BROOKHAVEN BULLETIN
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BROOKHAVEN NATIONAL LABORATORY

Top Quark Discovery: BNL Contributes Expertise, Hardware, Software

A worldwide search that began in 1977 ended on Thursday, March 2, when the discovery of the top quark was announced by two rival experiments at the Tevatron collider at Fermi National Accelerator Laboratory (Fermilab). The experiments' collaborations each submitted their findings to *Physical Review Letters*, which will publish the papers soon.

One of the discoverers is a collaboration known as the Collider Detector at Fermilab (CDF), to which 36 institutions belong. The other is a 42-institution collaboration called DZero (D0), which, since its inception in 1983, has included members of the Omega Group in BNL's Physics Department.

After witnessing hundreds of thousands of proton-antiproton collisions a second and having seen its first top-quark candidate produced by one of these collisions two years ago, D0 made its announcement last week based upon the analysis of 17 events observed to date, 11 of which provided enough information to measure the quark's mass.

According to that analysis, the top quark has eluded physicists for nearly 20 years because it is so massive: D0 found that the top tips the scale at 199 billion electron volts (GeV) — making it heavier than many atoms. This finding is consistent with the top-quark mass of 176 GeV reported by CDF.

BNL Physicist Bruce Gibbard heads the on-line data acquisition for D0, and BNL Physicist Serban Protopopescu led the top-quark analysis group and continues as the leader of D0's off-line data reconstruction and analysis. As it turned out, that analysis relies heavily upon the measurements made by one of the D0 detector's four major systems: the central calorimeter, which was designed, engineered and built by the Omega Group.

Roger Stoutenburgh

Before a Physics Department seminar last Monday on D0's discovery of the top quark, Serban Protopopescu displays a photo taken of the detector and many of those who work on it.

"I am pleased that BNL has contributed in a substantive way to the success of the D0 detector and to the observation of the long-sought top quark," says BNL Director Nicholas Samios. "The reported top mass of 180-200 GeV should both teach all of us humility in our lack of predictive powers, since early estimates started at 15 GeV, and again illustrate the unexpected ways of nature, since this quark possesses such a large mass compared to the others."

Standard Model Prediction

As predicted by a particle-physics theory called the Standard Model, the top is one of six "flavors" of quarks in three generations: up and down, charm and strange, and top and bottom. While these elementary particles were all present at the birth of the universe, only up and down quarks exist today in ordinary matter. In particular combinations of three, they make up the protons and neutrons found within atomic nuclei.

The other two generations of quarks have not naturally occurred since the Big Bang, so these four quarks have had to be created by high-energy particle accelerators. Since the 1977 discovery of the bottom quark, also at Fermilab, physicists around the world had hunted for the last holdout — the top — at higher and higher energies, ultimately finding it using the 1.8 trillion electron volt (TeV) Tevatron, which is the world's highest energy collider at present.

"The top discovery completes one aspect of the Standard Model," explains BNL Senior Physicist Howard Gordon, head of the Omega Group, "but it still doesn't answer all of our questions, such as 'Why is the top so heavy?' and 'Why does matter have mass?' "

In addition, the discovery of the top quark may aid in understanding the violation of CP-invariance, a Nobel prize-winning discovery made at Brookhaven in 1964 that results in the observed excess of matter over antimatter in the universe and the existence of the universe itself.

Adds Gordon, "With the future upgrade of the Tevatron to increase beam intensity by a factor of five and with improvements to the detector, I see more physics coming out of D0 over the next five years before we move on to the next energy frontier."

Crucial Calorimeter

Because of its interest in high-mass phenomena at the high-energy frontier, the Omega Group became involved in D0 at the birth of that experiment in 1983. Conceived five years later than CDF,

(continued on page 2)

BNL Lecture: Speeding Up Human Genome Sequencing

Hardly a month passes without news reports of another success in identifying a human gene whose malfunction can produce disease. The hope is that decoding the DNA that carries the genetic information will provide clues to the causes of the disease, aiding the search for prevention or cure.

The Human Genome Project, a national endeavor to sequence, or decode, all human genes, holds great promise for speeding these medical advances and for increasing our understanding of human biology generally. But there are 100,000 human genes, formed from DNA containing three billion base pairs of information. The challenge is to develop technology capable of determining the sequence of these three billion base pairs within the next ten years or so.

Roger Stoutenburgh

William Studier

In 1992, researchers William Studier, John Dunn and Jan Kieleczawa, all of BNL's Biology Department, published a paper detailing a breakthrough that promised to increase the speed of DNA sequencing at least tenfold. By improving and simplifying a sequencing method called primer walking, they opened the door to automation of the process with no unnecessary duplication and no loss of accuracy.

To explain this innovative work, Biology Department Chairman William Studier will deliver the 304th Brookhaven Lecture, "DNA Sequencing for the Human Genome Project." His talk will begin at 4 p.m. in Berkner Hall on Wednesday, March 15, and he will be introduced by John Dunn.

In his talk, Studier will briefly describe the basics of DNA sequencing, explaining the essential terminology and illustrating the process with easily understood diagrams.

Among the difficulties researchers face, he will point out, is that although there are three billion base pairs of DNA to sequence, present technology limits the amount that can be sequenced at one time to strands only 500 base pairs long. After that, a new start must be made, with a new primer to start it.

Usually, each primer is 18 bases

(continued on page 2)

AUI Distinguished Lecture

Understanding Aging and Cancer

Today's Americans are the healthiest in history. Since 1950, life expectancy has increased every year in the U.S., while the death rate from all cancers combined — excluding those attributable to smoking — has declined.

Nonetheless, further in-depth investigations must be conducted into the causes of aging and cancer if even greater strides are to be made.

Bruce Ames, Director of the National Institute of Environmental Health Sciences (NIEHS) Center at the University of California (UC), Berkeley, whose work has had a major impact on both basic and applied research on mutation, cancer and aging, will give an AUI Distinguished Lecture on "Understanding the Causes of Aging and Cancer," in Berkner Hall on Friday, March 17, at 4:30 p.m. Coffee, tea and cookies will be served in the lobby before the lecture.

While at BNL, Ames will also present a Biology Department Seminar entitled "Oxidants, Antioxidants and the Degenerative Diseases of Aging," at 11 a.m. on March 17, in the Seminar Room of Bldg. 463.

The creator of the Ames test, used by more than 3,000 laboratories and all major drug and chemical companies to detect potential carcinogens, Ames also holds strong views on the causes of aging and cancer.

He contends, for example, that the

Bruce Ames

degenerative diseases of aging, such as cancer, cardiovascular disease, cataracts and brain dysfunction, are in large part due to oxidants produced as by-products of normal metabolism. These oxidants damage DNA, proteins and lipids, and repair mechanisms cannot keep up.

Antioxidants, such as carotenoids and vitamins C and E, which are abundant in fruits and vegetables, play a major role in minimizing oxidant damage. For example, studies show that people who eat few fruits and vegetables have double the risk of most cancers compared to those who eat five servings a day. But only nine percent of the U.S. population eats the

(continued on page 2)

Top Quark (cont'd)

D0 was named for the accelerator region where the 4,700-ton detector resides and took its first data in 1992, also five years after CDF.

The Omega Group contributed to D0's software, with the contributions by Gibbard and Protopopescu, and its hardware, with the delivery of a central calorimeter system.

After design work and prototype testing were completed, a factory was set up on the BNL site to build the 64 modules making up D0's 315-ton liquid-argon central calorimeter. Assembled at Fermilab in January 1991, that device measures the direction and energy of the particles, including electrons and "jets," showers of particles mainly made up of what are called hadrons, emerging at angles greater than 45 degrees from the collisions of protons and antiprotons within the Tevatron.

"Because the top is so heavy, it decays quickly into other particles that are detected mainly in the central calorimeter — which made it crucial to the discovery of the top," Gordon points out.

Seeking Signatures

As D0 and CDF found, when a proton and antiproton collide at a combined energy of 1.8 TeV inside the Tevatron, they rarely produce top quarks.

When these collisions do result in top quarks, however, they appear in pairs of top and antitop quarks, which promptly decay: The top into a W^+ particle and a bottom quark; the antitop into a W particle and an antibottom quark. In turn, these W bosons and bottom quarks spontaneously disintegrate: The W decays in several ways, into an electron and/or muon, plus a neutrino or into two jets; the bottom turns mainly into a jet that has a distinctive signature.

Since a top event and its resulting signatures are so rare, D0's on-line software was designed to record only the most likely-looking collisions for later off-line event reconstruction and analysis, registering the outgoing particles' path and energy as they travel through the detector.

Uncovering the Candidates

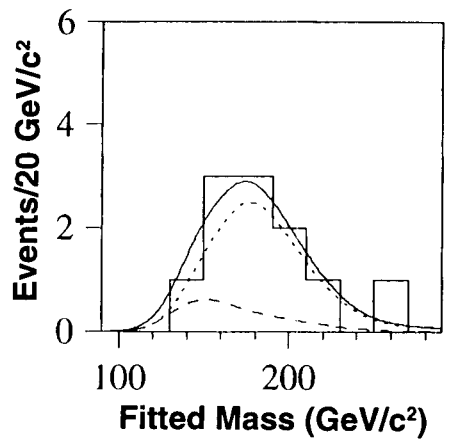
Protopopescu explained that, to uncover the 17 top quark candidates, D0 physicists relied heavily on the calorimeter information to determine that the necessary decay products had been identified by their telltale signatures.

First, out of 40 million events recorded in the calorimeter, tens of thousands were selected based on the presence of a W boson, the signature of which is the detection of an isolated electron or muon, plus a large amount of missing transverse energy indicating the production of a high-energy neutrino.

Next, these tens of thousands of events were reduced to a few hundred that produced high-energy jets in the calorimeter. The jets are a signature that high-energy quarks or gluons are produced, in addition to the W bosons.

Finally, by studying the pattern of energy distribution in the calorimeter, the physicists selected 17 events that had the characteristics expected from the decay of massive objects. Only four events from standard background would have been expected to satisfy all the selection criteria, so the 13 excess events are attributed to top-quark production.

By studying other characteristics, such as the number of events with more than one lepton (electrons or muons) or the number of observed jets, the physicists showed the excess events to be consistent with what is expected if the events contained a top and an anti-top quark.



A plot showing the fitted mass distribution for top-quark candidate events (histogram) with the expected mass distribution for 199 GeV/c² top-quark events (dotted curve), background (dashed curve), and the sum of top and background (solid curve) for standard event selection.

Of the 17 events, 11 could be used to calculate the top quark's mass, which came out as 199 GeV, with a statistical error of plus or minus 20 GeV and a systematic error of plus or minus 22 GeV.

No Disagreement

"This is higher than what CDF found, but, within errors, we are not in disagreement," says Protopopescu. "Our mass error estimate is more conservative than CDF's because we calculate a larger contribution to the error from the complexity of the events. Much of the systematic error comes from uncertainty in the energy scale, which will decrease with further study of the detector over time. A bit of a surprise is that the top's mass is turning out to be close to the limit of what theorists thought acceptable."

Since the Tevatron is scheduled to collide protons and antiprotons until the beginning of August, D0 and CDF are expected to gather twice as much data this year, which will help refine the analysis.

Protopopescu concludes, "The top quark is a good laboratory because it is so heavy. According to the Standard Model, it can only decay one way, into a W boson and a bottom quark; so, if we find any other decay mode, then this would indicate a breakdown in the Standard Model. In three to four years from now, with the Tevatron running at higher luminosity, we expect to get better measurements of the mass and cross section, and to search for any deviations from theoretical expectations."

BNL Contributors

Since 1983, present, retired and former BNLers who have contributed to D0 include: Steve Adler, John Aloi Jr., Samuel Aronson, Hayden Brownell, Brenda Daniels, Donna Earley, Carol Escobar, Mirek Fatyga, John Featherly, Norm Graf, Bruce Gibbard, Howard Gordon, Rae Greenberg, Jan Guida, Wlodek Guryn, John Hammond, Kamel Hammoutene, Gene Hassell, Martin Howard, Steve Kahn, Hyon-Joo Kehayias, John Koehler, Jon Kotcher, Peter Kroon, Al Langhorn, Jonathan Lee, Salvatore Marino, Pat Meehan, Mordechai Montag, Irv Polk, Serban Protopopescu, Andris Ruga, Doris Rueger, Richard Ruggiero and Peter Yamin. — Marsha Belford

BNL Lecture (cont'd)

long, costs about $50 and takes a day or two to prepare. Studier will show how, drawing on their extensive experience in this field, he and his colleagues found a way to prime DNA for sequencing by using three six-base primers, called hexamers, which in certain conditions combine together and replace the 18-base primers.

In contrast with the 18-base primers, individual hexamers can be used many times, and a library of hexamers makes primers immediately available at low cost. Not only does this innovation cut time and costs, but it is also suitable for trying out on a larger scale that can be automated.

Studier will conclude his talk by commenting on some of the work being done on the automating process.

William Studier obtained his B.S. degree from Yale University in 1958 and his Ph.D. in biophysics from the California Institute of Technology in 1963. He joined BNL's Biology Department in 1964 as an assistant biophysicist, becoming a biophysicist in 1970 and a senior biophysicist three years after earning tenure in 1971. He became Department Chairman in 1990. He is also an adjunct professor at the State University of New York at Stony Brook. Studier is internationally recognized for his contributions to the genetics and biochemistry of bacteriophage T7, a bacterial virus, and for his physical and chemical analysis of T7 DNA. He also developed a gene-expression system used worldwide to produce foreign proteins within bacterial cells.

After the lecture, all are invited to join Studier for discussion and refreshments. No dinner will be arranged this month.

Note to Employees:

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

Distinguished Lectures Have Distinguished History

Roger Stoutenburgh

Thirty years and 64 lectures ago, in 1965, Associated Universities, Inc., adopted a plan for lectures to be given at BNL on topics of general interest. The plan evolved into the AUI Distinguished Lecture series, for which the 65th speaker will be Bruce Ames (see story, page 1). The first was Ralph Bunche, in January 1966, and subsequent lecturers have included such notables as Hans Bethe, Francis Crick, Freeman Dyson, John Kenneth Galbraith and Stephen Jay Gould. Speakers are selected by the Lab's Lectureship Committee, which has also chosen the 23 speakers in the George B. Pegram Lecture Series since 1959.

Shown here are some of the current committee members: (seated, from left) Jeffrey Coderre, Medical Department; Michael Tannenbaum, Committee Chair, Physics Department; Peter Wanderer, Relativistic Heavy Ion Collider Project; (standing, from left) Walter Kato, Department of Advanced Technology; and Anita Cohen, ex officio, Public Affairs Office. Also shown are Jane Guido and Christine Ronick, Staff Services Division, who see that the lecture and the dinner in the speaker's honor run smoothly. Committee members not shown are: Gerry Bunce, Alternating Gradient Synchrotron Department; Geoffrey Hind, Biology Department; Laurence Passell, Physics Department; Stephen Schwartz, Department of Applied Science; Stanley Seltzer, Chemistry Department; and William Thomlinson, National Synchrotron Light Source Department.

AUI Lecture (cont'd)

three vegetables and two fruits daily that are recommended for good health.

In addition to diets high in fat and low in fruits and vegetables, Ames says major causes of cancer are smoking and infections leading to chronic inflammation, which causes the body to release oxidants that both stimulate cell division and are mutagens.

Also, Ames estimates that hormones that stimulate cell division, such as estrogen, cause about 20 percent of all cancers, while synthetic chemical pollution causes less than one percent.

Thus, Ames questions whether great concern over small amounts of pollution created by humankind is justified. He contests the claim that synthetic pesticides are a major cause of cancer, concluding that the levels of synthetic pesticide residues people consume are trivial, and their cancer-causing potential is extremely low. Ames says the effort to eliminate synthetic pesticides because of unsubstantiated fears about residues in food will make fruits and vegetables more expensive, decrease consumption and actually increase cancer rates.

After earning a B.A. in chemistry from Cornell University in 1950 and a Ph.D. in biochemistry from the California Institute of Technology in 1953, Ames worked at the National Institutes of Health from 1953 to 1967, becoming Chief of the Section of Microbial Genetics in the Laboratory of Molecular Biology in 1962. In 1968, he moved to UC, Berkeley, to become a professor of biochemistry and molecular biology. Eleven years later, he assumed an additional role there as Director of the NIEHS Center.

A member of the National Academy of Sciences, Ames has received many scientific awards, including the General Motors Cancer Research Foundation Prize, in 1985.

Lab Rescue Crews Respond Quickly to Accident at Main Gate

A BNL employee and three others, including two children, were injured on March 1 in a traffic accident at BNL's main entrance that drew the response of eleven of the Lab's police and emergency medical personnel.

The two-car crash occurred just before the evening rush hour, and highlights anew the need for caution at the intersection of Princeton Avenue and Route 46, William Floyd Parkway, said Michael Carroll, Deputy Chief of the Safety & Environmental Protection Division's Fire/Rescue Group.

"We've had a number of accidents at this intersection, sometimes involving cars moving north and south on William Floyd at highway speeds," explained Carroll, whose group sent four emergency medical technicians (EMTs), an ambulance, a rescue truck and a fire engine to the scene in an effort coordinated by Capt. Robert Safranek.

Added Carroll, who was Fire/Rescue's incident commander at the scene, "Good defensive driving techniques are appropriate at all intersections, particularly highway intersections such as this one."

Last week's accident involved James Waters of the Department of Applied Science, who was leaving the Lab alone in his car and intending to make a turn into the southbound lane of Route 46. A motorist in the northbound lane struck his car's front end by the wheel well.

A lieutenant and three patrol officers from the Safeguards & Security Division were the first to reach the accident scene, and helped to clear the intersection and direct traffic while Suffolk County police responded. A tow truck from the Staff Services Division Motor Pool was called in to remove vehicles.

After being treated by BNL EMTs, Waters was transported to John T. Mather Memorial Hospital in Port Jefferson by Ridge Fire Department emergency personnel. The BNL ambulance transported the occupants of the northbound car, a woman and two children ages 6 and 8, to Brookhaven Memorial Hospital.

Although Waters had been wearing his seatbelt, he suffered a concussion from the impact of his head on the steering wheel, and a broken collarbone. He is now recuperating from his injuries and recognizes that he is lucky to be alive. "A second earlier and I would have been dead," he said.

Carroll emphasized the lesson for BNL employees and visitors. Said he, "When you're leaving the Lab and the light turns green, give a good look to make sure that oncoming traffic has stopped before you enter the intersection." —Kara Villamil

Coming Up

BERA Concert

Lucy DeSa, an outstanding young pianist from the State University of New York at Stony Brook, will give the next BERA concert in the 1994-95 series on Wednesday, March 15, in Berkner Hall at 8 p.m. She will play works from Debussy, Haydn and Schumann.

A $6 donation is suggested.

Sixgun Concert

Original music, popular country and country rock songs and bluegrass, an exciting stage show — you'll get it all with tickets to the SixGun concert on Friday March 17, at 8:15 p.m. in Berkner Hall.

The concert is sponsored by BERA, and tickets cost $9 for adults, and $5 for children under 12 and senior citizens. Purchase them at the door, or in advance at the BERA Sales Office, 9 a.m. to 1:30 p.m., weekdays, or from any of the following:

	Bldg.	Ext.
M. Kay Dellimore	185	2873
April Donegain	134A	2459
Andrea Epple	750	5943
Haskell Frei	750	5651
August Hoffmann	510C	3884
Elliot Levitt	134	2495
Lois Marascia	460	3315
Virginia Morante	460	3555
Luis Nieves	179B	5350
Rosalie Piccione	355	3160
Bridget Ramos	197	3452
Edward Sperry IV	902A	2697
Arlene Wolochuk	902C	3428

Special Seminar

Shirley Strum Kenny, President of the State University of New York at Stony Brook, will speak at BNL on Monday, March 20, in conjunction with Women's History Month. Sponsored by Brookhaven Women in Science and the Women's Program Advisory Committee, Kenney's talk on "Research Universities — Today and Tomorrow," will begin at 3 p.m. in the Berkner Hall auditorium and will be followed by a reception in the lobby.

Women's History Month: Focus on Women in America

Women's History Month is being celebrated throughout March at BNL, with some related activity to be found going on almost every workday this month. The events are not for women only — they are open to the entire Lab community.

Next week's theme is "Women in the Arts," and the agenda includes:

- **Lecture: "Long Island Women and Art in the 1970s: Central Hall Cooperative Gallery"** — Connie Koppelman, an historian at the State University of New York at Stony Brook; Thursday, March 16, noon, Berkner Hall, Room A (see box for details).
- **Art Exhibit: "Women-in-Art at BNL"** — Arts and crafts by BNL women; Berkner Hall, Room C, 11:30 a.m. to 1:30 p.m., Tuesday through Friday, March 14-17, with a reception on Tuesday, from 5 to 6:30 p.m.
- **Outreach Workshop: "Domestic Violence"** — Jane Schmitt, President of the Board of Directors, Nassau County Coalition Against Domestic Violence; Tuesday, March 14, noon, Berkner Hall auditorium (see box).
- **Book Fair** — Books provided by the Sou'wester Bookshop in Bellport; Wednesday, March 15, 11 a.m. to 2 p.m., Berkner Hall lobby.
- **Video: "Women in American Life"** — Five-part series concludes Monday, March 13, with "1955-1977: New Attitudes Force Dramatic Changes;" Berkner Hall, Room C, at 11:30 a.m., noon and 12:30 p.m.
- **Photography Exhibit: "Through Her Eye"** — BERA Camera Club display featuring works by women, outside the Cafeteria all month.
- **Exhibit: "Prominent Women"** — Berkner Hall lobby; next week will feature women in the arts.

Long Island Women and Art

Much of the material that historian Connie Koppelman will use in her noon talk on March 16 in Berkner Hall is drawn from "Long Island Women and Art in the 1970s: Central Hall Co-Op Gallery," an exhibit she is preparing for 1996 at the Art Museum of the Museums at Stony Brook.

As Koppelman will explain, before the 1970s, women artists on Long Island and elsewhere found it difficult to exhibit their work in an art world dominated by men. Then, as now, there were more female artists than male, yet 95 percent of the works in U.S. art museums are by men.

So, in the 70s, all-women cooperative galleries began to open across America. One of these — the only one on Long Island and the second to organize in the U.S. — was the Central Hall Gallery, which operated in Port Washington, 1973 to 1980. Its members were artists, but they were also wives and mothers living in suburbia on the border of the art capital of the world, New York City, which Koppelman says was hostile to them.

Using slides, oral histories and documents, Koppelman will explore the quality of these women's work and the circumstances that caused them to join forces — and, inadvertently, to make art history.

Connie Koppelman received her B.A. in art history from the State University of New York (SUNY) at Stony Brook, her master's of library science from Queens College and her Ph.D. in social and intellectual history from SUNY Stony Brook. She has been a Helena Rubenstein fellow at the Whitney Museum of American Art and a research assistant at the Museums at Stony Brook. She spent many years as a reference librarian and a lecturer in the Art Department at SUNY Stony Brook, where she currently teaches in the Women's Studies Program.

Outreach Workshop
Domestic Violence: Myths vs. Facts

Whether or not O.J. Simpson murdered his ex-wife is something the jury must decide. However, the fact that the Simpsons' relationship involved domestic violence appears incontrovertible.

The facts are that one woman is battered every 18 seconds in the U.S. and approximately 4,000 women are killed each year by spouses or boyfriends. But what about the myths, for example, that domestic violence only occurs among the poor and uneducated?

"Exploring the Myths About Domestic Violence" will be presented on Tuesday, March 14, by Jane Schmitt, president of the Board of Directors of the Nassau County Coalition Against Domestic Violence, at the next noon Outreach workshop sponsored by the Employee Assistance Program (EAP) of the Occupational Medicine Clinic. The talk will be available afterwards on audiocassettes in the Research Library.

Schmitt will discuss the causes of domestic violence, why it is on the increase, and what can be done to decrease and prevent its incidence. She will also answer the question, "Why doesn't the woman leave the relationship?"

Jane Schmitt holds a master's degree in education and taught science at the junior high school level for 24 years. She is a past president of the Nassau Chapter of the National Organization for Women and has received many awards for her activism on behalf of women.

To register, return the bottom portion of the Outreach flyer sent to all employees to EAP Staff Psychologist Dianne Polowczyk, Bldg. 490, by March 13. For more information about EAP, call Ext. 4567.

Women on the Web

BNL's Women's Program Office now has a home page on the World Wide Web. To access it, use *http://www.wp.dir.bnl.gov/~wp/* as the location address.

Adult Fluoride Study

Dental appointments for the Adult Fluoride Study have been scheduled for March 27-31, in the Brookhaven Center's North Room. If you have not received your appointment, call Robin Johnson at the School of Dental Medicine, State University of New York at Stony Brook, 632-8970. For other information, call Mary Wood, BNL Health Promotion Specialist, Ext. 5923.

Correction

In the February 17 issue of the Brookhaven Bulletin, the reported funding source for BNL's participation in the Cooperative Research and Development Agreement with Cotton Incorporated was incorrect. The BNL research program that provides the foundation for this project is funded by the U.S. Department of Energy's Office of Energy Research, Division of Energy Biosciences.

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The Brookhaven Bulletin is printed on paper containing at least 50 percent recycled materials, with 10 percent post-consumer waste. It can be recycled

C/W Dance News

The BERA Country/Western (C/W) Dance Club will offer a Cajun Dance Workshop on Tuesday, March 14, from 7:15 to 9 p.m., in the Brookhaven Center, for $5 per person. If you have C/W dance experience and are interested in attending, contact Ginny Morante, Ext. 3555, by noon on March 13.

Camera Club

The BERA Camera Club is offering a color-printing seminar on Tuesday, March 21, at 5:30 p.m., in its darkroom in the Recreation Building in the apartment area, for those who wish to learn how to develop and print color photos. First, club member Chris Masullo will demonstrate how quick and easy color printing can be. Every Tuesday afterwards, attendees will be invited back to make their own prints.

For more information, call club president Ripp Bowman, Ext. 4672.

Parallel Computing

The Mathematical Science Group of the Department of Applied Science and the Computing & Communications Division will jointly sponsor two sessions on "Parallel Computing Awareness." The first will be on Monday, March 20, from 9:30 to 11:30 a.m., at which time IBM will present parallel computing on the SP2 that is currently on loan to BNL. At the second session, on Wednesday, March 22, from 2 to 4 p.m., CONVEX will discuss parallel computing on their shared-memory machine.

Microcomputer Club

At the next meeting of the Microcomputer Club, at noon on Wednesday, March 15, in Room B, Berkner Hall, member Joseph Kahn, a veteran portable-computer user, will give a talk entitled "Portable PCs: History, Evolution and Some Uses." He will discuss portables since the early 80s, and two of today's state-of-the-art laptops, P90s and Apple's Powerbook, should make cameo appearances.

All are invited; bring your lunch — and your portable computer for a show & tell. Members should note the nonstandard date and location. For further details, call Steve Stein, Ext. 5694.

Arrivals & Departures

Arrivals

Syed Khalid ..... NSLS
Humberto Palacios ..... AGS

Departures

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

Timothy R. Connolly ..... Cent. Shops
Elisabeth M. Deazley ..... Cent. Shops
Steven Halderman ..... Cent. Shops
Zidan Li ..... NSLS
Giuseppe Mondi ..... Cent. Shops

Cafeteria Menu

Monday, March 13	
Soup: Chicken & escarole	.90/1.20
A la Carte: Ragout w/biscuits	3.95
Lite: Cod w/lemon sage & spring onions	3.85
Deli: Turkey w/cranberry jelly	3.20
Grill: Monte Cristo	3.30
Tuesday, March 14	
Soup: Cream of vegetable	.90/1.20
A la Carte: Balsamic-grilled chicken	3.95
Lite: Eggplant & potato gratiné	3.85
Deli: Top round of beef	3.20
Grill: Kentucky turkey	3.30
Wednesday, March 15	
Soup: Split pea w/ham	.90/1.20
Display Cooking: Cajun foods carnivale	4.75
Deli: Loin of pork & apple compote	3.20
Grill: Spicy wings & bleu cheese	3.30
Thursday, March 16	
Soup: Beef & bean	.90/1.20
A la Carte: Chicken w/sausage stuffing	3.95
Lite: Vegetable & tofu strudel	2.95
Deli: Jerk lamb w/Caribbean slaw	3.20
Grill: Turkey chili in a tortilla	3.30
Friday, March 17	
Soup: Salsa fish	.90/1.20
A la Carte: Turkey saute w/couscous	3.95
Lite: Sea bass w/lemon glaze	4.20
Deli: Corned beef w/caraway cabbage	3.20
Grill: Swordfish teriyaki	3.30

Pick a H.S. Student

For six weeks each summer, the Community Summer Science Program (CSSP) provides talented local high-school juniors and seniors with opportunities to study and serve as interns, participating in research under the direction of Laboratory staff sponsors at no cost to the sponsoring departments. This year's program will begin Monday, July 10, and end Friday, August 18. If you are interested in sponsoring a CSSP intern, review student applications at the Science Education Center, Bldg. 438, from Monday, March 13, to Friday, March 24.

Contact Nina Leonhardt, Ext. 5963, if you have any questions.

Be Social Saturday

The BNL Ballroom, Latin & Swing Dance Club will hold its monthly informal social tomorrow, Saturday, March 11, at 8 p.m. in the North Ballroom of the Brookhaven Center. All are invited to dance to the CD music provided by club member Ralph Izzo. The $1 per-person donation goes into the club's music fund. For more information, call John Millener, social chairman, Ext. 3853.

Equipment Demo

L&M Associates will present a software seminar and vendor exhibition from 9 a.m. to noon on Thursday, March 16, in Berkner Hall. The exhibition will include: Druck pressure measurement; Fieldworks PC; IFR spectrum analyzers; Mueller test accessories; ROD-L hipot testers; Trompeter patching and interconnects; and more. In addition, a PC-based data acquisition IEEE-488 and ATE seminar will be conducted by IO Tech and Geotest presenters in Room D.

'94 FSA Deadline Near

To deplete your 1994 Dependent Care Reimbursement Account and/or Health Care Reimbursement Account, you must submit documentation of those respective expenses incurred in 1994 to Connecticut General by Friday, March 31. Reimbursement forms for both accounts are available from the Personnel Division, Bldg. 185.

Please note: Prepaid services are only reimbursable once those services have actually been provided. For example, though day care or summer camp are often paid, respectively, before the start of the month or the summer, these expenses can only be reimbursed through the Dependent Care Reimbursement Account after the start date of those services.

At the Vanguard

Vanguard, one of the mutual fund companies available to BNLers through the AUI Retirement Plan and/or a supplemental retirement annuity, has developed four new investment funds. Called LifeStrategy Funds, they invest in a predetermined mix of other Vanguard mutual funds. Ranging from a fund designed for agressive growth-oriented investors to one for conservative income-oriented investors, the four funds are:

- **Growth Portfolio** — for seekers of capital growth who will accept substantial short-term declines (80% stocks, 20% bonds);
- **Moderate Growth Portfolio** — for those seeking reasonable exposure to stocks who will accept possibly large short-term declines (60% stocks, 40% bonds);
- **Conservative Growth Portfolio** — for those seeking current income and low-to-moderate growth who will accept periodic short-term declines (40% stocks, 40% bonds, 20% reserves);
- **Income Portfolio** — for those seeking current income who will accept moderate short-term declines (60% bonds, 20% stocks, 20% reserves).

For additional information, call Vanguard, (800) 523-1188.

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 - Doctorate normally required. Candidates may apply directly to the department representative named.

POSTDOCTORAL RESEARCH ASSOCIATE - Trained in physics or biophysics, with experience in design of scientific instrumentation emphasizing optics, electronics and low-signal fluorescence detection. Research will include the design of an optics, excitation, emission and data-acquisition system for measuring the fluorescence signal from phytoplankton. Knowledge of biophysics of photosynthesis, phytoplankton physiology and existing techniques for fluorescence-based assessment of phytoplankton photosynthetic performance, and seagoing experience are preferred. Contact: Zbigniew Kolber, Department of Applied Science.

POSTDOCTORAL RESEARCH ASSOCIATE - Trained in condensed matter physics. Electronic structure theory experience preferred. Research conducted will involve the study of electronic and structural properties of metallic alloys using first-principles methods, with emphasis on finite-temperature effects, impurities and defects. Contact: Michael Weinert, Physics Department.

LABORATORY RECRUITMENT - Opportunities for Laboratory employees.

MK 0773. MATERIAL HANDLER POSITIONS - Supply & Materiel Division.

OPEN RECRUITMENT - Opportunities for Laboratory employees and outside candidates.

LS 3321. PLUMBER A - (term appointment) Requires substantial commercial/industrial experience. Under minimum supervision, will lay out, construct, install, repair and maintain water sewage and gas systems, related facilities and auxiliary equipment. Plant Engineering Division.

DD 3324. CARPENTER - (temporary position) Under minimum supervision lays out, constructs, modifies and maintains buildings and component parts from construction drawings, rough sketches or verbal instruction. Will work with wood, wood substitutes and combination materials, and flooring, roofing and wall materials. Plant Engineering Division.

DD 0558. TECHNICAL POSITION - (term appointment) Requires an AAS in electrical technology or equivalent. Experience with electronic test instruments, high-current power supplies and computers is desirable. Skills in soldering and other wiring techniques are required. Will work from electronic schematics, verbal instructions and rough sketches in building complex equipment. Experience in prototype circuit and chassis construction and safe handling of small power tools is desirable. RHIC Project.

DD 0559. TECHNICAL POSITION - (term appointment) Requires an AAS in electrical technology or equivalent. Experience with electronic test instruments, high-current power supplies and computers is desirable. Demonstrated mechanical skills with experience with bench and hand tools required. Will work from electronic schematics, verbal instructions and rough sketches in building complex equipment. RHIC Project.

NS 2995. MEDICAL ASSOCIATE POSITION - (term appointment) Requires a BA in chemistry or a biological science and experience analyzing samples with an atomic emission spectrometer. Responsibilities will include routine preparation of sterile boron drug solutions for intravenous injections and analysis of boron in samples. Medical Department.

NS 5559. COMPUTER OPERATIONS POSITION - (term appointment) Requires previous computer operator experience, a background with UNIX and excellent communication skills. Familiarity with networking, PCs and other operating systems such as VMS is desirable. Some weekend work is required. Computing & Communications Division.

Audio, Video & Computer

COMPUTER - IBM, hardcard+, dual disk, display, keyboard, Epson printer, new cond. Donna, Ext. 4599 or 331-7385.

TV - 26", color, $75; Olivetti electric typewriter, $25. Ron, Ext. 5905 or 298-5625.

Free

COAL-BURNING STOVE - Surdiac in excel. cond., you pick up. Bente, 928-5956.

FIREWOOD - many hardwood trees, stacked up, some pine, lots of kindling, bring saw, backhoe avail. to help you load. Frank, 234-0538.

OLD BLUE JEANS - for crafts. Jack, 744-3919.

SWING SET - wood w/slide. Jörg, Ext. 5653.

WATER BED - great cond., come & take. George, Ext. 7654.

Car Pools

LIE EXIT 36 - fourth needed. John, Ext. 5181.

Lost & Found

LOST - 3/3, Timex Indiglo Triathalon digital watch, bright purple band, just purchased, reward. Marcia, Ext. 7129.

Real Estate

Real Estate advertised for sale or rent is available without regard for the race, color, religion, sex, age, national origin, disability or veteran status of the applicant.

For Rent

BELLPORT VILLAGE - upstairs 1-bdrm. apt., full bath, all new, village amenities, $625/mo. incl. all. Jim, 744-2095 after 6 p.m.

CALVERTON - 2-bdrm. condo, 5 appl., ac, patio, upper deck, Ext. 7595.

FARMINGVILLE - 1 bdrm., furn., priv. ent., cable, single nonsmoker pref., no pets, $650/mo. incl all + sec. Patricia, Ext. 2907 or 758-3952 after 6 p.m.

MILLER PLACE - 1-bdrm. apt., l/r-kitchen, spare room, pvt. ent., gar., incl. util. Arlene, 473-1658 after 6 p.m.

MILLER PLACE - 1-bdrm. apt. w/sep. bdrm. & study/office, all new appl. & carpets, nonsmoker, off-street parking, pvt. ent., & bath, $850/mo. neg., all util incl. Doan, Ext. 7535 or 345-0462.

ROCKY POINT - mint studio near beach, furn./unfurn., pvt. ent. & bath, cable, microwave, single person only, 10 min. to Lab, $500/mo. + sec. Jerry, 821-0682.

SHIRLEY - 3-bdrm. house, waterfront, big fenced yard, fp, walk to beach, 15 min. to Lab, $750/mo. Matthew, 399-2989.

STONY BROOK - 1-bdrm cottage, l/r-kit., close to village, beach, RR & university, cable, avail. May 1, $600/mo. + util. 474-8715.

YAPHANK - restored 4-bdrm. Victorian, 1½ baths, lg. country kit., lg. property, 4½ mi. from Lab, avail. now. Linda, 924-4872.

CATSKILLS, NY - 3-bdrm. chalet w/sleeping loft, fully furn., near Hunter & Windham Mt., great for skiing. Kay, Ext. 4501, or Bea, Ext. 3642.

LAKE PLACID, NY - 3-bdrm. condo in town, 2 baths, walk to village, skating oval, arena, restaurants, Ski Whiteface, magnificent view of Lake Placid and Whiteface. Tom, Ext. 4631 or 744-0681.

HILTON HEAD, SC - 2-bdrm. condo, 2 baths, sleeps 6, fully furn., beach, golf nearby, tennis on site, BNL disc., $300/Mar. Guy, Ext. 3147 or 689-5378.

LUDLOW, VERMONT - ski house near Mt. Snow, sleeps 7, avail. wk./wknds., $125/night, 3 night min. Lloyd, 627-7589.

WARDSBORO, VT - 3-bdrm. ski house, 2 baths, loft, 9 mi. Mt. Snow or Stratton, pond, trails for x-country, avail. wk./wknds., Marilyn, Ext. 5251 or 360-3020.

For Sale

BRIGHTWATER FARMS/BAY SHORE - 3-bdrm. Colonial, eik, fd/r, l/r, den, laundry, 2 full baths, bsmt., Andersens, new driveway/walks, fenced, patio, 35 min. to Lab, $135,000. Bill, Ext. 2762 or 665-3782.

CALVERTON - Marlette 1972 3-bdrm. mobile home, full bath, kit., d/r, l/r, cac, immaculate, $500/mo. covers all, Lilco heat, maint., ask. $14,000, must be 55 yrs. or older. Faye, 588-8113.

EAST MARION - beautiful 1 acre bldg. lot, adjacent to greenbelt, walk to Sound. 325-0447.

FLANDERS - 1+ acre lot, have permits, excel. horse area, ready to build, very private. Beth, Ext. 4986 or 369-4295.

MASTIC BEACH - mint 2-bdrm. ranch, kit., dinette, l/r, laundry rm., 1½-car detached gar., 10'x12' new cedar deck, 80'x100' landscaped lot, new roof, freshly painted, $73,000. Kathy, 395-6520.

MASTIC BEACH - 9-rm. high ranch, 5 up, 4 down, 2 baths, 2 kit., det. 1-car gar., lg. property & more, $115,000. Ed, Ext. 4667.

MIDDLE ISLAND - 2-bdrm. co-op, upper unit, l/r, d/r, kit., all appl., cac, gas heat, newly carpeted, many extras, pool, tennis, clubhouse, 80% tax write-off, $58,000 neg. Angela, 924-5282.

RIDGE - 3-bdrm. townhouse, 1½ baths, lg. l/r, 5 min. to Lab, $69,900. 924-4734.

ROCKY POINT - custom 3-bdrm. ranch, corner plot, eik, 4 appl., custom cabinets, w/w, OHWH, city water, nicely landscaped, $85,000. Donald, 473-6570 after 7 p.m.

SELDEN - 2-bdrm. co-op, lg. custom bath/Cor. Jacuzzi, lg. custom eik, l/r, d/r, w/w, cac, terrace, pool, tennis, clubhouse, all 2 yrs. new, best of everything, $72,000. 696-5322.

WADING RIVER - 3-bdrm. Colonial, 2½ baths, 2-car gar., custom kit., Jennair, gazebo, shed, igs, igp, deck, steam bath, satellite dish, SWRSD, 1.1 acre, $209,900. 929-8323.

WADING RIVER - 3-bdrm. farm house, fully remodeled, 2 baths, l/r, d/r, OHWH, 0.53 acre, c. 1900, modern kit., patio, porch, shed, ½ mi. to beach, taxes $2,600, $157,000. Bill, Ext. 2906 or 929-6189.

PORT CHARLOTTE, FL - ¼ acre bldg, lot, developed neighborhood, ready to build, $9,000. 929-8323.

TAMPA, FL - 3 bdrm., 2-story, double front door, 2 baths, across from pond, 3 min. from Busch Gardens, $67,000 or best offer. Mark, 924-0960 or leave message.

LITTLE RIVER, SC - furn. 1-bdrm. condo, 1 bath, w/all appl., near all: beach, shopping, entertainment, golf, excel. cond., very low taxes, ask. $49,990. Joann, 584-3830.

Wanted

CHILDREN - for Upton Nursey School, visit during open house March 30, Recreation Bldg., Apt. area, 10:30 a.m.-1 p.m., children welcome.

COMPUTER TERMINAL - for PC, VGA. Kumi, Ext. 3165.

DRAWING TABLE - Anco-type, adjustable, 23"x31" all wood. John, Ext. 7671.

GARAGE DOOR OPENER - in good cond. 289-8105.

GUITAR - acoustic, in good cond. Danny, Ext. 4677 or 475-2707.

HOUSEMATE - to share 2-bdrm. house, fp, skylight, Miller Place, $400/mo. + util. Marcia, Ext. 7129.

TV - color or b/w, 20" approx.; radio, good short or long wave reception, working cond. Vidya, Ext. 3293/3443.

In Appreciation

Thank you to my friends at the NSLS and SEP for your sympathy following the loss of my father.

— John Klug

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