BROOKHAVEN BULLETIN
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BROOKHAVEN NATIONAL LABORATORY

Spotlight on NSLS Research

Doug Humphrey

Jerry Silverman (center) talks to visitors from the IBM Research Group based in Yorktown Heights, New York.

X-Ray Lithography

An integrated circuit is several square millimeters in area, and scientists are attempting to make it even smaller by reducing the sizes of its components: capacitors, resistors, diodes, and transistors.

Jerry Silverman, Rolf Haelbich and Dino Costas of IBM's Research Group from Yorktown Heights, New York are doing research at the National Synchrotron Light Source (NSLS) to determine the capabilities of x-ray lithography for the replication of circuit patterns, a necessary step in the production of integrated circuits.

To achieve the high resolution needed to make the components of an integrated circuit smaller, the patterns must be copied with short wavelength radiation, such as x-rays. And the synchrotron radiation at the NSLS provides both the best available resolution, as well as extremely high intensity.

There are two reasons to make smaller components. First, it would be more economical. But, more important, what slows down a computer is the interconnections between the integrated circuits. If integrated circuits were smaller and denser, electrons would flow along a shorter path and the computer would operate more efficiently.

The components of an integrated circuit are similar in structure and material — that is, similar techniques are used to make both a transistor and a capacitor. A transistor consists primarily of a silicon substrate to which dopant atoms (boron, phosphorus, or arsenic) have been added to alter the silicon's conductivity. Then, by applying appropriate voltages in different areas, the flow of electrons can be controlled, resulting in the desired currents. The doped areas, called the source and the drain, as well as metal interconnections, must be precisely patterned. That's where x-ray lithography comes in.

The silicon substrate is cleaned and heated, forming a silicon dioxide layer which acts as both a diffusion barrier against dopants and as an electrical insulator. The wafer is then coated with radiation-sensitive material, usually an organic compound, called a resist. Positioned between the radiation source and the resist is a mask which acts as a stencil.

The vacuum ultraviolet ring (750 MeV) of the NSLS provides the x-ray source needed by the IBM group. The wavelengths of light emitted from the NSLS's other ring, the x-ray ring (2 GeV), are too short. Instead, the softer x-rays from the VUV ring are used.

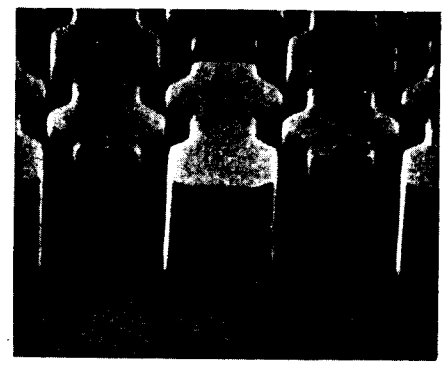
At the U-6 beam port, the beam emanates tangentially from the ring and deflects off an oscillating cylindrical mirror, which scans the beam over the wafer. It next passes through a beryllium window which filters out the less desirable longer wavelengths. The window also acts as a vacuum barrier between the storage ring and the exposure chamber, which is 10 meters from the source.

Inside the chamber is the wafer and the mask. The mask consists of a thin silicon membrane, covered with a gold pattern that absorbs the x-rays and allows a pattern to be formed on the resist. Gold is preferred because it is easy to electroplate, and because of its high density, it has a high absorbability.

Once the resist is exposed, it's developed and the exposed areas are dissolved, revealing the silicon dioxide layer. An etching step, involving hydrofluoric acid, is then used to remove the oxide in the exposed areas. The regions of the silicon exposed by the silicon dioxide etch process are then treated with silicon dopants to form the source and drain regions, in the same pattern as on the mask.

Next, a gate oxide between the two regions must be formed. The remaining resist and the silicon dioxide from the previous step are removed, and the silicon surface is reoxidized and is recoated with resist. Another exposure step, using a mask with a different pattern, allows an opening to be etched in the new silicon dioxide layer. A thin layer of oxide is then allowed to form in this region. Still another exposure step creates patterns for a metal layer, such as aluminum, which acts as a wire connecting the wafer's regions. The transistor can now become part of an integrated circuit. Size and levels and types of impurities, such as dopants, determine the difference between the transistors.

"A lot of people think we do the actual etching of the wafer here," says Silverman. "But that's all done at Yorktown. The only thing we do here is the exposure step."



A PMMA resist, 3.4 microns thick, exposed using the IBM x-ray lithography beam line.

Two types of research can be done at the NSLS: basic and proprietary. Most scientists at BNL are involved in basic research — that is, the results are not directly applicable. The IBM group at beam port U-6 is doing basic research; papers describing their work have been published. "We're happy to let the world know a lot about what we're doing,"says Silverman. "Of course, IBM does have an interest in making money, and if we work on something that we may wish to keep as a trade secret, that work would be proprietary."

When, and if, IBM decides to do proprietary research they will have to pay for operating costs and for a percentage of the construction costs. There is no fee for basic research.

What they do varies from day to day. Some days they do exposures. Other days they try to get the beam line to work better. They also make plans and designs for future work. And sometimes they go to Yorktown to collaborate with scientists handling other phases of the research.

Eventually, more people will be arriving from Yorktown Heights to work with new equipment and perhaps to man the beam line around the clock if the method proves to be effective.

—Steve Eisenberg

Next week the Bulletin will explore the research on x-ray microscopy being done by a university team.

BNL Participates in US/Canada Acid Rain Study

A six-week scientific experiment jointly conducted by the United States and Canada will begin in September. Brookhaven scientists, along with those from DOE's Environmental Measurements Laboratory and Pacific Northwest Laboratory, will be working with a team of Canadian scientists to study how pollution is carried over long distances by wind currents in the atmosphere.

This joint study, which has been planned for several years, has been officially recognized as part of an agreement signed this week by the United States and Canada to cooperate in research on the movement of pollutants that cause acid rain. The study is known as Captex, an acronym for cross-Appalachian tracer experiment.

Russell Dietz, in the Environmental Chemistry Division, DAS, originally developed a technique using perfluorocarbon compounds to trace air masses over long distances, in an economically viable way. The method uses portable sampling units called BATS, for Brookhaven Atmospheric Tracer Samplers, which were developed at BNL and are now commercially available.

For the U.S./Canada experiment, the BNL tracer technique will be used with perfluoro-monomethyl-cyclohexane (PMCH). Inert, colorless and nontoxic, PMCH will be released from two industrialized areas regarded as major sources of air pollution — the region around Dayton, Ohio, and Sudbury, Ontario. Using airplanes and a network of ground-sampling stations, both equipped with BATS, the scientists will trace the movement of PMCH east across the continent.

Funding for the project comes from the National Oceanic and Atmospheric Administration, the U.S. Department of Energy, the Environmental Protection Agency, the Electric Power Research Institute, and Canadian Government agencies.

Doug Humphrey

Rolf Haelbich (left) and Dino Costas at beam port U-6 used by IBM.

A Night at the Main Gate

"How much do I owe you, honey?" "Excuse me." "Isn't this a toll booth?" "No. It's the entrance to Brookhaven National Laboratory." "Well, could I come in?" "Who are you visiting?" "You." "Sir, I'll have to ask you to leave." "I don't have to. I pay my taxes."

Patrol Officer Cathy Vanderoef steps into the booth at the main gate, picks up a walkie talkie and speaks with Captain Baulch, her shift supervisor, who arrives in a few minutes to escort the man off-site.

It's twilight and Vanderoef has just started a two hour shift. Deer, some coughing softly, begin to walk around the booth. And a nine point buck gets hit by a speeding car near the blinking light farther down the road as a limousine drops off a visitor near the main gate.

Two dogs, a German Shepherd and a Labrador Retriever, both with leashes, come out of the woods, lope over to the booth, and rub their paws against the bricks. They begin to pout, then whimper, but don't bark. Vanderoef lets them into the booth where she pets them.

The traffic light on the William Floyd turns green and a set of high beams comes toward the main gate. They pass the sign, "Headlights Off," and pull up to the booth.

"Could you shut your lights please?" "I'm looking for two dogs." "What kind of dogs?" "A mutt and a Dalmation." "When did you last see them?" "A few hours ago." "And you think they're here?" "Don't you take dogs off the street and use them for experiments?" "No." "Then why are those dogs inside with you?" "They're leaving as soon as the captain escorts them off-site." "Can you arrange it so he also talks with me?" "Yes. Just pull up alongside the information booth." "Thank you."

Patrol Officer Jeff Taylor and Captain Baulch, in a green pick-up, stop at the main gate. Taylor relieves Vanderoef, who goes back with Baulch after he talks with the owner of the lost dogs.

Taylor listens to the radio and watches as a Cadillac stops at the gate.

"Excuse me, officer, is this the turn-off for Brooklyn?" "No." "Is this the entrance to the LIE?" "No. Can I help you?" "I'm looking for Brooklyn." "What you have to do is turn around, make a left at the traffic light and take the second right, which will take you to the expressway." "Thank you."

The Cadillac turns around but into the oncoming lanes of traffic. Taylor picks up the walkie talkie and talks with Baulch who speeds down the road. Patrol Officer Roger Kiely in a green pick-up is two car lengths behind. They turn left at the light and coming toward them is the Cadillac. So they stop him and show him where the LIE really is.

It's midnight, and Kiely is now on duty. He looks up and sees Igor the Bat flying near the lights which shine upon a stopped car whose driver is screaming that he's having a heart attack. An ambulance arrives and takes him to Brookhaven Hospital.

Kiely steps out of the booth and walks around it a few times. He sees a car stop thirty feet from where he's wiping sweat from his forehead. The car makes a U-turn and leaves the Lab.

The booth phone rings. It's Baulch, who tells Kiely that Patrol Officer Harvey Richardson is on the Lab's outer perimeter and will be a few minutes late.

Seven minutes, to be precise. He turns on his scanner, sits down and looks at a moth sliding down the tinted glass of the booth. Lightning begins to strike. The moth flies off into the lights to which several types of insects are attracted.

Richardson packs tobacco into his pipe and strikes a match. He strikes two more matches, and smoke fills the booth. He slides the door open after the lightning stops and begins to imitate a cat meowing below the insect zapper attached to the information booth.

An orange Vega stops at the gate.

"I know you're in there, Harvey.

"How are you, buddy?"

"I'm fine. Have a good night."

"You too, buddy."

A station wagon with a flat tire follows the Vega past the booth, turns around at the traffic light, and returns in the same lane. Richardson chases the car with a flashlight and waves it over to the other side of the road. The driver's window rolls down.

Peter Horton

Tom DeSimone greets a nighttime visitor.

"Could you check to see if I have a flat tire?"

"You sure do."

"Thank you."

It's 4:25 and a Suffolk County police officer pulls up to the booth and chats with Patrol Officer Frank Crifasi. They talk about the humidity and the fallen tree near the cafeteria. He stays for five minutes and leaves.

Crifasi sits down and calls headquarters. He talks about a mouse crawling underneath the pipes in the back of the booth. It's not a very big mouse; it's a little over two inches long. And it's dirty white.

The deliveries are next. Milk. Newspapers. Bread. The drivers are always the same.

Two minutes after the bread truck leaves, a pick-up with two people on the back passes Crifasi who watches a car follow the pick-up. The driver of the second car yells, "I'm a Suffolk County cop." Crifasi picks up the walkie talkie and notifies Baulch who, with another patrol officer, chases the pick-up to one of the firebreaks, where it can't drive any further, turns around and is about to ram into the captain's pick-up when he pulls out his pistol and shoots the left front tire. By this time the two on the back are running into the woods, and the driver is being handcuffed.

The three had robbed a gas station. The sun is rising.

Not a typical night at the main gate. The names, of course, are true. The stories are true. But the events occurred over a long period of time with the stories not necessarily matching the names.

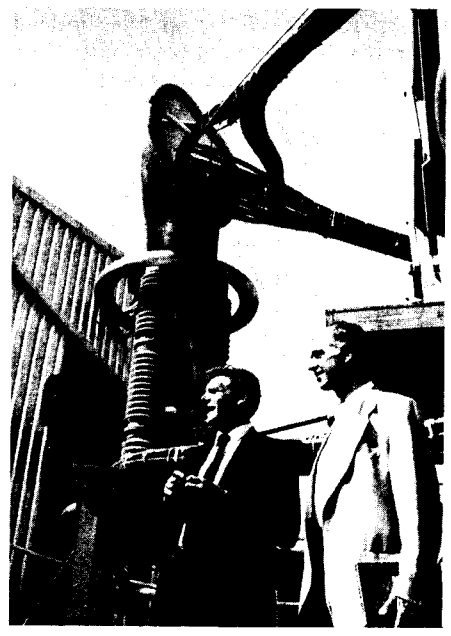
A typical night usually entails recording license plate numbers or entering cars from 8:30 p.m. to 6:30 a.m. and of exiting cars from 10:30 p.m. to 6:30 a.m.

...and sometimes something interesting happens.

— Steve Eisenberg

Alex Reben

The technology for creating high temperature, solid oxide electrolyte fuel cells was the subject of a three-day conference which concluded last week in Berkner Hall. The workshop was a follow-up to a 1977 meeting on the same topic, also held at BNL. Over 70 of the world's leading experts in this field, from both research and industry, participated in this year's program, including representatives of DOE's Office of Fossil Energy, which sponsored the conference, and members of the Organizing Committee (OC): (from left) Frank Salzano, OC, BNL; Frank Gmeindl, DOE; Mo Zahid, DOE; Hugh Isaacs, OC, BNL; Darrell Fee, OC, Argonne National Laboratory; Ann Schuler, OC, BNL; Clovis Linkous, OC, BNL; John Fillo, OC, BNL; and Richard Gariboldi, DOE. (Not shown: Gerald Wirz, OC, University of Illinois.) In the opening address, Gariboldi said, "The solid oxide fuel cell, with its potential for high system efficiency and high quality waste heat, has great promise as a system for distributed power generation... Clean, quiet, highly efficient electricity from a variety of fuels at a lower cost continues to be the major reason for pursuing more advanced fuel cells." At BNL, research into fundamental fuel cell phenomena is conducted by the Materials Chemistry & Energy Conversion Division of DAS, headed by Salzano, as well as the Materials Technology and Reactor Systems Divisions of DNE.



Doug Humphrey

On August 10, Eric Forsyth (above, left), head of the Power Transmission Project, gave a tour of the superconducting power transmission facility to Volker Soergel, director of DESY, the accelerator laboratory in West Germany. Dr. Soergel was at BNL for a general visit. He also toured the CBA tunnel and magnet facilities, the National Synchrotron Light Source and PETT VI, the positron emission transaxial tomography brain scanner which is jointly operated by the Chemistry and Medical Departments. A week later, the Power Transmission Project was busy with a very different activity. On August 16, W.A. Chester, Inc., high voltage installation specialists who install cable for commercial utility companies all over the country, came to BNL. Their purpose was to install a room temperature cable that has been developed by the BNL group and built on the same winding machine that manufactured the superconducting cable. This innovative room temperature cable carries considerably more current at higher voltage than the same size conventional cable. Also, it can be retrofitted (pulled into an existing pipe) and impregnated in the field with oil in a very small fraction of the time it takes with ordinary cables, which must be impregnated under special conditions at the factory. On August 17, W.A. Chester began to install high voltage stress cones and termination bushings. When that was finished at the end of the week, the BNL team began preparations to connect power to the newly installed terminations. Next the pipe will be evacuated and filled with special cable oils. Pictured at right is Bill Kristiansen, who was guiding the room temperature cable during installation.

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Train Taxi

Every weekday, a Laboratory driver meets the 8:40 a.m. train from Penn Station on its arrival at 10:16 a.m. in Patchogue. BNL-bound travelers are then brought to their individual destinations on site.

At 4:25 p.m. every weekday, New York-bound visitors may take a Laboratory car to Shirley to meet the 4:55 p.m. train which gets in to Penn Station at 6:32 p.m. The car leaves from Bldg. 134 (Public Relations) and passengers should be on hand by 4:20 p.m. Reservations must be made by calling Ext. 2345.

John Lee Hooker

Doug "Harmonica" McLean

John Lee Hooker will sing the blues at Berkner Hall on Saturday, September 3, at 8 p.m. One of the all-time greats, Hooker said in a California Today interview that there are five or six bluesmen still performing, and that "When we're gone, they'll still be people playin' the blues, but not the way we play it." And he's probably right. There won't be many opportunities left to hear a singer who really knows how to sing the blues. Hooker will be accompanied by his Coast to Coast Blues Band. On the same bill is Doug "Harmonica" McLean's Blues Band. McLean has worked with Hooker and other blues greats, B.B. King and Muddy Waters. Now, with his own band, he is delighting audiences with his innovative, electrified harmonica. Tickets are $10, if purchased in advance from the BERA Sales Office, or from ticket reps. The night of the concert, tickets will be $12 at the door. Ticket reps are: Mary Durham, Ext. 7982; April Donegain, Ext. 2903; Mac Thomas, Ext. 2959; Kay Hunt, Ext. 2882; Deidre Seymour, Ext. 5037; and Sandra Green, Ext. 4933.

Ph.D.'s on the Rise

A nine-year decline in the number of science and engineering doctoral graduates ended in 1981 when the number of degrees granted increased to 17,600, up 400 from the previous year, according to a report by the National Science Foundation. Preliminary data for 1982 show the number of science/engineering degrees virtually unchanged from 1981.

The report also found that the number of science/engineering doctorates granted to women has increased yearly, from 400 in 1960 to 4,000 in 1981. Still, women doctorates were concentrated in the life and social sciences.

Since the 1960's the fields in which doctorate degrees are concentrated have been shifting. The proportion of doctorates in the life and social sciences and psychology rose from slightly more than one-half in 1960 to three-fifths in 1981, while the share for the physical sciences declined from 25 percent to 15 percent.

The report provides such information as sex, race and citizenship of new doctorates, as well as their post-graduate plans. Also included are rank-ordered lists of the 100 institutions that awarded the most science/engineering doctorates during the 1960-81 period and the 300 baccalaureate institutions with the largest number of alumni holding science/engineering doctorates.

Copies of the report, NSF 83-309, are available from the Division of Science Resources Studies, National Science Foundation, Washington, DC 20550. Telephone (202)634-4622.

Att: Commodore Users

All those interested in joining the Commodore Users Club may contact Ken Orsini at Ext. 5042, Bldg. 901A.

Cafeteria Menu

Week Ending September 2

Monday, August 29

Cream of celery soup	(cup) .65
	(bowl) .75
Cheese omelet & 1 veg.	1.80
Beef chow mein on rice	1.85
Hot Deli: Corned beef	(bread) 1.85
	(roll) 2.00

Tuesday, August 30

Turkey okra Creole	(cup) .65
	(bowl) .75
London broil w/1 veg. & mushroom gravy	2.10
Baked lasagna & 1 veg.	1.95
Hot Deli: French toasted ham & cheese	1.80

Wednesday, August 31

Old fashioned bean soup	(cup) .65
	(bowl) .75
Beef Stroganoff on egg noodles	1.95
Ham & broccoli crepes & 1 veg.	1.85
Hot Deli: Knockwurst & sauerkraut	(bread) 1.85
	(roll) 2.00

Thursday, September 1

Split pea soup	(cup) .65
	(bowl) .75
Stuffed pepper & 1 veg.	1.85
w/spaghetti	2.05
Tuna noodle casserole & 1 veg.	1.85
Hot Deli: Barbeque boneless pork rib	2.00

Friday, September 2

Fish chowder	(cup) .65
	(bowl) .75
Fish & chips	1.85
Beef hash & 1 veg.	1.85
Hot Deli: Baked ham	(bread) 1.85
	(roll) 2.00

Arrivals & Departures

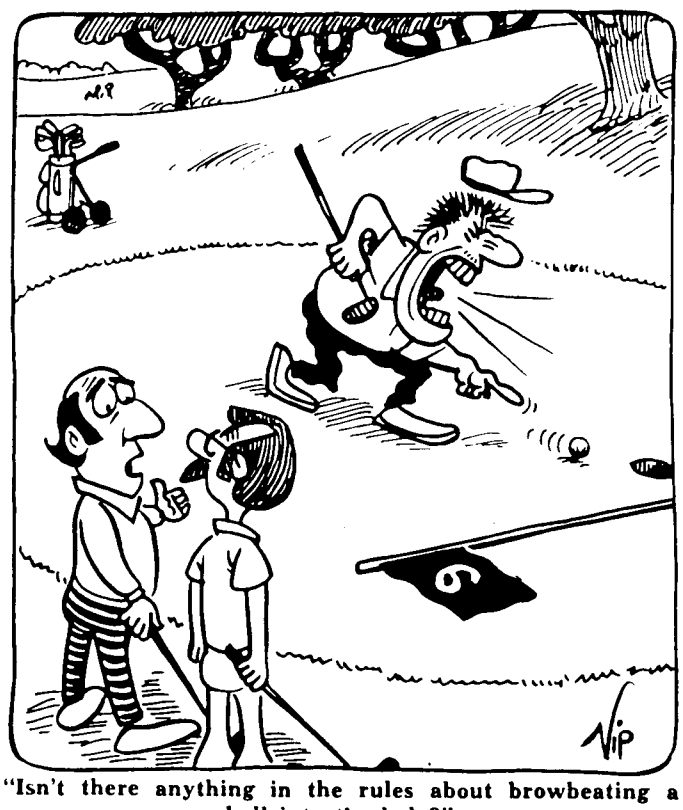
Arrivals

Robert D. Baldwin, Jr. ..... Reactor

Departures

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

Aryeh A. Frimer ..... Medical
Masanori Okawa ..... Physics



"Isn't there anything in the rules about browbeating a ball into the hole?"

Service Awards

The following employees received service awards during the month of August:

Thirty-Five Years

Murray J. Klein ..... Reactor
Smith G. Pearsall ..... S&EP

Twenty-Five Years

Benon H.J. Bielski ..... Chemistry
Leon Green ..... Nuclear Energy
Blanche R. Laskee ..... Personnel
Dorothy C. Luther ..... Plant Eng
Benjamin Magurno ... Nuclear Energy
Paul A. Michael ..... App. Science
Edward A. Pluta ..... Central Shops

Twenty Years

Nicholas Alonzo ..... Biology
Daniel L. Gilliam ..... S&EP
Richard Lehmann ..... Accelerator
Erno A. Ostheimer ..... Accelerator
Joseph T. Russo ..... Physics
Roy Skarka ..... P&GA
Robert J. Warkentien ..... Accelerator
George C. Warner ..... Accelerator

Ten Years

Peter M. Heotis ..... Medical
Fletcher E. Johnson ..... S&M
Renee M. Tonini ..... MIS

NYC Train Trip

The Hospitality Committee is planning a group railroad trip to New York City on Wednesday, September 7. Departure will be at 7:55 a.m. from the Patchogue LIRR station. Round-trip fare for adults is $3.50; 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, September 1. 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.

Sugar Facts

If you're an average American, the Cooperative Extension Association of Suffolk County says you probably consumed about 125 pounds of sugar last year. About two-thirds of the sugar eaten in the U.S. is in the form of refined sugar, while the rest comes from dairy products, fruits and other foods. As far as your body is concerned, sugar is sugar. But eating foods that contain natural sugar gives you an added bonus — important nutrients, rather than just energy and calories.

Diners Note

The Cafeteria will be closed on Saturday, August 27. On that day, snack bar service will be available from 9 a.m. to 2 p.m. at the Brookhaven Center.

Swimming Pool

Summer season tickets are valid through Sunday, September 4. During the week of August 29 through September 4, the pool will be open as follows:

Monday through Friday
(Employees only)
11 a.m. to 1:30 p.m.
(Employees/Families/Guests)
1:30 p.m. to 9:30 p.m.

Saturday and Sunday
(Employees/Families/Guests)
1 p.m. to 6 p.m.

The pool will be closed on Monday, September 5 (Lab holiday).

New Season

Tickets for a new four-month pool season will be sold at the pool starting Tuesday, September 6.

Fees:

Season Tickets (fees not prorated)	
Individual Membership	$23.00
Family Membership	33.00
Daily Admissions	
Employee/Family Member	1.25
Guest	1.75

Schedule:

Monday through Friday
(Employees only)
11 a.m. to 1:30 p.m.
(Employees/Families/Guests)
5 p.m. to 9:30 p.m.

Saturday and Sunday
Employees/Families/Guests
1 p.m. to 6 p.m.

Guest Ruling (Applies to all recreation facilities)

One Guest - An employee is allowed to bring one guest per visit without special permission or prior arrangement. The guest must be accompanied by the employee.

Two to Five Guests - Advance arrangements for two to five guests may be made at the Recreation Office. (No more than five guests per employee is ever permitted.) When such an arrangement is made, the Recreation Office issues an admission card stating the sponsor's name and life number, the number of guests permitted, the date of visit, and the facility to be visited. Guests must be accompanied by the employee, who will be requested to show the admission card at the main gate and at the swimming pool ticket desk.

Sponsoring employees are responsible for their guests during the entire time they are on site.

Special Event

Reserve the date of October 14 or 15 for Dinner Theatre at BNL sponsored by the Special Events Committee of BNL. Watch for additional details in future Bulletins.

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.

OPEN RECRUITMENT: Opportunities for present Laboratory employees and outside applicants.

1930. TECHNICAL POSITION - Requires AAS degree in electronic technology or equivalent and at least 5 years' experience with high voltage, high power pulse work. Requires thorough knowledge of construction, diagnostic and modification techniques as well as test equipment. Accelerator Department. (Reposting of Job #1903).

1931. TECHNICAL POSITION - Requires AAS degree in electronic technology or equivalent and at least 5 years' experience with analog and digital circuits. Thorough knowledge of construction, diagnostic and modification techniques as well as a wide range of test equipment necessary. Background with high current power supplies is desirable. Accelerator Department.

Autos & Auto Supplies

30 CHEVY - restoration started, all wood and parts, $2,500. Pete, 744-8349 after 6 p.m.

78 HONDA MOTORCYCLE - CM4OOT, $1,000. Ext. 7125.

81 DATSUN 210 - $4,200. Lloyd, Ext. 3381 or 286-1024 after 6 p.m.

78 YAMAHA SPECIAL - 750cc, asking $1,600. 289-2864.

VW PARTS - brand new, call for needs. Augie, Ext 2419 or 289-4211 eves.

77 HONDA - 750CBK, $900. Rich, Ext. 4482 or 277-1129.

74 DODGE COLT - station wagon, $450 firm. Tony, 732-3338.

76 BUICK CENTURY - station wagon, $1,900. 581-7656.

TIRES - (4) P175/75R14, $25. 363-6940 after 5 p.m.

73 FORD MAVERICK - $1,300. 363-6940 after 5 p.m.

74 AUDI FOX - $1,500. Ext. 4976 or 929-3061 after 5 p.m.

79 OLDS CUTLASS SUPREME - diesel, $4,100 or best offer. Ext. 3103.

STOCK CAR - trailer and many extra parts, $1,800. Ext. 3371 or Paul, 924-8143 after 6 p.m.

73 CUTLASS - $895. 732-8928 after 6 p.m.

RADIAL TIRES - (2) P155/80R13, mounted and balanced on Chevette rims, $50 for both. Jake, Ext. 4532.

77 BMW 320I - $6,800 firm. 472-1831.

78 CHEVY PICKUP - $6,000. 878-4567 eves.

81 TOYOTA CELICA COUP - $6,300. 924-8522 after 6 p.m.

78 CADILLAC ELDORADO BIARRITZ - $6,600. Rosalie, Ext. 3160 or 289-5704 after 5:30 p.m.

FUSE EMERG. KIT - British autos, i.e., Austin Healey, Triumph etc. Susan, Ext. 4267.

80 HONDA HAWK - asking $600. Gary, 473-2473.

81 CHEVETTE - $3,795. 981-3401.

77 HONDA MOTORCYCLE - XL75, asking $225. Bob, Ext 4672 or 929-4753.

82 MALIBU CLASSIC - $6,595. 981-3401.

82 CITATION - $5,895. 981-3401.

TREK SLIDE-ON CAMPER - 878-0516.

83 TOYOTA CELICA SUPRA - 477-0264 eves.

69 DART - $800 firm. Ext. 3375 or 751-6139.

83 FORD - F100, $7,000. 727-3921.

71 VW SUPER BEETLE - $600. 878-9592.

TAILGATE - $50; front & rear bumpers, $25/ea.; crossbed toolbox, $75; for Chevy C-10 pickup. Jim, Ext. 4040 or 289-0876.

66 CHRYSLER NEWPORT - $250 or best offer. 751-0627.

58 GERMAN MOTORSCOOTER - needs full restoration, $100. Harry, Ext. 3783.

80 DIESEL RABBIT - $4,000. 286-1046 after 8/29.

68 TROTWOOD TRAVEL TRAILER - Rich, 363-6845.

78 OLDS OMEGA - $2,775. 744-5224.

82 FORD EXP - 878-2375 after 6 p.m.

79 OLDS CUTLASS SUPREME - $3,900. 744-5224.

79 MG MIDGET - $3,400. 878-0201.

61 BUG - $375. Erik, 281-5565 after 5 p.m.

76 HONDA 750 MOTORCYCLE - 363-7032.

78 TRIUMPH TR7 - $2,500. 363-7032.

76 CHEVY CAMARO - 2,000 or best offer. 286-8041 after 5 p.m. or weekends.

67 DART - $200 firm. 821-0758 6-8 p.m.

72 SAAB ENGINE - parts or as a whole unit; parts for 72-79 SAAB; parts for Honda CVCC Civic, 75-79; 744-5079 after 6 p.m.

CANVAS TOP - beige for Jeep, $200 or best offer. 286-8041 after 5 p.m.

76 CADILLAC SEVILLE - $3,000. Bruce, Ext. 4113.

81 CHEVY CITATION - $5,400. 878-6878.

HONDA MOTORCYCLE - CB400F, $800. 981-7054, 7-10 p.m.

HONDA MOTORCYCLE - 550, $1,000. 981-7054, 7-10 p.m.

73 BUICK - $600. Yasushi, Ext. 3883

75 FORD TORINO - $1,200. 924-0589 anytime.

64 OLDS F85 - classic for restoration, $800. Joe, Ext. 5131.

75 FORD TORINO - $800 or best offer. David, Ext. 4362 or 4890.

70 KARMAN GHIA - $1,000. 286-1618.

74 DODGE VAN - make offer. Dionne, 878-1124.

77 PORSCHE 924 - $7,900. Joachim, Ext. 2070.

77 PLYMOUTH VOLARE PREMIER - $3,000. Joachim, Ext. 2070.

72 FIAT SPIDER - $1,200. 286-0342 eves.

TIRES - (2) 950 x 16.5 traction tread $5/ea.; tire (1) 800 x 16.5 highway, $10. Ext. 2898 or 363-7620.

79 PONTIAC GRAN PRIX - $4,000. 286-1790.

74 GREMLIN - $400 or best offer. Zhongwu, Ext. 4495.

CHEVY TRUCK WHEELS - 15", 6 lug, $10/ea.; chrome bumper guards 73-80 Chevy truck, $15/pr. 727-4859.

77 BATAVUS MOPED - $200. 924-6835 eves/weekends.

72 CHEVY VEGA - asking $400. Paul, 286-2517.

Boats & Marine Supplies

TIDECRAFT BASS BOAT - 1981, 35 HP Johnson; 1978 Johnson foot controlled trolling motor; trailer, $2,250. 698-1676 after 6 p.m.

33' NAUTALINE HOUSEBOAT - self-contained, sleeps 6, complete rebuilt outdrive, priced to sell. Ext. 2939.

WINDSURFER - Starboard + 2 sails, $550. 475-4428.

18' V HULL FIBERGLASS MFG - new, navy top, side curtains, 65 HP Evinrude, seldom used, original owner, $2800. M. Kurka, 727-3145.

30' PACEMAKER - 1962, FWC 270 HP, repowered '76, many extras, must be seen, asking $8,000. 289-0012.

LASER - rowing shell, complete, new condition, 19 ft., $1,500 firm. 589-3407, eves.

CHRIS CRAFT SPEEDBOAT - 1969, collector's item, mahogany, mint, $3,000. Ext. 7160 or 289-0602 eves.

29' SPORT FISH - 1965, Lapstrake hull, bridge, dual stations, head, dinette, many extras. Ext. 3739 or 928-6944.

SEA SPRITE - electric start, 85 HP Mercury, complete pkg., $2,195. 744-5224.

Yard Sales

MILLER PLACE - 112 Tyler Ave., Saturday, Aug. 27, 9-5.

Miscellaneous

ANTIQUE TRUNK - w/brass fittings, great shape, $45. 475-2090 eves.

RAILING - (2) wrought iron, for 4'stoop with 3 steps, good condition. Jim, 744-3792.

CAMPING EQUIPMENT, North Face 2-man backpacking tent, $75; Camptrails backpacks, (1) medium, (1) large, $25 each; stove & more. 929-8662.

TABLE LAMPS - (2) by Stiffel, baked enamel with silk shades, $60. Ext. 4231.

DISHWASHER - portable, butcher block top, $75. Rolf, Ext. 4238 or 286-2045.

CHAIN SAW "MAC" - $95; windows doub. hung 4' x 3', slider 3' x 2', alum. with storm & screen, $10 each. Ron, Ext. 7696 or 289-1003.

DRYER - electric, runs well, new bearing and belt, $25. Roy, Ext. 4664 or 744-8779.

ANTIQUE TELEVISION - with built-in radio, Admiral TV on bottom, $150 or best offer; antique wagon wheels, excellent condition, $50/pr.; 1000 Electrostatic copier, multicopy, 8-1/2 x 11, Speed-O-Print, $100 or best offer. 732-3338.

MOVIE EDITOR - dual 8, $7; car top carrier, steel, $8. J. Medina, Ext. 7636 or 924-6971.

REFRIGERATOR - 32" Amana, side-by-side, coppertone, 19 cubic feet, $250. Anna, 281-4202.

HOTPOINT REFRIGERATOR - with top freezer, 13 cubic feet, bronze, left hand door, working condition, $75. Walter, 878-8967 after 5 p.m.

MIRRORS - 2' x 2', $10 each; end table, $10. Paul, Ext. 3371 or 924-8143 after 6 p.m.

KITCHEN SET - w/4 chairs, butcher block, like new, $50. Chet, Ext. 3762 or 928-3014 after 5 p.m.

TENNIS RACQUETS - (2) Wilson T-5000, like new, $20 each, $35 takes both. Mati, Ext. 3999.

CANOPY BEDROOM SET - full size, 2 dressers, end table, $200; assorted baby furniture, cheap. 369-1792 before 8 p.m.

HOODED WEDDING GOWN - ready to wear, no need for veil, excl. condition, must see, beautiful, size 8, $75 firm. 878-9102.

ELECTRONIC DETECTIVE GAME - Milton Bradley, like new, needs batteries, $10; beer signs, Harp and Beck's, electric, $8 each. 363-6753 after 5 p.m.

ANTENNAS - Wilson Tribander, $60; Radio Shack V185 TV antenna, new, $50. 744-9677.

SEARS DADO BLADE - with carbide tips, adjustable settings, $18. 751-3666.

BLANK CASSETTE TAPES - BASF, CrO_2, C-90, $2.75 each. Ext. 2521.

TENNIS RACQUET - Black Max, $60. Marie, Ext. 3673.

BMX DIAMONDBACK RACING BIKE - excellent condition, $350. Glenn, 928-3545.

CHANDELIER - 5 light, Spanish style, silver wrought iron. J. Medina, Ext. 7636 or 924-6971.

STORM WINDOW - brown colonial style, 32" x 80", w/screen, $25; 48" white formica & teakwood table, $50. Ken, Ext. 4421.

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

24" BICYCLE - 10 speed, unisex, good condition, $45. Harry, Ext. 3783.

OSTER CAN OPENER - electric and citrus juicer, $16; Salton yogurt maker, $8; steam vaporizer, like new, $6; Remington lady's shaver, w/light, excel. condition, $8; glass piece for table top, 40" dia. x 3/8", $45; carriage stroller, good condition, $10. 878-0717.

WATER DISTILLER - new, reasonable. Ext. 3688 or 363-7032.

COLOR TV - 19", good picture tube, some work needed, $25; B/W TV, 19", RCA, portable, good condition, $25. Ext. 4240 or 286-0295.

PROJECTION SCREEN - home movie/slides type, good condition, $10. Victor, Ext. 2395.

MET OPERA TICKETS - (2) balcony, Boheme, Jan. 6th; (4) M. Lescaut, March 23rd, $20/ea. Dave, Ext. 2694.

DRESSERS - (2) old, $10 & $20; 20 dozen ball jar rubbers, 50¢/dozen; 2 dozen quart & pint jars, $5. 878-6637.

DISK DRIVES - 5-1/4 inch, 40 track, MPI model 51, $125. Dick, Ext. 2911.

AMIGO MINI-COMPUTER - 64K, w/dual disk drives, CRT, separate keyboard, Epsom RX80 III graphic printer, $1,700; CDC 5-1/4" floppy disk drives, model 9409T, quad-density, $140/ea; Shugart model SA200, self contained dual disk drives, 5-1/4" floppy, $180. Ext. 3160 or 289-5704 after 5 p.m.

POOL - 24' x 4', good condition, filter and pump, $150. Dave, Ext. 4148.

DINING ROOM FURNITURE - 60" table with (2) leafs (opens to 84"), pads and (4) chairs, china closet, all formica, all like new. 727-2167.

CARGO CARRIER - 21 cu. ft. capacity, new about $170, sell for $25; fish tank, complete stand & all, 20 gal., $50. Ext. 2898 or 363-7620.

BICYCLE - boys, 10 speed, new, $80. James, Ext. 4890 or 4362.

TABLETENNIS TABLE - $75; fan, $14; 50' hose & jet $5; 100' aerial cable $5; all almost new. Angela, Ext. 4890.

MEN'S SKI BOOTS - 8-1/2, Salamon SX90, used 2 wks., $135; men's ski pants, 34R, dark blue wool & synthetic stretch, never worn, $75. Ext. 4727.

BEAVER JACKET - new, long hair, med. size, $200. Ed, Ext. 4249.

LE ROI DIESEL COMPRESSOR - 125 CPM, 400 lb.; sandblaster jack & chipping hammer; air water pump, air 24"; chain saw. Ext. 5319.

OIL BURNER - Repco 134,000 BTU, w/Econojet gun, complete unit, $250. 281-0122.

AIR CONDITIONER - 6,000 BTU, GE, good condition, $75. R. Lane, Ext. 2575.

MEN'S BIKE - Peugeot, 10 speed, excellent condition, $65. Naomi, Ext 3699 or 744-1081.

WASHING MACHINE - Frigidaire, 7 years old, white, needs minor part, otherwise excellent condition, $75. Ext. 7130 or 929-8323.

COFFEE TABLE - cherry, 56" x 20", 2 drawers, $30; 3 tier plant cart, $5; pine spoon rack, $15. 727-4859.

REFRIGERATOR - 14-1/2 cu. ft., good conditon, $135. 751-8240 eves.

TOY CHEST - $20; children's school desk, $35; bicycle child carrier, $12; wagon, $5. Vince, Ext. 4660.

TORO CULTIVATOR - 5 HP, excellent, $250; pot belly stove, w/grate damper, stove pipe, complete, $75; recessed lights, new in carton, $25/pr., CB antenna, 8' whip. 325-1961.

FISH TANK PUMP - 24x13x16; good mirror 55x36; and wishing well. Jerry, Ext. 4337 or 286-2680.

COUCH - contemp. style, super cond., $150 firm. 928-7745.

TV - RCA XL-100, good condition, $150; Maytag washing machine, runs but needs work, best offer; (2) GM love seats (infant car seat) one for $5, one for $15. Anne, 751-6781.

SOFA BED - flip-flop, excellent condition, Herculon design, $60; Waring blenders, good condition, $10; Osterizer, $20; Presto hot air corn popper, used only once, $12; Salton yogurt maker, $8; queen size sofa/sleeper, light brown, good condition, $80; (2) chest of drawers, $20 and $30. 924-6835 eves/weekends.

MATTRESS - queen/frame, good condition, $25; Kenmore washer, works well, $25; cassette tape recorder, $20; metal coat rack, $5; oval coffee table w/removable glass top, $30; many misc. items. Ext. 2733 or 878-8491.

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

MARGARETVILLE, N.Y. - year round, 2-plus bedrs., 2 baths, elec. & wood heated, full cellar, fireplace, 2 car gargage with shop & loft, all heated and insulated storage bldg., eight acres, 2 cleared, 1/2 stream, adjoins state land. (914) 586-4634.

RIVERHEAD - mobile home, family park, 12' x 50' with 12' x 15', master bedroom extension, 3 bdrs., 2 sheds, deck, $16,000. Dave, Ext. 7922 or 369-1792 before 8 p.m.

RIDGE - one acre plot, over 100 x 400 ft. in quiet residential area, $13,900. 924-3236.

COOPERSTOWN VIC. - 200 acres, adjoining state forest, reasonable. 363-7032.

For Rent

MASTIC - 2 rooms, furnished, private entrance, utilities incl., working person. 281-6099.

MASTIC - beautiful, mother/daughter house, 3 bdrms/1 bdrm with lg. basement (10 minutes from Lab.), appliances avail. w/many extras, you must see it to believe it. Kathy, 281-5605.

BROOKHAVEN - studio apt., private ent., heat, h/w, a/c, elec., cable tv, utilities incl., $450/mo., starts Sept. 1. 654-3877 days or 286-2588 eves.

STONY BROOK - 3 bdrm. colonial, furnished house, for two months during Nov./Dec. '83, transportation available to the Lab. Jag, Ext. 5080 or 751-1884.

APT. - 1 bedroom, 12 minutes from Lab., heat included, Sept. '83-May '84 with option to continue thereafter. $430/mo. 878-9520.

Car Pools

E. PATCHOGUE - would like to start car pool, LaBonne Vie apts, 8:30-5:00. Pam Esposito, Ext. 4303.

BELLPORT VILLAGE - need driver to complete a 4 person car pool, 8:30-5:00. Joe, Ext. 3569.

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

RONKONKOMA - driver to join 3 person pool, near LIE exit 59, 8:30-5:00. Victor, Ext. 2395.

Lost and Found

FOUND - man's watch in Bldg. 478. Bob, Ext. 5286.

LOST - field glasses, in black case, near tennis courts. Robin, Ext. 4421.

LOST - motorcycle riding gloves, tan leather w/velcro straps. Bob, Ext. 3354 or 744-3289.

Wanted

HOUSE TO RENT - or lease, 2/3 bedroom, in South Country School District, for family with children. Ext 4154 or 286-8743.

USED CONSOLE PIANO - in reasonable condition, low price. Mati, Ext. 3999.

GENERATOR - 110V, at least 10 amp. Bob, Ext. 7197.

RECORD PLAYER - need not be automatic, but must work, reasonable, for church group. Claire F. Hull, 281-2002.

EIGHT CIGAR BOXES - Gordon, Ext. 4095.

SOFA BED - good condition, reasonable. Kathy, Ext. 3420 or 281-2849 eves.

AUTO TAPE DECK - 8 track, am/fm stereo, working, reasonable. Steve, Ext. 3327.

EXERCISE BICYCLE - under $50. Ken, Ext. 4421 or 744-0722.

TRAVEL TRAILER - self contained, 13 ft. to 15 ft. Harry, Ext. 3783.

ROOMMATE - female, to share 2 bdrm house in Bellport, 15 min. from Lab. 286-3865 after 2 p.m.

BIRD CAGE - with stand, reasonable. Ext. 5241 or 286-3377 after 5 p.m.

BABYSITTER - on site, for 6 & 8 yr. old boys, until Sept. 12, then after school, Apt. 4B. Cameron, Ext. 3130.

HOUSE SITTER - last three weeks of September. Ext. 4373.

OLD BICYCLE PARTS - to practice on and experiment with. Ext. 4030 or 878-2484.

RIDERS OR SPONSORS - for bikathon, to benefit Camp Paquatuck for handicapped children. Jim, Ext. 4030.

REFRIGERATOR FREEZER - normal size, reasonable. Mike, Ext. 7160.

CABINET - for basic Singer sewing machine. Anne, 751-6781.

APARTMENT/HOUSE - to rent, near BNL, utilities included, reasonable. Denise, Ext. 2272.

AIRQUIPT 100 SLIDE MAGAZINES - circular, also Airquipt 40 slide straight magazines. Tony Torre, 281-0510.

Ads for Services may be posted at the BERA Sales office.

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