BROOKHAVEN BULLETIN
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BROOKHAVEN NATIONAL LABORATORY

Current Lowdown on High-T_c Superconductors

At the March meeting of the American Institute of Physics, held in St. Louis on March 21-24, Senior Physicist John Axe and Associate Physicist John Tranquada presented invited papers on their recent findings on high temperature superconductivity — the phenomenon of resistance-free flow of electricity through materials at relatively high temperatures above absolute zero.

Considering their papers important, the APS distributed lay-language versions to the science press. The Bulletin discusses their work in two stories below.

Zurich-Oxide T_c Drops; New Crystal Structure Cited

Add enough barium to an insulator called lanthanum copper-oxide and the compound becomes a superconductor at 35 kelvins (K) — the first high temperature superconductor to be discovered. It is affectionately called "Zurich-oxide" — in reference to the IBM laboratory in Zurich where the superconducting properties of lanthanum-barium copper oxide were uncovered in 1986.

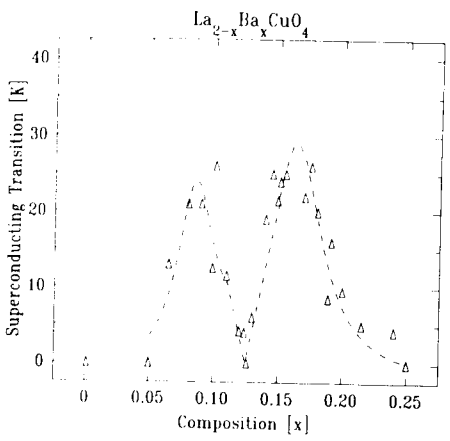


Figure 1

Graph showing that the temperature at which Zurich-oxide becomes superconducting takes an unexpected drop when it is composed of about 12 percent barium atoms.

It was recently discovered at Brookhaven, however, that the superconducting transition temperature (T_c) of Zurich-oxide does not steadily increase until it reaches 35 K as more and more barium is added.

Instead, the superconducting transition temperature at first increases, but then takes an unexpected drop before its rise to about 30 K (see figure 1) in Zurich-oxide samples prepared and investigated by Arnold Moodenbaugh, Youwen Xu and Masaki Suenaga, of the Division of Materials Science in BNL's Department of Applied Science. Their collaborators were from the University of California, Davis.

This drop, it was also just discovered at BNL, corresponds with a slight structural change in the compound — "such an infinitesimally small rearrangement of the atoms that we had to look very hard to find it," says John Axe, a senior physicist and head of the scientific program at BNL's High Flux Beam Reactor (HFBR), where much of the research was carried out.

(From left) Hamid Moudden, John Axe, Arnold Moodenbaugh and David Cox discuss their findings on Zurich-oxide. Behind them is a photo of the core of the High Flux Beam Reactor, where much of their research was performed; before them is a model of the perovskite crystal structure of Zurich-oxide.

Photos on this page by Roger Stoutenburgh.

While such small, temperature-dependent structural rearrangements are fairly common in compounds like Zurich-oxide, what is unexpected and startling is their large effect on superconductivity.

"Whatever theory ultimately explains high temperature superconductivity, it will have to take these related phenomena into account," comments Axe.

His collaborators included Moodenbaugh and Xu, who again prepared the Zurich-oxide samples; David Cox, Kim Mohanty and Abdel-Hamid Moudden, all of BNL's Physics Department, who undertook the spectroscopy studies.

Perovskites

When classed according to its three-dimensional atomic structure, Zurich-oxide is one of a very large number of crystal materials called perovskites.

Long before this and several other perovskites were found to be high-T_c

(Continued on page 2)

An Intriguing Competition — and Another 'Hole' Story

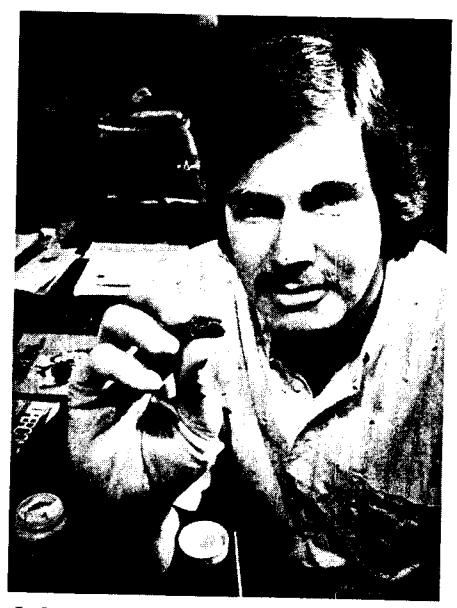
As any experienced investigator knows, before a tricky case is solved, there may come a stage when the information coming in seems to add a fresh mystery for every one it clears.

Take, for example, the tricky case of compounds that become superconducting at a high critical transition temperature (T_c). Discovered in 1986, high-T_c superconductors are ceramic compounds that lose all resistance to electricity at relatively high temperatures of between 35 and 125 kelvins (K). How the high-T_c compounds work is still largely a mystery, but this tricky investigation came closer to solution with the findings of two recent experiments at Brookhaven.

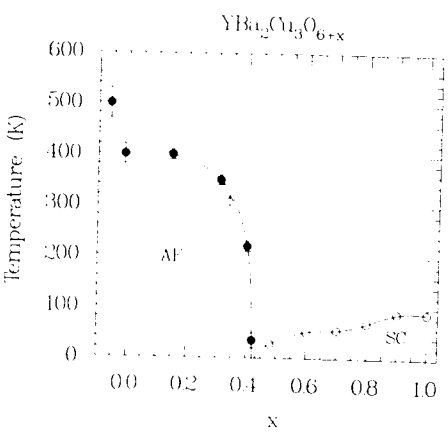
The Plot Thickens

The BNL research gives valuable new information about these materials' magnetic and electronic properties — new information that resolves certain important questions and immediately poses others.

Using neutron scattering measurements at the High Flux Beam Reactor (HFBR), John Tranquada, together with Gen Shirane and Henry Chou, all of the Physics Department, and Bernhard Keimer, Massachussetts Institute of Technology (MIT), showed that in the high-T_c compound yttrium-barium copper-oxide (Y-Ba-Cu-O) magnetism and superconductivity compete.



John Tranquada holds a large, single crystal of yttrium-barium copper-oxide.



This graph shows the crossover from antiferromagnetic ordering (AF) to superconductivity (SC) in an yttrium-barium copper-oxide sample as the oxygen content increases.

At the National Synchrotron Light Source (NSLS), Tranquada worked with another group, which included Steve Heald and Arnold Moodenbaugh of BNL's Department of Applied Science, as well as collaborators from Rutgers University. Their experiments on a new copper-oxide superconductor revealed that it carries electric current in a new way, using electrons instead of electron holes.

Commenting on these results, Tranquada said, "The magnetic properties of yttrium-barium copper-oxide are quite consistent with the Brookhaven theory of high T_c superconductivity, while the electron-doped compound introduces an intriguing new permutation."

The well-regarded theory to which Tranquada referred was put forth by Senior Physicist Victor Emery, a solid state theorist in the Physics Department. Emery believes that the strong tendency of high-T_c superconductors towards magnetic ordering is related to the forces between the compound's electrons that causes them to pair and become superconducting.

Magnetism vs. Superconductivity

Fluctuations in magnetic order were examined in neutron scattering experiments at the HFBR. "Our collaborators at the Institute for Molecular Science in Japan grew large, single crystals of an yttrium-barium copper-oxide compound that becomes superconducting at about 90 K," Tranquada said. "Without these large single crystals, measuring the magnetic excitations would not be possible."

In conventional superconductivity, known since 1911, any hint of magnetism means that the material would be a very poor superconductor. Research at Brookhaven and elsewhere, however, has shown that the new superconducting materials also have a strong tendency towards magnetic ordering.

Early work by Robert Birgeneau of

(Continued on page 2)

Wiggler Sheds More Light

As some at BNL seek to understand how the new, high-temperature superconductors work, others continue to apply the better-known technology of low-temperature superconductivity in new and exciting ways.

The first data from the first two experiments using the superconducting wiggler in the x-ray ring at the National Synchrotron Light Source were obtained on Tuesday, April 11.

Hard x-rays from the superconducting wiggler were first beamed down beam line X17 and into the B1 experimental hutch at 1:48 p.m., earlier that day.

When this commissioning milestone was reached, the wiggler was working at 4.9 teslas (T), 2.5 billion electron volts of energy and a current of 1.93 milliamperes. The wiggler is expected to reach its maximum magnetic field strength of 5.2 T during further studies.

Evaluating Nuclear Data

Core analysis, waste management, shielding — the nuclear data used in these and other phases of the design of U.S. nuclear reactors come from ENDF, the U.S. evaluated nuclear data file — a complete set of nuclear information on reactions and structure. These data are compiled at the National Nuclear Data Center (NNDC), in BNL's Department of Nuclear Energy, from work done at all the national laboratories.

Sometime next fall, the next edition of these data — ENDF/B-VI — will be released. Earlier this month, the data were reviewed at BNL by those attending the 23rd annual meeting of the Cross Section Evaluation Working Group (CSEWG), which evaluates the nuclear data files, does benchmark testing, and reviews and approves the final results.

Among the more than 40 CSEWG participants April 4-6 were: (from left) Robert Peelle, Oak Ridge National Laboratory; Herve Derrien, Cadarache, France; Philip Young, Los Alamos National Laboratory; Michael Sowerby, Harwell, United Kingdom; Charles Dunford, CSEWG Chairman, NNDC; and Valery Guolo, International Atomic Energy Agency, Vienna.

Roger Stoutenburgh

Facing the Future

It's a new age in the workplace, and today's secretaries, and the people with whom they work, must be in a position to assimilate the rapid changes and go forward with them. The first step toward accomplishing this is to define the changes.

That's what Susan Fenner will do in Berkner Hall on Secretaries' Day, Wednesday, April 26, when she speaks about "Changing Concepts and the Work Force of the Future." Fenner, who is Education Director and Professional Development Manager of Professional Secretaries International (PSI), will be the guest speaker in a program cosponsored by the Upton Chapter of PSI and the Personnel Division.

Fenner received her Ph.D. from the University of Missouri-Kansas City in 1979, and her background includes over 12 years' experience in higher education teaching and administration, organization development, and training of management and support staff. In this regard, she has developed workshops and materials in such areas as motivation, time-management, assertiveness, positive thinking, decision-making, creative problem-solving and leadership.

Among her responsibilities at PSI, a non-profit organization representing over 41,000 secretaries in some 710 chapters worldwide, Fenner prepares personal and professional development materials for chapter training, administers the Continuing Education Unit program, develops and promotes secondary and postsecondary curricula for office careers, and consults with publishers and companies providing secretarial training and education materials.

Susan Fenner

Fenner is a member of the American Management Association, American Society for Training and Development, American Society of Association Executives, National Business Education Association, American Vocational Association and Phi Delta Kappa.

To minimize impact on department and division workloads, the program will be repeated in two sessions: 9 to 11 a.m. and 1 to 3 p.m. Secretaries and administrative personnel may attend one of the sessions, provided they have approval well in advance from their supervisors, to assure appropriate department and division scheduling.

Between sessions, exhibits and vendor displays will also be available for viewing. Copies of the program agenda are available from Mary White, Personnel, Ext. 7994.

Zurich-Oxide (cont'd)

superconductors, scientists had been interested in these structures because of their ferro- and antiferromagnetic properties — now thought by many to be a key to high-T_c superconductivity.

Recalls Axe, "In fact, the first experiment I performed at Brookhaven, in 1969 at the HFBR, was a study of a perovskite crystal in collaboration with Gen Shirane of BNL's Physics Department and Alex Muller, who was awarded the 1987 Nobel Prize in Physics with Georg Bednorz for their discovery of the first high-T_c superconductor."

Shake & Bake

Superconductivity is thought to take place within copper-oxide planes in the atomic structure of Zurich-oxide and the other high-T_c superconducting perovskites.

After being mixed together following relatively simple "shake & bake" recipes, the copper-oxide superconductors are baked in an oven. While cooling, they undergo a temperature-dependent structural phase change: Hot out of the oven, they are in a high-temperature, high-symmetry phase; when cooled they transform into a low-temperature phase having low symmetry.

In this low symmetry phase, the stress of the bonds between copper and oxygen causes the copper-oxide planes to pucker.

Going Into a New Phase

Axe and company found another highly symmetrical phase — but a new, low-temperature one that only occurs in Zurich-oxide containing the intermediate composition of about 12 percent barium atoms.

As this intermediate Zurich-oxide is cooled, it makes two phase transitions — first from high-temperature symmetry to low-temperature unsymmetry, then to low-temperature symmetry. In this new, low-temperature symmetrical phase, the copper-oxide planes are also puckered — but in a different pattern (see figure 2).

The existence of this new low-temperature, high-symmetry phase was first discovered by Axe and his colleagues during x-ray diffraction studies at the Physics Department's X-22 beam line on the x-ray ring of BNL's National Synchrotron Light Source.

But, in order to see the different patterns of the copper-oxide planes within Zurich-oxide that are responsible for the phase changes, they moved the research to BNL's HFBR. There, they undertook scattering experiments using neutrons, which are much more sensitive than x-rays to such subtle changes.

"BNL is the only laboratory in the world where it is literally possible to walk across the street from one world-class facility — the NSLS — to another — the HFBR — to carry out this kind of research," Axe comments.

Structure & Composition

The new low-temperature, high-symmetry phase occurs only in Zurich-oxide with 12 percent barium atoms —and surprisingly corresponds with the unexpected drop in superconducting T_c seen in Zurich-oxide of this intermediate barium composition.

In fact, Axe and his coworkers believe that the new phase of Zurich-oxide may not be superconducting at all — that Zurich-oxide reverts to being an insulator like its parent, lanthanum copper-oxide.

"For reasons that are yet unknown, the difference between the low-temperature symmetrical and unsymmetrical phases has a profound effect on superconductivity," concludes Axe, "so our observations may prove to be an important constraint on a correct theory of high-T_c superconductivity."

— Marsha Belford

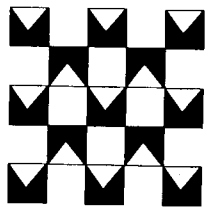


Figure 2a

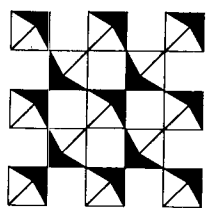


Figure 2b

As seen from above, the unsymmetrical phase (figure 2a) and the symmetrical phase (figure 2b) of Zurich-oxide's structure at low temperature. While the unsymmetrical phase is puckered along only one axis, the symmetrical phase is simultaneously puckered along two axes and correlates with the unexpected drop in the superconducting transition temperature.

'Hole' Story (cont'd)

MIT, Shirane and others on lanthanum copper-oxide — the first-discovered high-T_c superconductor — had established that a fluctuating magnetism could be detected.

Explained Tranquada, "In both the lanthanum and yttrium compounds, the copper and oxygen atoms form two-dimensional layers. Our observations confirm that the magnetic interactions between copper atoms within a layer are unusually strong. A difference is that, in the yttrium compound, the layers are stacked in closely-spaced pairs, and the magnetic coupling between paired layers is surprisingly strong.

"Most of the work so far has been on magnetically ordered, nonsuperconducting crystals," continued Tranquada. "When, recently, we detected magnetic fluctuations in a large superconducting crystal, we confirmed an important feature of Emery's model — the coexistence of magnetic fluctuations and superconductivity."

Electron Pairing — Whole New Story

Meanwhile, a short walk away at the NSLS, Tranquada and other researchers studied a new Japanese discovery, a copper-oxide compound doped with the element cerium. The way that the sample absorbed x-rays showed features characteristic of different electronic states of atoms in the material.

Other research had established that the structure of high-T_c superconductors contains two-dimensional planes of copper and oxygen atoms. And, until now, it has been observed that, when a material becomes superconducting, electrons are removed from the copper-oxygen layers, leaving "holes" in the oxygen atoms.

Instead of this now familiar process, Tranquada and his group were the first to find that, in the new material, electrons are donated to the copper atoms. The electric current in the superconducting state appears to be carried by the electron pairs, not the "hole" pairs.

Said Tranquada, "Further measurements should establish whether there is a fundamental difference in hole and electron superconductors."

The movement of an electron from one point to another point in the copper-oxide layers is essentially equivalent to the movement of a hole in the opposite direction. However, the differences between the electron-doped and hole-doped materials are such that, while they provide new insights for solving the "tricky case" of superconductivity, they also provoke new questions for theorists such as Emery to resolve. — Liz Seubert

Reports Available

The following reports are available to Laboratory Staff and affiliates of DOE, AUI, and NRC. Others may purchase the report from the National Technical Information Service, U.S. Department of Commerce, 5285 Port Royal Road, Springfield, VA 22161. Staff members should call the designated contact.

NUREG/CR-2331
BNL-NUREG-51454
Vol. 7 #4; Vol. 8 #1,2; Vol. 8 #3
Contact: L. Smith, Ext. 2922
Safety Research Programs Sponsored by Office of Nuclear Regulatory Research. Progress Report Jan. 1-June 30, 1988. A.J. Weiss.

NUREG/CR-2907
BNL-NUREG-51581 Vol. 7
Contact: F. O'Brien, Ext. 2265
Radioactive Materials Released From Nuclear Power Plants. J. Tichler et al.

NUREG/CR-4618
BNL-NUREG-51995
Contact: J. Danko, Ext. 7125
Evaluation of Reliability Technology Applicable to LWR Operational Safety. M.A. Azarm et al.

NUREG/CR-5140
BNL-NUREG-52145
Contact: K. Nasta, Ext. 2267
Value-Impact Analysis for Extension of NRC Bulletin 85-03 to Cover All Safety-Related MOVs. J.C. Higgins et al.

Free Concert Next Week

All are invited to attend a free concert of chamber music by Hayden, Brahms and Ravel, on Wednesday, April 19, in Berkner Hall, at 9 p.m. The concert is being held in conjunction with the Second International Workshop on the Molecular and Cellular Biology of Plasminogen Activation, April 18-21, at Berkner Hall. For more information about the workshop, call Walter Mangel, Ext. 3373.

If You've Got It, Why Not Share It?

Food Drive Goal:
2,000 pounds per month
Pounds Collected:
November — 1,680
December — 1,306
January — 740
February — 860
March — 800

As the deadline for filing tax returns looms, it's easy to lose one's perspective about what paying taxes means: It means a person earned enough to pay taxes. And if that's so, that person probably earned enough to buy enough food to feed their family all year.

Unfortunately, that's not true for everyone. For many people, the dollars simply don't stretch far enough to feed their family enough all year. In fact, some 10,000 people in Brookhaven Town go to bed hungry almost every night.

Thanks to the contributions given by BNL employees since the Laboratory began its year-long food drive last November (see chart), hunger has been eased for some. But there's still a long way to go.

You can help by bringing in your contribution next week, during the April food drive, and putting it in one of the 18 collection cans located around site. Look for Donald Duck's nephew holding a stop sign, but if you can't find him, call Food Drive Chair Carole Kerr, Ext. 7100, to ask where he's hiding.

In cooperation with Brookhaven Town and the INTERFACE Coalition of Corporations, the BNL food drive is looking primarily for nutritious, nonperishable food contributions, though support items such as vitamins, paper goods and toothpaste are also welcomed. Foods can range from baby foods to canned items, to such staples as the 420 servings of instant mashed potatoes pledged each month by the Marriott Corporation, which operates the Cafeteria.

So dig into your pantry or into your wallet. For those whose larders are empty and are too busy to shop, the food drive "helpers" will be happy to do your shopping for you. Just hand a donation to Kerr, Bldg. 460, or to one of the other 19 helpers listed in the memo distributed this week. After they shop for you, they'll bring you a receipt. That's not too taxing, is it?

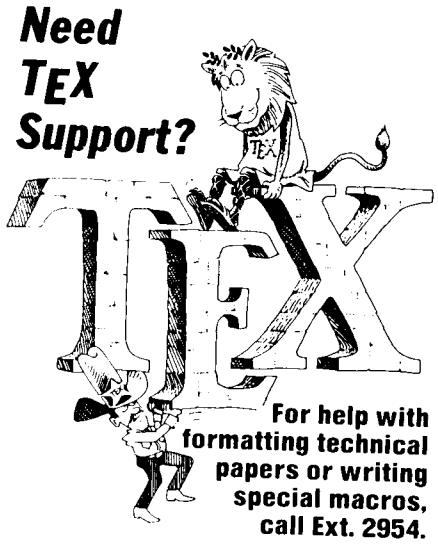
Contest! Contest!

There was a fine poet named Lear
Whose limericks were without peer.
If you think you can write,
Poems like his, with a bite,
There's a contest awaiting you here!

In honor of the birthday of the great English limerick writer, Edward Lear, who was born in 1812, May 12 has been proclaimed Limerick Day. We're not sure just who made that proclamation, but it's a wonderful excuse for running the second Limerick Contest in the Bulletin's history (in 1983, the contest focused on Love Limericks for Valentine's Day).

To win the first prize of a five-balloon bouquet of your choice from the BERA Sales Office, you must write the best limerick having something to do with BNL and send it to the Brookhaven Bulletin, Bldg. 134, by Wednesday, May 3. Enter as many times as you wish, but remember — your poem must be in limerick form and have a BNL focus. The best of the bunch will be published in the Bulletin on Limerick Day, May 12.

Need TEX Support?



For help with formatting technical papers or writing special macros, call Ext. 2954.

Arrivals & Departures

Arrivals

Patrick D. Borello ..... Instrum.
Daniel J. Errante ..... S&EP
Robert P. Grand ..... P&GA
Andre T. Krzywicki ..... Physics

Departures

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

Raymond V. Moore ..... Plant Eng.
Lawrence M. Taibbi ..... C&CD

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

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

PSI Meeting

Edith DeBello, a registered nurse from Health House in St. James, will be the guest speaker at the April meeting of the Upton Chapter of Professional Secretaries International (PSI). She will discuss "Unnecessary Surgery and Overmedication of Women," on Wednesday, April 19, at 6 p.m., in the Brookhaven Center, North Room. Her talk will cover such topics as "Questions you need to ask, answers you should look for," and "What you don't know *can* hurt you."

Software Demo

Microsoft Corporation will present a demonstration of their EXCEL spreadsheet package on Wednesday, April 19, at 2 p.m., in the CCD Seminar Room, Bldg. 515. EXCEL is available on IBM PC and PS/2 computers and on the Apple Macintosh.

Social Club

The Social Club has scheduled the following events:

- **Muppet Babies 1989** — Sunday, May 21, 1 p.m., Nassau Coliseum; adults - $10.50, children 12 and under -$9; buy tickets now to ensure good seating.
- **WWF Wrestling** — June 10, 8:05 p.m.; all tickets $15, money due now.
- **Maine Clambake** — June 25; four days, $313 each for 2 per room; $309 each for 3 per room; $427 for single; $25 deposit due now, balance due May 5.
- **Montreal Trip** — September 1; four days, $313 each for 2 per room; $303 each for 3 per room; $436 each for single; $25 deposit due now, balance due June 28.
- **San Francisco, Three-Island Hawaiian Deluxe** — October 14; 14-day trip; $1,899 each for 2 per room; $1,870 each for 3 per room; $2,469 for single; $100 deposit due now, balance due by August 15.

Call Doris Terry, Ext. 7610, for reservations and flyers.

Update Your ID Card

Employees and guests — check your wallets. Has your BNL identification card expired? If so, please renew your card at Police Headquarters, Bldg. 50, 9:30-11 a.m., Mondays, Wednesdays and Fridays. For more information, call Hank Raimondo, Ext. 7258.

Attention: Women

Women's Coordinator Avril Woodhead addresses the individual, job-related problems of women through confidential counseling. You can contact her at Ext. 3482.

Basketball

First Makeup Game

Runaways	74	Penetrators	63
P. Johnson	19	T. Abbott	15
R. Moran	17	R. Garappolo	14
S. Gilbert	14	R. Domenech	12
G. Shepherd	12	R. Tonkyn	12
J. Desmond	8	C. Jones	6
B. Doty	4	F. Ligon	4

Three-point shots: Domenech (3), Garappolo (3), Gilbert, Johnson, Moran (3)

Second Makeup Game

Knicks	79	Celtics	50
W. Cummings	34	C. Edwards	19
L. Walcott	16	P. Browne	15
T. McGill	8	M. Barrett	6
G. Thompson	5	J. Gaeta	3
B. Turner	5	D. Hoggard	3
M. Lawrence	4	N. Schowski	2
J. Mendez	4	M. White	2
F. Thompson	3		

Three-point shots: Cummings (2), Gaeta, Hoggard, G. Thompson, Turner, Walcott (4)

Bowling

Pink League

Carol Hirschmugl had a 188, Sandy Asselta 184/183, Kathy Folkers 177, Donna Cunningham 172, Renie Rosati 172.

Purple League

John Niemczyk had a 229/201, Ben Belligan 213, Caryl MacDougall 187, Marsha Kipperman 183.

White League

Ed Sperry IV had a 244/200/616 scratch series, Andy Warkentien 234, Ron Picinich 225, Dan Harrow 214, Joe Ferrante 204, Mary Addessi 199, Pat Manzella 198, Elsie Murray 193, Marilyn Picinich 190.

Red/Green League

J. Morris had a 257/201/642 scratch series, T. Prach 226, E. Sperry IV 225, N. Combatti 214, W. Powell 212/201, K. Asselta 208, C. Bohnenblusch 205.

Volleyball

Standings — Week of April 3

League I
1st round playoffs

Dinkers defeated Xrayted, 3-0

Upfagrabs defeated Cannonballs, 3-0

League II

Fossils	50-13
Set Ups	48-15
Krush	45-18
Nuts & Bolts	37-26
Ziegfield Vollies	23-40
Slammers	20-43
Upton-Ups	16-47
Chunga's Revenge	13-47

League III
2nd round playoffs

High Volley'em defeated Frazzled, 2-1

MISfits defeated Printouts, 2-0

Open League
2nd round playoffs

Phoenix defeated Tom's Mutants, 3-0

Dig Your Lips defeated Meriem's Team, 3-2

Awards Dinner

The 1989 Volleyball Awards Dinner will be held on Friday, May 12, at 6 p.m., at Rock Hill Country Club in Manorville. Admission is $10 for league members and $15 for each guest. The menu features a variety of hot dishes, and a D.J. will provide dance music. For tickets and more information, contact your team captain by Wednesday, May 3.

Walkers Needed

On Sunday, April 30, a BNL team wearing BNL/AUI T-shirts will participate in WalkAmerica, the annual national walkathon held in more than 1,000 local communities to raise money for the March of Dimes. Each walker helps the cause by signing up sponsors who pledge a certain amount for each kilometer completed or who make flat donations.

To earn money for the March of Dimes and a T-shirt from BERA, pick up a registration form and route information sheet at the BERA Sales Office in Berkner Hall, any weekday, 9 a.m. to 2 p.m.

Stretch Yourself Thin

It's not too late to join the stretch classes now being offered by the Aerobic Dance Club. Just go to the next class, on Monday, April 17, and pay the $21 fee for the remaining seven classes. Classes are held from 5:15-6:15 p.m., on the third floor of the Collider Center, Bldg. 1005S. A mat is recommended for floor exercises. For more information, call Bill Leonhardt, Ext. 2378; Elinor Norton, Ext. 4355; or Janet Sillas, Ext. 2345.

Cafeteria Menu

Week of April 17

Monday, April 17		
Soup: Chicken noodle	(cup)	.75
	(bowl)	.95
Lasagna w/garlic bread		3.00
Beef burgundy w/egg noodles		3.10
Lite-line: Sliced roast beef salad platter		2.25
Hot deli: Barbequed fresh ham		2.85
Tuesday, April 18		
Soup: Minestrone	(cup)	.75
	(bowl)	.95
Chicken stir-fry		3.10
Meat loaf w/mushrooms & veg.		3.00
Lite-line: Cottage cheese & fruit salad platter		2.25
Hot deli: Pastrami		2.85
Wednesday, April 19		
Soup: Cream of broccoli	(cup)	.75
	(bowl)	.95
Stuffed pork chop w/veg.		3.10
Sliced turkey breast w/veg.		3.10
Lite-line: Tortellini salad w/shrimp		2.95
Hot deli: Fish on a bun		2.85
Thursday, April 20		
Soup: Split pea w/ham	(cup)	.75
	(bowl)	.95
Sweet and sour meatballs w/rice		3.00
Lite-line: Broiled cod w/rice or veg.		3.10
Hot deli: Chicken Parmesan hero		2.85
Friday, April 21		
Soup: New England clam chowder	(cup)	.75
	(bowl)	.95
Whitefish Florentine w/pot. or veg.		3.10
Light-line: London broil au jus w/pot. or veg.		3.10
Hot deli: Turkey melt		2.85

Note to Employees:
Attendance at lectures, meetings and other special programs held during normal working hours is subject to supervisory concurrence.

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.

4020. LABORERS - (temporary, 5/15/89 - 10/1/89) Plant Engineering Division.

4021. MAIL CLERK - (temporary, 5/15/89 - 8/25/89) Staff Services Division.

4022. MATERIAL HANDLERS - (temporary, 6/12/89 - 9/1/89) Supply and Materiel Division.

4023. SECRETARIAL POSITION - (term) Requires AAS in secretarial science or equivalent and a thorough knowledge of Laboratory policies and procedures. Duties will include technical typing, correspondence and travel arrangements. Previous word processing experience necessary; IBM PC experience desired. National Synchrotron Light Source Department.

OPEN RECRUITMENT - Opportunities for Laboratory employees and outside applicants.

4024. OFFICE SERVICES POSITIONS - (part-time) Will act as night clerk in the Housing Office. Responsibilities will include distributing keys to guests, collecting money and maintaining records of transactions on data base. Additional duties will include typing housing agreements, transmittals, monthly bills and invoices; and handling service and emergency repair calls. Previous data-entry experience and accurate typing skills required. Will work three evenings a week (1600 - 2400), after one month's training on day shift. Staff Services Division.

4025. TECHNICAL POSITION - Requires AAS in mechanical technology or equivalent and at least five years' experience involving detailed mechanical assembly and troubleshooting. Will assist in Beam Components Group. Knowledge of high vacuum technology helpful. Alternating Gradient Synchrotron Department.

Motor Vehicles & Supplies

88 KX 125 DIRT BIKE - w/extras, many new parts, excel. cond., asking $1,600. Bob or Lois, Ext. 4672/4904 or 929-4753 eves.

87 HYUNDAI GL - 4-dr., hatchback, a/c, am/fm cass., excel. cond., must sell, $5,200. Ext. 5459.

87 MAZDA 626 - 5-spd., 2-dr., 33k mi., a/c, am/fm cass., excel. cond., $7,000. Greg or Richard, Ext. 3123 or 283-4948 days.

86 HONDA SCOOTER - w/helmet, good cond., $250. Ext. 3103 or 2963.

84 NISSAN STANZA - hatchback, 5-dr., a/t, a/c, p/s, p/b, am/fm stereo, sunroof, new muffler, tires, excel. cond., $3,500 neg. S. Spark, Ext. 4111.

84 NISSAN 300ZX - 2+2, T-tops, 40k mi., excel. cond., asking $8,600. 281-6617 after 5 p.m.

83 YAMAHA VIRAGO - 750cc, black, mint cond., garaged, low mi., $1,900 neg. Charles, Ext. 5211.

82 CADILLAC CIMARRON - 4-dr., blue, 4-cyl., $3,500. Ed, 331-9017 after 7 p.m.

81 HONDA CIVIC - 4-dr. sedan, 80k mi., a/c, $1,100. Lin, Ext. 3137.

81 SUBURU GL - s/t, 4wd, new battery, exhaust, 87k + mi. Ext. 4144 or 472-1518.

81 ESCORT - runs well, high mi., 2-dr., 4-spd., $700. 929-5911.

80 MAZDA 626 - a/c, am/fm, 5-spd., new brakes & muffler, $1,000. Jim, Ext. 7735.

80 VW RABBIT - 2-dr., hatchback, 4-spd., am/fm cass., new brakes & tires, 75k mi., very good cond. Rich, Ext. 4395 or 654-3609 eves.

79 HONDA CIVIC - hatchback, runs well, new motor, 95k mi., green, some rust, am/fm cass., dependable, $950 neg. John, Ext. 2919 or 929-3795.

78 CHEVY BLAZER 350 - 4-spd., a/c, am/fm stereo cass., good cond., $2,000. Neil, Ext. 4688.

78 DATSUN 280Z - 2+2, needs front-end work, engine & radiator, has new air-flow box, good tires, T-tops, make offer. Ext. 2345 or 929-3910.

78 DODGE - subcompact. 369-8683 after 6 p.m.

78 FIREBIRD - 4-spd., T-tops, blue, 65k mi., garaged, new tires & clutch, excel. cond., runs well. Ext. 3334.

78 DATSUN 280Z - fuel injection, new paint, carpet, clutch & exhaust, runs well, looks great, $3,450. 543-7065.

77 AUDI FOX - a/c, radials, runs well, 85k mi., $950. Al, Ext. 4442 or 929-8411.

77 FORD GRENADA - 4-dr., a/t, runs well, body good, $500 neg. Ext. 3622 or 744-2905.

77 KAWASAKI KZ 1000 - runs, needs work, extras, asking $600. Jim, Ext. 4986.

77 DODGE VAN - rust bucket, runs, good tires, engine, radio, $300 or best offer. Ext. 2550 or 654-0407.

77 CAMARO - 305 cu. in. V8, a/c, am/fm cass., radial tires & snows, $1,500. Victor, Ext. 2395.

76 PORSCHE 911S TARGA - gold, tan leather, 5-spd., a/c, Blaupunkt, oil cooler, 15k on rebuilt engine, 95k mi., total, $11,500. Kathy, Ext. 7537.

75 DATSUN B-210 - good for local driving, or parts, $150. Dave, 929-4522.

73 JEEP - mail truck, 6-cyl., a/t, runs well, $250. 744-4386.

73 HARLEY DAVIDSON - 125cc, m/c, street/dirt, 160 orig. miles, V6, $300. 265-4811.

71 CHEVY MINI MOTORHOME - 315 V8, 115k mi., sleeps 6, complete, clean in/out, asking $4,000. Ron, Ext. 2467 or 924-8644.

67 CHEVY 427 ENGINE - 4-bolt main, 30 over size. 475-9452 after 5:30 p.m.

67 YAMAHA MOTORCYCLE - 180cc, oil injection, new battery, $150. Dan, 698-7322 days or Ext. 4987 eves.

60 WILLYS - panel, delivery, independent suspension, rack and pinion disk brakes, small block Chevy, many extra parts, $4,300. Dan, Ext. 2075.

MAG WHEELS - aluminum, 5-lug, 15", 5½" bolt circle w/ 235R X15 tires, Ford/Jeep, $60/four. Ray, Ext. 3536 or 289-7615.

TIRES - two, Good Year Eagles, VR60P255, 60VR16 for Corvette, Thunderbird or Cougar, new, list $225/each, best offer. Ray, Ext. 3536 or 289-7615.

CASSETTE PLAYER - for 85 Toyota Camry LE, may fit 86 also. Witkover, Ext. 4607 or 368-0452.

TRAILER HITCH - class 2, for mid-size GM cars, free installation, $50. Ext. 2799 or 757-1581.

TIRES - used, one P195/75 R14 mud & snow, radial; two P185/80 R13, Goodyear, $5/each. Ext. 2610 or 924-5272 eves.

SLIDE-ON CAMPER - 12', open road, full bath, refrig., hot water, reg. heaters, stove, oven, good cond., $800. Jim, Ext. 4986.

TIRE - new, 721 Firestone, 235/75R15, Eldorado rim, $75 neg. Ernie, 588-4987.

FORD FACTORY CAP - $400 neg. 474-5715.

HITCH - Reese, class III, w/universal receiver, asking $200. 281-6617 after 5 p.m.

SLIDE-ON CAMPER - Starcraft, 11½', self-contained, shower, refrig., freezer, heat, stove, oven, $1,850. Ext. 4100 or 929-5872.

Boats & Marine Supplies

30' CATALINA - fully equipped, ready for launching, excel. cond., $32,000. Ext. 4221 or 765-3818 after 6 p.m.

28' MORGAN - keel/centerboard, great shoal draft, cruising boat, completely equipped, $16,500 or best offer. Campbell, 286-3675.

25' SLOOP LANCER - 1977, new 150% Genoa, new 9.9 h.p. Evinrude, electric start, must sell, $4,900. 289-8693.

23' COLUMBIA SAILBOAT - 1976, 1986 6 h.p. Yamaha, very clean, must see. 924-2016 after 6 p.m.

19' BOWRIDER CRUISER - 1972, camper, w/1976 115 h.p. Johnson, Coast Guard pkg., w/trailer, $3,500. Frank, 567-5131.

18' SLOOP - fiberglass, 4 sails, sail cover, knotmeter, depth sounder, new battery, galvanized trailer. Bergoffen, Ext. 7898.

17' MFG - 55 h.p. Johnson, auto lift, little use, Navy top, extras, good cond., no trailer. 878-1805.

17' ARISTOCRAFT - 1965, fiberglass, rebuilt 60 h.p. Merc I/O, very economical, w/trailer, ready to go, excel. cond., $1,700. Mark, Ext. 2599.

13½' BOAT - inflatable, Metzeler steering, 30 h.p. Tohatsu, windshield, bench seats, Highlander trailer, asking $3,500. 281-6617 after 5 p.m.

12' ROW BOAT - Sears, new, fiberglass, $350. 929-5911.

8' DINGHY - 1988, fiberglass, $550. Dawn, 758-3830.

7' ELI DINGHY - w/oars, excel. cond., $250. Ext. 2610 or 924-5272.

SAILING RIG - for canoe, complete except for maststep, $400. Bob, Ext. 4044.

GALVANIZED BOAT TRAILER - 1986, 600 lb. capacity, like new, $250. Ext. 2799 or 757-1581.

MOTOR - Minnkota model 65, electric, weedless, 25 lb. thrust, 5-spd., battery & battery box, asking $185. 281-6617 after 5 p.m.

Furnishings & Appliances

SOFA BED - gold, $75 or best offer. Ext. 7657.

DRESSER - w/mirror, hardwood, pecan finish, good cond., $95. Scott, Ext. 3369.

COUNTERTOP STOVE - wall oven combo, all new elements; 22 cu. ft. refrigerator, avocado, $100/each. Penny, Ext. 2625 or 467-8297 eves.

COUCH - & chair, heavy pine, w/cushions, $400. Ext. 2543.

FREEZER - Westinghouse, 19.6 cu. ft., upright, hardly used, excel. cond., $400. 696-2258 eves.

CHEST - w/matching nightstand, maple, $150; twin mattress w/frame, excel. cond., $50. Ext. 4697.

Sports, Hobbies & Pets

DRY SUIT - Poseidon, man's large, like new, asking $500. 474-5715.

BASS GUITAR - Honda, used once, in original box, $70. Mark, Ext. 2599.

KEYBOARD - Yamaha CVP-10 Clavinova, digitally sampled piano, harpsichord & more sounds, full 88-key, mint, $2,500. Brian, Ext. 5265 or 234-9487.

PET VARI KENNEL - airline approved, used once, 3'x2'x2', orig. $120, sell for $60. Ken, Ext. 4220.

CAMPING STOVE - 2-burner, good cond., $10. Ext. 2610 or 924-5272.

CAGES - one, rabbit, 40"x30"; one, transport, $35/both. Chris, Ext. 7189.

PIANO - Lester Betsy Ross spinet, light wood, includes bench, good cond., $700. Tony, Ext. 3658/3637 or 929-4903.

BICYCLE HELMET - Bell, small, w/visor, like new, $25. 473-2473.

BICYCLE - Schwinn Caliente, 10-speed, looks like new, $60; weights, no bar, (4) 14.4 lbs., (4) 8.8 lbs., (2) 4.4 lbs., $20. Lou, Ext. 2050.

SKY KENNEL - wooden, 24"L x 16"W x 19"H, $15. 744-6874.

PIANO - Acrosonic, upright, good action sounds, good ivory keys, w/bench, $450. Nancy, 281-4673.

PIANO - Lester Betsy Ross spinet, w/bench, solid walnut, three working peddles, excel. cond., asking $750. 924-3906.

FISH TANK - 20 gallon, $20; maple table, $45; high chair, $20; suitcase, $10. Kathy, 744-2203.

Tools, House & Garden

TUNE-UP CENTER - Snap-On, 3 meters, $250; brake bleeder, $125; 20-ton hydraulic jack, air assisted, $250. 474-5715.

LAWN MOWER - Craftsman, 20", fair cond., $35. Ext. 7225.

TOPSOIL - delivered, $19/per yard, also sand & gravel delivered. 924-9427.

IRIS BULBS - large flowering, $2/per bulb. 289-1585.

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

LAWN MOWER - Snapper, 3½ h.p., new blade, 21" cut, $100; Briggs & Stratton go-kart eng., 2½ h.p., $40. Dan, 698-7322 days or Ext. 4987 eves.

KEROSENE HEATERS - Crestline, 1,800 Btu, radiant heat, $25; Corona, 2,300 Btu, round convection, $40, both w/5 gallon can. Lou, Ext. 2050.

DIVING BOARD - 10', fiberglass, $75; ladder, 3-rung, $50. Ext. 2462.

DEEP WELL PUMP - 2"; glass-lined water tank, 30 gallon, $50/both. 924-6751.

Audio, Video & Computers

TELEPHONE DIALER - automatic, w/speaker phone, fits modular jack, 63 number memory, orig. $130, sell for $75. Janet, Ext. 4049 or 744-8087.

TELEVISIONS - 19", color, $75; two 13" b&w, $30/each. 744-3068.

TV - 12", b&w, excel. picture & sound, $25. Ext. 5236.

COMPUTER - Aquarius 17k complete system, printer, data-recorder, file & FIN form, games, like new, $90. Ernie, 588-4987.

ALARM PANEL - Napco, new battery, charger, magnet switches, RMT panel & more, $80/all. Fred, Ext. 4798.

COPIER - Sharp SF-751, full size, 4 years old, excel. cond., must sell, orig. $1,300, asking $500. Al, Ext. 4669 or 226-1828.

COMPUTER - PC Jr, 640k, two floppy drives, mouse, plus joystick, modem, misc. programs, reference books. Chris, Ext. 7189.

STEREO CABINET - wood sides, glass top & front door, good cond., $30. Kim, Ext. 4461.

MUSIC SYSTEM - Wurlitzer, digital, double keyboard, model D-S, list value $700, asking $400. 261-7296 after 4 p.m.

STEREO CASSETTE DECK - Teal A-100, $15; Setton stereo receiver, 40 watt channel, great specs, $50; both w/service manual. 298-4171 after 6 p.m.

Lost & Found

LOST - key chain, 15-20 keys, on 3/31, around Bldg. 725. John, Ext. 3988.

Free

ORGAN - I'm an organ donor! Take my GTR electric chord organ. Bruce, Ext. 2450 or 473-8817.

Yard & Garage Sales

EAST PATCHOGUE - baby items, clothes, tools, 32 West Masem Square, off Head of Neck road, Sat. & Sun., April 15 & 16, 9 a.m.-4 p.m. Ext. 4030.

Car Pools

BOHEMIA/OAKDALE AREA - need 2 more drivers for car pool. Frank, Ext. 2314.

Miscellaneous

CRAFT ITEMS - country hats, wreaths, baskets, butterflies, hoops, covered photo albums, great Mother's day gifts. Lois/Karen, Ext. 4904/3513.

TYPEWRITERS - 3; 2 desks; TI-16K computer; trumpet; trombones; kerosene heaters; motorcycles; refrigerator; $35-90/each, 751-2655 eves.

MEDICINE CABINETS - two, wall openings, 14"x18"x3½", glass doors, almost new, excel. cond., $15/each. Don, Ext. 2981.

STROLLERS - one Gerry Double umbrella w/canopy, $90; one Cosmos single folding carriage, $75. Mark, Ext. 5350 or 369-0793.

SHOWER ENCLOSURE - Fiat, w/stone base glass door, 36"x36", new, $250. 269-9510 after 7 p.m.

POLYESTER STUFFING - for crafts, 50 bags, mostly 2 lbs., $100; beautiful fabrics used for crafts, $200. 475-8658.

STROLLER - new, excel. cond., orig. $150, sell for $75. 689-9234.

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 Rent

BROOKHAVEN - furn. 3-bdrm. house, eik, l/r, d/r, den, 2½ baths, screened porch, one-acre lot, avail. mid-Aug. for 1 year, $1,000/mo. + 1 mo. sec., refs. 286-0263 eves.

EAST MORICHES - two 2-bdrm. apts., in Victorian house, unfurn., 1 block to school, 3 blocks to bay; $650/mo. + util., ground floor; $600/mo. + util., upstairs. Mona, Ext. 5056, or Michael, Ext. 2081, or 878-9384 eves.

MIDDLE ISLAND - Artist Lake condo, 1 bdrm., l/r, kit., full bath, a/c, new w/w, dishwasher, redecorated, pool, 5 min to Lab, avail. May 1, $700/mo. heat incl. Ext. 3144 or 698-5046 eves.

MILLER PLACE - 2 bdrms., kit., l/r, full bath, non-smoker, no pets or children, $800/mo. all, + sec. 732-9324.

NORTH SHIRLEY - 2-rm. apt., furn., eik, w/w, bdrm. w/skylight, 5 min to Lab, 1 person only, non-smoker, no pets, sec., $475/mo. incl. util. 281-8044.

PORT JEFFERSON STATION - 3-bdrm. ranch, eik, l/r, d/r, den, 2 baths, 2-car garage, 3-V school district, short-term rental, 1 mo. sec. Ext. 4368 or 928-3371.

STONY BROOK - $339/mo. + util. For appointment call Jim, Ext. 2183.

ESTES PARK, COLORADO - 1-bdrm. condo, sleeps 4, 5 miles from Rocky Mountain National Park, weekly or monthly summer rentals. Mike, Ext. 2242.

POCONOS, NY - vacation getaway, accommodations for April 15-21, many different recreational activities, asking $175 neg. Charles, Ext. 5211.

For Sale

BLUE POINT - 3-bdrm. Cape, 2 baths, kit., dining area, l/r, TV room, full bsmt., garage, 1 acre, on dead-end, vinyl siding, near school, church & beach. Ext. 4843.

CORAM - 9-rm. Colonial, 4 bdrms., 2½ baths, family rm., f/p, eik, d/r, l/r, cul-de-sac, in-ground pool, sprinklers, 2-car garage, mud room, $195,000. Ext. 2303 or 732-3902 after 5 p.m.

EAST SETAUKET - 4-bdrm. Colonial, l/r, d/r, family room w/fp, eik, 1½ baths, full bsmt., 2-car garage, a/g pool, 0.42 acre, 3-V school district, $192,000. Cheng, Ext. 2958 or 473-6429.

EAST SETAUKET - 4-bdrm. Colonial, 2½ baths, eik, l/r, d/r, family rm., f/p, wood floors, screened porch, 2-car gar., 0.52 acre, new vinyl siding, gazebo. Shiue, Ext. 4395/3372 or 751-8224.

MASTIC BEACH - 5-rm. ranch, 3 master bdrms., tiled bath, cabinet-lined country kit., oil/hot water heat, full bsmt., 3 blocks to marina, approx. 100'-120' lot, $118,000. Ext. 8764 or 281-8685.

MIDDLE ISLAND - Artist Lake condo, 1 bdrm., l/r, kit, bath, a/c, new w/w, dishwasher, clubhouse, sauna, pool, gas heat, 5 min to Lab, avail. May 1, $80,000. Ext. 3144 or 698-5046 eves.

NORTH SHIRLEY - ½-acre lot, 75'x265', Manorville school and fire district, 5 min. from Lab., nice area, $50,000. Jim, Ext. 2305.

NORTH SHIRLEY - 0.8 acre lot, 100'x320', 5 min to Lab, located across the road from Southaven Park, $57,000. Roy, 727-6959.

RIDGE - 5-bdrm. Cape, 2 baths, 2-car garage, country kit., ¾ acre, coal/wood stove, porch, deck, poss. M/D, 5 min. to Lab, asking $145,000. 924-4749.

RIDGE - 3-bdrm. Colonial, low assumable mortgage, 8 min. from Lab., large fenced yard, oversized rooms. Mike, Ext. 7865.

SETAUKET - 3-bdrm. L-ranch, cul-de-sac, 2 baths, eik, l/r, d/r, rec. rm., wood floors, patio, full bsmt., attic, 2-car gar., ca/c, ⅓ acre, mint, 3V schools, $220,000. Ext. 5265 or 584-8339 after 6 p.m.

SETAUKET - N of 25A, 4-bdrm. Colonial, 2½ baths, eik, l/r, d/r, den, fin. bsmt., 0.4 acre. 751-5667 eves.

SETAUKET - N of 25A, 4-bdrm. contemporary Cape, skylights in kitchen, f/p, many custom extras, lovely country setting, ⅓ acre, mint cond. P.J. Vincent, 689-8675.

SHOREHAM - 4-bdrm. Cape, 2 baths, l/r, d/r, eik, fam. room., f/p, BBQ pit, oak floors, garage, deeded beach rights. 744-2947 eves.

SHOREHAM - north, Soundview Acres, 3-bdrm. contemporary ranch, 2 baths, brick f/p, large windows onto deck, 2-car garage, priv. beach, $249,000. 744-9746.

STONY BROOK - N of 25A, 4-bdrm. Colonial, 2½ baths, bsmt., den, f/p, new appli., 2-car garage, hardwood floors, walk to village, LIRR, SUNY, private. $269,000. Bob, 689-9331.

STONY BROOK - N of 25A, 8 rooms, 4 bdrms., 3½ baths, ⅔ acre, 3-V school district, mint cond. 751-2860 eves.

WADING RIVER - 3-bdrm. Cape, ½ + acre, 2 baths, den, d/r, l/r, fam. room w/fp, full fin. bsmt., SWR schools, $230,000. 929-6748 after 3 p.m.

WADING RIVER - 3-bdrm. ranch, eik, l/r, solar skylight, ¼ acre, low taxes, circular drive, walk to beach, excel. cond., $130,000. Kathy, Ext. 7105. 929-3207.

WADING RIVER - 3-bdrm. ranch, 2 baths, l/r w/fp, den, formal d/r, full bsmt., 0.62 acre, landscaped yard, priv. beach, $158,000. Nick, 929-4901 after 5 p.m.

NORTH MIAMI, FL - 2 bdrms., 1 bath, d/r, l/r, sprinklers, fenced in yard, $47,000. 345-3142.

PALM COAST, FL - ¼ acre lot, 80'x125', 5 mi. to Atlantic Ocean, 24 mi. N. of Daytona Beach, water drainage & sewage util. in, $11,995 or $1,995 and assume. Thomas Nolan, Ext. 5265.

Wanted

SCIENTISTS - to judge BNL's annual Elementary School Science Fair, Sat., May 20. Janet Tempel, Ext. 4049.

HOUSE/APARTMENT - to share/sit, May-Sept., responsible, neat, non-smoker, female. Ext. 4470.

MILITARY ITEMS - Bob, 475-3255.

VCR - good cond. Tim, 744-2203.

LAWN MOWERS - old, complete. Dan, 698-7322 or Ext. 4987 eves.

CONTRIBUTIONS - Mrs. Carroll is leaving the Nursery School, if you would like to contribute to her gift call Karen, 473-6550.

BOAT SLIP - for 18' boat, Sayville, Bayport, Bluepoint or Patchogue area. Chris Robertson, Ext. 3355.

8MM PROJECTOR - or viewer. Ext. 2833.

HORSE - carriage, driver and pooper scooper to transport wedding party in June. Ext. 4764 or 821-2875.

MINERALS - mineral collections, mineral books (old), any language. Plotkin, Ext. 7974 Wed. only, or 798-2887 other days.

BASEBALL CARDS - sets, anything up to 1980, will pay top prices. 473-5343 after 5 p.m.

In Appreciation

The Shanley family wishes to express their appreciation for the support, comfort and prayers offered for the late John Shanley, who retired from the Medical Department in October 1986.

— Mary Shanley

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