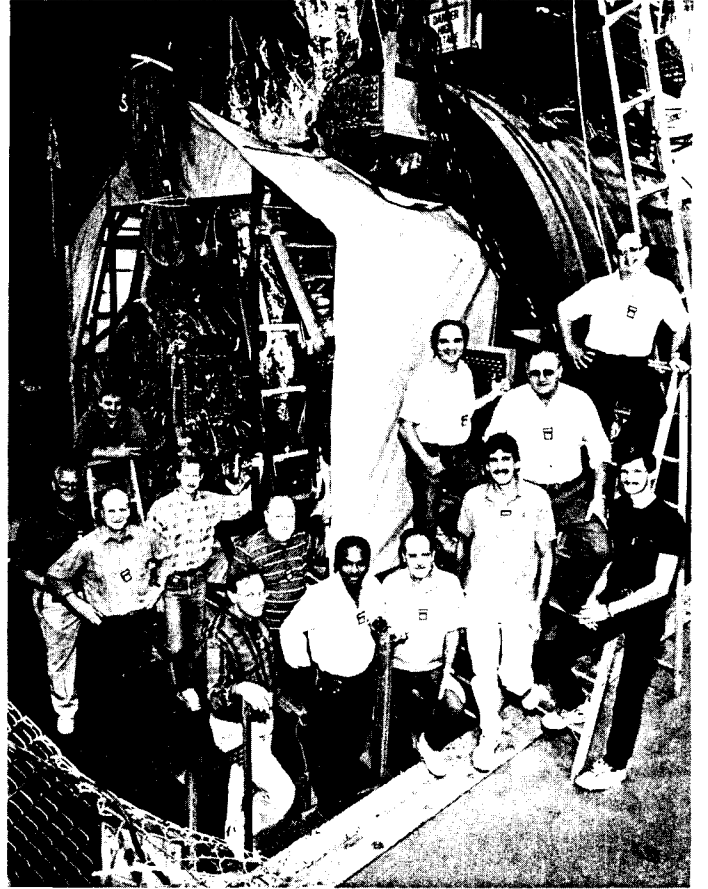


Brookhaven Physics Team Closes In On Rare Kaon Decay at the AGS

Photo at left: Checking the connections of the range stack of Experiment 787 are physicists (top) Steven Kettel, (bottom, from left) Laurence Littenberg, Steven Adler, (center, from left) Kelvin Li and I-Hung Chiang.

Photo at right: Assembled by the detector for Experiment 787 are the team's technicians: (clockwise from right) Dave Brady, Joe Cracco (left), Harry Sauter, Bill Smith (right), Neal Donahue, George Munoz, Pierrot Bichoneau, Marty Van Lith (front), John Raynis (back), Bill Lenz Jr., Manny Garber, Horst Ratske and Joe Cuccia Jr.

— Photos by Roger Stoutenburgh



The E787 research team working at the Alternating Gradient Synchrotron (AGS) in search of a rare kaon decay went into a recent experiment armed with a more intense kaon beam and an upgraded detector.

Preliminary results from the May 1 to July 31 experimental run indicate that these improvements have brought the team closer to its goal of processing a trillion positively charged kaons (K^+) during a single run, said team members.

Processing a trillion K^+ , subatomic particles made up of an "up" quark and a "strange" antiquark, will in-

crease the team's chances of observing certain rare types of decay processes.

"We implemented a lot of upgraded hardware this year, and all of it worked," said Maged Atiya, a physicist with the Electronic Detector Group (EDG), which is responsible for E787. "Now we are studying how well it all works. The amount of data we previously obtained in a whole year of running, we will now be able to do in a week. This is necessary to get an order of magnitude increase in rate to reach our goal of processing a trillion kaons during one run."

These particles break down, or de-

compose, in a number of different "modes," and some modes are more common than others.

The E787 team is mainly searching for a kaon decaying into a positively charged pion (π^+), a neutrino (ν) and an antineutrino ($\bar{\nu}$), symbolized by the equation $K^+ \rightarrow \pi^+ \nu \bar{\nu}$.

Twice in 10 Billion Decays?

This type of kaon decay is estimated by the Standard Model, the current theory of elementary particles, to happen only twice in 10 billion decays. The signature of this decay is an unaccompanied positively charged pion because neutrinos and antineutrinos interact too weakly to be detected.

Observation of this rare decay would extend the verified domain of the Standard Model, refine the values of its physical parameters, and probe the behavior of matter and forces at ultra-high energies, according to EDG Leader and Senior Physicist Laurence Littenberg.

The experiment is a collaboration between BNL, Princeton University, the Canadian laboratory TRIUMF, the Japanese laboratory KEK and the Institute of Nuclear Studies of the University of Tokyo.

Subsystem Upgrades

Since E787's last run in 1992, the team has upgraded virtually every subsystem of the detector: the stopping target, drift chamber, range stack, readout and triggering electronics, and the photon-vetoing end caps.

"The technicians really got the thing working," said James Frank, a physicist on the E787 team. "It's a major, major effort. They worked very long and hard, with a lot of skill and dedication."

Even the beam was upgraded. The AGS Department staff built a two-stage, electrostatically separated beam, with a three-fold higher intensity, or flux, and a higher ratio of kaon-to-pion particles. When protons from the AGS hit a target in the C line used for the project, a mixture of particles is produced. The upgraded C4 beam line is used to extract and purify the kaons from this mixture, and then deliver them to the detector.

"This year, for every one pion, we see roughly five kaons," said Steve Adler, a doctoral candidate from the State University of New York at Stony Brook, who is on the E787 team. "Before, the ratio was three pions to every one kaon. It's a much purer kaon beam now."

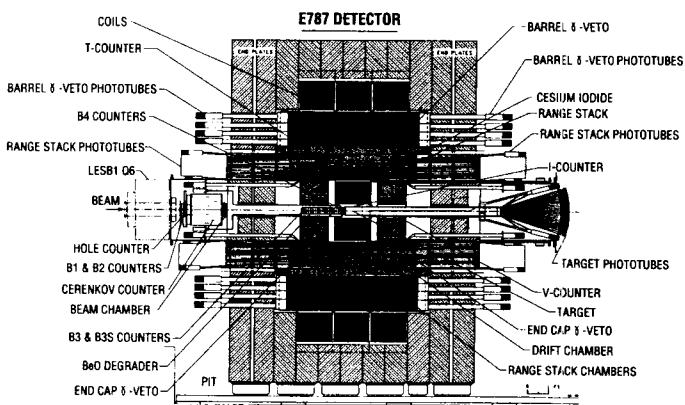
Hand in hand with increasing the number of kaons produced is upgrading the technology for detecting and tracking them. Kaons have only a 12-nanosecond lifetime. The detector must be able to identify kaons, track at least a million decay events per second, identify and record those that could be the rare decay of interest, and discard the rest.

New Tracking Record

The upgraded detector can be triggered by an interesting event in only 12 microseconds instead of the 250 microseconds the previous model took during 1992 runs, Atiya said.

Chu Ng, a project engineer, is the principal designer of the detector's (continued on page 2)

Schematic of the second-generation detector for Experiment 787 at the Alternating Gradient Synchrotron.



Reduction in Force Affects 53 Additional Employees

In the second phase of the reduction in force necessitated by funding problems with BNL's budget for fiscal year 1995, layoff notices were given to 53 employees from 13 departments and divisions, last Friday, September 16.

In July, when the first 39 layoffs were announced, the reductions in force during fiscal year 1994 were expected to affect about 115 employees. Through reassignments and attrition, however, the Laboratory was able to reduce this number to 92.

Whether further reductions will be necessary in the new fiscal year is still unclear. As Deputy Director Martin Blume explained, "When Congress passed the Energy and Water Development Appropriations Bill, which funds most of the Laboratory's programs, it imposed general reduction on funding for the U.S. Department of Energy [DOE]. DOE has not notified the Laboratory of the effect of those reductions on our programs, so, unfortunately, I cannot assure you at this time that there will be no further reductions in force. The Laboratory will make every effort to hold this number to a minimum.

"We regret that this action was necessary," Blume continued. "The Personnel Division is working with the employees affected by the layoff, trying to find positions for them either within or outside the Laboratory. We will keep you informed of further developments."

Coming Up

Mechanical Engineer Upendra Rohatgi, Department of Advanced Technology, will deliver this season's first Brookhaven Lecture on Tuesday, October 4. His talk on "Safety in Next-Generation Reactors" will begin at 4 p.m. in Berkner Hall.

Nobel Prize-winning physicist Georges Charpak of CERN and the Ecole Supérieure de Physique and Chemistry in Paris, will give an AUI Distinguished Lecture on Wednesday, October 5, entitled "From Imaging of Particle Trajectories to Applications in Biology and Medicine." The talk will begin at 4:30 p.m. in Berkner Hall.

Rare Kaon Decay

(cont'd)

new, faster control board, which is responsible for reducing the time needed to decide whether or not to record a kaon-decay event.

"Its performance is equivalent to 120 million instructions per second, or MIPS," Ng said. "The general-purpose commercial equivalent has 30 MIPS."

"I'm excited about this board because this is the first time I have built a circuit board of this complexity," she continued. "When we got the preliminary results, I knew it would be at least ten times faster than the earlier model."

There are now 68 of these boards in use, each taking about 150 watts of energy and running at 40 megahertz, she said.

Not only have the detector's readout electronics been updated, but as the particles enter, they are met by an improved scintillating fiber target.

"The new target produces a lot more light so the energy given off during particle decay is easier to detect," said James Frank, who designed the target, "It allows you to measure energy with much better precision. There is also much less inert material where kaon decay products could be lost."

Also new are the Cerenkov counter, which is a device used to distinguish between incoming pions or kaons, provided by Princeton University; an up-



Working on the E787 detector's new control board are (from left) Yi Zhao, Chu Ng and Marty Van Lith.

graded drift chamber with five times less mass, resulting in twice the resolving power to determine particle momentum, provided by TRIUMF Laboratory; and a modified range stack with more photomultiplier tubes, which provides a better measurement of particles that reach its inner layers and a better energy measurement, done by BNL.

Additionally, upgrades of the straw chambers, which provide a finer measure of exactly where particles passed through the range stack, were done by Princeton; and a new endcap detector system was created by members of the BNL team with their Japanese collaborators. This system was made up of 143 pure cesium iodide crystal blocks used to find photons generated by different kaon decays.

Before the next run, which is expected to start next December or January, the team will be working to improve the detector even more. Members of the team say they hope the next run will last 25 weeks. "We can only achieve the level of sensitivity we want if we have a long run," Frank said.

Other BNL staff on E787 include: physicists I-H Chiang, AGS; Milind Diwan, John Haggerty, Steven Kettell, Thaddeus Kycia, Kelvin Li, Richard Strand, Christoph Witzig, and Aki Yamashita, all of Physics, and Alan Stevens, Relativistic Heavy Ion Collider Project; software engineer Bob Strzelinski; electrical engineer Yi Zhao; and designers Emanuel Garber and Igor Trigor.

—Georgia Moore

Dealing With BNL's 'Legacy' Waste: First Step Completed

The word "legacy" usually brings to mind family heirlooms or wealth passed from generation to generation.

But at some U.S. Department of Energy (DOE) facilities, "legacy" means something much different — hazardous and radioactive waste that has been stored for years in areas such as BNL's Hazardous Waste Management Facility (HWMF).

Left there during previous times when on-site storage was viewed differently than today, legacy waste is now subject to stringent regulations. At BNL and elsewhere, it must be cleaned up, packaged, and transferred to permanent disposal sites.

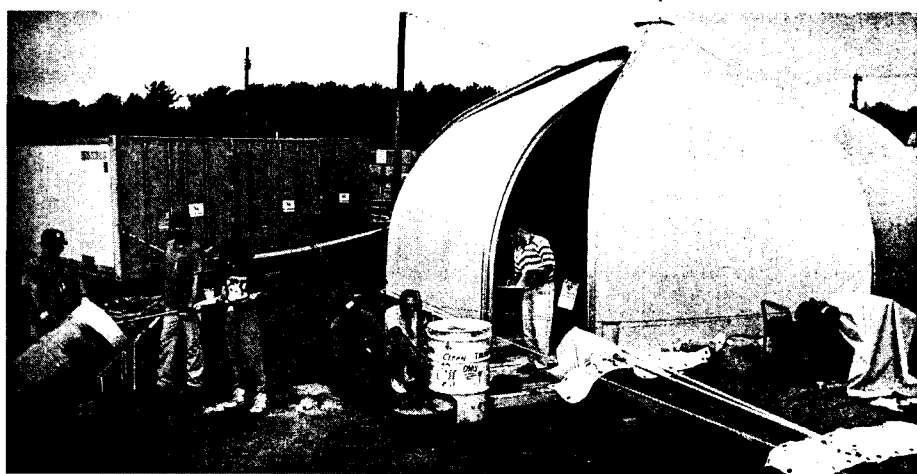
Recently, a contractor working with the Lab's Safety and Environmental Protection (SEP) Division completed the first chapter in the remediation of

BNL's hazardous legacy — characterizing waste from the HWMF to determine its exact makeup.

Now, planning is under way for the packaging of the waste and its disposal at DOE's Hanford Disposal Site in Washington State. The entire project is expected to be completed by February 1995, at a total cost of over half a million dollars.

Rust Federal Services, Inc., the contractor chosen for the legacy waste project, spent the summer sampling the contents of 9 trenches and 24 holes at the HWMF and confirming or determining their radioactive content using gamma spectroscopy.

The company's highly trained staff, working under SEP's strict, health-protecting conditions, performed some operations inside an igloo-shaped con-



At the Hazardous Waste Management Facility, (from left) hazardous waste technicians Daniel Errante, Allen Jones, Cheryl Burns, William Sells and Robert Elliott, and project engineer Alan MacIntyre, transfer legacy waste materials to an "igloo" containment tent for cutting.

tainment tent erected over one of the trenches. They took samples from all of the trenches, each 6 meters (m) x 0.6 m x 2.4 m, and from each of the 3.6 m-deep vertical holes and 4.8 m-deep slanted holes, moving everything with remote-handling tools and wearing personal protective equipment and self-reading dosimeters.

Radiation readings from the waste ranged from under 100 millirems per hour to over 1,000 rems per hour at contact, in some cases, said Alan MacIntyre, SEP's project engineer for the legacy waste effort.

Among the items characterized were targets from the Brookhaven Linac Isotope Producer (BLIP), chips of the High Flux Beam Reactor's core shroud taken during testing, and radioactive material from the Brookhaven Graphite Research Reactor (BGR), which was in operation from 1950 until 1968.

To keep expensive sampling to a minimum, characterization of the waste began six years ago, said Peter Kwachyn, leader of SEP's Engineering and Operations Group for Hazardous Waste Management. "We've been performing non-sampling characterization by examining records and talking to the departments that generated these wastes," he explained.

The result is a three-inch-thick binder full of records. For example, documents dating back to the 1950s showed which of the HWMF's holes and trenches were used to hold pieces of BGR targets. This kind of detective work is known as process knowledge.

But while SEP and Rust personnel were able to use process knowledge information to determine the origin of most of the waste, "there were some unknowns," MacIntyre said. Sampling was used to clear up these mysteries.

Now that the area's exact contents

are known, the next stage of legacy waste cleanup can begin.

In October, Rust's workers are expected to begin exhuming the contents of each hole or trench, dividing it into manageable pieces using remote cutting tools, and packing it in drums and other containers. The waste may then be encapsulated, or sealed, in concrete to prevent leaking.

Then, Rust personnel will help SEP personnel prepare the paperwork and permits that will accompany the waste on its journey toward disposal at Hanford. Rust's staff will also determine the extent to which the trenches and holes themselves were contaminated by the waste they held. Cleanup of the ground and structures, if any is determined to be necessary, will be the responsibility of BNL's Office of Environmental Restoration.

BNL's HWMF staff hope to gain new knowledge from the Rust contractors — especially when it comes to planning for and carrying out the handling of some specific kinds of wastes.

"This is a learning experience for us as well," said Kwachyn. "Observing this operation will help us out in future endeavors."

Added Leonard Emma, head of SEP's Environmental Management Section, "The legacy waste project represents a very positive learning experience in that it clearly demonstrates the need for timely and total waste management."

By observing the contractors at work and reviewing "lessons learned" throughout the operation, the SEP specialists also hope to gain insights that will be helpful in building and outfitting their new hazardous waste handling facility, which will be constructed during 1995 on Fifth Avenue east of the Alternating Gradient Synchrotron.

—Kara Villamil

In Memoriam

Robert L. Rowley, a tool and instrument maker in the Central Shops Division, died of cardio-pulmonary arrest on September 14. He was 45 years old.

A year after he graduated from Bellport High School, Rowley started his 26 years at BNL on July 8, 1968, as a technician I in the Physics Department. He became a technician II in 1970 and a technician III in 1974.

In May 1975, Rowley joined the Personnel Division as a participant in the Craft Apprenticeship Training Program, which would lead to his becoming an experimental machinist in Central Shops, in May 1980. Normally, the apprenticeship program takes four years, but midway into his training, Rowley learned he had a faulty kidney and began dialysis. A successful kidney transplant allowed him to return to the program after about nine months.

Over the years, Rowley also had to cope with hip problems and just recently had undergone his second hip replacement surgery. Diagnosed with heart disease in July, he was scheduled to receive an artificial pacemaker at the time of his death.

Central Shops Manager Richard Spellman remembered Rowley, who was promoted to his final position in May 1984. "Bob's death comes as a shock to all of us," he said. "He seemed to be on the road to recovery. Bob was an asset to our division and will be



missed by all of us. We extend our sympathy to his family."

Also at BNL, Rowley was a long-time softball player on such teams as the Ravens and Cutting Edge. He had played basketball with the Tandem team and refereed in the Basketball League for several seasons.

A community leader in his hometown of North Bellport, Rowley is survived by his wife Joyce and two sons, Robert and Jason. Contributions in his name may be made to the American Heart Association or the American Kidney Foundation.

The following retirees passed away recently:

Gustav K. Barwald, one of the Lab's first employees, died on September 4, at the age of 89. He started as a cabinetmaker in the Architectural Planning & Plant Maintenance Department on March 10, 1947, and retired from the Plant Engineering & Planning Division as Cabinet Shop Foreman, on April 12, 1968.

Edward G. Divis, who left the Department of Applied Science as a senior technical associate on October 31, 1984, died on September 13, at the age of 71. He had started in the Nuclear Engineering Department on August 6, 1962, as an advanced technician.

William S. Webster, who became Manager of the Staff Services Division on April 1, 1968, and held that position until his retirement on March 31, 1989, passed away on September 14. He was 76 years old. His BNL career began in the Plant Maintenance Division, which he joined as Staff Services Supervisor on May 5, 1965. In addition to his daughter Patricia Giacalone of the Budget Office, he is survived by his wife Edna, son William Webster III, stepdaughters Joan Goebel and Ellen Tyree, and seven grandchildren.

Swim Lessons

Sign up now at the BNL pool, Bldg. 478, for swim lessons for both children and adults. In addition to the lesson fee, participants must either purchase a season pool pass or pay the \$2 daily pool fee. For more information, contact Susan Juzwak, Ext. 3147, after 4 p.m.

... For Children

A trial run of eight weeks of swimming lessons for children will run on Mondays and Tuesdays, from 4 to 4:45 p.m. Beginner and advanced beginner lessons will be held on Mondays, October 3 through November 21; advanced beginner and intermediate lessons will run on Tuesdays, October 4 through November 22.

A minimum of ten children is needed for each session, and a maximum of 20 will be allowed. Red Cross certification will be awarded to children who meet the requirements by the end of the class. The cost is \$35 per child.

... For Adults

Adult swimming lessons for beginners and intermediates will be offered for eight weeks, 5:15-6:15 p.m., on Wednesdays, beginning October 5. The cost is \$40.

Yoga Practice

The BERA Indo-American Society will hold yoga practice sessions every Wednesday, from 12:10 p.m. to 12:50 p.m., beginning October 5, in the Recreation Building. A typical session will include breathing exercises, Sun salutation, asanas (postures) and relaxation. Participants should wear a loose outfit and bring a mat or a beach towel. There is no fee, but openings are limited due to space.

For more information, call Smita Sathe, Ext. 3924.

Walking Club to Host Exercise Physiologist

On Monday, October 3, John Viollis, an exercise physiologist from Personal Best Fitness, will be at the next Walking Club get-together to present "Proper Exercise Mechanics for the Entire Body." The talk will run from noon to 1 p.m. in Berkner Hall, Room B, with a Q & A session, so bring questions. All employees are invited. If interested, call Mary Wood, Ext. 5923 or 4567.

Bowling

Red & Green League

J. Griffin 279/257/732 series, R. Mulderig 247/233/222/702 series, R. Larsen 247/202/606 series, H. Arnesen, 246/235/674 series, A. Warkentien 217/201/617 series, K. Asselta 279/660 series, R. Wiseman 266, B. Giuliano 225, E. Meier 216, K. Koebel 211, R. Raynis 209, S. DiMaiuta 203, F. Griswold 203.

Purple & White League

S. DiMaiuta 243/222/619 series, E. Sperry IV 235/213/609 series, M. Meier 212/201, S. Frei 203, S. Logan 199, E. Meier 193, R. Picinich 191, P. Callegari 189, D. Klein 186, B. Belligan 181, K. Moylan 170, E. Sperry III converted the 6-7 split.

Fox Family Bluegrass Returning for Third Encore

The Fox Family Bluegrass has delighted country music fans with their well-blended harmonies at three previous BERA concerts. On Friday, November 4, they will return for a fourth time to perform another concert presented by BERA at 8 p.m., in Berkner Hall.

Winners of the talent contest at the Winterhawk Bluegrass Festival in 1989, the Fox Family Bluegrass is a group of four young musicians who are natives of New York's Adirondack Mountain region. The quartet is composed of a fiddle player, a banjo player and two guitarists.

Tickets for the concert cost \$8 each for adults and \$5 each for children under 12, students and senior citizens. Purchase them now at the BERA Sales Office in Berkner Hall between 9 a.m. and 1:30 p.m. daily.

Tickets can also be purchased from M. Kay Dellimore, Bldg. 185, Ext. 2873; April Donegain, Bldg. 134A, Ext. 2459; Andrea Epple, Bldg. 535A, Ext. 4424; Skelly Frei, Bldg. 750, Ext. 2760; August Hoffmann, Bldg. 510C, Ext. 3884; Elliott Levitt, Bldg. 134, Ext. 2495; Louis Nieves, Bldg. 179B, Ext. 4031; Rosalie Piccione, Bldg. 355, Ext. 3160; Bridget Ramos,



Fox Family Bluegrass

Bldg. 197C, Ext. 3452; Ed Sperry IV, Bldg. 902A, Ext. 2697; or Arlene Wolochuk, Bldg. 902C, Ext. 3428.

Vanguard Ensemble in Concert

The Vanguard Ensemble, a 15-member instrumental ensemble, will present a special concert in the 1994-5 BERA Concert Series, on Tuesday, September 27, at 8 p.m. in Berkner Hall. A donation of \$6 is suggested for the performance.

The Vanguard Ensemble bridges the gap between the old and new by infusing the standard repertoire with fresh insight and making contemporary music enticing and accessible.

On the program for the concert are works by Bach, Boros, Cage, Lubman and Schoenberg. The Lubman piece, entitled "These sounds (as they are here-in presented) please me," is written by Bradley Lubman, one of the ensemble's founders and music director of the Stony Brook Symphony Orchestra at the State University of New York at Stony Brook.

This concert is made possible in part by a grant from the Long Island Natural Heritage Trust, through the Greater Port Jefferson Arts Council.

Art Bus Trip

Fall for leaves and beautiful 18th-century Van Cortlandt Manor and Tavern house, as well as picturesque Cold Spring village on the banks of the Hudson, when you join the up-the-river-in-autumn bus trip sponsored by the BERA Art Society on Saturday, October 22. All are welcome.

The luxury coach will leave the BNL tennis court parking lot at 7 a.m. After coffee, the group will arrive about 10:45 a.m. to visit the manor and adjoining period tavern, with demonstrations of early American open-hearth cooking and brick making. Lunch and the afternoon will be at nearby Cold Spring, with historic houses, antique shops and a bandstand in the tiny river harbor. At 5:30 p.m., the bus will leave, arriving at BNL by about 8 p.m.

The cost is \$25, including the group museum ticket. To join the trip or for information, call Liz Seubert, Ext. 2346 or 286-8563.

Arrivals & Departures

Arrivals

Bruce W. Baker Sfgdrs. & Sec

Departures

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

Valerie Biou Biology
Alan S. Fisher NSLS
Pamela E. Meehan RHIC
Xiaomin Pei RHIC

Donald W. Marrs, who retired on September 2 after 32 years with the Central Shops Division, was incorrectly identified as Donald Marris in the Arrivals & Departures of September 9. The Bulletin regrets the error and wishes Marrs well in his retirement.

Cafeteria Menu

Monday, September 26	
Soup: Spicy potato kale	.90/1.20
A la Carte: Arroz con Pollo	3.95
Fitness: Pot roast	4.25
Deli: Pastrami	3.20
Grill: Bratwurst & peppers	3.30
Tuesday, September 27	
Soup: Cream of mushroom	.90/1.20
A la Carte: Eggplant Parmesan	3.95
Fitness: Chicken curry	3.95
Deli: Virginia ham	3.20
Grill: Spanish omelet	3.30
Wednesday, September 28	
Soup: Split pea	.90/1.20
A la Carte: Tortellini carbonara	3.65
Fitness: New England cod	3.95
Deli: Roast beef	3.20
Grill: Monte Cristo	3.30
Thursday, September 29	
Soup: Chicken vegetable	.90/1.20
A la Carte: Chicken lo mein	3.75
Fitness: Stir-fry beef	3.95
Deli: Turkey	3.20
Grill: Cuban sandwich	3.30
Friday, September 30	
Soup: Manhattan clam	.90/1.20
Display cooking: Omelet	2.95
Fitness: Flounder w/julienne veg.	4.25
Deli: Corned beef	3.20
Grill: Fried clams	3.30
<i>Deli, burger and other specials daily.</i>	

Have a Heart: Walk With BERA

BERA invites all employees and their families to join this year's Heart Walk on Sunday, September 25. All money raised will go to the American Heart Association (AHA) to help in the fight to overcome heart disease. The walk will start at the Radisson Hotel in Islandia, off LIE Exit 57.

Sponsor forms are available at the BERA Sales Office or call the Long Island AHA directly at 567-7900, for more information.

Note to Employees:

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

Free English Classes

BNL is offering free English as a Second Language classes to employees, guests, visitors and their spouses. Classes will be held every Thursday evening at 7 p.m. starting September 29, in the Personnel Training Room in the rear of Bldg. 459, Management Information Systems Division.

All interested persons should attend a special preclass registration meeting for information and an assessment of their skills, on Tuesday, September 27. Assessment will start at 7 p.m. for beginners and 8 p.m. for intermediate to advanced learners. For more information, contact Starr Angelos, Ext. 7631, or Marilyn Pandorf, Ext. 5251.

Softball

The End-of-the-Year Softball Party will be held on Friday, October 7, beginning at 5:30 p.m., in the Brookhaven Center. The cost of \$15 per person includes food, fun and music. A cash bar will be available. For tickets, contact team captains by Friday, September 30.

Final Standings

League E1		League M1	
Blue Jays	16-2	Good Timers	13-1
Phoubars	14-4	Stingrays	12-2
Magnuts	10-8	Snake Bites	8-6
Six Pax	8-10	Just-4-Fun	6-8
Up & Atom	6-11	Simply Awesome	6-8
Ravens	5-12	Personnelities	5-9
Cocoon	3-15	Strike Force	4-10
		Parke Avenue	2-12
League E2		League M2	
Titans	14-3	Sure Fire	9-8
Lights Out	13-4	Big Sticks	7-10
Older Butt Wiser	13-4	Phase Out	6-11
Hy Tech	13-4	Medical	5-11
Lunatechs	11-6	Out Of Control	5-12
Hammerheads	9-8	Bombers	2-14
Scream	9-8	Feds	2-15
Well Heads	12-2	Stray Cats	4-9
Varmints	10-4	Skeleton Crew	4-9
Service America	9-4	Lead Bottoms	3-11
What's on 2nd	8-5	Tandooris	2-12

1+ Dialing Coming To Long Island

Starting tomorrow, September 24, Long Island will join the majority of the U.S. in that the three-digit area code must be preceded by the digit 1 when placing telephone calls to other areas. The same pertains when dialing 800 toll-free calls.

So, when placing calls from BNL to locales off Long Island, the complete call structure will be: 9 + 1 + area code + 7-digit number.

Calls within the Long Island 516 area code will continue to be placed as they are now, by dialing 9 + 7 digits.

BROOKHAVEN BULLETIN

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

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