Achievement & Accolades Mark PET Research at Brookhaven

Positron Emission Tomography (PET), a key component of BNL’s neuroimaging program, has a long history at BNL. Pioneered in the Chemistry Department by Alfred Wolf in the early 1970s, the program is now pursued by two departments under the joint leadership of Senior Chemist Joanna Fowler, Chemistry, and Medical Department Chair Nora Volkow. Funded at BNL by the National Institutes on Drug Abuse and the U.S. Department of Energy, the neuroimaging program involves investigating aspects of the nervous system — in particular, the brain — using techniques that produce a graphical representation of the system under study.

For a PET study, a person is injected with a radiotracer labeled with a short-lived, positron-emitting isotope that binds to the area of the body being studied, such as the brain. The PET machine detects photons resulting from the decay of particles called positrons, then creates images from the patterns of the emissions. These images give information about how the brain is working or how it is responding to another influence, such as cocaine.

This overview of recent achievements and accolades garnered by the people and projects associated with PET includes:

• a report on the renovation of Chemistry’s radiotracer labs (below).
• summaries of PET research involving Volkow and Fowler, which focus on drug addiction, mental illness and aging (page 2).
• announcements of awards that Fowler and Volkow have earned (below) for their contributions to science.
• a story about the symposium at the American Chemical Society’s annual meeting that will honor Wolf, and a summary of BNL speakers (page 3).
• a notice about a TV show Sunday night that will discuss the subject of Fowler and Volkow’s research (page 2).

— Anita Cohen

Brookhaven Town Honors Volkow

Nora Volkow, Chair of the Medical Department and Director of Nuclear Medicine at BNL, is one of 13 women whose award-winning work was honored by the Brookhaven Town Council on Tuesday, March 31, for their accomplishments and contributions to Brookhaven Town. The women will be the guests of honor at Women’s Recognition Night, sponsored by the Town as part of its observance of National Women’s History Month. Volkow will be recognized for her excellence in medicine.

A leader in drug abuse research, Volkow uses the PET imaging technique to view how addictive drugs, such as cocaine, affect the brain. In the 1980s, she discovered that the brains of heavy cocaine users frequently had regions where there is no blood flow, similar to stroke victims. Thus, Volkow is credited with being the first researcher to report that cocaine is toxic to the human brain.

Some of her recent research findings were reported in a Time magazine article (continued on page 2).

After $2.2 Million Renovation, BNL Reopens Labs Used With PET

BNL Chemist Joanna Fowler has been awarded the Francis P. Garvan-John M. Olin Medal for her research on the biochemical effects of drugs, aging and selected diseases on the brain.

Sponsored by the Olin Corporation Charitable Trust and administered by the American Chemical Society, the award consists of $5,000, an inscribed gold medal and a bronze replica of the medal. Established in 1936, the award recognizes distinguished service to chemistry by women chemists who are U.S. citizens.

Fowler will receive the award next Tuesday, March 31, at the American Chemical Society’s national meeting in Dallas, Texas, where, on Sunday, March 29, she will deliver the award address on “Rapid Organic Synthesis, PET and Imaging the Human Brain,” at the Francis P. Garvan-John M. Olin Medal Award Symposium.

To perform her studies of the brain, Fowler uses the PET imaging technique. “I am honored to receive this award and am especially proud of the basic research that my colleagues and I have done at Brookhaven to develop radiotracers to understand brain biochemistry and the effects of drugs on the brain,” said Fowler, who heads the PET program at BNL. “PET has emerged as a powerful tool in the study of drug action. Its application in this area is particularly compelling because drug addiction is one of society’s most medically, socially and economically devastating public health problems.”

In a study cited as one of Discover magazine’s “Top 100 Science Stories of 1996,” Fowler and her colleagues found that smokers had an average of 40 percent less of a crucial brain enzyme called monoamine oxidase, which breaks down dopamine, a chemical substance in the brain that is important in movement, motivation and reward. The study suggests that an undetermined substance in cigarette smoke inhibits the enzyme, which may keep dopamine levels up. Findings (continued on page 3).

Unique DOE-EPA Agreement Promotes Pollution Prevention

At the signing of the interagency agreement between the U.S. Department of Energy (DOE) and the U.S. Environmental Protection Agency (EPA) are: (from left) BNL Director J ohn Marburger; Jeanne Fox, EPA Regional Administrator; Martha Krebs, Director of DOE’s Office of Energy Research; and Dean Helms, Executive Manager of DOE’s Brookhaven Group.

The Lab will develop a program-by-program blueprint in pollution prevention, waste minimization and compliance through new and expanded initiatives.

DOE and Brookhaven Science Associates, the Laboratory’s new management and operating contractor, will work together to demonstrate to EPA and the community that we are serious about cleaning up past problems and making environment, safety and health a priority.”

The agreement is the direct result (continued on page 4).
PET Research Yields Clues as to Why Addicts Crave Cocaine

In a discovery that strikes at the very heart of addiction, BNL scientists may have found a clue to why addicts crave the drug so strongly and use it repeatedly. The study was published last month in The American Journal of Psychiatry, describes signs of damage to the very chemical pathways that send signals between the cells in cocaine addicts’ brains.

"We do not yet know if this is damage caused by the cocaine molecule or is already present in the addicts' brains," Volkow said. "But the discovery that it is destructive both physically and so-called, says team leader Nora Volkow.

At BNL's Regional Neuromaging Center and her colleagues demonstrated for the first time how cocaine affects the brain as a medical problem and who believe that research that uses addicts as subjects raises ethical problems. In this interview with the Brookhaven Bulletin (BB), Volkow (NV) and Fowler (JF) address some of these issues.

JF: Why do you do research on drug addiction?
NV: Our lab here at BNL is most devastingly and costly problems. But, even apart from that, drug abusers are a disadvantaged population who need our help. To withhold that help would not only be discriminatory but also unethical, for it would deny drug users the benefits of science and medicine that are the right of all people in our society.

JF: But such research is not without its critics, who do not view drug addiction as a medical problem and who believe that research that uses addicts as subjects raises ethical problems. In this interview with the Brookhaven Bulletin (BB), Volkow (NV) and Fowler (JF) address some of these issues.

BB: What about the addicts themselves? Are they voluntarily participating in the research? Are they considered voluntary?
NV: No. As documented by the College on Problems of Drug Dependence, enrollment in a research protocol is often the drug addict's first contact with the medical community. And, as part of an investigation, drugs are given under very restricted and controlled laboratory conditions and for a very specific purpose — all of which is communicated to the individual and which occurs only with his or her informed consent.

JF: If anything, participation in a research protocol is often the drug addict's first contact with the medical community. And, as part of an investigation, drugs are given under very restricted and controlled laboratory conditions and for a very specific purpose — all of which is communicated to the individual and which occurs only with his or her informed consent.

NV: Ultimately, our goal is to gather knowledge that will help in the treatment of drug addiction, as has happened in the past with research on other medical illnesses.
Two of the most common signs that a person is growing old—diminished motor skills and decreased mental agility—are greatly connected to a reduced capacity to absorb a key "communication molecule" in the brain, a new PET study has found.

"And while we don't know for certain what might be able to prevent these changes, we do know the potential of what might be able to slow those normal changes in brain chemistry that occur in healthy people as we age," said Nora Volkow, the team leader.

Alfred Wolf, then, in 1988, the two chemists shared the Gustavus John Esselen Award for Chemistry in the Public Interest, given by the Northeastern Section of the American Chemical Society. In 1994, Fowler was honored with BNL's Distinguished Research & Development Award, and, last year, she was named a Javits Investigator Award from the Society of Nuclear Medicine and a U.S. Department of Energy Research Award. Diane Greenberg

Brookhaven Bulletin
March 27, 1998

New PET Study Connects Brain Chemistry to Symptoms of Old Age

A comparison of PET scans from three people who participated in the study, showing the concentration of dopamine receptors and dopamine transporters in the brain. Darker shades within the light areas indicate highest concentrations; the dark background indicates lowest.

Chemists from around the world will gather in Dallas on Wednesday and Thursday, April 1 & 2, to salute Al Wolf, then 75, for his accomplishments by others that his work helped make possible.

In 1976, Fowler, working with Al Wolf and others, developed 18F-Fluorodeoxyglucose (FDG) as a PET imaging agent.

As Wolf's colleagues called the putamen and the caudate, two areas of the brain that control motor function. Those with Parkinson's disease have a severe deficiency of dopamine receptors. "Using PET in conjunction with standardized neuropsychological tests opens up a whole new way to study the dopamine system," said Volkow.

"Al's work laid the foundation for a form of glucose that is now used in hospitals worldwide to make images of brain function and to diagnose and treat heart disease," said Vincent Fowler and their colleagues developed PET scans of the brains of 30 healthy volunteers, ranging in age from 24 to 86 years of age, to show the concentration of dopamine receptors in parts of the brain. Then, the scientists correlated each person's brain scans with his or her performance on an extended battery of cognitive and motor skills tests.

In 1996, he was honored by the American Chemical Society's Section of the American Journal of Psychiatry and the Society of Nuclear Medicine's Javits Investigator Award in the Neurosciences in both 1986 and 1993. She was named a Javits Investigator Award from the Society of Nuclear Medicine and a U.S. Department of Energy Research Award.

"Using PET in conjunction with standardized neuropsychological tests opens up a whole new way to study the dopamine system," said Volkow.

Among the BNL scientists who will be speaking at the annual meeting is "Alfred Wolf's Career at Brookhaven," "Rapid Organic Synthesis," "Probing the Biochemical Basis of the PET Image," with Joanna Fowler, "Clinical PET and Imaging the Human Brain," and "PET Studies of Addiction."

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DOE Symposium Salutes Al Wolf at 75

Alfred Wolf

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An Event to Remember

Most Fridays at 5 p.m., everyone hurries home from the Lab to start enjoying their weekend. But on Friday, February 27 — the final day for BNL’s ten-month-old interim management — some 300 BNLers preferred to stay on to attend a thank-you party for outgoing Interim Director Peter Bond and Interim Deputy Director Mike Bebon. Associated Universities, Inc. (AU) sponsored the party to thank Bond and Bebon for their leadership under unusual and difficult circumstances, during the interim period between the U.S. Department of Energy’s (DOE) termination of its contract with AU for the management of BNL and the beginning of BNL’s management by Brookhaven Science Associates (BSA), which was then to begin on Monday. So, with the party’s taking place on the last day of AUI’s 50-year-plus tenure at the Lab, it could have been a bitter-sweet evening. But the bright balloons, the friendly atmosphere, the spontaneous performance of BNL bagpipe inscription) John King, the heartful and witty speeches, and, above all, the overwhelming gratitude expressed by every one present for — in the words of John Marburger, then BSA President and incoming BNL Director, “the energy, imagination and self-sacrifice” demonstrated by the two guests of honor — all turned the reception into an event to remember.

As the evening’s emcee, Marge Lynch, who now is BNL’s Assistant Director for Community Involvement & Public Affairs, reminded the audience that Bond and Bebon had led the Lab during one of “the most tumultuous and turbulent times” in its history, and that their direction had been highly productive, “filled with several new management improvement initiatives, a renewed commitment to community involvement and outreach, and the furthering of the Lab’s mission as a world-class research institution.”

Dean Helms, Executive Manager of the Brookhaven Group, was out of town, but acknowledged Bond’s and Bebon’s contributions in letters read by Jan Shandos, who had been OIE’s transition manager during the two-month period between the U.S. Department of Energy’s (DOE) termination of its contract with AU for the management of BNL and the beginning of BNL’s management by Brookhaven Science Associates (BSA), which was then to begin on Monday.

“You assumed this position under very difficult circumstances and worked effectively to steady the course and build confidence for the future,” Helms wrote of Bond. “Your tireless efforts have clearly been rewarded as we build confidence for the future,” Helms wrote of Bond. Helms added, “I am very proud of the leadership they exhibited for the Lab at this time.”

In congratulating Bond, Helms noted, “You deserve great credit for building and improving management systems that will serve the Laboratory well as it enters a new era. Of particular note is the Management Systems Improvement Program, which is a blueprint for sweeping enhancements to critical institutional programs and systems at the Laboratory.”

Shands also relayed a message of thanks from John O’Fallon, DOE’s Director of High Energy Physics. Recalling that he had recommended Bond and Bebon to fill the interim positions, Leland Williams, AUI’s Vice President for Environment, Safety & Health, said “I felt very proud of the leadership they exhibited for the Lab at this time.”

Also commending the honorees’ many contributions were Maurice Goldhaber, BNL’s third Director, and Mike Schaeffer, Manager of Engineering & Construction Services in the Plant Engineering Division.

In return, Bond and Bebon eloquently recalled the support they had received from BNL staff, who had responded to the past hectic months by drawing closer and becoming more aware of their own commitment to BNL’s mission.

— Liz Seubert

The cushions they received at their February 27 party may have been the only “cushy” part of Peter Bond’s (left) and Mike Bebon’s time as interim BNL’s Regional Neuroimaging Center last spring. — Kara Villani

Cleanup Information: BNL & Public Meetings

As part of Brookhaven’s continuing efforts to keep employees and the local community informed about its activities, BNL will hold three information sessions focusing on upcoming groundwater remediation activity off the Lab site.

One session will be held for BNL employees on Friday, April 3, in Berk- ner Hall lobby, from 11 a.m. to 1 p.m. All may attend the other two sessions, which will be held on Saturday, April 4, in the Large Room of the Longwood Middle School, 41 Yaphank-Middle Island Road, Middle Island, starting at 4 p.m. and 10 a.m., and on Monday, April 6, 5:30-8:30 p.m.

As part of the remediation to be discussed at these sessions, BNL will construct its first off-site groundwater treatment facility in the industrial park south of the Lab, beginning in July. Before construction starts, BNL will conduct a groundwater sampling project in an undeveloped section near the railroad tracks, beginning shortly.

A three-fold approach will be used to assess the extent of the groundwater contamination that is the focus of this proposed remediation system to be used, the project schedule, and past accomplishments that have addressed the groundwater contamination on the Lab site. BNL staff will be on hand to answer questions and discuss concerns.

DOE-IA Agreement (cont’d)

A comprehensive inspection of BNL that EPA conducted at Peña’s invitation occurred in May 1998. EPA is completing DOE’s contract with the Lab’s former manager, Associated Universities, Inc. (AU). This March, the inspection resulted in EPA’s proposing fines of $80,000 against DOE and AUI for violations of environmental law (see Brookhaven Bulletin of March 13, 1998).

When he invited EPA’s inspection, Peña committed to undertake additional projects to ensure that DOE would improve environmental safety management at BNL. The present memorandum of agreement, developed by BNL and the U.S. Environmental Protection Agency’s (EPA’s) Environmental Investigation Center, defined the steps Peña’s administration will take to fulfill Peña’s commitment. It is considered as phases 2 and 3 of the inspection, which, following phase 3 of the agreement, identified areas of non-compliance.

The next step, phase 2, will be a Lab-wide evaluation of all experimental and industrial-type operations. Using appropriate techniques and tracking potential benefits, BNL will identify all waste-generating sources, establish appropriate operational and regulatory requirements and develop a five-year annual audit program. BNL will conduct an independent review of the audit program and continue to ensure that objectives are achieved.

For phase 3, DOE and BNL will develop a five-year annual audit program that the auditors will use to ensure that the Lab’s progress in establishing an environmental management system to assure regulatory compliance and continuous improvement in environmental stewardship. Initially, the audits will cover the Lab’s entire operations. Later, to maximize objective, DOE will call on outside expertise.

BNL will provide periodic reports to EPA, state and county environmental agencies and community groups on an ongoing basis as audit progresses.

— Liz Seubert

See Supplement for other news and for classified ads.

Springs — and Snow — in the Air!

After a winter that felt like a prolonged spring, spring started out by feeling like winter. On Sunday, March 22, the third day of spring, BNL meteorologist Victor Cassella measured a snowfall of 0.5 inches at Brookhaven Lab. The BNL’s Plant Engineer- Division, the upgrade was completed by Frendolph Construction of Hauppauge. The new labs complement the state-of-the-art PET scanner that came to BNL’s Regional Neuroimaging Center last spring.

BNL’s research focuses mainly on understanding how aging, mental illness and other sensations through the brain (see stories on page 2 & 3).

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Gospel Extravaganza! Saturday, April 4

Gospel singers will be in the spotlight in Berkner Hall, while in the lobby, an exhibition of Afro-American art, crafts and photography will be displayed as the Lab’s Afro-American Culture Club once again sponsors a Gospel Extravaganza, starting at 7 p.m., on Saturday, April 4. The featured group will be the 35-member ARC Gospel Choir of New York City, which started in 1975, when eight residents of the Addicts Rehabilitation Center began singing to the congregation at the Manhattan Christian Reform Church in Harlem. Also singing will be the dedicated Young Adult Choir, Somerset, New Jerseypictured here. This group, established in 1959, is also involved in community help programs such as serving meals to the homeless. Other artists on the program will be the Stephens Singers, Jersey City, New Jersey; the First Baptist Church Choir, Riverhead; and BNL’s own Gospel Choir, made up of Lab employees. Tickets are on sale now at $10 for adults and $6 for children under 12, at the BERA Sales Office in Berkner Hall, weekdays 9 a.m.-1:30 p.m. No seats will be reserved, and no tickets will be sold at the door.

Learn About Tritium

Tritium has been an in-the-news topic for many months at BNL. Every- one has read about it, but how much do you really know about this radioisotope? To learn more about tritium or to review what you know, come to the talk to be given by Kathleen McIntyre, a health physicist with the Environmental Safety & Health Services Division, on Tuesday, March 31, in Room C, Berkner Hall, from noon to 1 p.m. Sponsored by Brookhaven Women in Science, the talk will outline the properties and applications of tritium, including potential doses, release points and current remediation efforts at the Lab.

In addition, McIntyre will also answer individual questions, which she invites you to send her at Bldg. 129 or e-mail mcintyre@mail.sep.bnl.gov, so that she has as much time as possible to research particular concerns.

New Golf Season Tees Off

Spring and golfing fever are in the air, and the BERA Golf Association (BGA) is set to tee off the 1998 season when league play begins on Tuesday, April 28. To join the league, call J eff Williams, Ext. 5987, or e-mail williams@mail.sep.bnl.gov.

A Winning Team

Last October 4 was a great day for BNL golf, when a team of Lab players at the Rock Hill Country Club captured the Long Island Industrial Golf Cup from the Parker Gull team, who were the four-time defending champions. Non-playing BNL team captain Dennis Hall holds the cup, which (from left) John Usher, Andres Ruga, John Fish, Tom Doyle, Barry Karlin and (not pictured) John Millener won with the best four out of five scores, beating the competition by 29 shots. Injured team members Alan Raphael (far right) and See-Meng Wong (not pictured) were unable to play that day, but they hope to help keep the cup at the Lab for another year next time around.

BERA Elections Next Week

The following four BNLers are running for two spots on the Executive Board of the Brookhaven Employees Recreation Association (BERA): Carol Bel, Environmental Safety & Health (ES&H) Services Division; Tracy Blydenburg, Reactor Division; Bob Calichia, ES&H Services; and Richard Conte, Relativistic Heavy Ion Collider Project. Last week’s Bulletin carried background on each candidate, who, if elected, will serve four-year terms, which begin May 1, and will help decide recreation policy for all BERA members.

BERA members include all BNL employees, on-site AUI and DOE employees, and those employed by permanent on-site contractors, who are eligible to vote at the election times and polling places listed below.

Everyone who signed up for the program was entered into a drawing, and the winners are: Jan Naidu, ES&H Services Division, and Bruce Stein, Information Services Division, who each won a Canon camera. Advanced Technology, who each won a one-month certificate to the Ultimate Fitness Spa in Medford. Whether you are running miles, swimming laps or working hard around the house, if you are one of the 375 BNLers who have signed up for the March Into May physical activity program organized by the Lab’s Health Promotion Program of the Occupational Medicine Clinic, then keep marching! May — and improved fitness — will be here presently! Brookhaven was one of ten employers nationwide that was selected by the Centers for Disease Control and the National Coalition for Promoting Physical Activity to have its employees, regardless of their current fitness and activity levels, participate in March Into May, a program of moderate-to-vigorous physical activity began on Monday, March 9, and continues through Sunday, May 17. Having set personal goals for those ten weeks, employees and guests are now filling out their activity records daily, with one point for every ten minutes of exercise. At least 100 minutes or 10 points must be earned weekly.

To inspire this season’s BGA golfers, here are two pairs of winners from last season’s playoffs: (from left) Joe Roecklein and Tony Krupien, who outplayed Nate Carter and Walter Powell in Division 2; and the husband-and-wife team of Bob and Sharon Jones, who defeated John Axe and Vinny Ranciariello in Division 1. Congratulations, champions!

March Into May
Three Weeks Along
Keep on Marching!

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Everyone who signed up for the program was entered into a drawing, and the winners are: Jan Naidu, ES&H Services Division, and Bruce Stein, Information Services Division, who each won a Canon camera with case; Claire Retardi and Linda Smirra, both of the Financial Services Division, who each won an executive portfolio with calculator; and Richard Ferrieri of the Chemistry Department, Susan Foster of the Human Resources Division and Peter Zuhoski of the Department of Advanced Technology, who each won a one-month certificate to the Ultimate Fitness Spa in Medford.

After the halfway mark, another drawing will be held for those who have completed five weeks of the program — sokemarching! For more information, contact Health Promotion Specialist Mary Wood, Ext. 5923.
Defensive Driving
The Environmental Safety & Health Services Division will offer defensive driving instruction to Brookhaven Science Associates employees, guests and their family members. Classes will be presented by Master Instructor Steve Melton once a month from April 1998 to March 1999. The six-hour course will be held 6-9 p.m. over two weekends or 9 a.m. to 3:30 p.m. on Saturdays. Completing the course entitles you to a 10 percent discount on collision and liability insurance for three years and to have fouls points deducted from your driving record if they were incurred during the 18 months before you completed the course.
The fee will be $20 per person. To register, call 249-3000, Ext. 5123, and leave your name and phone number.

AirBridge Seminar
Telecom Services is sponsoring a seminar on the AirBridge Services offered by Bell Atlantic Mobile, to be held on Tuesday, March 31, at 10:30 a.m., in the seminar room in Bldg. 515. There. Rick Pedone of Bell Atlantic will discuss the AirBridge data services, which provide some of the latest and most cost-effective technologies available for wireless transmission of data. To attend or for more information, call Cathy Lombardo, Ext. 7099.

Cell Phone Service
On Tuesday, March 31, from 10 a.m. to 2:30 p.m., in Berkner Hall, CTP Wireless World will discuss its digital personal communication services corporate program, which has rates as low as 20¢ per minute, a monthly access charge as low as $19.99 and includes 30 minutes of air time per month. CTP will offer BNL employees a special Air & Wireless Services corporate cellular rate. Free digital features such as caller ID, voicemail with notification, numeric paging and self-dispatch alphanumeric messaging; three free digital phones, the Nokia 2160, the NEC DT 2000 and the Ericsson DH 318, call Michael Wesinger or Dennis Lamm at 585-2900, for more information.

The Women’s Millennium — Video at 11:30 Today
Today, in Room C, Berkner Hall, the Women’s Program Advisory Committee will show the video The Women’s Millennium — Changing the Way We Do Business, which features Tom Peters, Linda Ikebari, Stephanie Coontz and Dr. Pat Heim. Part I includes understanding business opportunities for women and will be shown at 11:30 a.m. Part II, which focuses on identifying the important challenges in gender relations, will be shown at 12:30 p.m.

For more information, call Nancy Hoy, Ext. 2821.

Saturday Shopping
Brookhaven Science Associates is continuing to provide apartmentarea residents and laboratory personnel with the Saturday shopping service from BNL to Shirley.
As is the past, in the pickup point is the Fieneing House parking lot. Starting at 8:00 a.m. each Saturday, a continuous van service will run to Pathmark and Caldor shopping malls in Shirley, with the last trip leaving the Caldor mall at noon. Look for the van with the “Sunrise Coach Lines” logo.

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Classified

Placement Notices
The Lab’s placement policy is to select the best-qualified candidate for an available position. Candidates are considered 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, disability or veteran status. Each week, the Human Resources Division lists new placement notices, first, so employees may review them before the information is released for open recruitment. Because of the priority policy stated above, last-hiring does not necessarily represent an opportunity for all people. Except when operational needs otherwise require, positions will be open for one week after publication. For more information, contact the Employment Manager, Ext. 2882; call ONLINE, Ext. 7744 (7744-7744); for a complete list of all job openings, use a TDD system to access job information by calling (516) 344-9188; or access current job openings on the World Wide Web at http://www.bnl.gov/jobs/jobs.html. The following vacancies are exempt from the Director’s hiring freeze. SCIENTIFIC RECRUITMENT — Doctorate usually required. Candidates may apply directly to the department representative name.

Open Recruitment — Opportunities for laboratory employees and outside candidates.

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