext. 4539.

REFRIG/FREEZER - good cond. 281-2002 after 5:30.

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MILLER PLACE - immac 4 bedrm colonial, L/R, w/fp, formal D/R, fam rm, 1½ baths, full bsmt, 2-car gar, flagstone patio, wooded. \$51,900. Ext. 3305, 734-5527.

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UPRIGHT FREEZER - 19 cu ft, lock, good cond. \$200. 281-4871.

2 PWR LAWNMOWERS - 1 rotary, \$35; 1 reel, \$40. Ext. 4539.

REFRIG/FREEZER - good cond. 281-200