BROOKHAVEN BULLETIN
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BROOKHAVEN NATIONAL LABORATORY

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 graphic 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 (page 2) and old age (page 3).
- a conversation with Fowler and Volkow about the use of cocaine in their research (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

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

Roger Stoutenburgh

At the open house this past Tuesday to mark the reopening of the Chemistry Department's renovated radiotracer laboratories, Joanna Fowler, who, with Nora Volkow (fourth from right) jointly heads BNL's neuroimaging program, addresses those on hand, who include: (left) Chemistry Chair Carol Creutz, (center) BNL Director John Marburger, and former Directors Nicholas Samios (third from right) and Peter Bond (eighth from right).

On Tuesday, March 24, BNL unveiled renovated Chemistry Department laboratories that will help brain researchers advance in their studies of drug addiction, mental illness and aging.

The $2.2 million overhaul gives chemists in BNL's Center for Imaging & Neurosciences more sophisticated equipment and 50 percent more work space than before for pursuing their forefront studies in radiotracer chemistry research and development, and the production of radiotracers used in PET studies at BNL.

"Radiotracer chemistry is at the heart of our ability to image and understand the function of the human brain," said Joanna Fowler, who leads BNL's radiotracer team. "This new laboratory will keep Brookhaven scientists in the forefront in the development of new radiotracers which can be applied to problems in medicine."

"This is a very special chemistry lab — the heart of our radiotracer development program," said Chemistry Chair Carol Creutz, who commended Fowler on her tenacity in seeing the project through to completion, Dave Schlyer on his planning of the new facilities and everyone else on the

(continued on page 4)

ACS Award Goes to Fowler

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

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Brookhaven Town Honors Volkow

Nora Volkow, Chair of the Medical Department and Director of Nuclear Medicine at BNL, is one of 13 women who will be honored 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* maga-

(continued on page 2)

Unique DOE-EPA Agreement Promotes Pollution Prevention

Roger Stoutenburgh

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 John 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.

At a media conference held at the U.S. Department of Energy's (DOE) on-site Brookhaven Group office on Monday, March 23, Martha Krebs, Director of DOE's Office of Energy Research, and Jeanne Fox, U.S. Environmental Protection Agency (EPA) Regional Administrator, signed an innovative interagency agreement to promote pollution prevention and compliance with environmental safety regulations throughout BNL operations.

Under the voluntary agreement, the first of its kind in the nation, DOE, overseen by EPA, will support comprehensive evaluations of environmental processes and activities at BNL. 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," noted Secretary of Energy Federico Peña in a news release issued jointly that day by DOE and EPA.

The agreement is the direct result

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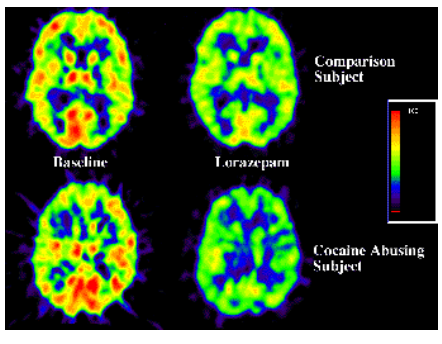
PET Research Yields Clues as to Why Addicts Crave Cocaine

In a discovery that strikes at the very heart of cocaine addiction, BNL scientists may have found a clue to why addicts crave the drug so strongly and use it repeatedly.

Their study, 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.

"While we do not yet know if this is damage caused by the cocaine use or is already present in the addicts' brain chemistry, this is an important step in understanding why people use cocaine repeatedly, feeding an addiction that is destructive both physically and socially," said team leader Nora Volkow.

At BNL's Regional Neuroimaging Center, Volkow, Joanna Fowler and their colleagues found the signs of brain-chemistry damage using the brain-scanning technique known as PET. Twice, they scanned the brains of 27 volunteers — 13 cocaine addicts and 14 non-drug users. Then, they looked for differences.



In this side-by-side comparison of PET scans from two subjects, the top two scans show a non-drug user's brain before and after taking a dose of lorazepam; the bottom two are from a cocaine addict. Note the difference in activity between the two scans in the right-hand column: The addict's brain is more sensitive to lorazepam, indicating an abnormal response to stimulation of the GABA pathways that transmit dopamine "pleasure signals" in the brain.

The first scan was performed after the volunteers were given a placebo, the second after they were given the drug lorazepam, known commercially as Ativan and used to treat anxiety.

"For this study, we were able to use lorazepam in place of cocaine because lorazepam stimulates the same chemical pathways that transfer signals between brain cells when a person uses cocaine," Volkow explained. "These pathways let our brains receive the message sent by the neurotransmitter chemical dopamine — the message that tells us that what we're doing is pleasurable and we should do it again."

In other studies, some using the actual subject drugs (see story below), Volkow and others have shown that cocaine and other drugs affect the brain's dopamine system, causing the "pleasure message" to be repeated and reinforcing the desire to take the drug.

The PET scans showed drastic differences between lorazepam's effect on cocaine addicts' brains and the effects in the comparison volunteers. The difference, said Volkow, indicates that addicts are more sensitive to lorazepam because of damage to a crucial chemical pathway called GABA. As the brain's main inhibitory neurotransmitter, GABA tells neurons to stop firing.

Cocaine addicts' abnormal response to lorazepam, which stimulates GABA pathways, may also explain their increased propensity to seizures and the sleep abnormalities seen in such subjects.

Said Secretary of Energy Federico Peña, "Dr. Volkow and BNL have made important contributions to our understanding of addiction, which can have lasting impacts on how our society copes with this public health problem. I congratulate her team for this progress." — Kara Villamil

Fowler & Volkow Discuss Use of Drugs in Clinical Research

In their research into drug addiction, BNL's Joanna Fowler and Nora Volkow have used real cocaine and real drug addicts to gain real insights into this affliction. Like all human study research conducted at BNL, their research has been conducted under strict protocols and reviewed by several committees, including Institutional Review Boards at Brookhaven, at the Veterans Administration in Northport, at University Hospital at Stony Brook, and, for some projects, at Columbia University.

Nora Volkow

Recently, Fowler and Volkow's research was audited and found to be of the highest standard. In a few months, they will begin investigating drug addiction using crack cocaine in a collaboration with Columbia that has been approved by the U.S. Food & Drug Administration.

This summer, in another approved PET study, Stephen Dewey, Chemistry Department, will begin clinical trials with cocaine users to see if a medicine called vigabatrin, already approved to treat epilepsy in children, can block the effects of cocaine in humans, as he has already shown it to do in animals.

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.

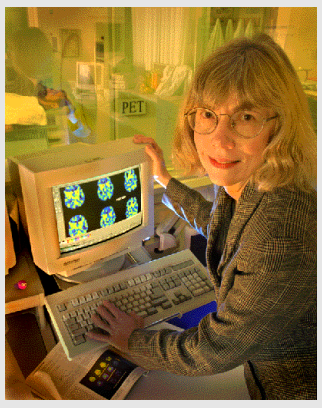
BB: Why do you do research on drug abuse?

NV: Drug abuse is one of society's most devastating 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: Although research on drug abuse should ultimately benefit both abusers and the rest of society, it's ethically important to consider that research with drug abusers is targeted to a problem that directly affects them, and thus they are not bearing a burden for research that will benefit another population. This is an important point relating to the concept of justice, one of the three basic ethical principles for the protection of human subjects, which is put forth in one of the major guidelines of clinical research, the 1979 *Belmont Report of the National Commission for the Protection of Human Subjects of Biomedical and Behavioral Research.*

BB: Investigators doing research on drug abuse are frequently criticized for doing research in drug addicts. Why?

NV: Critics apply different standards to drug abuse research than to other types of clinical research, largely because they do not recognize addiction as a medical illness. Failure to treat addiction as a medical disease stems from the belief that addicts are addicted because of their own free will, without an understanding that, for addicts, the drug produces a series of responses that take over their behavior. Most of us were brought up under the idea of free will and of will power, so it may be hard to accept that a drug can disrupt someone's brain process in such a way that the subject loses control of an apparently conscious and voluntary behavior.



Joanna Fowler

photos by Roger Stoutenburgh

JF: But it is true: Drug intake may reflect an unconscious reflex activation of brain pathways. Certainly, addicts don't want to be addicted, and, when they started taking the drug, they most likely never imagined where it would lead.

BB: What about the concern that addicts will do anything to get drugs, so their participation in clinical research protocols cannot be considered voluntary?

NV: But that's really no different from medically sick patients who will do anything in the hope of knowledge that may help them. If we treat the addicts differently, we're presuming that their motivations are always clouded by the desire of getting the drug and that they can't make a valid decision. That's a judgment that it simply isn't fair for us to make.

BB: In 1995, the Advisory Committee on Human Radiation Experiments criticized the policy of giving a volunteer fee to drug addicts who volunteer for clinical research. By giving such a fee, or by following clinical study protocols that administer a drug of abuse to a current drug abuser, aren't you just making it easier for an addict to feed an addiction?

NV: No. As documented by the College on Problems of Drug Dependence, also in 1995, drug abusers will obtain drugs or the money to buy drugs regardless of whether they volunteer for a clinical protocol or not. And there is absolutely no evidence that clinical investigations negatively affect the addictive behavior of the subject in any way .

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.

Volkow Honored (cont'd.)

zine cover story on May 5, 1997. Volkow and her colleagues demonstrated for the first time in human subjects that cocaine causes euphoria by increasing dopamine, a chemical substance in the brain that is important in movement, motivation and reward. The researchers also found that cocaine users have a reduced glucose metabolism in the part of the brain known as the orbital frontal cortex, which is key to controlling and planning behavior.

"I am honored to receive this award from Brookhaven Town," said Volkow. "Addiction is a devastating problem, and my hope is that my research and that of my colleagues will continue to contribute to greater understanding on the mechanisms underlying it. Brookhaven Lab is home to a regional center of drug abuse research, and using the state-of-the-art facilities available, investigating how drugs affect the brain will continue to be one of my research priorities."

In related work, Volkow has also used PET in pioneering studies of the biochemical changes in the brain associated with alcoholism and aging.

After receiving her M.D. in 1980 from the National University of Mexico, Volkow completed her residency in psychiatry at New York University in 1984. During this period, she used Brookhaven Lab's PET facility to study schizophrenia and to develop a PET radiotracer to measure cell growth in brain tumors.

At the University of Texas Medical School from 1984-87, Volkow led a research program using PET to investigate the toxic effects of cocaine. In 1987, she joined BNL to continue this research. She became Associate Chief of Staff in the Lab's Clinical Research Center in 1990, was appointed Director of the Nuclear Medicine Program in 1994, and, two years later, was named Medical Department Chair.

Volkow has been an associate professor in the Department of Psychiatry at the State University of New York at Stony Brook (USB) since 1987, and a lecturer in the Department of Psychiatry at Columbia University since 1994. She was recently appointed Associate Dean of the USB School of Medicine at BNL. —Diane Greenberg

Drug Addiction Research Featured on TV

BNL's Joanna Fowler and Nora Volkow were interviewed about their research with drug addicts for the second part of a new five-part series hosted by Bill Moyers, which will air on PBS Channel 13, Sunday through Tuesday, March 29-31.

The five segments of *Moyers On Addiction: Close To Home* will air as follows: March 29, 9-11 p.m., "Portrait of Addiction" and "The Hijacked Brain"; March 30, 9-10:30 p.m., "Changing Lives"; March 31, 9-11 p.m., "The Next Generation" and "The Politics of Addiction." The program can be previewed on the Internet at http://www.wnet.org/closetohome/.

New PET Study Connects Brain Chemistry to Symptoms of Old Age

Two of the most common signs that a person is growing old — diminished motor skills and decreased mental agility — are directly connected to a reduced capacity to absorb a key "communications chemical" in the brain, a new PET study has found.

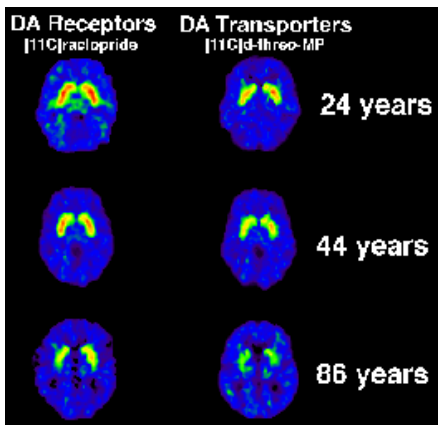
But, the study's authors say, the effect may be preventable, raising the possibility of future means of improving the quality of life for the nation's growing elderly population.

The finding is reported in the March issue of the *American Journal of Psychiatry* by a team of researchers from BNL, the State University of New York at Stony Brook and the University of Pennsylvania School of Medicine.

"This is the first study to look at the significance — both for motor function and cognitive function — of the normal changes in brain chemistry that occur in healthy people as we age," said Nora Volkow, the team leader.

"And while we don't know for certain what might be able to prevent these changes and slow these universal effects of aging, we think it should be possible," Volkow continued. For example, she said, exercise and varied daily activity may help preserve the brain's chemistry.

Volkow, Joanna Fowler and their colleagues focused their study on dopamine, a neurotransmitter that sends signals between brain cells, or neurons, when dopamine molecules released from the end of one neuron attach to docking ports called receptors on a neighboring neuron.



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 spots within the lighter areas indicate highest concentrations; the dark background indicates lowest.

Previous studies had shown that the number of dopamine receptors in the brain decreases with age, and that the symptoms of Parkinson's disease are caused by dopamine problems. But no one had ever looked at the physical and mental result of that decrease in healthy people.

Volkow's team was able to make that connection using PET, in combination with simple, standardized motor function and cognitive tests. At BNL's Center for Imaging & Neurosciences, the research team made 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.

Among other skills, the tests measured the speed with which the subjects were able to tap their fingers on a table, their ability to learn and remember the rules of a card-sorting game, and their success at sorting out contradictory stimuli — for example, fulfilling a request to read out loud the printed name of a color, such as "red," even though the word was printed in a different color, such as green.

The study included only right-handed subjects who had shown no evidence of disease, including psychiatric disorders, and who had no history of alcohol or substance abuse. The group was made up of people of many races and educational levels.

Overall, the results showed that the people with the best performance on the finger-tapping tests also had the highest concentration of dopamine receptors in two areas of the brain, called the putamen and the caudate, that control motor function. Those with best scores on the card-sorting game and the word-color test also showed higher dopamine receptor concentrations in these regions. The researchers adjusted the results to correct for differences in education and age.

The results of the study should encourage future studies on the association between the dopamine system and physical and mental agility.

And, said Volkow, further research might suggest ways to improve dopamine system function and therefore the motor and cognitive performance of older people. Already, researchers in other laboratories have shown that a lower-calorie diet slowed the loss of dopamine receptors in laboratory animals, and that a shift from a sedentary life-style to an exercise-rich life-style increased the number of dopamine receptors.

"Using PET in conjunction with standardized neuropsychological tests opens up a whole new way to study the dopamine system," said Volkow. "We know that sedentary people who start exercising improve their performance on such tests, but using PET, we could find out if this improvement is somehow connected with dopamine. We know that people with Parkinson's disease have a severe deficiency of dopamine, but we need to better understand their decrease in cognitive ability." — Kara Villamil

DOE Symposium Salutes Al Wolf at 75

Chemists from around the world will gather in Dallas on Wednesday and Thursday, April 1 & 2, to salute BNL Senior Chemist Alfred Wolf on his 75th birthday.

The former Chair of BNL's Chemistry Department will be recognized for nearly 50 years of pioneering contributions in the field of organic radiochemistry, at a symposium being held at the American Chemical Society's (ACS) annual meeting, sponsored by the ACS' Division of Nuclear Chemistry & Technology, with partial support from the U.S. Department of Energy and Associated Universities, Inc.

Discussions will focus both on Wolf's own achievements and on subsequent accomplishments by others that his work helped make possible.

"Al's work laid the foundation for many of the nuclear medicine and medical imaging procedures performed in the world today, which help save thousands of lives each year and expand our knowledge of our brains and our bodies," said his colleague and symposium co-chair Joanna Fowler of BNL. "Though he works mainly with elements that are short-lived, his impact on humankind will last forever."

Among the speakers will be Fowler and her BNL colleagues, who have used Wolf's discoveries as the basis for more than two decades of studying brain phenomena. In 1976, Wolf, Fowler and their colleagues developed a form of glucose that is now used in hospitals worldwide to make images of brain function and to diagnose cancer and heart disease PET scanning.

Wolf's career of contributions mainly centers around the synthesis of molecules that contain both radioactive and nonradioactive elements. Such compounds have found a wide variety of uses, from diagnosing disease to tracking the movement of air in the atmosphere, and have helped in the study of basic chemical processes.

The short-lived radioactive elements, such as carbon-11 and fluorine-18, must be made in a small particle accelerator known as a cyclotron, then swiftly attached to the organic molecules before their usefulness fades — adding a "beat the clock" urgency to already intricate chemical synthesis processes.

After the radioactive elements have been attached to an organic molecule, the result is called a radiotracer — a chemical beacon that sends a faint but detectable signal. If a radiotracer is injected into the body, that signal can be picked up by medical imaging equipment to track, for example, brain activity or the location and movement of a drug such as cocaine.

Al Wolf began his career as a physical organic chemist in 1951, when he joined BNL's Chemistry Department.

His early studies involved research on the chemical fate of carbon atoms, using the Brookhaven Graphite Research Reactor, the 60-inch Cyclotron and the Cosmotron, BNL's first accelerator. His investigations of the factors controlling the chemistry of radioactive atoms such as carbon-11 provided the knowledge required to control the chemistry occurring in accelerator targets.

By the mid-1960s, Wolf's fundamental studies had laid the groundwork for the synthesis of small, radiolabeled compounds in pure form for organic synthesis and basic chemistry studies. This grew into a new interest in developing radiotracers labeled with short-lived positron emitting isotopes like carbon-11 so that the tracer method could be applied to visualize biochemical transformations in living systems.


Alfred Wolf

Fowler said, "Al approached and solved problems in this area with his typical rigorous style, measuring important characteristics of the hot atoms and developing the targets that came to be used in the cyclotron to produce the large quantities of C-11 and F-18 labeled precursors. He also developed the methods that we now use routinely to make the radiotracers used in PET imaging. Indeed, most of the cyclotron-PET centers around the world have one or more individuals who, to their great advantage, have spent part of their careers at Brookhaven working with Al Wolf."

A member of the National Academy of Sciences, Wolf was given ACS' Nuclear Chemistry Award in 1970, and the Society of Nuclear Medicine's de Hevesy Nuclear Medicine Pioneer Award in 1991. In 1996, he was honored by the Institute for Clinical PET with its Distinguished Scientist Award. — Kara Villamil

Award to Fowler (cont'd.)

such as these offer important clues to understanding addiction and the epidemiological features of smoking.

In 1976, Fowler, working with Al Wolf and others, developed ^{18}F-fluorodeoxyglucose (FDG), a radiotracer used in PET. Today, FDG is widely used in PET centers around the world to diagnose and study neurological and psychiatric diseases and to diagnose lung and colon cancer.

Fowler earned a B.A. in chemistry from the University of South Florida in 1964, and a Ph.D. in chemistry from the University of Colorado in 1967. After completing postdoctoral appointments at the University of East Anglia, England, and at BNL, she joined the staff at Brookhaven in 1969.

Fowler has written 250 published scientific papers and holds six patents for radiolabeling procedures. In addition, her research has garnered numerous honors, including the Jacob Javits Investigator Award in the Neurosciences in both 1986 and 1993. She shared the 1986 award with 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 received the Aebersold Award from the Society of Nuclear Medicine and a U.S. Department of Energy Research Award. — Diane Greenberg

BNLers to Speak at ACS Meeting

Among the BNL scientists who will be speaking at the annual meeting of the American Chemical Society on subjects related to medical imaging and the brain are the following members of the Chemistry and Medical Departments:

- **Stephen Dewey**, "PET Studies of Neurotransmitter Interactions," from a paper written with J.D. Brodie and Al Wolf.
- **Yu-Shin Ding**, "Probing the Biochemical Basis of the PET Image," with Joanna Fowler and Wolf, and "PET Imaging of Optically Active Drugs, from a paper written with Fowler and Nora Volkow.
- **Joanna Fowler**, "Alfred Wolf's Career at Brookhaven," "Rapid Organic Synthesis, PET and Imaging the Human Brain," and "PET Studies of Addiction."
- **Dave Schlyer**, "Development of Cyclotron Targetry for PET," from a paper written with Mahmoud Firouzbakht, Richard Ferrieri and Wolf.
- **Nora Volkow**, "Imaging the Biochemical Effects of Drugs on the Human Brain."

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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. (AUI) sponsored the party to thank Bond and Bebon for their leadership under most unusual and difficult circumstances, during the interim period between the U.S. Department of Energy's (DOE) termination of its contract with AUI 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 bittersweet evening. But the bright balloons, the friendly atmosphere, the spontaneous performance of BNL bagpiper-in-residence John King, the heartfelt and witty speeches, and, above all, the overwhelming gratitude expressed by everyone 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 is now 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 Joan Shands, who had been DOE's transition manager during the two-month changeover from AUI to BSA.

"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 have seen the spirit of the institution begin to rebound and regain momentum to address the challenges that lie ahead."

In congratulating Bebon, 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."

Joe Rubino

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 BNL's Interim Director and Deputy Director, respectively. Other gifts were heart-shaped boxes of chocolate, to reflect the heartfelt thank-yous being sent their way, and crystal sculptures — a globe for Bond, for having had the weight of the world on his shoulders, and a sailboat for Bebon, to represent the hobby he'd had no time for over the past ten months.

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 Willis, AUI's Vice President for Environment, Safety & Health, said he "felt very proud of the leadership they exhibited for the Lab at this time." Willis expressed the thanks of AUI's corporate officers and Board of Directors, who continued to wish every success to the Laboratory.

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

Cleanup Information: BNL & Public Meetings

As part of Brookhaven's continuing efforts to keep employees and the local community informed about Lab 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 Berkner Hall lobby, from 11 a.m. to 1 p.m. All may attend the other two sessions, which will be held in the Activities Room of the Longwood Middle School, 41 Yaphank-Middle Island Road, Middle Island, on Saturday, April 4, 10 a.m.-1 p.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.

At each session, posters and maps will show the extent of the groundwater contamination that is the focus of this project, the proposed cleanup system to be used, the project schedule, and past accomplishments that have addressed soil and groundwater contamination on the Lab site. BNL staff will be on hand to answer questions and discuss concerns.

Labs Renovated (cont'd.)

team for their efforts.

Both Creutz and Fowler noted with regret the absence of Al Wolf, who had been hospitalized that day after an injury. Wolf had pioneered the program at BNL, which has led to Lab chemists' being world leaders in the field of attaching short-lived radioisotopes to chemical compounds, creating radiotracers that make it possible to see biochemical activity and drug action in the human brain with PET (see story on page 3).

After first setting foot in the old labs in 1956, Wolf did some "pretty daunting things for those days," Fowler said, noting that these efforts "have led to some remarkable advances of neuroscience and of our knowledge of the brain.

"Al worked in the most primitive of labs, but amazing things came out of them," Fowler added. "Now, we have both the kind of labs that match the science that we do and the people with the imagination and drive to do it."

Fowler also acknowledged the contributions of the U.S. Department of Energy's (DOE) Gerald Goldstein, "our angel at DOE," for his efforts in obtaining funding for the new laboratories from DOE's Medical Applications Program in the Office of Biological and Environmental Research, Office of Energy Research.

The labs are located in Bldg. 901, adjacent to small, room-size particle accelerators called cyclotrons. After radioisotopes are produced in the cyclotrons, they are brought into the nearby labs, where chemists perform their work.

For example, by attaching a short-lived, radioactive form of fluorine to glucose, BNL chemists have provided physicians with a simple means of tracking brain metabolism — and therefore brain activity. Known as ^{18}FDG, the radiotracer has become the standard radiotracer for PET scans that are used in hospitals around the world to diagnose cancer and other diseases.

BNL's research focuses mainly on creating new radiotracers that are used in studies that seek basic understanding of how aging, mental illness and drugs, including cocaine, alcohol and tobacco, affect the human brain. A major focus has been dopamine, a communications chemical or neurotransmitter that carries signals of pleasure and other sensations through the brain (see stories on page 2 & 3).

Designed by BNL's Plant Engineering 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. — Kara Villamil

DOE-EPA Agreement (cont'd.)

of a comprehensive inspection of BNL that EPA conducted at Peña's invitation, issued in May 1997 upon terminating DOE's contract with the Lab's former manager, Associated Universities, Inc. (AUI). 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 with EPA oversight that would improve environmental safety management at BNL. The present memorandum of agreement, developed by EPA and DOE, with the assistance of EPA's National Environmental Investigation Center in Denver, Colorado, fulfills Peña's commitment. It is considered as phases 2 and 3 of the inspection, which, forming phase 1 of the agreement, identified areas of noncompliance.

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, evaluate compliance with environmental regulations and identify pollution prevention and waste minimization opportunities.

For phase 3, DOE and BNL will develop a five-year annual audit program. The auditors will evaluate the Lab's progress in establishing an environmental management system to assure full regulatory compliance and continuous improvement in environmental stewardship. Initially, the audits will be made by BNL experts. Later, to maximize objectivity, DOE will call on outside expertise.

BNL will also provide quarterly reports to EPA, state and county environmental agencies and community groups for review and comment as the audit progresses. — Liz Seubert

Spring — and Snow — in the Air!

Roger Stoutenburgh

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 1.5 inches at Brookhaven Lab. These Laboratory visitors wasted no time in taking advantage of the unseasonable surprise. They built two snowpeople who are only memories now — like the other 3 inches of snow that had fallen at BNL previously during the winter of 1997-98. For meteorological purposes, the winter season is not yet over. But with only 4.5 inches of snow recorded to date, this year seems to be on track for setting a new record for the least snowfall, since the previous low was 5.7 inches for the winter of 1972-73.

See Supplement for other news and for classified ads.

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 Jersey, pictured 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. Everyone has read about it and discussed 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 Jeff Williams, Ext. 5587, or e-mail williams @mail.sep.bnl.gov.

First Tournament

The league will host its first tournament of this season at Swan Lake Golf Course, on Wednesday, April 22. Both members and nonmembers are welcome to sign up by the deadline of Friday, April 17. For details and an application form, call Michael Lenz, Ext. 5423, or Hank Arnesen, Ext. 5935.

A Winning Team

Roger Stoutenburgh

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 of six 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.

Fore Golf Champs!

Roger Stoutenburgh

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 Racaniello in Division 1. Congratulations, champions!

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 Bell, Environmental Safety & Health (ES&H) Services Division; Tracy Blydenburgh, Reactor Division; Bob Colichio, 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 BSA, 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.

However, if you will not be on site March 30-April 3, then you may cast an absentee ballot today, March 27, in person at the Recreation Office, Bldg. 185. For more information, contact Recreation Supervisor M. Kay Dellimore, Ext. 2873.

Date	Time	Place
Monday, 3/30	11:30 a.m. to 1:30 p.m.	Berkner Hall
Tuesday, 3/31	10 a.m. to 2 p.m.	Credit Union
Wednesday, 4/1	11:30 a.m. to 1:30 p.m.	Berkner Hall
Thursday, 4/2	11:30 a.m. to 1:30 p.m.	Berkner Hall
Friday, 4/3	10 a.m. to 2 p.m.	Credit Union

March Into May

Three Weeks Along — Keep on Marching!

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. The ten-week 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.

Everyone who signed up for the program was entered into a drawing, and the winners are: Jan Naidu, ES&H Services Division, and Bruce Style, Information Services Division, who each won a Canon camera with case; Claire Retundi and Linda Sinatra, 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 — so keep marching! For more information, contact Health Promotion Specialist Mary Wood, Ext. 5923.

Defensive Driving

The Environmental Safety & Health Services Division will offer defensive driving classes to all BNL employees, guests and their family members. Classes will be presented by Metropolitan Life instructors once a month from April 1998 to March 1999.

The six-hour course will be held 6-9 p.m. over two weekdays 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 up to four 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.

Tread Safely

The Safety Shoe Office located in Bldg. T-88 will be closed next week, Monday, March 30, through Friday, April 3. The office will reopen on Monday, April 6.

Weight Watchers

In its approach to weight management, Weight Watchers offers a nutritious food plan, an activity plan and a behavioral support plan. Also, the new 1-2-3 Success Weight Loss Plan is more flexible and easier to follow.

Registration for the next on-site, lunchtime Weight Watchers series will be held on Wednesday, April 1, from noon to 1 p.m. in the south dining room of the Brookhaven Center.

The class will meet for the first session on Wednesday, April 8. The $89 per-person fee includes ten sessions. For more information, call Mary Wood, Ext. 5923 or 6251.

Bowling

Week of March 16

Red & Green League

R. Mulderig, Sr. 257/223/209/689 scratch series, R. Mulderig, Jr. 268/212/671 scratch, E. Larsen 253/206/633 scratch, W. Powell 220/202/614 scratch, R. Raynis 246/638 scratch, J. Meier 238, B. Giuliano 236, A. Pinelli 227/606 scratch, K. Koebel 215/607 scratch, J. LaBounty 211, G. Mack 209, J. Toner 205, E. Sperry III 201, J. Griffin 200.

Purple & White League

R. Eggert 256/222/207/685 scratch series, T. Mehl 232/216/178/626 scratch, M. Meier 220, B. Mullany 220, K. Koebel 209, B. Tozzie 208, D. Keating 207, M. Guacci 201, S. Elliott 189, M. Yanez 195, L. Simes 190, P. Manzella 188, P. Wichnowski 185, J. Gormley 182, T. Dilgen 182, W. Rasmussen 182, F. Simes 178, R. Koebel 178/176, L. Hermes 175, L. Mulderig 174, K. Conkling 173, Donna King 173.

Volleyball

Standings as of March 20

League I		**League III**	
Bikers & Spikers	60-12	Silver Bullets	42-9
Set to Kill	44-28	Group Sets	40-11
Scared Hitless	38-34	Just 4 Fun	29-25
RudeDogs	37-35	Upton Ups	25-26
ReTurners	1-71	Six Samurai	21-30
League II		Just In Time	16-35
Safe Sets	46-11	NWO	7-44
Spiked Jello	43-14	**Open League**	
Monday Nite Live	40-17	Spikers	50-19
Jao-About-That	32-25	Shank,Carry&Throw	40-29
Undecided	31-26	Death Volley	31-38
Nuts & Bolts	22-35	Pass, Set & Crush	26-43
Fossils	12-45	Far Side	24-42
Setups	2-55		

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 AT&T Wireless Services corporate cellular rate; free digital features such as caller ID, voicemail with notification, numeric paging and self-dispatch alphanumeric messaging; and three free digital phones, the Nokia 2160, the NEC DT 2000 and the Ericsson DH318. Call Michael Weisinger 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 Ellerbee, 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 Hoey, Ext. 2821.

Saturday Shopping

Brookhaven Science Associates is continuing to provide apartment area residents and dormitory residents with the Saturday shopping car service from BNL to Shirley.

As in the past, the pickup point is the Fleming House parking lot. Starting at 8:30 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.

Classified Advertisements

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 request consideration for themselves, and, second, for 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; call the JOBLINE, Ext. 7744 (344-7744), for a complete list of all job openings; use a TDD system to access job information by calling (516) 344-6018; 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 named.

POSTDOCTORAL RESEARCH ASSOCIATE - Trained in biochemistry, cell biology, genetics or closely related fields, with a strong background in molecular genetics, immunological methods and/or protein purification. Experience with techniques in protein chemistry is desirable. Will participate in development and characterization of new immunological reagents for detecting post-translational modifications associated with the response of mammalian cells to DNA damage, and in characterizing DNA-PK, a large, nuclear serine/threonine protein kinase that is required for V(D)J recombination and DNA double-strand break repair. See http://bnlstb.bio.bnl.gov/biodocs/cellbio/Anderson.htmlx for additional information. Contact: Carl Anderson, Biology Department.

LABORATORY RECRUITMENT - Opportunities for Laboratory employees.

NS7414. Residence Custodians - (temporary, 5/4/98-9/25/98) Administrative Support Division.

OPEN RECRUITMENT - Opportunities for Laboratory employees and outside candidates.

NS7516. PROGRAMMER/SYSTEM ANALYST POSITION - Requires a bachelor's degree in computer science or related discipline, and a minimum of five years' hands-on experience in the field. Working knowledge of Microsoft Office and Windows environments required, conceptual knowledge of two-tier architecture, relational databases and PeopleSoft a plus. Will be responsible for the implementation of PeopleSoft modules on the Financial Systems Implementation Project. (reposting) Financial Services Division.

DD4774. TECHNICAL POSITION - Requires an AAS degree in electronic technology (BSET preferred) or significant relevant experience with high-voltage power supplies and/or radio frequency (rf) electronics. Will assemble, test and troubleshoot electronic circuits. Must be able to work from schematics, sketches and verbal instructions. May be required to work call-in hours as needed. (reposting) Alternating Gradient Synchrotron Department.

DD7344. TECHNICAL POSITION - (term appointment) Requires an AAS degree in a technical field or equivalent. Knowledge or significant experience in one or more disciplines such as mechanics or electromechanical assembly also required. Must be able to adhere to written procedures and follow quality-assurance standards in all work assignments. Responsibilities will include, but will not be limited to, assignments in magnet assembly that require developed skills and performance of functions with minimal supervision. Knowledge of superconducting magnet assembly procedures highly desirable. Relativistic Heavy Ion Collider Project.

DD7442. SR. STANDARDS INSPECTOR POSITION - Will work from blueprints and engineering specifications, perform all phases of in-process and acceptance inspection of purchased and Laboratory-fabricated parts and equipment. Will perform inspection as required throughout the Laboratory and off site. Must be proficient in the use of inspection equipment and be capable of programming and operating the Helmel Model Number 860-401 DCC machine. Position requires a basic knowledge of metals, machining, welding and sheet-metal fabrication. Must be willing to work the night shift (4 p.m. to 12:30 a.m.). Central Shops Division.