BROOKHAVEN BULLETIN
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BROOKHAVEN NATIONAL LABORATORY

BNL's Search for the Science of Superconductivity

Part II: New Superconductors Challenge Old Theory

Learning the nature of materials that become superconducting at high temperature is an interdisciplinary quest Brookhaven has undertaken since about the time of the discovery of the second 90-100 kelvins superconducting compound at BNL at the start of the year. Such an understanding is necessary if these new materials are to be used practically, yielding lower cost, resistance-free electricity.

In complementary studies, the Lab's three big machines are probing different aspects of the new superconductors. As the second in this four-part series of articles discusses, BNL staff and visitors are experimenting to find out how the new materials differ from the old and why the theory of conventional superconductivity fails to explain high superconducting transition temperatures (T_c).

BNL solid state theorists are then using these experimental results to explain the mechanisms of high T_c superconductivity, from the making of the new materials to the reason for high temperature superconductivity itself.

To understand the search for a new mechanism of high temperature superconductivity being conducted at BNL, it is necessary to understand the old mechanism for low temperature superconductivity, as explained by BCS theory.

Initial Theory

The initials BCS stand for the last names of the winners of the 1972 Nobel Prize in Physics: John Bardeen, Leon Cooper and John Schrieffer shared the prize for their 1957 theory explaining superconductivity at low transition temperatures.

Superconductivity is the loss of electrical resistance in a solid, as well as the expulsion of magnetic flux from the material's interior. This change of state is brought about by reducing the temperature below a critical transition temperature (T_c) that is characteristic of the material. Below T_c, superconductivity is established continuously, so the superconducting properties of the material gradually improve.

According to BCS theory, there are two ingredients for low T_c superconductivity: One, electrons pair. Secondly, electron pairing comes about because electrons and phonons interact.

"In high temperature superconductors, as in conventional ones, electrons do pair," explains solid state theorist Victor Emery, a Senior Physicist in the Physics Department, who is head of BNL's Interdisciplinary Task Force on High Temperature Superconductors. "So electron pairing is not in doubt. However, as experimental results at BNL have shown, it is unlikely that electron pairs in high T_c materials are formed by electron-phonon interactions."

Cooper Pairs

The first breakthrough in establishing BCS theory for low temperature superconductivity came in 1956, when Leon Cooper showed that two electrons in a metal can bind together to form a weakly bound pair, now known as a Cooper pair. In conventional superconductors, Cooper pairs owe their existence to phonons.

A phonon is the smallest unit of vibrational energy corresponding to a sound wave. These packets of sound make up the vibrations that naturally arise within the lattice of a solid.

A lattice is the structural framework of an ordered solid, made up of a regular, repeating pattern of the atoms composing the material. These atoms do not sit still in space. They vibrate: Depending upon the mode of vibration, atoms oscillate about their average position in the lattice.

As lattice vibrations, phonons interact with the electrons surrounding the atoms in a lattice. In conventional superconductors, certain vibrational modes cause conduction electrons to pair.

As in low T_c compounds, electron pairs make up the resistance-free supercurrents in the new, high T_c materials. However, two experiments at BNL convincingly suggest that electron pairing in high T_c materials is not mediated by the most likely phonons, the ones that interact most strongly with the conduction electrons.

Yes, We Have No Phonons

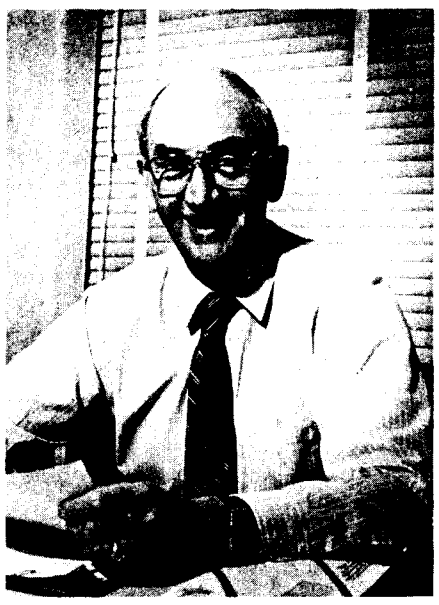
The lattice vibration that was thought to result in electron-phonon interactions is called the breathing mode. In the breathing mode, the oxygens of a copper-oxide layer within one of the new superconductors, for example, move rhythmically in and out about the coppers, relaxing and stretching the copper-oxygen bonds.

According to the phonon half of BCS theory, breathing-mode phonons were supposed to interact with the conduction electrons, allowing them to overcome their normal repulsion for each other and to pair.

However, working at the High Flux Beam Reactor (HFBR), BNL scientists and their collaborators from the Massachusetts Institute of Technology (MIT) found that breathing-mode phonons behave contrary to calculations. The researchers are Guest Senior Scientist Robert Birgeneau and nine colleagues from the Center for Materials Science & Engineering, MIT, and Senior Physicist John Axe, Associate Physicist Peter Boni and Senior Physicist Gen Shirane, all of BNL's Physics Department.

They looked at two compounds: the non-superconducting parent La-Cu-O, which is made up of lanthanum (La), copper (Cu) and oxygen (O), and one of its 35-55 kelvins (K) superconducting offspring La-Sr-Cu-O, which is made by doping, or adding, strontium (Sr) to the parent.

What are called band structure calculations (see box) had predicted that the interaction between the conduction electrons and the breathing-mode phonons would cause the breathing mode to freeze at low temperature in the parent compound La-Cu-O. Breathing mode was also supposed to slow down, or "soften," in the offspring La-Sr-Cu-O, resulting in high T_c superconductivity.



Peter Horton

Victor Emery

Instead, the researchers found that the breathing mode did not freeze in the parent compound. As it didn't stop in La-Cu-O, that meant breathing mode wouldn't slow down in La-Sr-Cu-O. Hence, breathing-mode phonons do not interact with the conduction electrons and cause high temperature superconductivity.

Significant Experiment

In finding no soft phonons, Birgeneau, Axe, Boni and Shirane had been looking at La-Cu-O for the lattice vibration responsible for a specific structural phase transition, called the tetragonal to orthorhombic transition.

They found that the softening of another lattice vibration, a rotational mode, was the cause of that structural modification. Unlike the breathing mode of vibration, the rotational mode does not result in electron-phonon interactions and Cooper pairs.

"I attach much more significance to this experiment than do the experimenters themselves," comments Emery. "It is the best evidence against the proposed phonon-mediated theories for high T_c superconductivity."

Conversely, band structure calculations had also incorrectly predicted that the breathing-mode vibrations of copper and oxygen should speed up as strontium is added to the parent compound La-Cu-O, and it becomes La-Sr-Cu-O.

At the NSLS doing extended x-ray absorption fine structure, or EXAFS, spectroscopy, Assistant Physicist John Tranquada, Physics Department; and Scientist Steve Heald, Physics Associate Arnold Moodenbaugh and Senior Metallurgist Masaki Suenaga, all of the Department of Applied Science (DAS), saw no change in the lattice vibration, as the compound was doped with strontium.

Perovskites

As with all solid state research, the scientists could not have interpreted these experiments had they not known the crystal structure of the materials with which they were working.

(Continued on page 2)

Physicists Band Together To Question Band Theory

Band theory describes the motion of electrons in solids, and calculations based on this theory are widely used by solid state scientists to predict the electronic properties of metals, alloys and conventional, low temperature superconductors.

However, from NSLS photoemission studies of the 90-100 K superconductor Y-Ba-Cu-O, a group of BNL scientists and their collaborators have found that band theory calculations of these superconducting materials may provide an inadequate description. Until this is resolved, the researchers are calling into question the use of band theory for the evaluation of superconducting transition temperatures.

The studies were performed by Physicist Peter Johnson, Assistant Physicist Shen Li Qiu, Guest Research Assistant Li-Qiang Jiang, Associate Physicist Mark Ruckman and Associate Department Chairman Myron Strongin, all of the Physics Department; Associate Physicist Steven Hulbert and Associate Physicist Richard Garrett, both of the National Synchrotron Light Source; and their collaborators from AT&T Bell Laboratories and Temple University.

Unlike in single atoms, when atoms combine to form solids, electrons are shared among atoms. So instead of occupying discrete energy levels, electrons are found in a range of energies called bands.

To compare the actual energies of the electronic bands with those calculated by band theory, the experimenters took advantage of photoemission, whereby electrons are emitted from a solid when radiation with sufficient energy strikes the solid's surface.

They found that significantly more energy is needed to remove outer electrons of Y-Ba-Cu-O than was predicted by band theory. As a result, they believe the difference will affect the prediction of superconducting transition temperatures.

Mort Rosen

At beam line U5 of the vacuum ultraviolet ring of the National Synchrotron Light Source, (top, from left) Mark Ruckman, Shen-Li Qiu, (bottom, from left) Jie Chen, Li Qiang Jiang, Richard Garrett, Peter Johnson, Steven Hulbert and Myron Strongin.

Superconductivity (Cont'd)

The new high T_c materials have perovskite-like structures (see figure 1a). Perovskite is a natural mineral, the three-dimensional structure of which describes the shape of over 150 other compounds.

Long before Alex Müller discovered high temperature superconductivity in metallic oxides, for which he and Georg Bednorz were awarded the 1987 Nobel Prize in Physics, Müller had studied perovskite structures. In fact, in 1969 at the HFBR, Muller collaborated with John Axe and Gen Shirane to investigate the structural phase transition of a closely related perovskite compound.

A BNL crystallographic team was one of several from around the world to independently elucidate the crystal structure of the 90-100 K superconductor Y-Ba-Cu-O. A third-generation compound, Y-Ba-Cu-O is made by replacing lanthanum in the 35-55 K superconductor La-Ba-Cu-O with yttrium (Y).

The team, made up of Physicist David Cox, Physics; and Arnold Moodenbaugh, Senior Materials Science Associate James Hurst and Senior Technical Associate Robert Jones, all of DAS, were among the first to find that Y-Ba-Cu-O is a distorted type of perovskite structure, in which two of the nine oxygen atoms that are normally present were missing from the structure.

The crystal structure of Y-Ba-Cu-O was discovered through neutron diffraction studies at the HFBR: first in March, using a polycrystalline sample, by Cox and colleagues, and then working with a single crystal in May, by Assistant Physicist Hoydoo You, Physics Department; Chemist Richard McMullan, Chemistry; John Axe and David Cox; and two collaborators from Argonne National Laboratory.

Neutron diffraction is very useful for determining the structure of crystals, such as Y-Ba-Cu-O, that contain both heavy and light atoms. Unlike x-rays, neutrons do not vary much in how they scatter depending upon atomic number. So Y-Ba-Cu-O could be more easily investigated using neutrons than x-rays.

Mainly on the Plane

According to Cox, the diffraction results show that the perovskite structure of Y-Ba-Cu-O consists of several layers: In the middle of the structural cell is a layer containing one yttrium; above and below the yttrium layer are layers each having one copper and two oxygens in a two-dimensional, "dimpled" plane (see figure 2a); there are two layers each consisting of a barium (Ba) atom; and, lastly, a layer made up of a one-dimensional chain of copper and oxygen (see figure 2b).

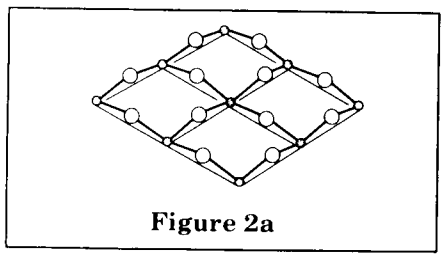


Figure 2a

Figure 2a: Layer of two-dimensional, dimpled plane of copper atoms (speckled circles) and oxygen atoms within the perovskite-type lattice of the 90-100 K superconductor Y-Ba-Cu-O.

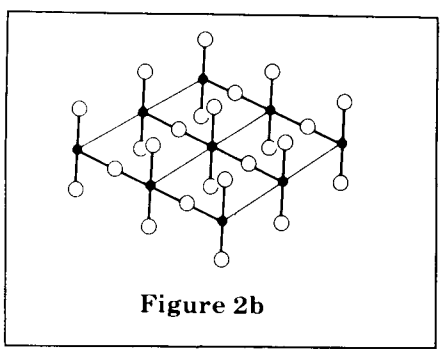


Figure 2b

Figure 2b: Layer of one-dimensional chains of coppers (dark circles) and oxygens within the perovskite-type lattice of the 90-100 K superconductor Y-Ba-Cu-O.

Mort Rosen

Some of the BNL researchers who work on the problem of high temperature superconductivity at the High Flux Beam Reactor: (from left) Peter Boni, Peter Zolliker, David Cox, Robert Jones and James Hurst.

As Cox and his colleagues found, the most outstanding feature of the structure is that the elements copper and oxygen have quite different relationships to each other in two different layers of the perovskite lattice. However, in both layers, the distances between copper and oxygen atoms are quite short. Thus, the transfer of electrons between the atoms and, hence, the flow of electric current is quite likely both in the chains and the planes of copper and oxygen.

Many, but not all, scientists working in the field believe that high T_c superconductivity actually takes place in layers of copper-oxygen planes.

T-O Transition

In the 90-100 K materials, superconductivity has been observed only when the perovskite structures of the materials is in what is called the orthorhombic phase (see figure 1b). Whether this is coincidental or significant is not yet known.

The crystal structure of many solids can be modified, depending upon temperature and pressure. During their preparation, the 90-100 K superconductors undergo a structural transition, from tetragonal to orthorhombic (T-O), as the materials are cooled from high temperatures.

The T-O transition in the Y-Ba-Cu-O structure corresponds to a reduction in the number of oxygen atoms in the copper-oxygen chains. In the tetragonal phase (see figure 1c), Y-Ba-Cu-O has six oxygen atoms per molecule and is not superconducting. In the superconducting orthorhombic phase, on the other hand, Y-Ba-Cu-O has seven oxygens per molecule. In general, the more oxygens in the chains, the greater the state of order and the higher the superconducting transition temperature.

Developing a statistical mechanical model of the T-O phase change is one way to understand how the number of oxygens in the chains and the degree of order in the structure depend upon the temperature and pressure of oxygen. At BNL, this was done by materials science theorist David Welch, a Physicist in the Materials Science Division, DAS, and Visiting Scientist Hans Bakker, of the University of Amsterdam, The Netherlands.

New & Improved Recipes

Their results have helped to understand why the so-called "shake & bake" recipes for the making of Y-Ba-Cu-O, which were developed by trial and error, work. Using the model, Welch and his collaborator hope to improve the steps of the recipes, so as to make improved materials.

As its oxygen content does not vary as much as that of its offspring Y-Ba-Cu-O, the structure and superconductivity of La-Ba-Cu-O is less dependent upon its oxygen content and more dependent upon the proper doping of its parent La-Cu-O. The parent compound La-Cu-O and its 35-55 K superconducting offspring, such as La-Ba-Cu-O, also undergo a T-O transition, but one different from that of Y-Ba-Cu-O.

Using the high-resolution x-rays at the NSLS, Hoydoo You, John Axe and David Cox, working with two University of Houston, Texas, collaborators, including Paul Chu, the discoverer of the first 90-100 K superconductor, found evidence that the structure of La-Ba-Cu-O is sometimes less symmetrical than orthorhombic. How this finding is related to superconductivity in La-Ba-Cu-O is still unknown.

Spin Exchange

"The structure of these new materials is telling us to look closely at the copper-oxygen planes for superconductivity," explains Emery, "and the lack of phonon interactions is saying that a new mechanism within those planes is responsible for electron pairing."

Emery suggests a new mechanism for high T_c superconductivity that takes place within the copper-oxygen planes: Instead of having electrons interact with lattice phonons, as they do to form electron pairs in conventional superconductors, Emery proposes that electrons interact through exchanging their spins. Emery's mechanism for the new materials produces Cooper pairs and high superconducting transition temperatures.

In the third of this four-part series in the next issue of the Bulletin, Victor Emery's theory of high temperature superconductivity and the supporting experiments performed at BNL will be examined. — Marsha Belford

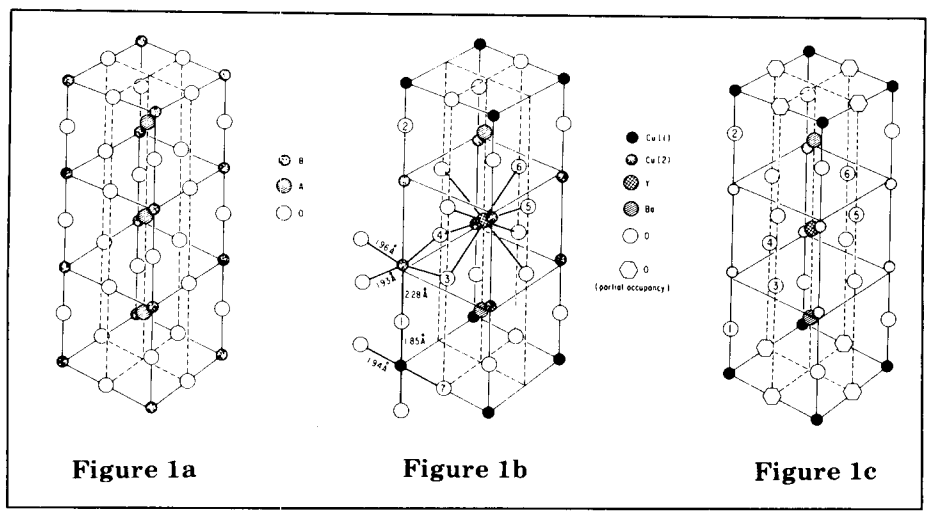


Figure 1a Figure 1b Figure 1c

Figure 1a: Perovskite structure showing three cubes stacked on top of each other.

Figure 1b: Orthorhombic phase of the 90-100 K superconductor Y-Ba-Cu-O, having seven oxygen atoms per structural cell (more than one cell is shown).

Figure 1c: In the tetragonal, non-superconducting phase, Y-Ba-Cu-O has six oxygens per structural cell (more than one cell is shown).

To Your Health

The following events have been scheduled by the Health Promotion Program. For more information about them, contact Health Promotion Specialist Elaine Friedman, Ext. 2699, Tuesdays and Fridays.

- **Seminar: Video Display Terminals (VDTs)** — To be presented by Otto White, Associate Division Head, Safety & Environmental Protection (S&EP) Division, on Tuesday, November 24, from noon to 1 p.m., in Berkner Hall auditorium.
- **Seminar: Fitness After Forty** — To be presented by Steven Jonas, author, triathloner and Professor of Medicine at the State University of New York at Stony Brook, on Thursday, December 3, from noon to 1 p.m., in Room B, Berkner Hall.
- **New Weight Watchers Sessions** — New and continuing members can sign up for another eight-session, on-site Weight Watchers (WW) program to begin on Wednesday, December 2 and continue through January 27. Registration can be done at the final meeting of the current session, on November 25, or at the first meeting of the new session, on December 2. Sessions are held from 5:15-6:15 p.m., in the S&EP Conference Room, Bldg. 535. The fee is $50; new members pay only half, as the Lab splits the cost with them.

Notice

Because of the Thanksgiving holidays on Thursday and Friday, November 26 and 27, the Bulletin will not be published next week. The deadline for acceptance of ads for the next issue, December 4, is noon on Tuesday, November 24.

At this time each year, the Bulletin publishes a listing of the names and addresses of all retirees and employees on long-term disability. Look for that supplement in a special distribution next week.

BWIS-AWIS Meeting

Margaret Holben Ellis, Chairperson and Associate Professor of the Conservation Center, Institute of Fine Arts, New York University, will speak on "Twentieth Century Drawings: Conservation Challenges for Everyone," at the next joint meeting of Brookhaven Women in Science (BWIS) and the Association for Women in Science (AWIS).

Ellis graduated from the Conservation Center in 1979. She has been with the Metropolitan Museum of Art since 1976 and is now Associate Conservator of Prints and Drawings there. She has participated in several workshops, lectured, published in her field and is a regular contributor to *Drawing*.

The meeting will be held on Thursday, December 3, 5:15 p.m., in Room A, Berkner Hall. For dinner reservations, please call Mary Kinsley, Ext. 5232. The entire Lab community is invited.

IBEW Meeting

Local 2230, IBEW, will hold its regular monthly meeting on November 23, at 6 p.m., in the Knights of Columbus Hall, Railroad Avenue, Patchogue. On the agenda will be regular business, committee reports and the president's report.

New Wave of UFOs at BNL

Mort Rosen

The UFOs (Unidentified Fund-raising Organizers) about to climb out of their spaceship are still unidentified personally, but they identify themselves strongly with the United Way cause.

Why are they so enthusiastic? Perhaps, where they come from, they've had experience with the effectiveness of organizations like the United Way. And they know that United Way will be able to help many more people if BNL'ers contribute enough to reach the 1987 goal of $87,000.

So far, the total collected stands at $48,000. Please help the UFO's and return your pledge card today.

BNL's Fabulous Forty

The BNL we know today is the sum of thousands of events that have taken place here since 1947. This sampling shows the variety of events — from the monumental to the minor —that have occurred throughout the month of November during the Lab's 40 year history.

November 3, 1947 — The 16 BNL bowling alleys, which no longer exist, opened in Bldg. 476, which has since been incorporated into Bldg. 902. A total of 123 games were rolled that day, with the main attraction being a match between the Motor Pool and the Men's Dormitory.

November 8, 1948 — The first block of graphite was set in place for the Brookhaven Graphite Research Reactor (BGRR).

November 21, 1949 — The Bulletin Board announced that, for $2.50, Laboratory personnel could enjoy "a gigantic Thanksgiving dinner" at the Lindenmere Hotel, Center Moriches, "complete with turkey and all the 'trimmings'."

November 21, 1950 — The price of a cup of coffee in the cafeteria rose to 7¢.

November 11, 1951 — BNL Botanist Frank German described and demonstrated the use of radioisotopes in studying life processes in plants, on "American Inventory," an NBC-TV weekly documentary.

November 17, 1953 — BNL researchers announced that, using the BGRR, it was possible, in the laboratory, to induce resistance to oat rust disease in a variety of oats previously very susceptible to the disease.

November 1956 — The Alternating Gradient Synchrotron (AGS) project moved from seven barracks to its new quarters in Bldg. 911.

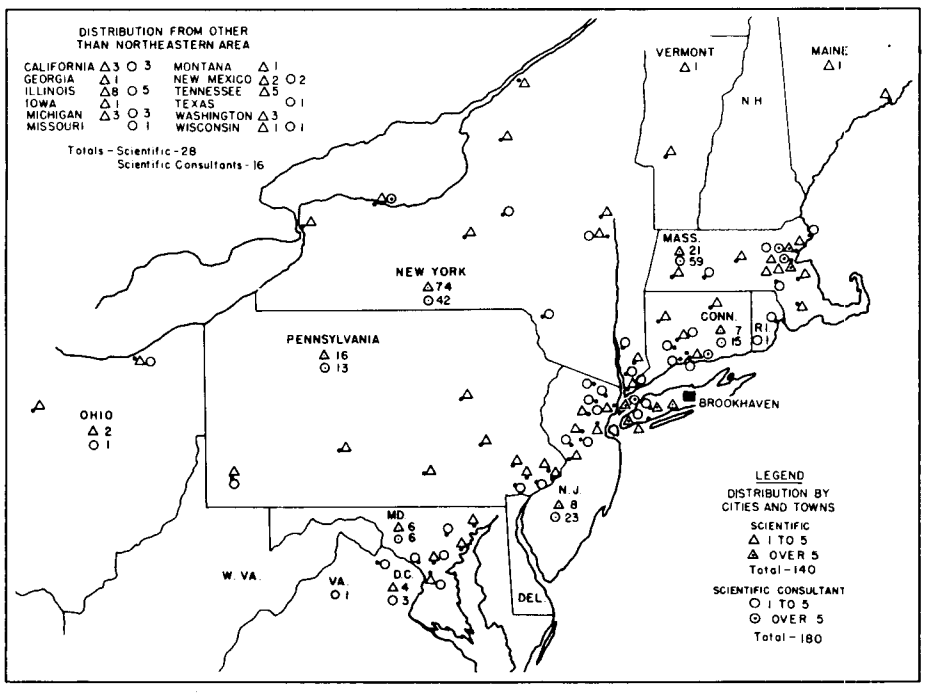
November 12, 1958 — The Bulletin Board announced that the Industrial Medicine Clinic had just moved into its new (and present) quarters in the Medical Building.

November 16, 1960 — The first Brookhaven Lecture was given by Nobel laureate Edward Purcell, a BNL Research Collaborator from Harvard University. He spoke about "Radioastronomy and Communication Through Space."

November 28, 1960 — Ground was broken for the High Intensity Radiation Development Laboratory (HIRDL).

November 22, 1963 — HIRDL was dedicated.

November 17, 1965 — Bulldozers started clearing the site of the new Lecture Hall-Cafeteria, now known as Berkner Hall.



This map shows the geographical distribution of BNL's scientific and scientific consultant personnel as of November 1947. Forty years later, scientific personnel have increased from 140 to 607, while scientific consultants have gone from 180 to 243.

November 9, 1967 — The Bulletin Board described how a 50-ton shielded room of the Whole Body Counter was the heaviest load ever to be lifted by the Lab's 80-ton crane.

November 10, 1967 — The first analyses of biological structures by neutron scattering were made by a BNL team under Benno Schoenborn.

November 1, 1969 — The seven-foot liquid hydrogen bubble chamber operated for the first time and was used to take pictures of cosmic-ray particle tracks.

November 6, 1969 — The start of Tune In!, a program for answering employees' questions in complete confidentiality, was announced in the Brookhaven Bulletin.

November 19, 1970 — The Tandem Van de Graaff Accelerator was dedicated.

November 17, 1971 — Julie Nixon Eisenhower came to BNL to transfer BNL's North Tract to New York State (NYS), for use as a public park and recreational area. NYS Governor Nelson Rockefeller was on site to accept it.

November 16, 1973 — The Bulletin reported that the world's largest superconducting bending magnet for an accelerator had begun operating at the AGS.

November 22, 1974 — "Physics Discovery of the Decade Made at the AGS" declared a Bulletin headline about the discovery of the J particle, which was announced by an MIT/BNL team headed by Samuel C.C. Ting. The discovery netted Ting a Nobel Prize in 1976.

November 3, 1979 — Ground-breaking ceremonies were held for a new building on William Floyd Parkway to house the editorial offices of Physical Review, which had been at BNL from 1951, and Physical Review Letters, which had been born on site in 1958.

November 19, 1982 — The Bulletin reported that the AGS had been upgraded to use negative hydrogen (H^-) ions to create the proton beam, a process called H^- charge exchange injection.

November 22, 1982 — The National Synchrotron Light Source was dedicated.

November 1, 1983 — Leon Van Hove presented a colloquium as the first Leland J. Haworth Distinguished Scientist.

November 1, 1985 — The AGS Booster-Accumulator received an initial allocation of $2 million.

Equipment Demos

The Knotts Company will display many of the new products that they distribute at a table top exhibit on Tuesday, December 1, from 10:30 a.m. to 3 p.m., in Berkner Hall. On display will be the latest in programmable controllers, positioning cylinders, teflon valves and fittings, miniature vacuum pumps, sensors, robotics and other instrumentation products.

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August Waeldin, Inc., will display their scientific and industrial products on Thursday, December 3, in Berkner Hall. The product lines on exhibit will include quality-inspection and biological microscopes, CCTV systems, image analysis and apparatus for testing and inspection.

AA Meetings

Alcoholics Anonymous (AA) meetings are being held at the Lab every Tuesday at 5:30 p.m. All employees, others with current BNL identification cards and their spouses are invited to participate. To find out the location of the meetings, call the Employee Assistance Program, Ext. 2733. As participation in AA is confidential, you will not be asked to identify yourself when making the inquiry.

Stony Brook Events

The following events are scheduled at the State University of New York at Stony Brook.

• **Visit evening graduate courses** — During the week of November 30 to December 4, prospective part-time graduate students may visit the evening graduate courses listed on a schedule available by calling 632-7050. Sponsored by the Center for Continuing Education in Recognition of Adult Learning week.

• **Orchestra of the 18th Century** — The largest early instrument orchestra in the world will appear at the Fine Arts Center on Saturday, November 21, at 8 p.m. The orchestra is made up of 40 musicians, who are all known individually as specialists in 18th century music. For tickets and information, call the Box Office at 632-7230.

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Gym & Pool Schedule

The entire gym and pool complex will be closed during the Thanksgiving holiday period: Thursday through Sunday, November 26-29. Normal hours will resume on Monday, November 30.

BWIS Ski Trip

Brookhaven Women in Science (BWIS) is sponsoring a one-day ski trip to Belleayre, New York, on Saturday, December 12. The bus will leave Brookhaven at 4:30 a.m. and return around 11 p.m. The cost is $40 for downhill skiing, including lift tickets, and $25 for cross country. You may bring your own equipment or rent it there.

To reserve a place, call Vicki McLane, Ext. 5205, or Susan Eng, Ext. 7988; or send a check for the full amount made out to Brookhaven Women in Science to Susan Eng, Bldg. 515.

Service Awards

The following employees are receiving service awards during the month of November:

Forty Years

Paul W. Roman ..... Chemistry

Thirty Years

Stanford E. Carde ..... Plant Eng.
Daniel F. Leahy ..... Appl. Science
Frederick W. Paffrath ..... Physics
Jack Weisenbloom ..... AGS

Twenty-five Years

Richard W. Allen ..... Plant Eng.
Edward P. Bihn ..... Physics
Anthony J. DiSena ... Central Shops
Jack Fajer ..... Appl. Science
Patrick J. Glynn ..... Staff Serv.
Herbert Hildebrand ..... Accel. Dev.
Frederick J. Hill ..... Plant Eng.
Warren F. Hulse ..... Plant Eng.
Milton Jones Jr. ..... Plant Eng.
Donald R. Meany ..... AGS
Paul V. Mohn ..... Plant Eng.
Gerry H. Morgan ..... AGS
William B. Sampson ..... AGS
Jane I. Schwaner ..... Dir.Off.

Twenty Years

Carol Ann Beckner ..... Tech. Info.
Alfred A. Bertsche ..... Accel. Dev.
Robert Bickerton ..... Central Shops
Robert R. Kinsey .... Nuclear Energy

Ten Years

Gerry M. Bunce ..... AGS
Robert A. Christianson ... Plant Eng.
Mark Cohen ..... Central Shops
Thomas J. DeSimone .. Sfgrds. & Sec.
Kathleen A. Griffin ..... Biology
Sonja B. Haber ..... Nuclear Energy
Douglas Hill ..... Appl. Science
Marsha R. Kipperman ..... Personnel
Deidre J. Seymore .... Central Shops
Karen A. Vogel ..... Fiscal
Lee M. Walcott ..... Chemistry

Fill 'Em up — With Toys and Gifts

Peter Horton

The boxes are in place, but as Louisa Barone points out, they're not overflowing yet. The boxes have been installed in the BERA Sales Office to receive the toys BNL employees donate to the 1987 Interface Toys-for-Kids Drive, an annual project organized by the Town of Brookhaven to provide happy holidays for needy young people in our local communities. Won't you help fill these boxes to the top with new toys and gifts for children of all ages —infants through teens? You can drop off your donations (wrapped, if possible) at the BERA Sales Office between 9 a.m. and 2 p.m., Monday through Friday, through December 11. If you wish to volunteer some of your lunchtime to help with collection efforts, call the Recreation Office, Ext. 2873.

Choral Group: Concert Rehearsals

The BNL Choral Group will present a Christmas Concert in the cafeteria during lunchtime on Thursday, December 17. A schedule of rehearsals has been set, but because of scheduling conflicts at Berkner Hall, some will be held at the Brookhaven Center, North Room, as follows:

November 24 — Brookhaven Center
December 1 — Berkner Hall
December 4 — Berkner Hall
December 8 — Brookhaven Center
December 10 — Berkner Hall
December 15 — Berkner Hall

Each rehearsal is expected to last less than half an hour. Please arrive at noon sharp. All parts are needed, especially sopranos. Please join us. For more information, call John Weeks, Ext. 2617, or Janet Sillas, Ext. 2345.

Arrivals & Departures

Arrivals

Rosalie M. Alongi ..... Sup. & Mat'l.
Hubert Frank ..... Central Shops
Luke S. Greco ..... Sfgrds. & Sec.
Charles F. Hayes ..... Sfgrds. & Sec.
Charles R. Meitzler ..... AGS
Michael E. Salvitti ..... AGS
David R. Seebaugh ..... Medical
Graig R. Sirot ..... Photo. & Gr. Arts

Departures

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

Jurg Schefer ..... Biology

Bowling

Red/Green League

High games were bowled by R. Jones 219/204, C. Bohnenblusch 213/202, K. Asselta 213, S. Dimaiuta 208, R. Mulderig 207, J. Muller 207, H. Arnesen 205, R. Jansson 205, J. Mayeski 203, L. Schairer 200.

White League

Jim Griffin rolled a 219, Frank Gaetan 203, Joe Mayeski 206, Pat Manzella 185.

Pink League

Maryann Reynolds had games of 172/162, Sandy Asselta 170, Renie Rosati 169/168, Ann Parrinello 161.

A Long Island Thanksgiving

Although the first Thanksgiving feast took place 366 years ago, the Long Island Farm Bureau says that, today, we can nearly duplicate the fare enjoyed by the Pilgrims and Indians in 1621, with the bounty of Long Island's local food products.

• The main course — The first Thanksgiving feast included turkey, partridge, quail, venison, eel, lobster and other shellfish. The game was cooked outdoors on spits turned by the men; the shellfish was buried in hot coals or simmered into stews in cast-iron kettles hanging over the open fire.

On Long Island, raising poultry has been an important occupation for well over a century. Some four million fowl are raised on the Island each year, including ducklings, turkeys and chickens. Fresh fish and shellfish, which include clams, oysters and eels, are now available from local waters. Shellfish can be a first course or prepared in a savory chowder or bisque; eels are a tasty appetizer panfried or topped with a light sauce.

• Fruits and vegetables — First Thanksgiving feasters also enjoyed vegetables from the women's "kitchen gardens" — parsnips, carrots, turnips, onions, cucumbers, radishes, beets and cabbage. Dessert consisted of dried wild summer fruits, including gooseberries, strawberries, plums and cherries, baked in dough cases — the forerunners of our modern-day pies. Corn was served parched in hoecakes, ashcakes, roasted over hot coals, as Indian pudding — boiled in a bag with molasses — or as popcorn, roasted in earthen jars until the kernels burst.

Long Island's most widely grown vegetable crops are cabbage, cauliflower, sweet corn. Carrots, beets, onions, parsnips, turnips and radishes also can be purchased through late fall. Potatoes, while not on the original Thanksgiving menu, are traditional Long Island Thanksgiving Day fare. Ideal fruits for holiday pies are locally grown apples, pears and pumpkin.

• Wine - At the first harvest celebration, the pilgrims introduced the Indians to red and white wines made from wild grapes. More than 1,000,000 bottles of Long Island wine were produced in each of the past two years; this year's harvest should be the biggest yet.

See Supplement for additional notices and Classified Advertisements, including Placement Notices.

Time to Circulate Your Blood

A two-day blood drive will be held at the Lab on Tuesday and Wednesday, December 15 and 16, and the goal is 400 pints.

Two pledge cards are being sent to each employee so that friends or relatives may also join the BNL campaign. Please sign up as soon as possible. If you need any more information, call Susan Foster, Blood Drive Chair, Ext. 5126, or contact the Blood Program Captain for your department or division (see list below):

Dept.	Bldg.	Captain	Ext.
ADD	1005	Patricia Webster	4628
	902A	Audrey Blake	5382
AGS	911	Marion Heimerle	4776
AMD	515	Michael Torres	4199
DAS	179A	Pat Taylor	2452
	526	Peter Fallon	3043
	815	Betty Ivero	2208
	480	Jim Hurst	3844
	475	Flo O'Brien	4953
	426	Debbie McIntire	7990
	318	Judy Giordano	3051
	120	Sharon Zuhoski	3359
	51	Lola Kopp	2265
AUI	134A	Elliott Levitt	2495
Bio.	463	Richard Sautkulis	3386
Chem.	555A	Sophie Kostuk	4302
CSD	903	Al Campbell	2043
	462U	Christine King	7725
	462A	Frank Monroig	4986
	479	Frank Flegar	3498
DCP	355	Linda Zahra	7745
DNE	130	LaRosa Collins	2063
	475B	Lydia Ryan	2380
	902C	Sue Signorelli	4931
DO	134	Janet Sillas	2345
DOE	464	Claire Gash	3438
Fisc.	134A	April Donegain	2459
Inst.	535B	Patrick Gilleeny	2836
Med.	490	Peter Heotis	2304
MIS	459	Kathy Boggi	3805
NSLS	510E	Pat Harlin	4828
	725B	Linette Finley	5136
PE	134C	Richard Scheidet	5284
	452 Elec.	Michael Brauner	4669
	326	Ronald Mulderig	3084
	422	Robert Zigrosser	5317
Pers.	185	Marsha Kipperman	2871
P&GA	197B	Bruce Style	2953
Phys.	901A	Sandy Asselta	4550
	510A	Liz Mogavero	3940
Reac.	750	Randi Vogt	4421
S&EP	599	Michael Carroll	2351
	490	Nate Carter	3556
SMD	211	Barbara Boerjes	4956
S&SD	50	Pat Cahill	2740
SSD	179B	Joan Perullo	2549
	179B	William Webster	2525
TID	477A	Arline Willsey	7665

Volleyball

Standings—Week of November 19

	W-L
League I	
Upfagrabs	11-1
Dinkers	7-5
Xrayted	6-6
Phoubars	5-7
Cannonballs	5-7
Bumpers	2-10
League II	
Set-Ups	8-1
Nuts & Bolts	8-4
Chunga's Revenge	7-5
Fossils	6-6
Slammers	4-5
Photons	3-6
Upton Ups	0-9
League III	
Printouts	8-1
Renegades	7-2
Sourcerers	6-3
Screwballs	5-4
Misfits	5-4
Spikes	3-6
Airheads	2-7
Good Times	0-9
Open League	
Serendipity	7-2
Phoenix	7-2
Dakota	6-0
Not Too Bad	4-5
Duituits	2-7
Leftovers	1-5
Rowdy Radicals	0-6

CREF Values

January	$33.54	February	$34.99
March	$36.02	April	$36.02
May	$36.03	June	$37.74
July	$39.33	August	$40.94
September	$40.06		

October $31.55

Note to Diners

The Cafeteria will be closed on Saturday, November 21. On that day, snack bar service will be available from 9 a.m. to 2 p.m. at the Brookhaven Center.

Over the Thanksgiving holiday weekend, Thursday, November 26, through Sunday, November 29, the Cafeteria will operate only snack bar service, from 9 a.m. to 2 p.m. daily. The Brookhaven Center will be closed on that Thursday, Friday and Saturday, reopening at 5 p.m. on Sunday, November 29. The vended food service in Bldg. 912 will be in operation throughout the Thanksgiving holiday.

Cafeteria Menu

Week of November 23

Monday, November 23

Louisiana corn chowder	(cup)	.75
	(bowl)	.95
London broil w/mushroom gravy & 1 veg.		3.05
Batter-fried fish & chips w/1 veg.		2.95
Stuffed tomato w/chicken salad cold plate		2.25
Hot deli: Grilled Rueben		2.75

Tuesday, November 24

Lentil soup	(cup)	.75
	(bowl)	.95
Crusty fried chicken w/1 veg.		2.95
Spaghetti & meat sauce w/garlic toast		2.85
Chef's salad cold plate (lite-weight)		2.25
Hot deli: Pastrami	(bread)	2.65
	(roll)	2.75
	(hero)	2.85

Wednesday, November 25

Cream of potato soup	(cup)	.75
	(bowl)	.95
Salisbury steak w/gravy & 1 veg.		2.95
Chicken chow mein w/rice		2.85
Hot deli: Italian meatball sandwich		2.75

Thursday - Sunday, November 26-29

Snack bar service only: 9 a.m. - 2 p.m.

Holiday Hams

Let the Cafeteria prepare your holiday ham. At $2.15 per pound, plus tax, these smoked, bone-in hams average 14 pounds each. The hams are fully cooked and ready to eat. To reserve your holiday ham for Thanskgiving or Christmas, call the Cafeteria at Ext. 3541.

BROOKHAVEN BULLETIN

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ANITA COHEN, Editor
MARSHA BELFORD, Assistant Editor
LIZ SEUBERT, Reporter

35 Brookhaven Ave., Upton, N.Y. 11973
(516)282-2345

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 and/or appropriate bargaining unit, 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 Employment Manager, Ext. 2882.

LABORATORY RECRUITMENT - Opportunities for Laboratory employees only.

2732. SECRETARIAL POSITION (Term Appointment) - Requires AAS in secretarial science or equivalent experience and a broad knowledge of Laboratory operations, policies, and procedures. Under minimum supervision will provide varied secretarial support including technical typing, correspondence, travel arrangements, and maintaining group files. Word processing experience on an IBM/PC necessary. National Synchrotron Light Source Department.

OPEN RECRUITMENT - Opportunities for Laboratory employees and outside applicants.

2733. DRAFTING POSITION - Requires an AAS degree in drafting or the equivalent, with an advanced working knowledge of electrical drafting procedures. Will perform non-routine drafting tasks which require the application of most of the standardized drawing techniques. Familiarization with Autocad or P-CAD helpful. National Synchrotron Light Source Department.

2734. ENGINEERING POSITION - Requires MS degree in power or electrical engineering and 7-10 years experience in the design and operation of high power electric generating equipment with emphasis in the motor generator pulsed operation mode, solid state motor speed control systems, electrical insulation, and thermal and mechanical stress effects. A strong design background in these areas as well as servo feedback loop and analog circuit design is required. Familiarity with high power ac-to-dc converters and ac line effects is highly desirable. Alternating Gradient Synchrotron Department. Reposting of Job #2504.

2735. DATA SERVICES POSITION - Requires AAS in data processing or equivalent experience as well as familiarity with data base and spread sheet concepts and PCs. Responsibilities will include preparing and entering data, writing new report procedures, and maintaining files. Accelerator Development Department.

2736. CLERICAL POSITION (part-time) - Requires good knowledge of office practices. Familiarity with word processing and IBM/PC helpful. Duties to include distribution of mail, typing, and telephones. Budget Office. Reposting of Job #2705.

2737. SECRETARIAL POSITION - Requires AAS in secretarial science or equivalent experience. Will perform diverse administrative and technical secretarial duties for Division Head. Responsibilities will include technical typing, arranging foreign and domestic travel, and maintaining division files. Word processing experience essential. Department of Nuclear Energy.

Motor Vehicles & Supplies

80 HONDA CIVIC - hatchback, 4 speed, radio/cass., roof rack, 80k mi., $2,000. 744-5448 after 5 p.m.

81 HONDA ACCORD - 4 dr., a/t, a/c, loaded, 96k mi., asking $2,500. Walter, Ext. 3499 or 757-6392.

71 VW SUPER BEETLE - red, 4 speed, many new parts, extras, wheels w/tire fenders, doors, glass. Ray, Ext. 3536 or 289-7615.

82 HONDA ACCORD LX - 5 speed, a/c, cruise, am/fm cass. Ext. 4095.

77 MERCURY GRAN MARQUIS - 2 dr., garaged, very good cond., $1,450. 744-2805.

84 FORD RANGER PICKUP - cap, 4wd, 5 speed, a/c, cruise, asking $6,500. 399-4487.

80 PONTIAC PHOENIX - 4 dr., 4 cyl., 4 speed, p/s, p/b, a/c, am/fm, 79k mi., $950. 271-5774.

80 PONTIAC SUNBIRD - very reliable, good cond., $1,300. Chris, Ext. 3191 or Peter, Ext. 3734.

80 FORD FAIRMONT WAGON - 4 cyl., 4 speed, manual, new clutch, good cond., $995. Dick, Ext. 3273 or 732-5071.

77 FIREBIRD - white, a/t, a/c, p/s, CB, excel. cond., $2,300. Dennis, Ext. 4028 or 765-3136.

84 CHEVY - 8 cyl., 12' enclosed box, hydraulic lift gate, a/c, p/s, p/b, 64k mi., $5,200. Ext. 4846 or 363-6940.

80 JEEP CJ7 LAREDO - 4 speed, new tires, 2 tops, good cond. Gary, 929-6031 after 6 p.m.

76 FORD GRANADA - 2 dr., excel. tires & exhaust, runs well, $600. 475-4678.

79 THUNDERBIRD - black, full power, am/fm, a/t, p/s, p/b, excel. cond. Jerry, Ext. 7427 or 475-5591 eves.

68 APACHE CAMPING TRAILER - sleeps 4, new floor, needs top cover, good cond., $200 or best offer. Marie, Ext. 7716.

84 CHRYSLER LASER - must see, must sell, excel. Ext. 2446 or 924-1911.

84 BUICK SKYHAWK - tan, 50k mi., excel. cond., $5,000 neg. Ext. 2238.

72 CHEVY NOVA - 6 cyl., a/t, p/s, runs well, $350. Paul, Ext. 4156.

68 CAMARO - 327, a/t, 63k orig. mi., orange/black int., restored, $4,200. Don, Ext. 4661 or 654-2106 after 6 p.m.

79 T-BIRD - full power, new exhaust, tires & more, needs engine work, $800. 563-2751.

84 HONDA 200X ATC - 3-wheeler, many extras, runs well, recently serviced, $700. Bob, Ext. 5222 or 744-3289.

TRUCK CAP - aluminum, 8', blue, $150. 732-8768.

UTILITY TRAILER - 4x8, $74; 2 snow tires, 14", Chevy rims, like new, $40. 281-8031.

65 MUSTANG FASTBACK - 2+2, black int., body & 6 cyl. engine parts. Ext. 2274.

75 COLT - red, runs well. Ext. 4006.

TIRES - 4, Firestone ATX, P235/75R15, on Chevy 6-hole rims, $100. Bill, Ext. 2807 or beeper #923.

82 CAMARO BERLINETTA - T-tops, p/s, p/b, p/w, a/c, am/fm stereo cass., 38k mi., $6,200. 924-8260 eves.

82 FIREBIRD SE - 2 dr., liftback, p/s, p/b, a/t, a/c, white/blue, 51k mi., excel. cond., $4,800. Ext. 2492 or 475-8658.

84 MONTE CARLO CL - deluxe int., p/s, p/b, p/w, a/c, am/fm stereo cass., 35k mi., $7,500. 924-8260 eves.

84 DODGE CONVERTIBLE - full power, a/t, new tires & brakes, $7,500 neg. Tallon, Ext. 4847 or 473-3987.

75 TOYOTA CELICA GT - 5 speed, a/c, 105k mi., runs well, dependable, new exhaust, $500. Tom, Ext. 5010.

75 CHEVY IMPALA WAGON - 9 passenger, $925. Arnold, Ext. 2050 or 473-6432.

80 EAGLE - 4x4, mint, new stereo, Eagle GT tires, 65k mi., $3,000. 475-3939.

76 DODGE ASPEN WAGON - runs, needs work, $250. Jim, 281-2849.

69 PONTIAC LeMANS - 1971 V8 Firebird engine, snow tires, new front tires, runs well. 924-6129.

79 VW RABBIT - diesel, needs work, 4 new tires, $200. 728-2104 eves.

81 DATSUN 280 2X - 80k mi., blue/silver, needs body work, runs well, $4,000. 368-0083.

80 RENAULT LeCAR - 4 speed, runs well, asking $400. Ext. 2578 or 821-9834, leave message.

79 BUICK LeSABRE - 350 V8, a/c, p/s, p/b, p/l, am/fm, 4 dr., 4 new tires, good cond., $1,600. Ext. 3137 or 3115 after 6 p.m.

77 FORD LTD - p/s, p/b, a/c, am/fm, dependable, 120k mi., $600. 395-4272 eves.

76 JEEP CHEROKEE - 4wd, 2 new tires, $675. 744-8790 after 6 p.m.

84 HONDA CIVIC - 4 dr. sedan, new exhaust, good mech. cond., no rust, $3,500. Ext. 2054 or 283-6409.

80 VW RABBIT - 2 dr., runs well, $500. Ext. 2423 or 669-9234.

78 AMC CONCORD - low mi., 4 dr., a/t, p/s, am/fm cass., good cond., $950. Ext. 4638 or 281-0360 eves.

75 CAMARO - 6 cyl., rebuilt engine, wire wheels, raised lettered tires, radio, $1,500. Ext. 2529 or 588-7989 eves.

75 PLYMOUTH VALIANT - 4 dr. sedan, 225 cu. in., p/s, a/t, runs well, $495. 277-4091

82 BUICK CENTURY - 6 cyl., 3.0, 4 dr., p/s, p/b, am/fm, a/c, vinyl roof, tilt steering, tinted glass, excel. cond., $3,600. Ext. 2683 or 751-2469.

65 T-BIRD - runs, extra parts, best offer over $100. Chuck, Ext. 5317 or 929-4413 after 6 p.m.

70 DODGE DART - 47k mi., for parts, $30. Robin, Ext. 2420.

86 SUZUKI SCOOTER FA50 - excel. cond., $300. 821-0250.

78 FORD BRONCO NXLT - 4x4, 4 speed, mint cond., $6,500. 744-1857.

86 SUBARU GL WAGON - 28k mi., full power, maintenance warranty, $8,000. 395-4272 after 6 p.m.

77 FORD LTD WAGON - runs well, high mileage, $425. 924-0277.

83 RENAULT ALLIANCE - 2 dr., a/t, am/fm cass., sunroof, excel. cond., $2,100. Ext. 3908 or 585-4038.

79 HONDA CIVIC - s/t, some new parts, good tires, runs well, needs paint, 85k mi., $700. Pete, Ext. 4100.

77 LINCOLN CONTINENTAL - green, 4 dr., $2,000; Cadillac Eldorado, red & white, 2 dr., $1,500, both for $3,000. 727-4041.

81 DATSUN 310 - 4 speed, am/fm stereo, new trans. & clutch, good cond., $2,100. J. Pontieri, 475-9131.

CARBURETOR - 600 cfm, Holley w/350 Chevy adapter, $140; 2 tires, 235x75x15, M&S on 6 bolt Chevy wheels, $65. Dave, Ext. 5454.

72 YAMAHA 650 - new tires, new battery, windshield, saddle bags, $250. Kevin, 281-8031.

KAWASAKI ATV - 110cc, 3-wheeler, used 5 hours, $800. Ext. 4100 or 653-8966.

Boats & Marine Supplies

19' BAYLINER CAPRI - 1984, Volvo I/O, trailer, must see, mint, $7,000. Ext. 2981 or 473-7809 eves.

20' O'DAY SAILBOAT - 1974, 3 sails, furler/reefer, VHF, 7½ Merc, compl. mooring, new trailer, extras, $5,500. Gene, 265-4376.

OUTBOARD MOTOR - Sears Gamefisher, 7.5 h.p., $250. Marty, Ext. 3843.

14" FIBERGLASS SAILBOAT - AMF Zuma, $890. Ext. 7636.

27' BRISTOL WEEKENDER - diesel, auxil., 5 good sails, fully equipped, must sell. Kuper, 941-9423.

Miscellaneous

FIREWOOD - seasoned oak, delivered, $130/full cord. 732-2849.

MAYTAG DRYER - used one year, in storage, $25. Ext. 4006.

GIRL'S ICE SKATES - $5; desk, $25; desk lamp, $5; bookcase, $8; Olympia typewriter, $15. Pete, Ext. 4326.

TABLE - chrome, glass top, 36"x60", like new, $50. Ext. 3254.

CAMERA - 35mm Olympus OM10, 28, 50 & 125mm lenses, flash, case, strap, etc., $225. will separate. 589-3608.

GE STOVE - 30", electric, harvest gold, good working cond., $75. 698-6436 after 6 p.m.

SOFA - natural Haitian cotton, comfortable, $25. Tom, Ext. 7196 or 286-2505.

BOY'S TRICYCLE - Fisher Price, used 4 months, $15; baby items, good cond. 744-9677.

MATTRESS - long twin size, Stearns & Foster, $15. Ext. 2981 or 473-7809.

THOMAS ORGAN - twin 60-note keyboards, 25 pedals, 23-key rhythm & sound, excel., $1,900. 286-0237.

SINGER SEWING MACHINE - w/cabinet & attachments; 2 antique wood flat-top trunks, 41"x20". 472-1397.

LEAF MULCHER - Snapperizer attachment for 19" Snapper lawn mower, $15. Steve, Ext. 3822 or 929-6527.

MOVING - 3 bedroom sets, lawn mower, 2 desks, chairs, bikes, deck furniture, sewing machine, etc., must sell. 277-4091.

TYPEWRITER - Smith & Corona, manual, good cond., $25. Bill, 924-1346 after 5 p.m.

WINDOWS - assorted, w/Sconzo storms & screens, very good cond., make offer. 475-1844.

FIREWOOD - split, delivered locally, $110/cord. Glenn, 924-6918 after 5:30 p.m.

DRAWING TABLE - 42"x31½", good cond., $50. Ext. 2274.

DINING ROOM TABLE - 50" round, dark pine, w/5 chairs, $150; ebony china closet w/2 doors, all glass front, $150. 363-6845 after 5 p.m.

BASS GUITAR - Hondo Deluxe Series 830, excel. tone, $125. Nick, Ext. 7652 or 758-9197.

WOOD STOVE - Scandia 200, airtight, cast iron, 50,000 Btu, free-standing, flue pipe, wood carriers, $250. Gary, Ext. 4095 or 758-5592.

KEROSENE STOVE - $35; wall & ceiling light fixtures, faucets & bath scale, $5/each. 924-2726.

(Continued on back)

PLAYER PIANO - good cond., best offer. Ext. 4100 or 653-8966.

MOVING SALE - sofa, arm chairs, children's dresser, night tables, dehumidifier, bikes, electric train. Ext. 7740 or 928-6389.

BLACK & WHITE TV - 19", $20; 20" girl's bike, $25; hockey skates, size 9. 929-4326.

PING PONG TABLE - w/net & 2 paddles, $25; lawn mower, 4 cycle, $20; Scott sreader, $10; Cyclone spreader, $10. Gene, 265-4376.

SWEATERS & VESTS - hand knitted, very reasonable, beautiful. Kae, 473-4319 eves.

UTILITY TRAILER - 4x8, good shape, $150. Dick, Ext. 2486.

HOCKEY EQUIPMENT - for all positions, good cond.. reasonable. Cheryll, 588-2239.

GE WASHER - heavy-duty, fully automatic, 10 months old, $200. Ext. 7933 or 345-3557.

SHREDDER/CHIPPER - Kemp Yardtamer, centrifugal clutch, bar grate, used 1 season, like new, $600. Pete, Ext. 7627 or 929-3847.

UNICEF XMAS CARDS - & gifts. Ann, Ext. 2022 or 744-8386.

METAL CABINET - 68x42x20, $25; banana seat bicycle, $15. K. Fuchel, Ext. 4116.

WOMAN'S BIKE - Lotus 10-speed, like new, orig. $375, sell for $150; 5' convertible couch, light brown, like new, orig. $275, sell for $75. 654-5485.

HAMMOND SPINET ORGAN - double keyboard, foot pedals, good cond., $300. 475-7391.

RUNNING SUIT - woman's small, waterproof, breathable, orig. $140, sell for $90. Elaine, Ext. 5329 or 286-8720.

LANE TRIPLE DRESSER - w/beveled mirror & armoire, oak/ash wood, quality construction, contemporary. Donna, Ext. 4599 or 331-7385 eves.

RED POINSETTIAS - several sizes, florist quality, low prices, delivery in Dec. 727-6818 after 3:15 p.m.

PEWTER BOWL - $5; electric alarm clock, $3; men's short sleeve shirts, size 15-15½. Susan, Ext. 4267.

MOUTON LAMB FUR JACKET - size 14-16, excel. cond. 475-1826 after 6 p.m.

RADIO CONTROL VAN - "Lunch Box", w/Ni-Cad battery & controls, $145. Medina, Ext. 7636 or 744-8790.

TABLE LAMPS - 2, gold color, 33" high, 3-way light switches, $15/each, both for $25. Joe, Ext. 2898.

HOLIDAY GIFTS - from Southeast Asia, jewelry, scarves & more. Corinne, Ext. 4493 days/eves.

XMAS TREE - 7' artificial, $5; crib, $20; gem tumbler, new, $30; 3-piece nativity set, $10. 878-6637.

FARBERWARE CONVECTION OVEN - $60; swivel lounge chair, $25; men's skiis, 205 cm, 200 cm, boots; women's skiis, Harts 185 cm, boots. 475-0509.

BLUE FOX FUR JACKET - woman's medium, full length, gorgeous, orig. $4,000, sell for $1,650. 277-4091.

COUCH/LOVESEAT - velvet, w/wood trim, $100; tble, $20; coffee table, $35; wooden étagère, $10; Oriental rug, 9x12, $25. 689-7259 after 6 p.m.

IBM COLOR GRAPHICS CARD - asking $65. Ext. 2521 or 924-2134.

PORTABLE TV - 5", black & white, $50. 878-2239.

MAN'S BIKE - 10-speed, $45; Sears bike, 3-speed, $10. 821-0754.

BABY ITEMS - stroller, $10; baby swing, $5; walker, $5; car seat, $10; mini-cycle, $5. Sang, Ext. 3193 eves.

PIANO - Yamaha, upright, excel. cond., asking $1,000. Ext. 2051 or 689-8685.

DITTO MACHINE - w/cabinet, fluid & mounting tray. Frank, Ext. 3120.

CRIB - w/mattress, good cond., $60; 24-piece glass set, $5; 7' Xmas tree, new, $25. Chris, Ext. 3191.

COPIER - $15. Ext. 4192.

TRUMPET - $50; mandolin, $25. Ext. 2607.

SOFA & LOVESEAT - Colonial, pine, excel., $125; car seat, infant/child, brand-new, $30. 473-6546.

MAN'S BIKE - 12-speed, w/light, water bottle, back bag, excel. cond. Liz, Ext. 2346 or 286-8563.

MOVING SALE - 3 bedroom sets, 2 desks, dishes, chairs, bikes, deck furn., lamps, kitchen/dining room furn., coffee tables, etc. 277-4091.

AKC AIRDALE TERRIER PUPS - champ sire, bred for temp., good with children, whelped 11/2/87. 288-9077.

PINE TABLE - ladderbacks, $250; cafe set, 4 chairs, $35; round end table, $10; oak china closet, $500. Ext. 2021.

SKI BOOTS - Kastinger SL-master, man's size 9½, used 1 season, $30. Gary, Ext. 4095 or 758-5592 eves.

VIVITAR CAMERA - 28-85mm, Macro focus, 200m lens, skylight filter, case, fits Nikon FE/FM, good cond., $75. Ext. 3872.

ROSSIGNOL 4S SKIIS - 170cm, Solomon bindings, poles, $125. Ext. 4449, 751-8403 after 6 p.m.

CAMERA - Minolta SRT102 SLR, 28-85 Macro, 50mm Rokkor X, F1.4, bounce flash, $75. Ext. 2109 or 472-9199 after 6 p.m.

IBANEZ GUITAR - Ebony inlay, Musicman amp, 2 speakers w/extra voice, microphone & stand. Al, Ext. 5454 or 231-4613.

Free

KITTENS - 3, multi-colored, long hair, 6 weeks old. Ed, Ext. 3275.

KITTENS - 1 grey tabby male, 1 white female, adorable, healthy, clean, litter-trained. 924-5192.

POOL TABLE - works, you pick up. Bob, Ext. 2964.

FIREWOOD - you cut the trees & keep the wood. Walter, Ext. 2907 or 698-0576 after 6:30 p.m.

Real Estate

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

For Sale

HILTON HEAD, SC - 3 bdrm. condo, sleeps 8, 2 baths, washer/dryer, wet bar, 6 tennis courts, 3 pools, whirlpool, golf, ocean view, asking $89,000, will rent. 929-8912.

MILLER PLACE - North of 25A, 3 bdrm. custom ranch, entertainment area, l/r, family rm., custom f/p, 24' x 26', 2-car garage, finished basement, and much more. Ext. 3353 or 473-5786.

SHIRLEY - Tangiers section, 4 bdrm. ranch, l/r, kit., d/r, 1½ baths, finished bsmt., deck, new appli., $127,000. Jim, Ext. 7669 or 399-1790.

PATCHOGUE VILLAGE - 2 bdrm. house, fully insulated, full attic & bsmt., quiet neighborhood, low taxes, asking $109,990 neg. Arnie, Ext. 2040 or 289-1870.

SHOREHAM - 3 bdrm. ranch, den, f/p, garage, ½ acre, cul-de-sac, SWR schools, $134,000. Ext. 7708 or 744-0903 eves.

SELDEN - 3 bdrm. L-shaped ranch, eik, den, formal d/r, new heating system, a/c, fenced, pool, garage, much more, $139,000. 698-0057.

WEST PALM BEACH, FL - house, excel. cond., reasonable. 363-7032.

RIDGE - 3 bdrm. townhouse, 1½ baths, good cond., nice location, Strathmore Ridge. 924-9276.

SILVER SPRING SHORE, FL - near Ocala, ¼ acre plot, citrus & horse breeding area $5,000 firm. Ext. 5320.

MASTHOPE, PA - ½ acre plot, vacation community, includes skiing, pool, horses, tennis, lake & river activities, hunting, etc., $23,000 neg. Ext. 5320.

For Rent

HILTON HEAD, SC - 2 bdrm. condo, sleeps 6, beach, pool, tennis, golf, winter rates, $300/wk. 585-9149.

STONY BROOK - 4 bdrms., 3 baths, large eik, d/r, lounge, no pets, non-smokers, $1,200 mo. + util. 862-7998.

SHOREHAM - large 1 bdrm. apt., full kitchen, bath, l/r, furn. or unfurn., avail. Dec. 1, $550/mo. incl. util. & cable. 744-8659.

RIDGE - 2 bdrm. apt. on secluded property, $675/mo. incl. util. 924-5541.

BELLPORT VILLAGE - 2/3 bdrm. furn. house, near bay, avail. Jan.-Dec. '88, non-smoker, single/couple, no pets. 286-8060 after 5 p.m. & wknds.

MASTIC - share house, l/r, d/r, eik, den, laundry room, yard, 10 mins to Lab, near Forge River Marina, clean, well-kept, $395/mo. + ⅓ util. Ext. 5110 or 399-3087.

BROOKHAVEN HAMLET - share house w/2 other professionals, 4 bdrms., 2 baths, ¾ wooded acre, $350/mo. incl. all. 286-4028.

MEDFORD - large studio, new, full kitchen, L/B combo, priv. ent., w/w, cable, mature person, no pets, $500/mo. + 1 mo. sec., incl. all. 654-5411.

MANORVILLE - near LIE, upstairs studio apartment, furn., priv. ent., single only, non-smoker, no pets, $350/mo. incl. util., 1 mo. sec. 878-2038.

BELLPORT BEACH ESTATES - 3 bdrm. contemp., 2 baths, l/r, d/r, den, eik, f/p, w/w, garage, non-smoker, no pets. 286-2005 or 698-0576 after noon.

CATSKILLS CHALET - 3 bdrms., sleeping loft, fully furn., great for skiing, near Hunter & Windham Mts. Judy or Kay, Ext. 3595 or Bea, Ext. 3642.

MEDFORD - 4 bdrm. Colonial house, 2½ baths, large kitchen, den with f/p, l/r, all appli., $1,100/mo. w/option to buy. 286-3599.

MIDDLE ISLAND - 3 min. to Lab, 1 bdrm. apt., priv. ent., patio, kitchen, bath, den, large bdrm., year-round outdoor hot tub privileges, non-smoker, no pets. 924-3855.

Wanted

TRAINS - Lionel, American Flyer, access., any cond., good price. Carole, Ext. 7100 or 924-4097.

BABYSITTER - experienced, for 4-month-old, our house, occasional weekends. Janice, 732-9724.

STEREO - 3D slide projector. Pete, Ext. 3297 or 821-9547.

BORROW OR RENT - VHS tape of the channel 21 Series 1951. Linda, 878-8847.

HOUSEMATE - Bellport village, preferably female, $400/mo. incl. all, avail. Dec. 1. JoAnn Ext. 2132 or 286-0745.

STUDIO APT - for single female, non-smoker. Ext. 4532.

Classified Ad Policy

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

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

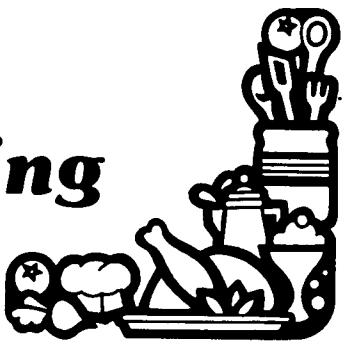
☐ For Sale: Autos & Auto Supplies ☐ For Sale: Miscellaneous ☐ Lost & Found ☐ Free
☐ For Sale: Boats & Marine Supplies ☐ Car Pools ☐ Wanted ☐ _____

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

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

NAME (Please Print) .....

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

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

Happy Thanksgiving