BROOKHAVEN BULLETIN

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BROOKHAVEN NATIONAL LABORATORY

A crowd of almost 500 BNLers, retirees and visitors were at the April ceremony celebrating the beginning of construction of the Relativistic Heavy Ion Collider. Among the luminaries on the dais were Presidential Science Advisor D. Allan Bromley (at the podium), and New York Senator Alfonse D'Amato. An accelerator 3.8 kilometers in circumference, RHIC is scheduled for completion in 1997, when it will begin to provide researchers with rare glimpses of conditions akin to those that existed in the universe instants after what is called the Big Bang.

Flanked by Brookhaven Director Nicholas Samios (left) and Mark Sakitt, Assistant Director for Planning & Policy (right), are the first five winners of BNL's Distinguished Research & Development Award. Holding their engraved glass and marble mementos are: (from left) Gordon Danby, Michael Creutz, Alfred Wolf, John Dunn and Benno Schoenborn (see story inside).

High Points — 1991

The past year will be remembered as one in which BNL took a giant step toward the future by receiving the first construction funding — $13.5 million — for the Relativistic Heavy Ion Collider (RHIC).

It will also be recalled as a year of successes firmly rooted in the present — when all of BNL's considerable repertoire of user facilities were up and running at the same time.

This impressive conjunction came in mid-June and owed its occurrence in particular to two major events: the May restart of the High Flux Beam Reactor, which reached an operating level of 30 megawatts in mid-June, and the proton commissioning of the Booster accelerator in June. By late October, heavy ions were also knocking on the Booster's door, promising the completion of heavy-ion commissioning by this spring.

Other facilities marked major accomplishments in 1991: In February, all the major Phase I milestones of the two-phase project to develop the nation's first compact, superconducting x-ray lithography source were completed; in September, the Radiation Therapy Facility opened for treatment of cancer patients and development of new cancer treatments; in October, experiments were approved for the new Accelerator Test Facility, which should begin in mid-1992; the Tandem Van de Graaff accelerator became the first facility in the U.S. to become certified for testing the effects of cosmic rays on microcircuits used in defense applications; and, throughout the year, over 2,600 researchers used the National Synchrotron Light Source (NSLS) — resulting in a record number of 439 publications for fiscal year 1991.

Impressive progress was also made with superconducting magnets. In the spring, the largest superconducting coil ever made — 14 meters in diameter — was completed for the magnet for the upcoming muon g-2 experiment at the Alternating Gradient Synchrotron. In September, BNL signed a $6.5 million contract to purchase 548,000 meters (1.8 million feet) of superconducting cable for RHIC dipole magnets. Then, in November, the first full-size, dipole magnets built by BNL for the national Superconducting Super Collider reached magnetic field levels of 7.4 teslas, significantly above the design field.

Achievements in research were many: In February, BNL biologists reported discovering and cloning a protein of the Lyme disease spirochete — a protein that may prove useful in testing and immunizing against the disease. That same month, Brookhaven physicists described in *Physical Review Letters* the world's first use of a synchrotron — the NSLS — to perform the analytic technique known as direct Mössbauer spectroscopy. As part of the National Maglev Initiative, BNL organized two workshops, one on site in May and one in Albany in October.

For employees, 1991 was also the year that saw the initiation of the Employee Recognition Awards program in May; the announcement of major changes to the AUI Medical Insurance Plan, which became effective this January 1; the expansion of the Employee Suggestion Program last summer to include ideas applicable to the Lab's radiation protection program; and the continual growth of BNL's recycling efforts.

Of course, throughout the year, all these endeavors were accompanied by a commitment to a culture that emphasizes safety for our employees and protection of our environment. This was underscored in February when BNL established the new Office of Environmental Restoration to oversee the Lab's activities as one of the Superfund sites designated by the U.S. Environmental Protection Agency.

In a major technology transfer effort, the BNL-developed red blood cell-labeling kit hit the medical-marketplace as Ultratag® RBC, in June. Here, Margaret Bogosian, Deputy Manager of BNL's Office of Technology Transfer, and Suresh Srivastava, Head of the Medical Department's Radionuclide & Radiopharmaceutical Research Division, display the kit.

(Photo below right) Leon Rebelsky (left) and Peter Gehring of BNL's Physics Department are two of the researchers who have returned to the High Flux Beam Reactor, which restarted in mid-May after two years of shutdown for a thorough safety review.

Cathy Osiecki, Office of Educational Programs, enjoys the sunlit lobby of the new Science Education Center, Bldg. 438. Since October, the 4,700-square-foot building has been the new home of OEP's staff, which administers about 25 programs for students from elementary school through graduate school and for faculty. In 1991, some 1,800 people came to BNL under OEP programs.

Other major construction projects last year included the completion of the new Child Development Center, which opened its doors to 65 preschoolers and infants in September, and the January start of the $1.7 million addition to the Computing & Communications Division, Bldg. 515, which is just about ready for occupancy.

A major milestone reached in 1991 was the June proton commissioning of the Booster, a small accelerator designed to increase proton and polarized proton intensity in the Alternating Gradient Synchrotron (AGS) and to allow the AGS to accelerate heavy ions up to the atomic mass of gold — a necessary prerequisite for the AGS to serve as the injector for the Relativistic Heavy Ion Collider.

The commissioning was preceded by a number of accomplishments, including the installation of about 290 kilometers (180 miles) of power cables. Surrounded by some of that cable are some of those who worked on the installation: (clockwise from left) Tom Nehring Joel Spinner, Bill Slavinsky (back), Fred Kuel, John Czachor, Mike Clancy and Don Bastedo.

Five Brookhaven Scientists Honored With Lab's First Distinguished Research & Development Awards

For their outstanding contributions to Brookhaven's research and development mission, five BNL scientists have become the first recipients of the Laboratory's new Distinguished Research & Development Awards.

The five recipients of before-tax awards of $5,000 each were:

- **Michael Creutz,** *Senior Physicist, Physics Department*
- **Gordon Danby,** *Senior Physicist, Alternating Gradient Synchrotron Department*
- **John Dunn,** *Senior Microbiologist, Biology Department*
- **Benno Schoenborn,** *Senior Biophysicist, Biology Department*
- **Alfred Wolf,** *Senior Chemist, Chemistry Department*

The honorees received their checks, along with an engraved glass and marble memento, from BNL Director Nicholas Samios at a ceremony held on Thursday, December 19.

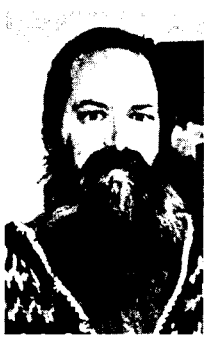
"It is a real pleasure to inaugurate the Distinguished Research & Development Award by giving it to such an outstanding group of scientists," said Samios. "The Laboratory's lifeblood is our ability to produce innovative and creative research. These individuals have greatly enhanced our Lab's scientific mission by their imaginative contributions."

One of four types of awards introduced last May as part of BNL's new Recognition Awards Program, the Distinguished Research & Development Award recognizes distinguished contributions, over one or more years, to the Lab's research and development mission. Those eligible for this award in its inaugural year included around 1,000 employees in BNL's scientific departments and divisions who are either members of the Scientific Staff or on the Engineer/Scientific Associate/Computer Analyst schedule.

From these groups, which represent about 30 percent of BNL's over 3,300 employees, all department chairmen and division heads were invited to submit nominations. A five-member selection committee reviewed all the nominations and selected the final five, who were recommended to Samios for his final approval. Chaired by Mark Sakitt, Assistant Director for Planning & Policy, the committee included John Axe, Associate Director for Basic Energy Sciences; Sy Baron, Associate Director for Applied Programs; Melvin Schwartz, Associate Director for High Energy and Nuclear Physics; and Richard Setlow, Associate Director for Life Sciences.

The other honors in the Recognition Awards Program are: the Brookhaven Award, for which five BNLers received before-tax awards of $2,000 and engraved mementos earlier this month (see Bulletin, December 13, 1991); the Spotlight Awards, for which 55 employees received a $500 after-tax award for short-term, extraordinary effort during fiscal year 1991 (see upcoming Bulletin); and Perfect Attendance Awards, for which the first $200 U.S. Savings Bonds will be distributed in early 1992 to weekly employees with perfect attendance in calendar year 1991 (see upcoming Bulletin).

Michael Creutz



A "landmark calculation leading to an explosive growth of a brand-new field of particle physics," is how Physics Department Chairman Peter Bond described Michael Creutz's award-winning work.

Creutz, a Senior Physicist in the Physics Department, introduced Monte Carlo simulations to quantum chromodynamics (QCD) — the physics theory that describes the interaction of quarks. Creutz's work led, said Bond, "to qualitative understanding of the structure of the theory and to calculations of quantities such as mass spectra of elementary particles and their decay rates. Mike is universally seen as the person who made the field of QCD lattice simulation possible."

A mathematical approach to defining the behavior of quarks — the smallest known constituents of matter — QCD theory was first advanced in the early 1970s. In 1974, Nobel laureate Kenneth Wilson of Cornell University proposed working QCD out on a cubic lattice in a regular geometric arrangement of discrete points of both space and time. While preserving particle size, the lattice spacing could then be shrunk, or renormalized, to ordinary time and space — the basis of what is called lattice gauge theory.

"I heard some lectures by Ken Wilson at the 1975 Erice meeting," recalled Creutz. "In 1979, Bob Swendson, then a BNL solid-state physicist, gave a talk on Monte Carlo techniques, which he'd combined with renormalization calculations to analyze spin systems. And I thought: This might be fun to try on gauge theories!"

Monte Carlo techniques get approximate solutions by statistical sampling strung over a three-dimensional lattice. To test whether these techniques could be applied to fundamental physics theory, Creutz, joined by then BNL Physics Department members Laurence Jacobs and Claudio Rebbi, started applying them to aspects of quantum electrodynamics (QED). QED is the theory that explains the motion of charged particles in an electromagnetic field. It had been well tested experimentally, so the outcomes were known. The researchers found that, with a few discrepancies, the new lattice calculations agreed with expected results.

Then, said Creutz, "One weekend I burnt up what was by theorists' standards a rather substantial amount of time on BNL's 7600, a supercomputer of its day, on a program I wrote to study quark confinement — the force between quarks. While varying the lattice spacing, I saw the force between widely separated quarks remain constant — or, at least, very good numerical evidence of it. Nothing in this game is ever a proof."

Creutz's article on the subject was considered proof enough that quarks are continually bound together to become 1980's most cited paper in physics. Said Creutz, "It's the only time I wrote a paper that I was so sure would be read!"

Since then, the new methods have been applied to QCD calculations and other theoretical issues and now play an important role in the physics of BNL's Relativistic Heavy Ion Collider. At present, Creutz is developing new algorithms to avoid the limitations of what has become too little computing power.

Armed with a 1970 Ph.D. in physics from Stanford University, Creutz joined BNL's Physics Department in 1972 as an assistant physicist. He became associate physicist in 1974, physicist in 1976, and senior physicist in 1985. Creutz received tenure in 1980. In 1986, he was elected a Fellow of the American Physical Society. — Liz Seubert

Gordon Danby

In nominating Gordon Danby for the Distinguished R&D Award, Derek Lowenstein, Chairman of the Alternating Gradient Synchrotron (AGS) Department observed, "His seminal contributions to accelerator physics and magnet technology have had a major impact on the construction of high-energy accelerators for the past 30 years."

Now a Senior Physicist at the AGS, Danby's training ground was BNL's 30-billion-electron-volt AGS accelerator, which he calls "a magnificent machine." He began assisting with its final design, construction and testing when he arrived at BNL early in 1957, shortly after obtaining his Ph.D. from McGill University in his native Canada.

In July 1960, the AGS started operations and Danby was named Associate Physicist, beginning the work that he continues to this day: contributing to the design of electromagnets used to transport particle beams and to particle spectrometers.

He first helped design special-purpose, high-performance magnets that made the successful AGS research program possible, and innovative techniques that Danby contributed have been adopted worldwide. Then, he and his group played a major role in building the first external proton beam from the AGS. When superconducting wire became available, Danby pioneered the design of high-field superconducting dipole magnets for beam transport.

Danby was promoted to Associate Physicist I in 1963, became Deputy Head of the AGS Division of Experimental Planning & Support in 1965, was named Physicist in 1966, and was awarded tenure in 1968.

Named Senior Physicist in 1980, Danby has also played a key role in the Booster that is so critical to upgrading the AGS and completing the chain of accelerators needed to inject the Relativistic Heavy Ion Collider. His group completed the magnetic circuit design of all the Booster's magnetic elements, inventing a new approach to minimize the magnetic fields produced by eddy currents that are generated in this rapidly cycling machine. Said Danby, "It works beautifully. I am quite pleased that we could make that contribution."

At present, Danby's group is largely responsible for the magnetic circuit design for the 14-meters-in-diameter storage ring being built for the upcoming muon g-2 experiment, E821, at the AGS.

Prior to E821, Danby participated in other particle physics experiments. In fact, he was the BNL member of E28, the Nobel Prize-winning AGS experiment that employed the first successful accelerator-produced neutrino beam ever used in high energy physics and resulted in the discovery of the muon neutrino in 1962.

Danby's expertise with magnets and superconductivity has led him outside BNL as well. In 1966, it was his original idea to build the accelerator at Fermi National Accelerator Laboratory as a separated-function machine in which the focusing and bending of the particles is done by separate magnets. "All major machines since," acknowledges Danby, "have been built in this way — including our own little Booster."

Further, Danby is recognized as the coinventer of the concept of magnetically levitated transportation, or Maglev. Since 1961, he and James Powell, of BNL's Department of Nuclear Energy, have been developing Maglev in their spare time. To date, their patented design has formed the basis of the first working demonstration built by the Japanese and is at the heart of the U.S. National Maglev Initiative, of which BNL is a part. "It appears now that there will be a major effort for Maglev in the U.S.," said Danby. "It's definitely alive and well!"

Danby stresses that some of the ideas underlying his long list of accomplishments did not originate with him. "We were extremely good at it," he said, "and simply reached conclusions that others may have missed."

For his distinguished contributions in accelerator physics and superconducting magnet technology, Danby was awarded the New York Academy of Sciences' Boris Pregel Award for Applied Science and Technology in 1983. — Anita Cohen

John Dunn

According to Biology Department Chairman William Studier, "John Dunn's sustained and creative efforts in basic research over almost 20 years at BNL have had wide impact on molecular genetics. His recent and continuing contributions to gene-expression and DNA-sequencing technology have been crucial to the scientific and commercial success of the T7 expression system and in attracting support for genome sequencing at the Lab. And his recent work on the Lyme disease spirochete is one of the most promising avenues to reliable diagnostics and vaccines for this significant local health problem."

After receiving his Ph.D. in microbiology from Rutgers University in 1970 and doing postdoctoral research at the University of Heidelberg through 1972, John Dunn came to BNL's Biology Department that year, as an assistant microbiologist. He was promoted to associate microbiologist in July 1974, received tenure and was named scientist in July 1977, and attained his present title in May 1988. His accomplishments were recognized by the U.S. Department of Energy in 1984, with the Ernest Orlando Lawrence Memorial Award.

Shortly after arriving at BNL, Dunn used a bacteria-eating virus, the bacteriophage T7, to discover the first example of site-specific cleavage of messenger RNAs in bacterial cells. He identified the enzyme, RNaseIII, that carries out the cleavage reaction. Using RNA sequencing techniques, Dunn went on to pinpoint the exact bonds that are cut in the RNA before it is used by the bacterial ribosomes to make viral proteins. This work led to the realization that RNaseIII had important roles during normal bacterial growth and laid the foundation for establishing a nucleic acid sequencing laboratory at BNL.

By 1982, a time when gene-sequencing techniques were not routine, Dunn's interest in the expression of T7 genes led him to sequence all 39,937 nucleotide base pairs in the DNA of T7 and to determine the

locations of the over 50 genes within T7's DNA. At that time, the T7's DNA sequence was the longest to be determined.

Explained Dunn, "Knowing the location of all the genes helped us to design strategies that allowed us to clone and then to express individual T7 genes in *Escherichia coli*, a common intestinal bacterium which T7 usually destroys quickly after invasion."

One gene in particular turned out to be not only of intrinsic interest, but also of use to other genetic engineers because it became the basis of a gene-expression system. It is the gene that specifies an enzyme that makes messenger RNAs only from T7 DNA. Foreign DNA also works just as long as it is cloned behind the T7 genetic signal that tells the enzyme where to start on the DNA molecule.

Over the years, refinements to this T7-based expression system have made it one of the most versatile and powerful gene-expression systems available today. As a result, it is used in molecular genetics, structural biology and biotechnology labs around the world. Protected by patents and licensed to over 75 companies for research or production use, it continues to be BNL's most successful transfer of technology to the private sector, both in terms of the number of companies and income from licensing.

Recently, Dunn used the T7 gene-expression system to begin work on the molecular genetics of the spirochete that causes Lyme disease. After altering a cloned gene for protein found on the surface of the Lyme-disease bacteria, Dunn used the system to produce large amounts of this engineered protein for study as a potential diagnostic tool and vaccine against the disease.

Over the next few years, Dunn hopes to sequence the Lyme-disease bacteria's 1-million-base-pair-long genome, as part of a genome sequencing effort within the Biology Department supported by the Human Genome Initiative of the U.S. Department of Energy.

"Ten years ago, sequencing the approximately 4 x 10^4 base pairs of the T7 virus was a significant piece of work, one which I could not have undertaken without the assistance of my technicians William Crockett and Barbara Lade," commented Dunn. "Today, however, we face the challenge of sequencing the human genome's 4 x 10^9 base pairs — but first we are challenged to develop the DNA sequencing technology that will enable us to do it within the next 15 years." — Marsha Belford

Software Training

The Computing & Communications Division is offering classes in electronic design using the P-CAD 5.0 design system. Call Pam Mansfield, Ext. 7286, for more information or to reserve space in the class.

Archery Club

The Archery Club will hold its monthly meeting on Thursday, January 9, at noon, in the seminar room lounge of Physics, Bldg. 510. New members are welcome. For information, call Bill Schoenig, Ext. 2377.

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Benno Schoenborn

As the father of structural biology at BNL, Benno Schoenborn, Senior Biophysicist, distinguished himself in both areas covered by the Lab's new Distinguished Research & Development Award: Not only has he conducted outstanding research, using neutron and x-ray diffraction and scattering to study biological structures, but Schoenborn has also developed complementary research facilities at BNL's High Flux Beam Reactor (HFBR) and the National Synchrotron Light Source (NSLS) for use by the entire structural biology community.

"Benno is largely responsible for building the strong structural biology effort in the Biology Department and for making the BNL facilities for the study of biological structures by neutron scattering among the best in the world," commented Biology Department Chairman William Studier. "The rosy future for structural biology at BNL is the direct result of Benno's efforts."

Schoenborn came to BNL in 1967 "to look at water structure and hydrogen bonding within protein using neutron scattering," he explained.

However, Schoenborn had to wait 23 years to return to that specific problem: First, he had to turn his immediate attention to establishing the neutron scattering and diffraction facilities needed to study biological structures such as proteins; and then, through collaborative research, he had to prove the power of neutrons to solve the mystery of many biological structures.

As a pioneer in the use of neutron scattering and diffraction techniques to investigate biological structure and function, he set up stations at the HFBR for protein crystallography, small angle scattering and membrane scattering that are used by the structural biology community at the Lab and around the world.

When the NSLS was first proposed, Schoenborn recognized that its high intensity, tunable x-rays could also be useful for elucidating biological structures, especially crystals too small to be looked at using conventional x-ray sources and structures such as muscle tissue that could best be examined using time-resolved measurements. After developing plans for crystallography and small-angle scattering stations at the NSLS, Schoenborn obtained the necessary support for their building, and recruited the staff needed to run these stations. In this effort, Schoenborn acknowledges particularly the assistance of people such as Ralph Brown, Eugene Kelly and Veljko Radeka.

Schoenborn's success in developing facilities and instruments for structural biology at Brookhaven has been largely responsible for similar centers at other national and international laboratories.

In addition to developing the technology, Schoenborn has performed collaborative research using it. Among his accomplishments, he has mapped the three-dimensional arrangement of proteins in ribosomes, analyzed the structure of rod photoreceptor membranes in the retina, located water in model membranes, and analyzed the structure of acetylcholine receptors.

With neutron scattering technology and the techniques established, Schoenborn successfully returned his attention last year to the problem that originally brought him to BNL — localizing hydrogen atoms and water molecules in crystals of myoglobin, the hemoglobin-like iron-containing protein within muscle fibers.

"I worked with a Ph.D. student, and we were able to show that physical chemistry works in proteins just as well as it does in other systems," commented Schoenborn.

Benno Schoenborn received his Ph.D. in physics from the University of New South Wales, Australia, in 1962. He joined the Lab's Biology Department as an associate biophysicist in 1967, was promoted to Biophysicist in July 1970, received tenure in July 1974 and was named to his present title in July 1974.

Schoenborn served as head of the Center for Structural Biology and as associate chairman of his department, 1984-90. His accomplishments were recognized by the U.S. Department of Energy in 1980 when he received the Ernest Orlando Lawrence Memorial Award.

—Marsha Belford

Alfred Wolf

An internationally recognized leader in the development and application of radioactive tracers for use in nuclear medicine, Senior Chemist Alfred Wolf has had a profound and far-reaching influence on basic research in radiotracer chemistry and the neurosciences.

Said Norman Sutin, Chairman of the Chemistry Department, "Al's rigorous mechanistic approach to problems in the chemical and biochemical sciences, combined with his intellectual curiosity, imagination and enthusiasm, has inspired numerous scientists over the years. He is a very valuable colleague, and it is perhaps worth recalling that his present outstanding contributions to nuclear medicine derive from years of fundamental studies of the chemical effects of nuclear transformations. These early studies, for which Al is also justly famous, were made possible and fostered by BNL's unique environment. Al had the foresight to appreciate their importance and their potential application to understanding human biochemistry and functioning."

Wolf began his career in BNL's Chemistry Department in 1951 by concentrating on physical organic chemistry. In the 1960s, he established his leadership in the field of nuclear medicine by developing methods for producing short-lived radioisotopes called radiotracers at very high specific activities. These tracers provided the necessary foundation to conduct studies in the human body using positron emission tomography (PET) — a method for measuring the rate of various biochemical processes in the brain and other organs.

"I saw the opportunity to convert my basic research to practical use," commented Wolf. "And it has been satisfying that we've done something really useful for human beings."

Now, over 25 years of research by Wolf and collaborators at the Brookhaven PET facility that Wolf founded and heads has increased the understanding of such brain disorders as schizophrenia, Alzheimer's disease and tumors. Recent work has included the study of the effects of alcohol and cocaine abuse on the living human brain.

One of Wolf's most notable achievements, and one of the major milestones in the PET field, was the design, development and application of fluorine-18-labeled fluorodeoxyglucose (FDG). A radioactive tracer, FDG was first synthesized in 1976 by Wolf and his collaborators to produce the first PET images of the living human brain's metabolism.

Wolf's pivotal role in the development and application of FDG to the study of neurological and psychiatric disease is considered to be largely responsible for the current worldwide growth in the use of PET for basic and clinical research. "But," he said, "It all depends on the people you have working with you, you don't do this by yourself."

People who have worked with Wolf have continued in the field and many of the cyclotron-PET centers around the world have one or more individuals who have spent part of their careers with Wolf at BNL. And FDG is used routinely in virtually every PET center in the world to provide basic and clinical information; for example, to identify the area of the brain responsible for seizures, to select patients for coronary bypass surgery, to choose appropriate cancer therapies, and to monitor response to various treatments.

Wolf joined the Chemistry Department at BNL in 1951 as an associate chemist, became a chemist in 1955 and received tenure in 1957. In 1964 he was named senior chemist, and served from 1982 to 1987 as Department Chairman. Among his many honors, Wolf's most recent was the Georg Charles de Hevesy Nuclear Medicine Pioneer Award he received in 1991 from the Society of Nuclear Medicine. — Liz Seubert

Reports Available

The following reports are available to Laboratory staff and affiliates of DOE, AUI and NRC. Others may purchase the reports 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.

BNL-52285
Contact: K. Tuohy, Ext. 3845
The Grating as an Accelerating Structure. R.C. Fernow

BNL-52284
Contact: F. Donnelly, Ext. 4835
Proceedings of the 1990 Oil Heat Technology Conference and Workshop. Edited by: R.J. McDonald and J.W. Andrews

BNL-52279
Contact: K. Ratto, Ext. 7250
The Phoenix Concept: Proposed Transmutation of Long-Lived Radioactive Wastes to Produce Electric Power. G.J. Van Tuyle, H. Takahashi, M. Todosow, A.L. Aronson, G.C. Slovik and W.C. Horak

NUREG/CR-5681
BNL-NUREG-52280
Contact: A. Lopez, Ext. 5768
Low-Level Waste Source Term Model Development and Testing. Prepared by: T.M. Sullivan and C.J. Suen

NUREG/CR-2907
BNL-NUREG-51581
Vol. 9 Contact: L. Dudzick, Ext. 2265
Radioactive Materials Released From Nuclear Power Plants. Annual Report 1988. Prepared by J. Tichler, K. Norden and J. Congemi

NUREG/CR-5226
BNL-NUREG-52225
Contact: D. Miesell, Ext. 4962
Analysis of Risk Reduction Measures Applied to Shared Essential Service Water Systems at Multi-Unit Sites. Prepared by P. Kohut, Z. Musicki and R. Fitzpatrick

NUREG/CR-5585
BNL-NUREG-52240
Contact: B. Apuzzo, Ext. 2746
The High Level Vibration Test Program. Final Report. Prepared by Y.J. Park, J.R. Curreri and C.H. Hofmayer

NUREG/CR-5692
BNL-NUREG-52282
Contact: A. Fort, Ext. 2114
Generic Risk Insights for General Electric Boiling Water Reactors. Prepared by R. Travis, J. Taylor and J. Chung

NUREG/CR-5662
BNL-NUREG-52271
Contact: K. Roman, Ext. 3643
Hydrogen Combustion, Control and Value-Impact Analysis for PWR Dry Containments. Prepared by: J.W. Yang, Z. Musicki and S. Nimnual

VIPs Feted for Years of Service

There were 220 Very Important Persons (VIPs) invited to the 1991 Service Award Reception, held in the Brookhaven Center the evening of Monday, December 16. These VIPs included 11 employees who marked 40 years of Laboratory service during the past calendar year, 27 who observed 35th anniversaries, 61 who completed 30 years at the Lab, and 62 for whom 1991 was their 25th anniversary year at BNL. Other VIPs included the 44 Brookhaven employees who have between 36 and 39 years of service, and the 15 who have been with the Lab over 40 years.

Photos on this page by Roger Stoutenburgh.

Different BNL Groups Salute Their Own

(Photo above) Physics Department Chairman Peter Bond (left) hosted a reception recently to honor members of the Physics staff who observed BNL anniversaries in 1991: (front, from left) Henry Arnesen, 30 years; Katherine Einfeldt, 10; David Brady, 30; Suh Urk Chung, 25; Sharon Reeve, 10; Joseph Weneser, 40; Isabel Harrity, 10; Patricia Valli, 20; (back, from left) Anthony Baltz, 20; Carl Dover, 20; Leigh Hawkins, 25; Lawrence Toler, 25; George Virtes, 20; Stanley Ulc, 25; William Marciano, 10; and Franklin Langdon, 35. Not shown: Seymour Lindenbaum, 40; Kenneth Foley, 30; Sidney Kahana, 25; Stephen Shapiro, 20; Richard Casten, 20; and Per Bak, 10.

(Photo above) Employees with the Relativistic Heavy Ion Collider (RHIC) Project and the Accelerator Development Department (ADD) who received BNL service awards in 1991 were recently honored by the department at a reception. Shown here with Satoshi Ozaki (center), ADD Chairman and RHIC Project Head, are: (from left) Kenneth Vitkun, 10 years; Dean Ince, 10; Daniel Schiappa, 10; John McNeil, 20; David McChesney, 20; George Cornish, 25; Melvin Month, 25; Richard Ferdinand, 25; Johannes Claus, 25; and Carl Avent, 30. Not pictured: Michael Stone, 30 years.

(Photo right) A party was held in the Staff Services Division (SSD) recently in honor of five SSD employees who observed BNL service anniversaries in 1991. Shown here with SSD Manager Ron Manning (center) and BNL Business Manager Barney McAlary (left) are the honorees: (from left) Jane Guido, 10 years; Roland Baillargeon, 25; and Gisella Murphy 20. Not shown: Linwood Johnson, 20, and Thomas Johnson, 10.

Service Awards

The following employees celebrated BNL service anniversaries during December 1991:

Thirty-Five Years

Franklin T. Langdon.....Physics
Francis J. Salzano.....Director's Ofc.

Thirty Years

Joseph M. Hendrie.....Nuc. Energy
Edward T. Schwaner.....AGS
George Stenby Jr......NSLS

Twenty-Five Years

Robert D. Baldwin Jr......Reactor
John B. Deitz.....Saf. & Env. Prot.
Warner B. Hayes.....Reactor
Niels F. Schumburg.....Comp.&Comm

Ten Years

Theodore W. D'Ottavio.....AGS
Theresa A. Esposito-Lippo.....P&GA

Arrivals & Departures

Jehuda Bineboym.....App. Science
Donald Cass.....Accel. Dev.
Kevin M. Collins.....Phot. & Gr. Arts
Liti Haramaty.....Biology
Philip A. Heilig.....Accel. Dev.
Patricia L. Helmes.....Accel. Dev.
James Johnsen.....Plant Eng.
Conrad F. Koehler III.....Chemistry
Barry W. Lafler.....Chemistry
Robert J. Lee.....S&EP
Henry J. Link.....NSLS
Marc A. Montemagno.....NSLS
Stephen P. Pontieri.....AGS
Dennis Poshka.....Accel. Dev.
James P. Rank.....Accel. Dev.
Dennis S. Remski.....AGS
Ronald J. Ryan.....Instrum.
Ernest R. Simon.....Plant Eng.
Patrick T. Sullivan.....S&EP
Charles B. Whalen.....AGS

Departures

This list includes all employees who have terminated from the Lab, including retirees.

Corazon J. Cabahug.....Medical
Marie-Christine Chung.....Physics
Robert A. Dagradi.....Accel. Dev.
Anne-Marie Fauchet.....NSLS
Sidney Fiarman.....Medical
Rudolph M. Funn.....Staff Serv.
Dale Sondericker.....NSLS

Social Club

The Social Club has planned several events for 1991. For more information, call Doris Terry, Ext. 7610.

- **Stratton, VT** — Jan. 31-Feb. 2; $279 ea. 2/room, $269 ea. 3/room, $259 ea. 4/room, includes slopeside accommodations and more; balance due Jan. 3; call for detailed flyer.
- **Gore Mountain, NY** — Jan. 31-Feb. 2; Ramada Inn, Lake George; $191 ea. 2/room, $181 ea. 3/room, $164 ea. 4/room; balance due Jan. 3; call for detailed flyer.
- **Ice Capades** — Sat., Feb. 8, 7:30 p.m., $16.50 ea., Nassau Coliseum; reservations and money due by Jan. 10 for good seats.
- **Wrestling** — Fri., Feb. 14, 8 p.m., $18 ea., Nassau Coliseum; reservations and money due by Jan. 17.
- **Killington, VT** — Feb. 21-23; slopeside condos; 4 or 6/condo $160 ea., 3/condo $194 ea.; call for detailed flyer.
- **Stratton, VT** — Feb. 28-Mar. 1; same as Jan. 31 above.
- **Davos, Switzerland** — Mar. 19-27, 7 nights; $1,089 ea. 2/room, $100 single supplement; deposit now, balance due Feb. 1; call for flyer.
- **Spain** — 10 days, leave May 25; $1,999 ea. 2/room, $1,959 ea. 3/room, $2,299 single; air transportation included plus lots more; call for flyer; $250 deposit, balance due Mar. 21.
- **Canadian Rockies** — 11 days, leave Aug. 19; $2,349 ea. 2/room, $2,299 ea. 3/room, $3,149 single; includes airfare plus much more; $100 deposit, balance due Jun. 10.
- **Reno/Tahoe, NV** — 6 days, leave Oct. 26; $969 ea. 2/room, $959 ea. 3/room, $1,209 single; includes airfare; $100 deposit, balance due Aug. 15.

See Supplement for more articles and classified ads.

Outreach Workshop

Substance Abuse: A Family Disease

When one person in a family abuses alcohol or drugs, that bad habit affects not only the abuser but every member of that family.

"Substance Abuse: A Family Disease" will be the topic of the first Outreach workshop of the new year. To be presented by social worker Joann Fallon, the two-part workshop will take place on January 7 and 14, from noon to 1 p.m., in Room B, Berkner Hall. The Outreach workshop series is sponsored by the Employee Assistance Program (EAP) of the Occupational Medicine Clinic.

In her workshop, Fallon will talk about the unhealthy dynamics among family members that become entrenched in a family containing a substance abuser.

According to Fallon, no family member is immune to the substance abuser's disease, as all members assume maladaptive roles based on the abuser's behavior rather than taking on the normally adaptive roles based on their own healthy needs. Finally, she will discuss how family members can switch from these inflexible roles to healthier adaptations.

Having worked in the field of substance-abuse treatment since 1975, Joann Fallon took her master's in social work at Adelphi University in 1977. Since 1980, she has practiced psychotherapy in Riverhead and Southampton.

To register for this workshop, return the bottom portion of the Outreach form recently mailed to all employees to EAP Staff Psychologist Dianne Polowczyk, Bldg. 490, before Monday, January 6. If space permits, registration will also be accepted at the door.

1992 Gospel Extravaganza

Featuring Local Community Choirs

February 1, 7 p.m., Berkner Hall

Tickets: Adults, $12; children, $5

Tickets available from: Robert Brown, Ext. 3569, Bldg. 490; April Donegain, Ext. 2459, Bldg. 134A; Fran Ligon, Ext. 3709, Ext. 185A; and Bruce Penn, Ext. 7213, Bldg. 197C.

No tickets will be sold at the door.

Aerobic Dance & Stretch Classes

To start the New Year on the right foot, the Aerobic Dance club will begin a new session next week.

Classes in aerobic dance will be held on Tuesdays and Thursdays, at the North Room of the Brookhaven Center in the apartment area, while stretch classes will be on Mondays at the Physics lounge, Bldg. 510. Classes run from 5:15 to 6:15 p.m., and mats are recommended for both.

Either or both classes may be taken, and each ten-week session of aerobic dance or stretch costs $30, payable at registration preceding the first classes:

- **Stretch** — Monday, January 6.
- **Aerobic Dance** — Tuesday, January 7, and Thursday, January 9.

For information and to verify location, call Pat Campbell, Ext.4853 (a.m.) or. Ext. 5070 (p.m.), or Janet Sillas, Ext. 2345.

BNL Was a Big Spender On Long Island in 1991

BNL purchased about $41.6 million in supplies and services from Long Island businesses in fiscal year 1991 — about $12 million more than last year. These local purchases account for approximately 40 percent of all goods and services purchased by the Laboratory during the period from October 1, 1990, to September 30, 1991.

Of the 11,154 purchases the Lab made on Long Island in 1991, 8,015 were made in Suffolk County and 3,139 were made in Nassau County. In dollars, $24.5 million were spent in Suffolk and $17.1 million in Nassau.

Mary-Faith Healey, Manager of the Division of Contracts and Procurement, said, "We make a policy of purchasing goods and services locally whenever feasible — a particularly important policy in these recessionary times. Long Island is a base for many excellent and dependable companies, as well as a highly skilled labor pool."

Most of the funds were spent on high-tech goods, construction and technical services. For example, the Laboratory's biggest order was for more than $10 million worth of superconducting magnets from Grumman Aerospace Corporation.

The magnets are being used for the construction of a compact synchrotron, which is an x-ray lithography facility being built at the National Synchrotron Light Source in collaboration with Grumman and General Dynamics. The U.S. Department of Defense-funded project is aimed at strengthening the U.S. position in the semiconductor market.

The Lab's three top vendors in Suffolk County were construction firms. BNL paid Fortunato Sons, Inc. of Bohemia over $3 million for work on several building projects, including the new on-site Child Development Center. Robbins and Cowan of Huntington received over $1.1 million for an addition to the Laboratory's Central Shops Division, and Radon Construction of Ronkonkoma received about $727,000 to build the Science Education Center.

Among other companies receiving the biggest orders from BNL were Ultra Concepts, Inc. in Farmingdale, which was paid over $550,000 for a computerized machining center used for fabricating scientific equipment, and Xerox Corporation's Long Island branch in Woodbury, for $483,000 worth of equipment.

In addition, 55.5 percent of BNL's total $331 million budget was spent on salaries and wages and 16.7 percent went toward fringe benefits. Most of these funds were also poured back into the Long Island economy.

1992 Healthline Lectures And Outreach Workshops

The Healthline lecture series of the Health Promotion Program and the Outreach workshop series of the Employee Assistance Program have 12 offerings so far on their 1992 programs of lunchtime presentations.

Under the auspices of the Occupational Medicine Clinic, the Healthline series presents one-time talks on topics related to healthy living, while the Outreach series offers multiple sessions on psychological issues and social problems.

See future issues of the Bulletin for specific details, or for general information call Ext. 5923 about the Healthline lectures, or Ext. 4567 about the Outreach workshops.

Dates	Series & Topics	Speakers
Jan. 7,14	*Outreach:* Substance Abuse: A Family Disease	Joann Fallon, CSW
Feb. 4	*Outreach:* Dealing With Teens: A Survival Guide	Robert Carrere, Ph.D.
Feb. 25	*Outreach:* Talking to Your Teens About Safer Sex in the Age of AIDS	John Quilan & Georgia Yesmont, Ph.D.
Mar. 3	*Outreach:* Communication Between the Sexes: How to Talk to Your Significant Other	Patricia Pitta, Ph.D.
Mar. 10	*Healthline:* Dos and Don'ts for a Healthy, Pain-Free Back	Howard Makofsky, P.T.
Mar. 24	*Healthline:* Money Matters — How to Finance Your Kid's College Education	to be announced
Apr. 7	*Healthline:* Money Matters — How to Budget Your Income	to be announced
Apr. 28	*Healthline:* Money Matters — How to Plan Your Estate	Franklin Federmann, CPA, & Michael Goldman, Esq.
May 5	*Outreach:* Not for Men Only — What Do Men *Really* Want	to be announced
May 12	*Outreach:* Not for Women Only — What Do Women *Really* Want	to be announced
June 2	*Outreach:* Relationships in the 90s	to be announced
June 9	*Healthline:* What to Expect From a Complete Physical Exam	to be announced

Inside Info

April Donegain, an administrative assistant in the Fiscal Division, has been named one of two Women of the Year by the Brookhaven Business and Professional Women's (BPW) Club of Patchogue.

Donegain was selected for her work "helping today's youth, tomorrow's future," stated the club's president, **Pauline Dixon,** who is a computer applications specialist in BNL's Department of Nuclear Energy.

Donegain is being cited specifically for serving as housemother and role model for high school students from New York City, who participate in BNL's annual Minority High School Summer Apprentice Program (see Bulletin of July 26, 1991). Since 1987, Donegain has taken 26 students into her Medford home over the summer.

Donegain will be honored at a dinner on Tuesday, January 28, at 6:30 p.m., at the South Shore Restaurant in Patchogue. Reservations, at $20 per person, may be made with Pauline Dixon, Bldg. 197D, Ext. 2164.

Rec Hall Closed

Until further notice, the Recreation Building in the apartment area will be closed for special maintenance. All activities should be temporarily postponed or reassigned.

Speakers Bureau

The following speakers have given talks on behalf of the Laboratory:

William Marcuse, DO: Long Island Mid-Suffolk Business Action, "X-Ray Lithography Chips: Potential Industry for Long Island," August 16.

Steve Musolino, S&EP: Port Jefferson Lion's Club, "Man-Made Radiation Sources," August 19.

Edward Jackle, Cent. Shops; **Ernest Jochen,** Cent. Shops: William Floyd High School Career Program, "Careers at BNL," October 18.

April Donegain, Fisc.; Frances Ligon, Pers.: Suffolk Community College Step Program, "Careers at BNL," October 26.

R.C. Anderson, DO Ret.: Patchogue-Medford Kiwanis Club, "Energy and the Environment," December 3.

Eleanor Grist, Biology; **Avril Woodhead,** TID: Judges at 27th Annual Shelter Island Science Fair, December 6.

Hospitality News

Marion Davis-Parzen will be the guest speaker at the next Hospitality Committee get-together on Tuesday, January 7, at 9:30 a.m., in the Brookhaven Center. She will discuss the Women's Forum, a support group for women living on site that she conducts every third Tuesday of each month.

Spouses of Lab employees and guests are welcome. Refreshments will be served. Bring the children, as free baby-sitting will be provided.

Atlantic City Trip

Seats are available for the next BERA-sponsored, one-day trip to the Trump Castle Hotel and Casino on the Marina in Atlantic City, on Saturday, January 18. The initial cost will be $20, but the hotel-casino will give a $10 coin return, $4 towards food and a $5 deferred return bus voucher.

Tickets are on sale now at the BERA Sales Office in Berkner Hall weekdays from 9 a.m. to 2 p.m. For more information, call Carolann Zebrowski, Ext. 3347; Rosalie Piccione, Ext. 3160; or M. Kay Dellimore, Ext. 2873.

Volleyball

Standings as of December 19

Open League		League I	
Magnum	19-2	Upfagrabs	21-6
G-Team	12-9	Rude Dogs	19-11
Phoenix	11-10	Network News	17-10
Me and the Boys	9-12	Dinkers	16-11
Penetrating Vollies	7-14	Six Pack Attack	15-12
Leftovers	5-16	Setups	7-20
		Bumps & Sets	1-26

League II		League III	
Mon.Night Live	17-1	Renegades	18-3
Net Wits	17-4	High Volley'em	14-7
Fossils	10-8	Nutcrackers	14-7
Night Court	10-8	Over the Top	15-9
Nuts & Bolts	9-9	Good Timers	12-9
Just Ups	8-10	Interns	8-13
Upton Ups	6-12	Sourcerers	6-15
Volley of the Dolls	5-13	Silver Bullets	5-16
Muffits	2-19	Undertakers	4-17

Film badges will be changed tomorrow. Please place your badge in its assigned rack space before leaving work today.

Bowling

Red/Green League

The Sandbaggers are the first-half champions. High games were bowled by R. Jansson 232/210/608 scratch series. F. Griswold 226, S. Thompson 217, M. Guacci 215/206, K. Riker 215, K. Asselta 213, A. Warkentien 211/205/603 scratch, R. Larsen 202, L. Jacobson 201, R. Priest 201, R. Wiseman 201.

White League

Tracy Ryan had a 243/201, Ron Picinich 221/200/619, Ken Riker 212/212/209/633 scratch, Ed Sperry IV 201, Gerry Riker 197, Nancy Mayeski 191, Annamarie Spira 181.

Purple League

Andy Warkentien had a 246, Phil Radusewicz 210, Jim Goode 210, Kevin Carney 209, Maryann Reynolds 197, Karen Jacobs 194, Nancy Erikson 187, Betty Jellett 184, Mary Addessi 181, Larry Musso converted the 4/6/7.

Cafeteria Menu

Luncheons

Monday, January 6

Soup: Chicken noodle	.80/1.10
Entree: Pork gumbo w/1 veg.	3.20
Entree: Spinach quiche w/1 veg.	3.20
Carvery: Hot pastrami sandwich	2.95
Grill: Deep-fried veg. boat w/fries	2.85

Tuesday, January 7

Soup: Navy bean	.80/1.10
Entree: Turkey divan w/1 veg.	3.20
Entree: Linguini w/white clam sauce	3.20
Carvery: Hot roast beef sandwich	2.95
Grill: Monte Cristo w/fries	2.85

Wednesday, January 8

Soup: Cream of tomato	.80/1.10
Entree: Beef stew over noodles	3.20
Entree: Baked Cajun catfish w/1 veg.	3.20
Carvery: Hot Black Forest ham sandwich	2.95
Grill: 3-D burger w/fries	2.85

Thursday, January 9

Soup: Chicken gumbo	.80/1.10
Entree: Hunan stir-fried beef w/rice	3.20
Entree: Vegetarian plate	3.20
Carvery: Hot corned beef sandwich	2.85

Friday, January 10

Soup: Manhattan clam chowder	.80/1.10
Entree: Veal casserole over noodles	3.20
Entree: Vegetable lasagna w/1 veg.	3.20
Carvery: Hot turkey sandwich	2.95
Grill: Tuna melt	2.85

Breakfast w/coffee & small juice 2.75

Mon.: 2 eggs, bacon, pancake, home fries
Tue.: Western omelet, home fries, toast
Wed.: Spanish omelet, home fries, toast
Thu.: 2 eggs, bacon, cheese on croissant, fries
Fri.: French toast, 2 eggs, bacon, home fries

Note to Diners

Due to renovations in Bldg. 488, which contains Berkner Hall and the Cafeteria kitchen, the Cafeteria will close at 2 p.m. today, Friday, January 3, and all day Saturday and Sunday, January 4 and 5.

To provide food service, the Brookhaven Center will be open on January 3 from 5 to 11 p.m., January 4 from 9 a.m. to 2 p.m., and January 5 from 9 a.m. to 2 p.m. and 5 to 9 p.m.

Phys Rev Openings

The American Physical Society's (APS) *Physical Review B* seeks editorial assistants. Will train someone with interest in journal publication willing to make the commitment necessary to develop editorial skills. Ph.D. in science and/or editorial experience desirable; M.S. in physics or a related science essential. Candidate should have broad interest in physics, broad command of English language, excellent communication skills and familiarity with the working scientist's expectations for a scientific publication. Send cover letter and resume including current salary and requirements to: Joseph Ignacio, Personnel Manager, APS, 1 Research Road, Box 1000, Ridge, NY 11961. The APS is an equal opportunity employer.

Classified Advertisements

Placement Notices

The Laboratory's placement policy is to select the best-qualified candidate for an available position. Consideration is given to candidates in the following order: (1) present employees within the department/division and/or appropriate bargaining unit, with preference for those within the immediate work group; (2) present employees within the Laboratory; and (3) outside applicants. In keeping with the Affirmative Action plan, selections are made without regard to age, race, color, religion, national origin, sex, handicap or veteran status.

Each week, the Personnel Division lists new placement notices. The purpose of these listings is, first, to give employees an opportunity to request consideration for themselves through Personnel, and, second, for general recruiting under open recruitment. Because of the priority policy stated above, each listing does not necessarily represent an opportunity for all people.

Except when operational needs require otherwise, positions will be open for one week after publication.

For more information, contact the Employment Manager, Ext. 2882, or call the JOBLINE, Ext. 7744 (282-7744), for a complete listing of all openings.

SCIENTIFIC RECRUITMENT - Candidates may apply directly to the department representative named.

POSTDOCTORAL RESEARCH ASSOCIATE - Position available for recent Ph.D. with background in analytical chemistry and kinetics, and mechanisms of either gas-phase or condensed-phase systems, to conduct laboratory and field studies of reactions important to atmospheric transformations regarding oxidant formation and hydrocarbon degradation. Contact Yin-Nan Lee, Department of Applied Science.

SCIENTIST/ENGINEER - With experience in arms-control verification methods, including techniques applicable for verifying the dismantlement of nuclear weapons systems and nuclear materials production controls. Contact Joseph Indusi, Department of Nuclear Energy.

LABORATORY RECRUITMENT - Opportunities for Laboratory employees only.

DD 8994. SECRETARIAL POSITION - (term appointment, part-time) Requires AAS in secretarial science or equivalent, excellent typing, and IBM PC word-processing skills. Previous experience with TEX preferred. Duties will include preparation of technical reports and correspondence, arranging travel, processing vouchers, and maintaining files. (Reposting). Physics Department.

DD 8997. OFFICE SERVICES POSITION - (term appointment) Requires AAS in secretarial science or equivalent experience. Will provide varied clerical support including reproducing engineering and design original drawings, preprint mailings and assisting in Department Administrative Office. Physics Department.

MK 0732. SECRETARIAL POSITION - Requires an AAS in secretarial science or equivalent experience, excellent oral and written communication skills, and knowledge of Laboratory policies and procedures. Working experience with dBase, WordPerfect 5.1, JCARS, and ability to process travel vouchers through IPAP also required. Will provide secretarial support for the Laboratory Operations Support Office. Director's Office.

OPEN RECRUITMENT - Opportunities for Laboratory employees and outside candidates.

DD 8119. ENGINEERING POSITION - Requires MS in environmental science or environmental radiochemistry and several years' experience in an environmental analytical laboratory. Also requires experience in radiochemistry, specifically Sr-90 and tritium assay, in environmental and facility effluent samples and the ability to interpret gamma spectroscopy data. Responsibilities include the supervision of radiological analytical and counting laboratory supporting environmental monitoring program. Additional duties include the review of radiological data and preparation of summary reports, assessment of facility performance and annual Site Environmental Reports. Safety and Environmental Protection Division.

DD 8117. TECHNICAL POSITIONS - Requires AAS in chemistry, engineering or related field or equivalent experience. Responsibilities include a wide-range of duties with regard to operations conducted at Hazardous Waste Management site. Duties include on-site transport, handling and packaging of chemicals and radioactive materials, operation of light and intermediate-range machinery, maintenance of protective equipment and record keeping. Safety and Environmental Protection Division.

MK 0734. ENGINEERING POSITION - Requires a BS in engineering or science, excellent communications skills, and significant experience in the support of industrial or scientific operations, maintenance and related activities. Background in analysis of methods to assure operational safety and quality is desirable. Will provide technical support to aid others in implementing policies regarding conduct of operations and maintenance including review and evaluation of operations and maintenance procedures and training. Laboratory Operations Support Office. Director's Office.

NS 1027. PHYSICS ASSOCIATE POSITION - Requires an MS in physics, good knowledge of theoretical electromagnetic capability, and computer skills in real-time PC-based environment. Will work as part of RHIC Project accelerator physics group and act as interface to the instrumentation section. RHIC Project, Accelerator Development Department.

Motor Vehicles & Supplies

89 FORD CROWN VICTORIA - 48k mi., black, 4-dr., p/w, p/l, p/m, tilt wheel, cruise, velour int., am/fm, alarm, $7,950. Dan, Ext. 7271.

89 NISSAN SENTRA - 4-spd., 2-dr., sunroof, white, am/fm cass., excel. cond. Georgia, Ext. 2384 or 929-8185 after 6 p.m.

88 FORD BRONCO XLT 4x4 - 302 eng., a/t, ac, tilt, cruise, am/fm cass., push bar, sun visor, 54k mi., asking $12,000. Ken, Ext. 2350 or 732-2635.

88 NISSAN MAXIMA SE - sport pkg., 5-spd., white, p/w, p/seat, p/l, ac, cruise, sunroof, tilt, am/fm cass., orig. owner, $8,700. Chris, Ext. 3292.

87 HONDA ACCORD LX - 4-dr., 5-spd., am/fm cass., ac, p/s, p/b, p/w, p/l, cruise, excel. cond., $5,800. Paul, Ext. 7644 or 929-4295.

87 MERCURY COUGAR LS - black/gray, every option, mint, 39k mi., $5,900. 224-1359.

87 BUICK LE SABRE - 65k mi., 4-dr., maroon, p/l, ac, am/fm, new tires, brakes & tranny, just tuned, clean $4,150. Dan, Ext. 7271.

87 CHEVY SUBURBAN 4x4 - loaded, $9,800. Victor, Ext. 5318 or 585-2084.

87 NISSAN PULSAR - ac, T-top, am/fm/tape, black, new tires, exhaust system, warranty transfer till Aug., $4,900 neg. 474-3080.

86 PONTIAC SUNBIRD - turbo, h/b, 83k mi., ac, am/fm cass., excel. cond, $,2,700. Andrea, Ext. 3090/5254.

85 BUICK REGAL - V-6, ac, am/fm stereo, p/s, orig. owner, high mi., maintained well, many new parts, $1,550. Ed, 765-2847

84 LUXURY CONVERSION VAN - Chevy G20, all options, 88k mi., more, ask. $4,650; '78 Malibu, high mi., runs well, ac, 2-dr., $650. Roy, Ext. 7357.

82 BUICK CENTURY - custom, a/t, p/b, ac, many new parts, excel. cond., $1,200. Peter, Ext. 4094 or 751-6575 eves.

81 VW RABBIT - diesel, ac, am/fm, new brakes, glow plugs, belts, hoses, tires, runs well, $995 or 874-4845 after 6 p.m.

80 PLYMOUTH VOLARE - 4-dr., runs well, 75k mi., $450 neg. 744-7549.

78 BUICK REGAL - sports coupe, needs head gasket, best offer over $300. 395-3485, leave message.

77 HONDA CIVIC - 5-spd. h/b, sporty, runs well, reliable, economical, no rust, am/fm, heater. Jim, 929-8185.

76 CADILLAC DEVILLE - orig. owner, v.g. cond. in & out, 100+k mi., no rust, asking $750. George, Ext. 2296.

76 AMC HORNET - needs starter, $200. Kathy, 744-2203.

76 CHEVY SUBURBAN - 6-cyl., 250 cu. in. eng., new battery & tires, a/t, p/s, runs well, $500. Frank, Ext. 7519, or Vita, 277-0464.

71 HONDA 750 - fair cond., runs well, $200. Siggy, Ext. 4360.

69 CAMARO RALLY SPORT - classic, $2,200. Jim, Ext. 3372 or 821-0250.

64 CHEVY BISCAYNE - 2-dr., 6-cyl., many new parts, runs, good for parts, best offer. Dan, Ext. 7271.

TIRES - 2, Falken low-profile sport steel-belted radials, 215/60R15904, $75 ea. or make offer. Bill, 281-4726.

VALVOLINE - all fleet plus motor oils, SAE 15W-40, limited quantity, $1/qt., 874-4845 after 6 p.m.

Boats & Marine Supplies

17' BOAT - f/g, full canvas, new int., windshield, all access., galv. trailer, excel. cond., 60-h.p. Evin. needs work, $1,000. 878-1617 after 6 p.m.

Furnishings & Appliances

COUCH - & matching chair, living room, Colonial, excel. cond., $200. Pete, Ext. 4581 or 399-2813 after 5 p.m.

PROJECTOR - slide, working cond., $15. Roger, Ext. 7518 or 878-8847.

REFRIGERATOR/FREEZER - freezer below, Admiral, 18 cu. ft., frost-free, 2 door, excel. cond., $75. George, Ext. 3061 or 751-0265 eves & wknds.

SOFA BED - queen size, Colonial, loose cushions, dark pine, good cond., $400. Rick, Ext. 3932.

WATER CLOSET - Kohler Rochelle model, color Mexican sand, $200. Nancy, Ext. 5274 or 281-2767 eves.

WATER FILTER - for neutralizing, Sears model #625, $100. Ext. 3421 or 727-8631.

Tools, House & Garden

FIREWOOD - full cord, plus seasoned oak, you pick up, $98. 924-3236.

MACRAME HANGERS - w/8" or 10" pot, many styles, colors & lengths, $13. Laurel, Ext. 4095.

HOT WATER HEATER - oil-fired, 32 gallon, Bock w/Beckett burner, 3 yr. old, $400 neg. 499-8816.

ORCHID PLANT - in flower, 3 sprays cymbidium, $20. 727-8631.

OIL BURNER - Wayne retention head, 2 hot water circulating pumps; 40 gallon electric hot water heater w/circulating pump, best offers. 286-6858.

ROUTER - Sears, $30; router table, $25; router edge guide, $10; $60/all. Ralph, Ext. 2591.

WOOD-BURNING STOVE - for fireplace, $295/complete. 874-4845 after 6 p.m.

WOOD STOVE - Hearth Mate HM 2400, rated for coal or wood, 10 yr. old, 20"x26"x34", good cond., heats whole house, $115. Greg, Ext. 3263.

Sports, Hobbies & Pets

BARBELL SET - w/bench, $50. Roger, Ext. 7518 or 878-8847.

WEIGHT-LIFTING BENCH - Weider, brand-new. Frank, Ext. 3120.

BIRDS - talking Conure w/cage, $300; finches, $5/ea., $7/pr.; 10" cage, $50; 4 parakeets w/cage, $50; more. Kelly, 744-3069.

CAMERA - 35mm, SLR Mamiya ZE2, auto exposure, 55 mm, 1:1.7 lens, flash, filters, close-up lens, $70. Don or Sue, 473-6570 after 7 p.m.

DRUM SET - Ludwig, professional, Zilgian cymbals, 12 piece, black, boom cymbals, must see, $995. Jeff, 345-0766.

FIGURE SKATES - size 8, w/leather shoes, $10; roller skates, size 8, leather, $15. Irv Meyer, Ext. 4309.

ICE SKATES - children's, size 12, $10; artificial Xmas tree, $45; 1964 Beatles magazine, $1,000; spreader, $10. 744-2203.

MOTORCYCLE SUITS - leather, worn 3 times, sizes small & medium, $200/ea.; camping toilet, $20. Siggy, Ext. 4360.

PUPPY - Golden Retriever, 10 wk. old, female, AKC, shots, adorable. Tirre, Ext. 3288 or 281-0360 eves.

SKI BOOTS - woman's, size 6, Dolimite rear entry, used 3 times, $45. Richie, Ext. 2175 or 734-7342 after 6 p.m.

SOLOFLEX - complete; Colnago Master bicycle, 56cm. Oscar, Ext. 3499.

AQUARIUM ITEMS - 150 lb. gravel, $15; 36" hood, $15; Diatom filter, $25; 20 gal. tank, $15; 50 gal. tank, complete, $125. Roy, Ext. 7357 or 878-5886.

Audio, Video & Computer

COMPUTER - Commodore 128, Thompson monitor, 1571 disk drive, programs, joystick, surge protection, $300. Patricia, Ext. 3427.

COMPUTER - IBM Turbo XT, 512k, hard disk, 10 MGB, display mono., $296. Xue Dejun, Ext. 5271 or 2520.

ADAPTER - electronics power supply, 120 Vac to 7.3 Vdc, $5; Pioneer stereo, Centrex 8-track, $50. Pete, Ext. 4581 or 399-2813 after 5 p.m.

VCR - Canon VR-HF 720, hi-fi, multichannel, TV sound, 107-channel, cable-ready tuner, 8-prog./1 mo. timer, ask. $400. 331-1003 eves.

Miscellaneous

SEWING MACHINE - Singer, antique, treadle, in oak cabinet, v.g. cond. Ext. 2352 or 821-5247.

COAT - burgundy, wool, woman's 4/6, new, $60; woman's gray tweed business suit, size 6, new, $50. Eugene, Ext. 7113.

COAT - Persian lamb, woman's, gray, size 10/12, full length, good cond., asking $95. Ext. 4341 or 475-4005.

OPERA TICKETS - 2, Met, Wed., Jan. 8, 8 p.m., Pucini's *La Boheme*, first row balcony, $29/ea. Carmen, Ext. 4135.

TYPEWRITER - portable, $10; 3-piece Samsonite luggage, lt. beige; 1942 wooden Army footlocker, $20; musical metal doll crib, $25. 878-6637

WEDDING GOWN - silk organza, new, size 10, orig. $600, sell for $300. 878-1617 after 6 p.m.

Free

FIREWOOD - you cut, you haul, must be experienced. Yue Shen, 744-3502.

Lost & Found

FOUND - scarf, fucshia & green tulip, outside gym during Blood Drive. Sue, Ext. 2888.

Wanted

ELECTRIC STARTER KIT - for Tecumseh engine on the 1985 BERA purchased Generac Model 8795 generator. Brown, Ext. 4747 or 765-1075.

HOUSEMATE - to share 2-bdrm. house in Sound Beach, $290/mo. incl. all. 744-3502.

HOUSEMATE - female to share private home, lg. bdrm., all appl., Blue Point. 363-2984.

LIONEL TRAINS - & American Flyer, private collector, pays top $. Bruce, 924-4097.

HESS TRUCKS - old, by private collector, top $. Jim, Ext. 4026.

ROOMMATE - to share 3-bdrm. ranch in N. Shirley, 5 min. from Lab, $400/mo. + util. Bob, 281-7432.

ROWBOAT - 7'-10', wood, aluminum or fiberglass, old, battered okay, should float, cheap. John, Ext. 7671.

SKIERS - for trip to Windham, 1/8, $42; also Windham, 1/22; Hunter, 2/5; Bellayre, 2/19. Send payment to Augie Hoffman, Bldg. 510C.

TRAINS - Lionel "O" gauge and "027" gauge, equipment, accessories, etc. Frank, Ext. 3120.

Services

*Services are listed in the first **Bulletin** of every month as a courtesy to BNL employees. They are neither screened nor recommended by the **Bulletin**. Services forms are available in the **Bulletin** lobby, Bldg. 134.*

ACCOUNTING - tax, personal, small business, make your tax appt. early, let a qualified CPA do all the work. Nadia, 878-5886.

BABY-SITTING - college student, afternoons, eves, through Jan. 21, exp. with infants, avail. again June. Suzanne, 744-8512, leave message.

BABY-SITTING - loving, stay-at-home mother, will take care of your child while you are at work, reasonable. Cathy, 345-0766.

BABY-SITTING - mature, exp. mom has on-site openings for children, reasonable rates. Karen, Ext. 3181.

BRICKWORK - masonry, patios, walks, swimming pools, retaining walls, landscaping ties, Belgian block, 25 yr. exp., Lab discount. Tony, 698-9274.

CARPENTER - 20 yr. exp., seeking small jobs, windows, doors, cabinets, etc., also will build custom-made furniture. Kevin, 758-2653.

CARPENTRY & PAINTING - roofing, decks, wood shingles, seamless gutters, interior wallpaper, staining, polyurethane, ins. James, 399-4912.

CARPETING - discount purchase, installation & repair, custom work, stripes, borders, printing in carpet. Mark, 399-2813.

CARPET/UPHOLSTERY CLEANING - spot, pet stains, odor removal, auto interior, fabric protector, free est., Lab discount. Jerry, 924-6019, days.

GENERAL CLEANUP - driveways sealed, reasonable. Ernie, 698-9274.

HOME IMPROVEMENTS - complete kitchen & baths, vinyl siding, doors, windows, 35 yr. exp. Carl, 698-9274.

HOUSE CLEANING/BABY-SITTING - reliable, mature mom of two grown children. Valentina Volkera, Ext. 3097/7502.

LOCKSMITH - sales & service, 10% Lab dis., keys cut during lunch. Pete, 399-2813 after 5 p.m.

MASSAGE THERAPIST - therapeutic massage by licensed therapist, office located in Medford. Alana, 475-4947.

PERMS - haircuts, reasonable, liscensed, cosmetologist. Sharon, 281-0062.

PLUMBING & HEATING ALTERATIONS - repair work by Jim Morris, retired BNL employee. Jim Morris, 472-1205.

SHEETROCKING & SPACKLING - free estimate. Kevin, 563-9855.

SHIN JITSU - self defense, situational-confrontational approach, street combat, rape survival, physical & mental fitness, classes start Jan. 289-2939.

SKYLIGHTS - complete, prof. service, cleaning, preventive maint., installations. Joseph, 924-6019.

VIDEOGRAPHER - capture those precious moments, will tape wedding, parties, all occasions. Larry, 281-7240.

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