BROOKHAVEN BULLETIN
Vol. 41 - No. 48 December 11, 1987
BROOKHAVEN NATIONAL LABORATORY

BNL's Search for the Science of Superconductivity

Part IV: Experience Counts in Applying New Materials

In discovering superconductivity in mercury in 1911, did Dutch physicist Heike Kamerlingh Onnes discover a perpetual motion machine?

Perpetual motion is movement that endures forever because no energy is lost. Historically, there has been a quest for a mechanism that, once set in motion, would continue to do useful work without an external source of energy.

Within a superconducting loop, a direct current will flow perpetually once set in motion. That is because a superconductor loses all resistance to the flow of a direct current below its critical temperature (T_c).

Nevertheless, keeping that current moving perpetually around a superconducting loop requires the energy needed to keep the material cold enough to superconduct.

In outer space, where the temperatures are cold enough, a superconducting loop made of one of the new, 90-100 kelvins (K) materials would be a perpetual motion machine. Here on earth, however, a superconducting loop needs to be refrigerated — as materials that superconduct at room temperature have yet to be discovered — and so the quest for perpetual motion continues.

The 90-100 K superconductors — including the second one, discovered at BNL — do not have to be kept as cold as the conventional, low T_c materials. In addition, their refrigerant, liquid nitrogen, is less expensive than liquid helium, used for the older superconductors. Regardless, the refrigerant and refrigeration are not the biggest expenses involved with the new materials.

Since they are not in a form ready to be applied, the new materials are going to cost time for scientific research into their properties and technical development of their applications — perhaps as much or more time than has been spent on the old materials.

The high T_c superconductors are brittle ceramic compounds. Unlike many low T_c materials, which are ductile alloys, the new superconducting materials cannot be readily drawn into wires, bent and joined. To make them pliable is going to take scientific and technical expertise, as well as time.

The challenges of the new superconductors do not daunt Brookhaven. As part of the national superconductivity effort, Brookhaven has redirected some of its existing funds and programs to concentrate on the new superconductors.

As explored in this, the last part of the Bulletin's four-part series on "BNL's Search for the Science of Superconductivity," Brookhaven scientists have been successfully developing superconducting applications since the early 1960's.

"The funny thing is that, within a year, the perception of me by those in the superconductivity field has swung 180 degrees: I went from being considered a raving, new-age radical who wants underground, superconducting utility cables -- I mean how crazy can you get — to being regarded as a nay-saying fuddy-duddy who pooh-poohs the new superconducting materials in favor of the old."

So says Eric Forsyth, Chairman of the Accelerator Development Department (ADD) and a member of BNL's Interdisciplinary Task Force on High Temperature Superconductivity. He also represented the Lab as a member of the National Academy of Sciences' panel on high temperature superconductivity.

As some would say around this time of year, bah-humbug.

Forsyth is neither a radical, nor a fuddy-duddy about the practical application of superconducting materials. In fact, he is an experienced realist in the field.

Despite all the hype about the short-term prospects for applications of the materials that become superconducting at higher critical temperatures (T_c), Forsyth and others at BNL have bravely voiced the fact — as pessimistic as it may sound — that the research and development of applications of the new high temperature superconductor are going to take time.

Full Power

Forsyth gained a large part of his experience in the practical application of superconductors from 1971-86 when he headed Brookhaven's Power Transmission Project (PTP). It was the only full-scale prototype ever to reach full power using superconductivity to transmit electrical power.

During eight operating runs from October 1982 to June 1986, the PTP's two 430-foot superconducting cables carried up to 660 megavolt amperes per cable, enough power for a city of one million. These cables were made of the superconducting compound niobium-tin.

Not So Marvelous

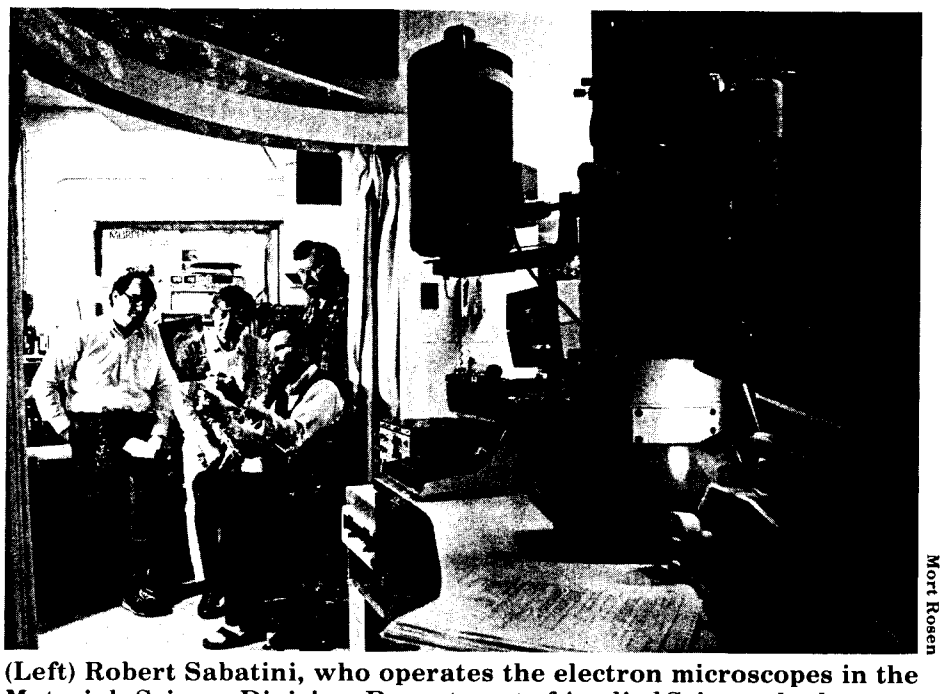
"Every application requires that the superconductor be put in a form suitable for that application — so that it is strong enough, can bend without breaking and can be joined together," explains Forsyth. "Now, the materials properties of these new superconductors are not so marvelous that new applications are going to drop into the marketplace like apples off a tree."

As Senior Metallurgist Masaki Suenaga will readily admit, lousy is a good word to describe the materials properties of the new superconductors, including the one Physics Associate Arnold Moodenbaugh and he discovered — the world's second 90-100 kelvins (K) superconductor.

"The new materials are deceptive," comments Suenaga. "Because they are easy to make and will levitate a magnet in liquid nitrogen, they give the impression that it will be simple to turn them into practical use. That impression is wrong."

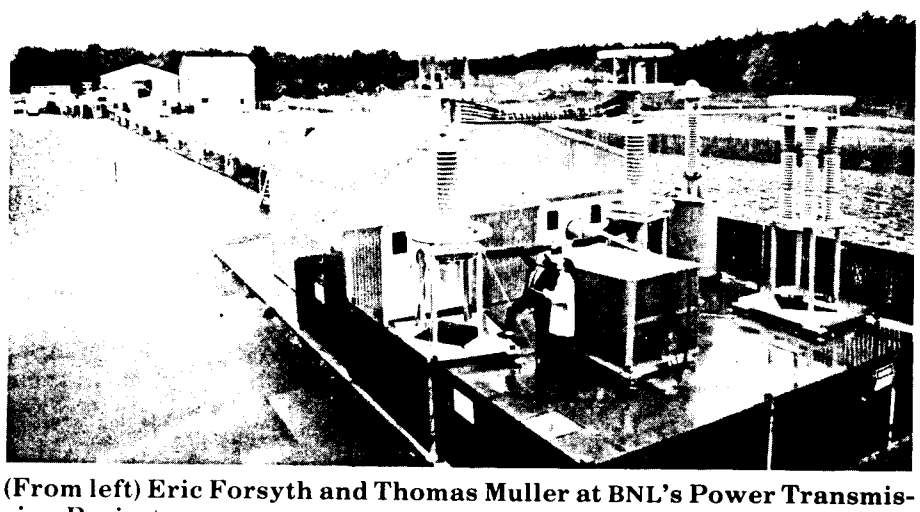
Suenaga should know. Since he came to Brookhaven's Materials Science Division of the Department of Applied Science (DAS) in 1969, Suenaga has been working to understand and improve the materials properties of superconductors.

(Continued on page 2)



Mort Rosen

(Left) Robert Sabatini, who operates the electron microscopes in the Materials Science Division, Department of Applied Science, looks on as (from left) Masaki Suenaga, David Welch and Arnold Moodenbaugh examine a micrograph of a new superconducting oxide material. In the foreground is a transmission electron microscope, and behind Sabatini is a scanning electron microscope; both are used to study materials properties.



Mort Rosen

(From left) Eric Forsyth and Thomas Muller at BNL's Power Transmission Project.

bnl Lecture:

A Common Heritage

Before they came to BNL's Medical Department, several renowned Brookhaven researchers shared a common heritage — as members of the staff of the Rockefeller Institute for Medical Research.

One of the scientists with whom many of them worked at Rockefeller was Vincent Dole, now Professor and Senior Physician Emeritus at Rockefeller University. Recalling these associations, Dole will deliver the 239th Brookhaven Lecture, the last in a series of four talks this fall to commemorate the Lab's 40th anniversary. He will speak about "Biomedical Research at Brookhaven and Rockefeller Hospital — Our Common Heritage," on Wednesday, December 16, at 4:30 p.m., in Berkner Hall.

Vincent Dole joined Rockefeller University in 1941, working in the department headed by Donald Van Slyke, who was at Rockefeller from 1907 until he retired in 1948. At that point, Van Slyke embarked on a second career, as Associate Director for Life Sciences at the fledgling Brookhaven National Laboratory. His research centered on collagen and the use of carbon-14 in studying metabolism. Though he later took on fewer administrative duties, Van Slyke continued research at BNL until his death in 1971.

Lewis Dahl joined Dole's staff at Rockefeller in 1948. He left in 1952 to join BNL's Medical Department, and he was Chief of Staff of the Medical Research Center when he died in 1975. Dahl's research in hypertension, which started in the late 1940's, showed that high salt intake is more dangerous in a person's early years. He also developed two special strains of rats — one genetically prone to hypertension, the other resistant.

George Cotzias also worked with Dole at Rockefeller Insitute, from 1946-52. He came to BNL in 1953, as the head of the Physiology Division of the Medical Research Center, and remained here until he died in 1977. His greatest contribution was in the treatment of Parkinsonism: It was his persistent, systematic investigations that provided the key to the successful use of L-Dopa in treating this crippling disease.

Another researcher who worked with Dole at Rockefeller in the early 1950's was Irving Schwartz. He came to BNL in 1956 as Research Collaborator and became a Senior Scientist in 1958. In 1961, he once again became a Research Collaborator, an association he continues today, in addition to his work at Mt. Sinai Medical School. Schwartz's research interests center on electrolyte and peptide metabolism.

Also sharing the common heritage was Lee Farr, who became the first Chairman of BNL's Medical Department, in April 1949. Farr had been at the Hospital of Rockefeller University from 1934 to 1940, in Van Slyke's Department. Farr stepped down as Medical Department chairman in 1962, but continued at BNL as a Research Collaborator until 1969.

Centering on Van Slyke, Vincent Dole will examine the common heritage these researchers shared at Rock-

(Continued on page 3)

Superconductivity (cont'd)

Since January, however, Suenaga has turned most of his attention to the new high T_c materials. Last February, Moodenbaugh and he discovered the 90 K superconducting compound lutetium-barium copper oxide. Suenaga also was a member of the National Academy's high T_c panel.

"Our superconductor is not practical because lutetium is very expensive," says Suenaga. "It was important to find, however, because it proved that yttrium-barium copper oxide [Y-Ba-Cu-O] was not a fluke, that other 90 K superconductors exist."

Critical Current

Because Y-Ba-Cu-O is practical and inexpensive, Suenaga and company are examining its materials properties. Particularly, they are investigating critical current, the maximum amount of current that can be sent through a superconductor before its resistance reappears and it loses its superconductivity. While they may become high enough for power transmission, the critical currents of the 90-100 K superconductors are not good enough for use in high magnetic fields, such as those associated with accelerator magnets.

In examining critical current and other materials properties, Suenaga has always worked in collaboration with materials science theorist David Welch, a DAS Physicist, who is also exploring the behavior of oxygen in the new oxide superconductors.

Between the crystals making up the new materials, Suenaga sees non-superconducting regions at their boundaries. He explains, "If a boundary is non-superconducting, then any current flowing through a superconductor meets resistance as it goes from one grain to the next."

To learn whether or not the problems caused by these weak boundaries can be overcome, Suenaga is looking at how they are affected by different ways of making the material. "Understanding this boundary problem will help us in making wire or tape out of the new superconductors," Suenaga explains.

To develop wire or tape for high field magnets or alternating-current power transmission, Brookhaven has joined Argonne National Laboratory and Ames Laboratory as one of two consortiums of laboratories, organized at the request of the Department of Energy, to conduct research on materials processing.

Next Generation

Before the new materials, Suenaga spent most of his time investigating the low T_c compound niobium-tin (Nb-Sn). Nb-Sn and niobium-titanium (Nb-Ti), the most widely used, conventional superconductor, were discovered in the early 60's. However, Nb-Sn is brittle, while Nb-Ti is easier to apply because it is ductile.

Despite its brittleness, Nb-Sn interested Suenaga because it can carry larger currents than Nb-Ti can in high magnetic fields —which are needed for physics applications. So, in the early 70's, he and his colleagues developed Nb-Sn tapes for the Power Transmission Project. Also, Suenaga and company continue to work on the production of multifilamentary wire of Nb-Sn for the high-field, solenoid magnets used in fusion reactors.

"When we have gone as far as we can with niobium-titanium, we'll move on to niobium-tin — not yttrium-barium copper oxide — for the next generation of superconducting accelerator magnets," declares Physicist Per Dahl, ADD, another member of the Interdisciplinary Task Force.

Because they are both brittle, Nb-Sn and Y-Ba-Cu-O are somewhat similar. "Solving the problems of niobium-tin will certainly assist us in developing the new materials," comments Dahl. "But bear in mind, we have been working with niobium-tin for 20 years and we are not yet ready to use it for accelerator magnets — so that is a warning about the new materials."

All in the Magnet Family

In 1962, BNL began investigating the use of superconducting magnets for accelerators, initially concentrating on Nb-Sn, despite its brittleness. A high field solenoid with a Nb-Sn coil, built in 1964, was one of the first magnets resulting from this effort.

When energized in 1968, the magnet for BNL's seven-foot bubble chamber magnet was the largest air-core superconducting magnet in operation. Its coil was made of Nb-Ti.

In 1973, a pair of superconducting dipole magnets with Nb-Ti coils were installed in the primary proton beam of the Alternating Gradient Synchrotron (AGS), to bend the beam by eight degrees on its way to the bubble chamber. At that time, it was the largest superconducting accelerator magnet in operation and the only one used for primary beam transport.

Today, the parentage of most superconducting accelerator magnets can be traced to the CBA Palmer magnet, named for its magnet-designing godfather, Robert Palmer, Special Assistant to the Director and former BNL Associate Director for High Energy Physics.

Mort Rosen

Robert Palmer

The CBA bending, or dipole, magnet's offspring include the dipole magnets for the HERA proton accelerator at DESY in Hamburg, West Germany; for BNL's 100-billion-electron-volt (GeV) Relativistic Heavy Ion Collider (RHIC) proposed for the CBA tunnel, and for the proposed national effort, the Superconducting Super Collider (SSC). The CBA dipole magnet was designed in 1982 for what was to have been BNL's Colliding Beam Accelerator (CBA), a 400-GeV proton collider, construction of which was discontinued in 1983 so the SSC could be pursued.

Engineering Feat

In designing the CBA dipole, Palmer's engineering feat was to put two layers of a superconducting cable inside an iron yoke originally designed only for one layer of a superconducting braid. The Nb-Ti cable he used was originally designed for Fermilab's Tevatron.

Unlike Tevatron's bending magnets, however, CBA dipoles and their offspring have a "cold," rather than a warm, iron yoke. It is cold because both the yoke and the superconducting coil are housed within the stainless steel cooling chamber or cryostat. Additional features pioneered by Palmer in the CBA magnet and passed on to the next generation include spacers and correction windings of the superconducting coil to improve magnetic field uniformity.

Another innovation that Palmer considered was the so-called two-in-one dipole magnet: two individual superconducting coils side-by-side in one common yoke. While this feature was not included in the CBA magnet or its offspring to date, it is being considered for the superconducting magnets of the Large Hadron Collider, a large accelerator being considered for the LEP tunnel at CERN.

Prototypes in Production

The next generation, with prototypes now in production, includes the RHIC and SSC magnets.

All four, 9.7-meter-long RHIC magnets built to date have exceeded the specified operating field of 3.5 teslas. They are full-length prototypes for the 288 magnets that will guide heavy ions around the 2.4-mile-long tunnel. One magnet was constructed at BNL, while the other three were commercially manufactured.

For the SSC magnet, Brookhaven is collaborating with Lawrence Berkeley Laboratory (LBL) and Fermi National Laboratory on a joint design. The superconducting cable was developed at LBL; Brookhaven turns the cable into coils and assembles the magnets; and Fermilab manufactures the cryostat and tests the full-length magnets. The effort is managed by the Central Design Group under Maury Tigner.

To date, four 17-meter, full-length magnets — prototypes for the approximately 10,000 magnets that will bend protons around a 52-mile circumference racetrack — have been assembled at BNL and shipped to Fermilab for testing. Fourteen more will be put together this year.

Wiggler & Storage Rings

At the National Synchrotron Light Source (NSLS), a superconducting Nb-Ti wiggler magnet will be inserted in the x-ray ring next year. Such a high-field magnet wiggles the electrons circulating around the synchrotron ring, causing them to radiate higher energy, more intense x-rays. The x-rays from the superconducting wiggler will be used for x-ray examinations of the heart and its blood vessels.

At the beginning of next year, the NSLS will begin research on an eight-meter, compact, superconducting storage ring. If built, it will be a prototype for industrial superconducting synchrotrons dedicated to the production of computer chips by the process of x-ray lithography.

A 14-meter, muon synchrotron is another superconducting storage ring being designed at BNL, by ADD. The muon channel at the AGS will inject this ring, which will be used for the study of the magnetic moment of muon.

Superconducting Essence

The superconductors for accelerator and synchrotron magnets are produced by industry, according to the specifications of laboratories such as BNL. "The superconductor is the essence of everything for an accelerator magnet," comments Per Dahl. "If it is not right, nothing is."

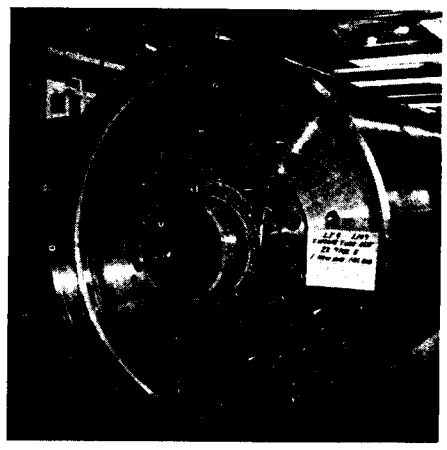
To make sure the Nb-Ti superconductors are right, the Research and Development Group of the Magnet Division, ADD, is charged with developing superconductor specifications and testing the superconductors delivered by industry. It is the largest effort of this kind in the world.

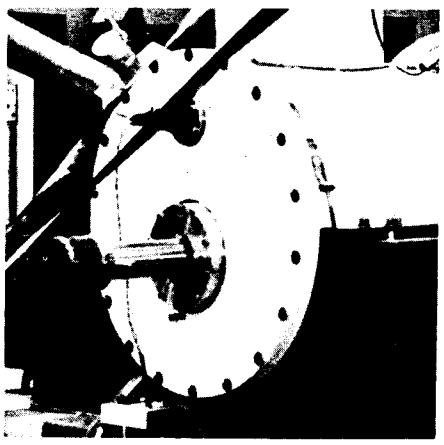
Headed by William Sampson, the group looks into improvements in the properties of commercially available Nb-Ti superconductors and different configurations of Nb-Ti cables, looking for improved performance. For example, this group is monitoring the quality of the superconducting coil being used for the HERA magnets.

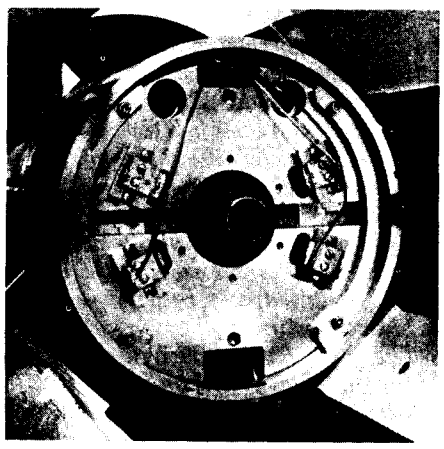
Explains Forsyth, "It wasn't until the late 60's, nearly ten years after the discovery of niobium-titanium, that the ideal wire form for high field, superconducting magnets evolved. But that didn't come about until all the basic physics, materials science and engineering were done first.

"And finally, somebody else had to figure out how to make this superconducting wire economically," adds Forsyth. As he learned through the Power Transmission Project, it is not the cost of the superconductor or the refrigeration that limits its application, but the great expense of going from the prototype into business.

"I'm not trying to sound negative, but all these problems had to be investigated with the old materials, and it has taken years to solve them, and we're not done yet," remarks Forsyth. "The new materials will be developed in their own time as well."







—photos by Rosen

The CBA magnet (top), RHIC magnet (center) and SSC magnet (bottom) have many similarities.

Novel Applications

Forsyth foresees that the first novel applications of high T_c superconductors may be hybrids of semiconductors and superconductors — and the first commercial success will be toys. "Don't knock it, toys are big business, and 'shake and bake' superconductor kits to make the new materials right in your own kitchen are selling like hot cakes," Forsyth says.

According to Forsyth, the high T_c superconductors could lower the cost of magnetic resonance imaging (MRI) devices used in hospitals, making them more affordable and thus more available. The commercial application of Nb-Ti superconductors to MRI would never have been possible to begin with, he points out, had it not been for the superconductor research and development done at BNL and Fermilab.

In 1966, Brookhaven researchers Gordon Danby, AGS, and James Powell, Department of Nuclear Energy, patented a concept for using powerful superconducting magnets to levitate and propel trains magnetically. The Japanese National Railway has already used this concept to develop a prototype railroad track.

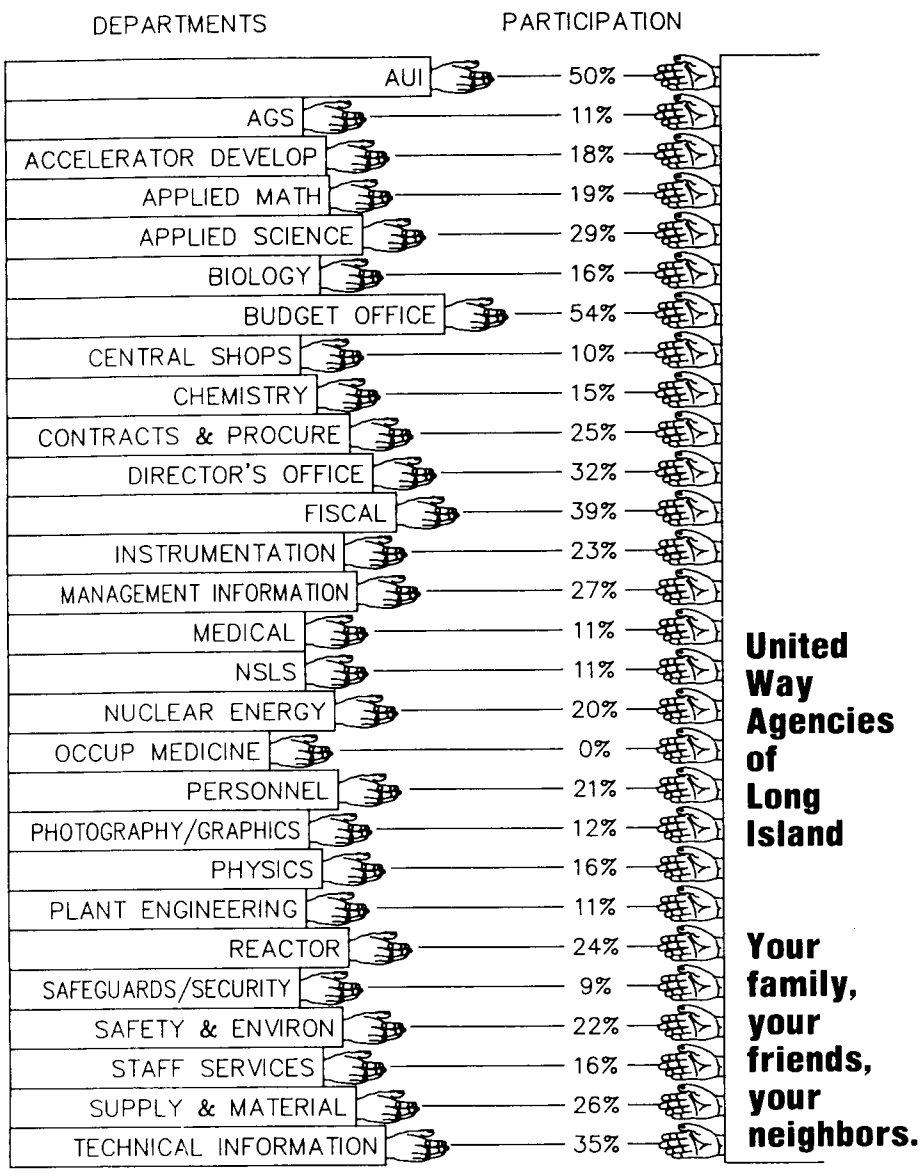
The Search Continues

As a multiprogram lab, BNL has the expertise, experience and facilities to continue its search for the science of superconductivity, simultaneously through basic science research and technical applications development, both with the new and old superconducting materials.

As Forsyth concludes, "One of Brookhaven's greatest strengths is that we can cover the superconductivity spectrum — from a solid state theory by Vic Emery, to materials discoveries by Mas Suenaga, to superconducting accelerator magnet research and development by teams of physicists, engineers and technicians — and make some of the most sophisticated superconducting devices in the world."

— Marsha Belford

Reach Out The United Way



*ALUMNI CONTRIBUTIONS = $1,425.

Travel Policy Revised

Any employee planning January travel should be sure to consider the impact of new travel regulations, effective January 1, 1988.

These changes are in accordance with the Federal Travel Regulations as required under the Federal Civilian Employee and Contractor Travel Expense Act of 1985 (Public Law 99-234). They will soon be addressed in revisions to the Standard Practice Instructions. Additional explanatory information will also be published, and an informational meeting for employees may be held when everything is finalized. In the interim, however, the Travel Office, Ext. 2531, can answer any questions about the new regulations, which apply to travel initiated after December 31.

In sum, the new rules allow for a combined subsistence per diem and lodging per diem for domestic travel. The subsistence per diem is either $25 or $33 (depending on city), while the lodging per diems vary according to the city, as listed in government tables. For example, the combined per diem for the New York metropolitan area is $136 ($33 subsistence; $103, lodging), and the Washington, D.C. combined per diem allows $117 ($33 subsistence; $84 lodging).

As the Lab is now entitled to government rates at hotels that offer these discounts, the Travel Office will book those hotels and rates when available. Receipts for lodging will not have to be submitted with employee expense reports. Any expenses incurred in excess of the allowable combined per diem will not be reimbursed to employees. Certain rare exceptions will require preauthorization by the Lab's Business Manager.

Domestic per diem allowances are expected to change only once each year. Foreign travel is more complex because per diem allowances may change more frequently.

The revised travel policy also reduces the personal auto mileage reimbursement from 22¢ to 21¢ per mile.

Getting Together for Safety

Mort Rosen

From safety coordinators and safety representatives to engineers, architects and project managers, many Lab employees are involved with building fire safety. About 50 of them attended a seminar on the Life Safety Code, held at BNL December 3-4 and conducted by the National Fire Protection Association. The Life Safety Code deals with safe means of exiting buildings and with general fire safety.

Lecture (cont'd)

efeller University, which provided such a solid foundation upon which to build an outstanding medical department at the young BNL.

Vincent Dole received his A.B. from Stanford University, in 1934, and his M.D. from Harvard Medical School, in 1939. He joined Rockefeller University in 1941 and was named Professor and Senior Physician to the Hospital in 1952. He is a Diplomate on the American Board of Internal Medicine, and his current research activities include narcotic addiction and alcoholism.

Dole is a member of the American Society for Clinical Investigations, the Association of American Physicians, the American Physiological Society, Sigma Xi, the American Academy of Arts and Sciences, the Institute of Medicine and the National Academy of Sciences. He is also a Fellow of the American Association for the Advancement of Science.

In Stormy Weather: Dial 282-INFO

Needed: 12.3%

Pledges are still being accepted for the BNL Blood Drive which takes place next week on Tuesday and Wednesday, December 15 and 16, in the gym.

BNL's goal of 400 pints donated seems quite reasonable considering that this number represents only 12.3% of the Laboratory population. Actually, 500 pledges are needed to meet this goal because some donors attempting to give may be deferred for a variety of reasons.

So, roll up your sleeves and share this holiday season. Donate a pint of blood to someone in need.

If you haven't signed up yet, call Susan Foster, Blood Drive Chair, Ext. 5126, to schedule an appointment. Identification is required by Long Island Blood Services on the day of the drive.

Long Island Blood Services has promised to do their utmost to hold donating time to a minimum. Cooperation in keeping to your appointed time to donate blood will help this winter's Blood Drive run smoothly.

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 during the month of December over the Lab's 40-year history.

December 23, 1947 — Representatives of AUI and the Atomic Energy commission signed a contract for the operation of BNL. Until then, the Lab was operating under the uncertainties of a letter of intent from the government.

December 26, 1947 — The Blizzard of '47 brought 19 inches of wet, clinging snow to the Lab site.

December 31, 1949 — BNL had 1,447 employees.

December 15, 1952 — The Cosmotron was dedicated.

December 12, 1955 — The Brookhaven Graphite Research Reactor began operation as a declassified facility.

December 2, 1957 — Studies with tritiated thymidine were initiated by a BNL team under Victor Bond and Eugene Cronkite.

December 11, 1957 — Neutrino helicity was observed by the BNL team of Maurice Goldhaber, Lee Grodzins and Andrew Sunyar.

December 16, 1958 — The Medical Research Center was dedicated.

December 13, 1963 — Ground was broken for the Applied Mathematics wing of the Physics-Mathematics complex, now Bldg. 515.

December 2, 1966 — Nuclear Engineering's Radiation Division held open house at its recently completed new quarters, constructed from several existing Lab buildings and using as a nucleus Chemistry's old Bldg. 318.

December 31, 1966 — The Cosmotron was retired after 14 years of operation.

December 18, 1969 — The Brookhaven Bulletin announced that a new section of the Long Island Expressway, connecting Exits 65 and 68, was scheduled to open that week.

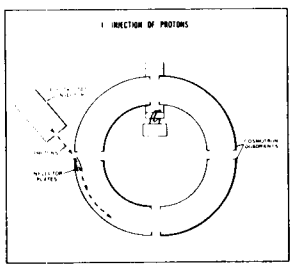
December 2, 1976 — A record run of 204,000 pictures was completed in the seven-foot Bubble Chamber.

December 1, 1977 — "Atom Smashers . . . 50 Years," an exhibit in which BNL figured prominently, opened at the Smithsonian Institution.

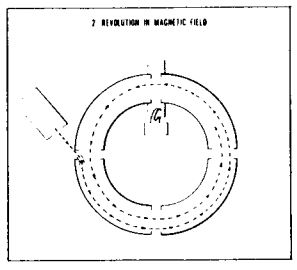
December 18, 1981 — The Bulletin reported that several firsts had occurred at the National Synchrotron Light Source the previous week, including the survival of the electron beam in the vacuum ultraviolet ring for multiple turns.

December 5, 1986 — Ernest Courant and the late Stanley Livingston won the Enrico Fermi Award from the Department of Energy, in part for their discovery, made at BNL in 1952 with Hartland Snyder, of the principle of alternating gradient, or strong, focusing.

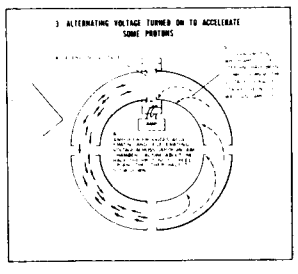
The Cosmotron was dedicated on December 15, 1952, and retired on December 31, 1966. These drawings show how BNL's first proton accelerator worked.



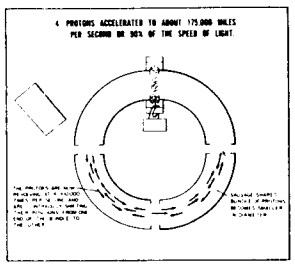
Protons from electrostatic generator "shot" into metal vacuum tank of the Cosmotron at an energy of 3.6 million electron volts.



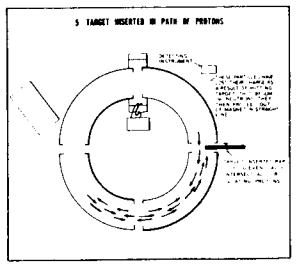
Increasing magnetic field causes protons to spiral in around Cosmotron making 350,000 turns per second.



The protons that have been speeded up by accelerating voltage, stop spiraling in, group together in a sausage shaped bundle and continue to revolve at higher and higher speeds.



Each passage through accelerating voltage adds 800 electron volts of energy to the protons. After about 3 million turns - the equivalent of four trips around the earth - these protons have acquired the energy of 2.3 billion electron volts.



Detecting instruments, such as cloud chambers, are used by scientists to study result of collision of these neutrons and other particles with various elements.

To Your Health

"Sleep Disorders" will be the subject of a seminar scheduled by the Health Promotion Program for Tuesday, December 15, from noon to 1 p.m., in Berkner Hall, Room B. The seminar will be presented by Wallace Mendelson, Director of the Sleep Disorders Clinic at the State University of New York at Stony Brook. For more information, call Health Promotion Specialist Elaine Friedman, Ext. 2699, Tuesdays and Fridays.

Aerobic Dance

The Aerobic Dance Club (ADC) can help you get back in shape after the New Year. Instructor Pat Campbell will lead the classes on the spring program:

•Stretch — Classes involve a choreographed program of exercises that concentrate on stretching and strengthening various muscle groups.

•Aerobic Dance — Classes emphasize cardiovacular improvement through vigorous, choreographed exercise.

Classes in aerobic dance will be held on Tuesdays and Thursdays, while stretch classes will be held on Mondays. All classes run from 5:15 p.m. to 6:15 p.m. Participants may take any or all of these classes.

The fee for each ten-week session (M, T or Th) is $30, payable at registration, which will precede the first classes and be held on the third floor of the Collider Center, Bldg. 1005S, as follows:

•Stretch — Monday, January 4

•Aerobic Dance — Tuesday, January 5, and Thursday, January 7.

For more information, call Bill Leonhardt, Ext. 2378; Elinor Norton, Ext. 3455; or Janet Sillas, Ext. 2345.

Shopping on Site

If you have not yet started your holiday shopping, you might be feeling a twinge of anxiety by now. After all, Hanukkah is next week, Christmas is just around the corner and the crowds are thickening in all the shopping malls.

Here's a tip: You can take care of many people on your gift list at one store — the Science Shop at the Exhibit Center, conveniently located in Bldg. 701. If you drive there, please park in the north parking lot.

The Science Shop will be open today, as well as next Friday, from 10 a.m. to 3 p.m. Like these shoppers, you're sure to find that the merchandise is intriguing, educational or just plain fun — and the prices are right.

Christmas Concert

The BNL Choral Group will present their Annual Christmas Concert at lunchtime, in the cafeteria on Thursday, December 17. On that day, the cafeteria staff will prepare a special holiday meal.

Bowling

Red/Green League

N. Parrinello bowled a 267, J. Mayeski 232, L. Jacobson 215, T. Holmquist 210, K. Asselta 206, R. Mulderig 205/204, J. Connelly 203, J. Muller 202, C. Scarlett 200.

Purple League

Caryl MacDougall had games of 218/194/185, Dick Adams 208, Skelly Frei 205, Ellie Adams 201, Mary Grace Meier 187.

White League

Paul Callegari rolled a 221, Ed Sperry IV 214, Jeannette Thiede 186.

Bulletin Schedule

The Bulletin of December 18 will be the last issue until January 8. The Bulletin will not be published on December 25 and January 1 because of the Christmas and New Year's holidays.

Any announcements pertaining to the period between December 18 and January 8 should be submitted to the Brookhaven Bulletin, Bldg. 134, by noon on Tuesday, December 15, for publication in the December 18 issue.

Gym Closing

Due to the Blood Drive, which will be held in the gymnasium, the building will be closed to all recreation activities all day Monday, December 14, until 5 p.m. Friday, December 18.

Note to Diners

The Cafeteria will be closed on Saturday, December 12. On that day, snack bar service will be available from 9 a.m. to 2 p.m. at the Brookhaven Center.

Cafeteria Menu

Week of December 14

Monday, December 14

Beef barley soup	(cup)	.75
	(bowl)	.95
Baked ham w/fruit sauce & 1 veg.		2.95
Beef Stroganoff over noodles		2.95
Chef's salad plate (lite-weight)		2.25
Hot deli: Roast breast of turkey	(bread)	2.65
	(roll)	2.75
	(hero)	2.85

Tuesday, December 15

Navy bean soup	(cup)	.75
	(bowl)	.95
Salisbury steak w/1 veg.		2.85
Super sausage pizza	(slice)	1.15
Stuffed tomato cold plate		2.25
Hot deli: Roast beef	(bread)	2.65
	(roll)	2.75
	(hero)	2.85

Wednesday, December 16

Split pea soup	(cup)	.75
	(bowl)	.95
Roast turkey w/stuffing & 1 veg.		2.95
Broiled fresh fish w/1 veg.		2.95
Hot deli: Baked ham	(bread)	2.65
	(roll)	2.75
	(hero)	2.85

Thursday, December 17

Christmas Dinner

Roast prime rib of beef

or

Whole roast cornish game hen

Baked *or* mashed potato

Fresh broccoli *or* Baby whole glazed carrots

Roll & butter

Small beverage

$3.95

Friday, December 18

Turkey rice soup	(cup)	.75
	(bowl)	.95
Chicken nuggets w/BBQ sauce & 1 veg.		2.95
Fried breaded cod w/1 veg.		2.95
Baked macaroni & cheese w/1 veg.		2.75
Hot Deli: Sloppy Joes		2.65

1988 NYC Train Trips
Reservation & Schedule Information

NYC train travelers please note: *As of January 1988, NYC train trips will no longer be sponsored by BNL. This will be the only time the LIRR train trip schedule will be published in the Bulletin; so clip and save the information below.*

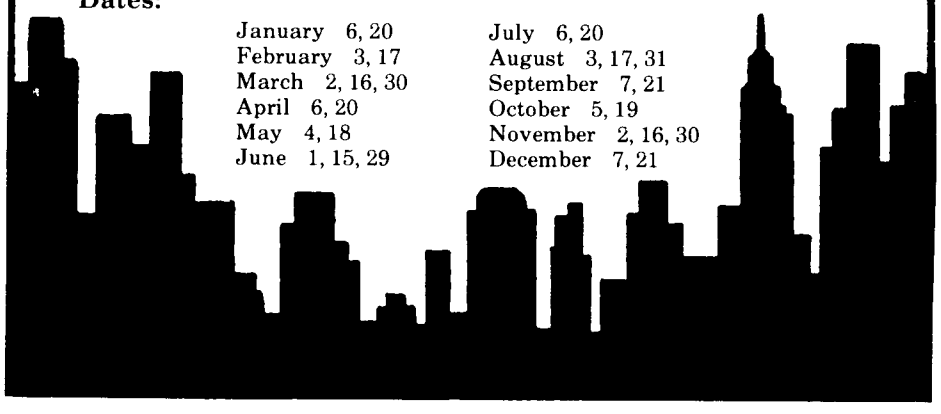
Group rate trips to New York City will run on the first, third and fifth Wednesdays of each month from the Patchogue station. The cost will be $6.50 per round trip ticket; children under five ride free. To make reservations, send a check made out to Cash to: D.W., 645 Old Medford Avenue, North Patchogue, NY 11772. Checks must be received by the Monday before a trip. Please include your phone number and indicate the date of the trip.

Only written cancellations will be accepted, and they must be received by the Monday before the trip. If you cannot cancel by mail, you may go to the station on the morning of the trip, where it may be possible to "sell" your reservation.

Departure: Patchogue LIRR station, Wednesday, 7:55 a.m.

Dates:

January 6, 20	July 6, 20
February 3, 17	August 3, 17, 31
March 2, 16, 30	September 7, 21
April 6, 20	October 5, 19
May 4, 18	November 2, 16, 30
June 1, 15, 29	December 7, 21



Volleyball

Standings as of November 30

League I	
Upfagrabs	18-3
Xrayted	13-8
Dinkers	13-8
Cannonballs	9-12
Phoubars	7-14
Bumpers	3-18
League II	
Set-Ups	15-3
Nuts & Bolts	13-5
Fossils	10-8
Chunga's Revenge	10-8
Slammers	9-9
Photons	4-14
Upton Ups	2-16
League III	
Printouts	10-2
Renegades	9-3
Screwballs	8-4
Sourcerers	7-5
MISfits	6-6
Spikes	5-7
Airheads	3-9
Good Times	0-12
Open League	
Phoenix	10-2
Dakota	8-1
Serendipity	8-4
Not Too Bad	6-6
Duituits	2-7
Leftovers	1-8
Rowdy Radicals	1-8

BROOKHAVEN BULLETIN

Published weekly
by the Public Affairs Office
for the employees of
BROOKHAVEN NATIONAL LABORATORY

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

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

PSI News: Wine & Cheese Social

The Upton Chapter of Professional Secretaries International invites everyone to meet with secretaries and other professionals at our Annual Wine and Cheese Social to be held Tuesday, December 15, from 5:15 - 9 p.m., at the Recreation Building.

The cost is $3.50. Checks may be made payable to Upton, PSI and sent to Pat Oster, Bldg. 923. For more information, call Pat Towey, Ext. 3445.

Arrivals & Departures

Arrivals

Frank J. Cullen ..... Accel. Dev.
Paul Geiger ..... Budget
Ganga P. Ghimiray ..... Plant Eng.
Christopher M. Goggin .... Accel. Dev.
Christine McEvaddy ..... Plant Eng.
Anna McManus ..... Fiscal
Luis Fernando S. Oliveira ..... DNE
Antonio M. Rodrigues ..... NSLS
Robert J. Todd ..... Accel. Dev.
Hong Wang ..... Biology
Wu Zhang ..... Accel. Dev.

Departures

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

Gustavo A. Cragnolino ..... DNE
Thomas J. Kelly ..... DAS

Holiday Hams

Let the Cafeteria prepare your holiday ham. At $2.15 per pound, plus tax, these smoked, bone-in hams average 17-18 pounds each. The hams are fully cooked and ready to eat. To reserve your holiday ham for Christmas, call the Cafeteria at Ext. 3541.

See Supplement for Classified Advertisements.

Lose your pledge card? Don't despair!
You can use the one that's here.
Why not send it out today —
To show support for United Way?

LIFE NUMBER	EMPLOYEE NAME (Please Print)	DEPARTMENT

In support of the Member Agencies of the United Way of Long Island, I hereby authorize Brookhaven National Laboratory to make regular Payroll Deductions for the amount indicated. Payroll Deduction PER PAY-DAY to start 1st payday of January 1988.

Payroll Status
☐Weekly ☐ Monthly

1987-1988 CAMPAIGN

bnl aui

1.00 ☐ 2.00 ☐ 5.00 ☐ 10.00 ☐ other ☐

☐ Here's my one-time gift in the amount of $_____ Paid by: ☐ Check ☐ Cash

Contributor's Signature _____ Date_____

Return to: B. Pergan, 1988 Financial Coordinator, Bldg. 179A

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.

2742. SECRETARIAL POSITION - Requires AAS in secretarial science or equivalent as well as extensive knowledge of BNL policies and practices. Excellent secretarial, communication and interpersonal skills are essential. Will provide diverse administrative and secretarial duties for Department Administrative Manager. Responsibilities will include correspondence, travel arrangements and file maintenance. Word processing experience necessary. Familiarity with MIS inquiry systems and PCs helpful. Accelerator Development Department.

OPEN RECRUITMENT - Opportunities for Laboratory employees and outside applicants.

2743. RESEARCH SERVICES ASSISTANT - Responsibilities will include the production, testing and shipment of special strains of rats. Knowledge of laboratory-animal science helpful. Term position through 9/30/88. Medical Department. (Reposting of Job #2722).

2744. EXPERIMENTAL MACHINIST - Requires a minimum of five years prototype experience in all-around machining, proficiency in job print interpretation, layout and machine set-up. Demonstrated ability and imagination in all phases of machine work is essential. Central Shops Division.

2745. TECHNICAL POSITION - Requires an AAS in mechanical technology or the equivalent. Will be responsible for chemical cleaning facility used for cleaning vacuum components. In addition, will work as a mechanical vacuum technician during periods of low demand for cleaning. Experience with chemical cleaning and knowledge of ultra high vacuum systems is desired. National Synchrotron Light Source Department.

2746. ADMINISTRATIVE/DATA SYSTEMS POSITION - Requires AAS in data processing or equivalent experience in business applications. Experience with data base and spread sheet applications on PC essential. Knowledge of MIS data base systems as well as the HP operating systems (MPE), utilities, and adhoc inquiry software (ASK) desirable. Under general supervision, will participate in the development of PC-based systems to support management reporting for various construction projects as well as update and maintain reporting systems utilizing MIS inquiry data bases. Accelerator Development Department. (Reposting of Job #2735).

BROOKHAVEN BULLETIN

Published weekly
for the employees of
BROOKHAVEN NATIONAL LABORATORY

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

35 BROOKHAVEN AVE., UPTON, N.Y. 11973
Telephone (516)282-2345

Motor Vehicles & Supplies

84 MONTE CARLO CL - deluxe int., p/s, p/b, p/w, a/c, am/fm stereo cass., 35k mi., $6,600. 924-8260 eves.

82 CAMARO BERLINETTA - T-top, p/s, p/b, p/w, a/c, am/fm stereo cass., 38k mi., $5,700. 924-8260 eves.

87 FORD MUSTANG LX - 4 cyl., 5 speed, am/fm cass. radio, 6/60,000, $8,000. Paul, 878-6878.

83 YAMAHA VIRAGO 750 - black, mint cond., garaged, sacrifice, must sell, $1,900. Charles, Ext. 5211.

76 DODGE ASPEN - V8, body needs work, engine's great, $150. Bob, Ext. 4660 or 758-5391.

77 AUDI FOX - a/c, radials, excel. running cond., 85k mi., $1,150. Al, Ext. 4442 or 929-8411.

83 TURISMO - black, sunroof, louvers, 4 speed, red velour int., new brakes, 70k mi., very good cond., $2,400. 929-3473.

74 CHEVY NOVA - very dependable, some rust, new exhaust, tires, carb., much more, $750. 499-6518.

WHEELS - OZ aluminum, 5½x13, for Datsun, Toyota, RWD, $250/set; truck snows, 235-75R15, $60/set. Dave, Ext.5454.

TRAILER HITCH - Class III, receiver, 2" sq., $35; 1⅝" sq., adjustable, $55. Mike, Ext. 4605.

83 MAZDA RX - 5 speed, 55k mi., mint cond., $6,300. 928-2244.

80 CITATION - new tires, radiator, batt., good cond. in/out, must sell, asking $600. Tom, 475-0084.

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

79 CHRYSLER LEBARON - V8, a/t, a/c, p/s, p/b, clean, 83k mi., $1,495; 75 Plymouth Valiant, 6 cyl., a/t, p/s, runs well, $495. 277-4091.

75 FORD - p/s, p/b, a/c, cass., 4 door, new tires, very good mech. cond., $750. Barbara, Ext. 5165.

80 PONTIAC SUNBIRD - 97k mi., excel cond., $1,000. Chris, Ext. 3191 or Peter, Ext. 3734.

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

84 CONQUEST - well maintained, 11 mos. left on unlimited mileage warranty, excel. cond., $6,500. Steve, Ext. 4678 days or 928-5291 eves.

TIRES - 4, low mi., Chevy rims, tuft box for full size pickup, 1 piece roan Chevy truck window. Gregg, Ext. 2022 or 727-2861.

70 OLDS DELTA 88 - V8, a/c, p/s, 130k mi., runs well, $350. Ext. 4457.

81 FORD F150 PICKUP - 4wd, 4 speed, Tuff box, R/B, new chrome rims, good cond. 727-7384 after 5 p.m.

85 VOLKSWAGON JETTA GL - a/c, am/fm cass., 58k mi., $6,000. Ext. 7264 or 283-7716 eves.

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

VW ROOF RACK - for 1980-84 Rabbit or Jetta, $25; 4 Rabbit wheels, $25; car stereo, Concord, Jensen 6x9 speakers, $150. Sheryl, Ext. 4400 or 689-7725.

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

67 M/B 200D - 4 dr., 2 eng., not running, $350. 567-9025 eves.

76 TOYOTA COROLLA - runs perfectly, moving, must sell, $400. 282-3856 or 473-5760.

WESTERN WHEELS - 4, cast alum., Cyclone II, 14x5.5 w/all parts, incl. locks, 4 lug, prev. on '78 Datsun 280Z, best offer. Sue, Ext. 4931.

81 SAAB TURBO - 4 dr., a/t, Blaupunkt stereo, dk. green, 60k mi., new Mich. tires, well kept, $5,500 neg. Ext. 2494.

84 PONTIAC FIERO - red/grey int., 4 speed, gold Eneke rims, excel., must sell, moving, $4,800 neg. Pat, 246-5809.

71 DUSTER - good running cond., great transportation, $350 neg. 727-7806 after 5:0 p.m.

YAMAHA TRIKE - 3 wheel, for small kids, 60cc, excel. cond., great Christmas gift, $350. Ext. 4081 or 874-3844.

87 KX80 DIRT BIKE - professionally maintained, excel. cond., Ext. 4904 or 929-4753.

84 OLDS DELTA 88 - loaded, excel. cond., must be seen, priced to sell, $5,400. Bob, 669-9331.

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

76 VW RABBIT - new clutch, batt., excel. body, $150; engine, 350 V8 w/acces., needs rebuilding; welded utility trailer. John, Ext. 3675 or 924-3528.

77 HONDA ACCORD - hatchback, a/t, a/c, new exhaust, runs smoothly, repainted, must see, $1,500. Gary, 758-5592 eves.

78 CHEV. MONZA - 4 speed, hatchback, $350. 874-3796.

TOOL BOX - for small pickup truck, crossover type, plastic, like new, $50. 744-5122 after 6 p.m.

77 BUICK - hatchback, V6, good cond., $200. Bob, Ext. 5010 or 289-2986.

71 OPEL STATION WAGON - runs well, needs odometer cable and/or gas gauge. Winsche, 286-0517.

81 CAMARO - 6 cyl., a/t, p/s, p/b, am/fm cass., good cond., $2,800. 585-4741.

76 CHRYSLER CORDOBA - parts, 1979-82 Mustang parts. 924-6761 after 5 p.m.

Boats & Marine Supplies

15' COLEMAN CANOE - fiberglass, paddles, rooftop carrier, more, $250; 3.5 h.p. Evinrude motor, never in salt water, $200. Mike, Ext. 4605.

WINDSURFER - 2 sails, harness, wetsuit, moving, must sell, $500. 282-3856 or 473-5760.

MERCURY OUTBOARD - 1972, 80 h.p., good running cond., needs control cables. Tom, 472-4228.

Miscellaneous

DEN/LIVING ROOM FURNITURE - pine frame, plaid, sofa, loveseat, rocker, ottoman, entourage, excel. cond. Jack, Ext. 2907 or 928-3545.

UNICEF XMAS CARDS - & gifts. 744-8386.

LIVE XMAS TREES - $5/each; artifical tree, 40", $4; pot-belly stove, old, good cond., 22" high, $40. 878-6637.

ATARI 130XE - Atari 1050 disk drive, like new, extras, reasonable offer. Ext. 3300 or 744-8823 eves.

PERSIAN LAMB COAT - full length, gray, excel. cond., asking $850. Ext. 3701.

TEAK DINING ROOM SET - 7 pieces, tiled buffet, rolling bar, like new, asking $1,950. Al, Ext. 4442 or 929-8411.

GIRL'S BIKE - 16", $20; girl's roller skates, size 4, used once, $18. E. Williams, Ext. 3338.

ELECTRIC TYPEWRITER - Smith Corona, portable, w/correcting ribbon, $40; old Burroughs office typewriter, classic, $10. Tom, Ext. 7196 or 286-2505.

SWIVEL CHAIR - brown plaid, $25; convection oven, $60; men's skiis, 205cm, 200cm, boots 10 med.; women's skis, 185cm, boots 7&8. 475-0509.

MEDICINE CABINET - new, sliding mirrors, $25. Mike, Ext. 4605.

ELECTRIC GENERATOR - Generac/Niagra, 4k watts, 120/140 volts, never used, $450. 286-8119.

STEREO CONSOLE - Colonial, am/fm radio, hard rock maple, 17"w x 55"l x 27"h, $100. Ext. 4312.

SKI BOOTS - Downhill, 10-10½, for novice. Richie, Ext. 2175 or 734-7342.

KITCHEN SET - table w/leaf, 4 chairs, $50; Edison humidifier, wood grain console, 4 gallon, $40. Tony, 698-9274.

MOVING SALE - 3 bdrm. sets, dining room, lawn equipment, 2 desks, chairs, kitchen & coffee tables, deck furniture, etc. 277-4091.

STORM/SCREEN DOOR - aluminum, 80¾x21½, w/storm & screen, good cond., $50. 473-9223 after 5 p.m.

KEROSENE STOVE - Radiant King, w/5 gallon can, $35; bath scale, $5. 924-2726.

SEARS KENMORE DRYER - gas, new parts, $75; table saw, needs some repair, $50. Rich, Ext. 3499 or 435-4316.

PLAYBOY MAGAZINES - 60 issues, 1957-1973. 473-2473.

SOFA BED - green & brown plaid, good cond. 751-7963 eves.

SNOW BLOWER - 20", gas, 3½ h.p., 2 cycle, electric start, semi self-propelled, used one season, $175. 281-2924 after 5 p.m.

SWEATERS - handmade, beautiful designs. Angela, 475-7569.

PANASONIC MICROWAVE - full-size, mint, $150; student desk, wood, slate top, $60; Tiffany kitchen fixture, beautiful, $60. 473-3070.

RABBITS - mini-lop, great Xmas gift, will hold. John Matthews, 265-2733.

MOVING SALE - table, chairs, shelves, etc. Ext. 3856 or 473-5760.

PANASONIC VCR 1461 - stereo, two heads, MTS, HQ, VHS, Dolby, 8 months old, $250. Ext. 4939 or 924-7552.

K2 EXHIBITION SKIS - 150cm w/Tryrolia bindings, $50; Dolomite boots, size 7, $25; poles, 2 pairs, $5. Ext. 3065.

PIANO - old, upright, best offer. Ext. 2876 or 878-2702 eves.

GUITAR - Fender Telecaster, 1976, w/case, mint, $350. Sheryl, Ext. 4400 or 689-7725.

LIONEL TRAINS - Rocky Mountain set, extra tracks, buildings. Bob Kiss, Ext. 4428 or 467-4222 after 6 p.m.

SOFA BEDS - 2, gold/brown plaid, good cond., $40 & $60. Jim, 281-2849.

BATHROOM ORGANIZER - 2 shelves, 1 cabinet, white, fits over toilet tank, $15. Joe, Ext. 2898.

IBM PC - mono CRT, 12" w/Hercules graphics card & parallel port; Taxan 640 12" color CRT w/Persyst Bob card, IBM CGA, $300. 744-9475.

CANON SURE-SHOT - w/extra lenses, little use, asking $50. 288-3104 eves.

HOLIDAY GIFTS - from Southeast Asia, jewelry, scarves, more. Corinne, Ext. 4493 day or eve.

TABLE LAMPS - 4, 36", $20/each; 2 twin chenille bedspreads, new, $14; 60" round picnic table, w/4 curved benches, $150. 928-5230 or 744-2203.

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

FAMILY PHOTO - Xmas cards, order now. Ripp Bowman, Ext. 4672.

HARVEST TABLE LADDERBACKS - $250; wrought iron table & chairs, $35; drum table, $10; oak china closet, curved glass, $500. 286-9685.

KEROSENE HEATER - Radiant 36, 9400 Btu, good cond., w/5 gallon can of fuel, $90; 14 wood screens & storm windows, good cond., $50. Ext. 3794.

FIREWOOD - not split, from 3 trees, you cart away, $20/tree. 286-9784.

SKI BOOTS - woman's size 6-7, Heierling, excel. cond., $45. Ext. 4449 or 751-8403 after 6 p.m.

ELECTRIC HOT WATER HEATER - 9' long, $25; antique children's roll-top desk & swivel chair. 878-2038.

BLACK & WHITE TV - new, still in box, 5" portable, $50; Sears electric stove, countertop & wall. 878-2239.

ATARI - 130XE, Atari disk drive, like new, $100. Ext. 3300 or 744-8823.

COAL STOVE - Franco Belge, 60,000, self-feeding, excel. cond., orig. $900, asking $300. Ext. 4081 or 874-3844.

CRIB - w/mattress, like new, $45; typewriter, old, $5; Xmas tree, new, $50. Chris, Ext. 3191.

COPY MACHINE - $15. Ext. 4192.

Free

DWARF RABBIT - & cage. Steve, Ext. 3988.

WINDOWS - alum., picture, 61x54; jalousie, 76x61, 68x61; double hung 57x25, slate. 475-8162 eves.

Car Pools

STONY BROOK - want to start or join existing car pool from or near M-section Stony Brook. Jag, Ext. 5080.

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

SHIRLEY - Tangiers section, 4 bdrm. ranch, l/r, kitchen, d/r, 1½ bath, finished basement, deck w/AGP, new appli., $127,000. Jim, Ext. 7669 or 399-1790.

N. SETAUKET - hilltop setting, 3 bdrm. ranch, 2 bath, garage, open & airy. 689-7494.

MASTIC - private, 3 bdrm., 2 bath, country style ranch, eik, 2 zone, 2 car garage, fenced, public water, full subdividable acre, low taxes, 281-2002.

RIVERHEAD - mobile home, adult park on Peconic River, 12'x60', new kitchen floor, w/w, 2 bdrms, 1½ bath, many extras, wood burning stove, ideal for newly retired, $40,000. 369-2838.

ROCKLEDGE, FL - 2 bdrms., 2 baths, kitchen, den, living rm., combination porch, 2 car garage, good location, 75x115 lot, $64,500. 305-631-2840.

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.

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.

For Rent

PORT JEFFERSON - 3 bdrm., eik, 2 car detached garage, full basement, ¾ acre, available 12/15, $1,200/mo. 928-8244, leave message.

NORTHPORT VILLAGE - 2 bdrm. apt in legal duplex, oversized l/r, kitchen, d/r, Jan. 1 occupancy, $775 + heat & elect. Ext. 3354.

BROOKHAVEN HAMLET - room, in 4 bdrm., 2 bath house, spacious, ¾ wooded acre, share entire house w/2 other professionals, $350 incl. all. Randy, Ext. 3835.

STONY BROOK - 4 bdrm., large eik, 3 bath, d/r, lounge, $1,200 mo + util. Ext. 3705 or 862-7998.

MILLER PLACE - 2 bdrm., f/p, furn., washer/dryer, quiet, walk to beach & store, $975/mo. 473-3349.

SMITHTOWN - 3 bdrm. house, l/r, d/r, eik, den, finished basement, w/w, laundry, garage, 1½ bath, mint cond., all appli., immed. occupancy. 718-894-3765 after 6 p.m. & wknds.

PANAMOKA -2 bdrm. house, 6 miles from Lab, Dec. 10 - Jan. 10, $150/wk. 929-6933.

SOUND BEACH - 2 bdrm. apt., l/r, eik, waterview, $600 + util. 473-6432.

MASTIC - share house, l/r, d/r, eik, den, laundry room, 10 mins to Lab, 5 mins to beach, clean, well-kept, secured, $395/mo. + ⅓ util. Ext. 5110 or 399-3087.

CATSKILLS - 3 bdrm. chalet, sleeping loft, fully furn., great for skiing, near Hunter & Windham Mts., avail. day, week or wknds. Kay, Ext. 4501 or Bea, Ext. 3642.

HILTON HEAD, SC - 2 bdrm. condo, sleeps 6, beach, pool, tennis, golf, Dec. & Jan. special, $250/wk. 585-9149.

Wanted

FAMILIES - for ski trip to Vail, Feb. 13 to 20. Ext. 7115 or 744-5801.

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

PERSON(S) - to house hunt & share house with. Ron, Ext. 4662 or 467-2127.

APARTMENT - in Shoreham or Wading River. Ext. 5482.

DOG CRATE - wire pen, floor pan, need size larger than 19"wx24"lx20"h. Steve, 728-9165 eves.

ARTIFICIAL XMAS TREE - 8'+ for church, reasonable. Walter, Ext. 2050.

SITTER FOR HOUSE - cat, plants, immed. till April 15, beautiful house on beach, call for financial details. 929-8443.

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