BROCHHARD BULLETIN Vol. 53 - No. 31 BROCKHAVEN NATIONAL LABORATORY

Structures of Ribosome's Two Subunits Revealed at NSLS, Published in Two Back-to-Back Articles in August 26 *Nature*

Detailed models for the structures of the two subunits making up the ribosome — the essential organelle that synthesizes proteins within living cells — have, for the first time, been developed, following two studies performed at BNL's National Synchrotron Light Source (NSLS).

In addition, in revealing the sur-

face contours of both subunits, this research has also resulted in the first model of how the two subunits fit together to form a whole, functional ribosome.

These results were published in back-to-back articles in the August 26 issue of the journal *Nature*. Both *Nature* reports were based on high-reso-



lution diffraction data from studies of crystals using high-intensity x-rays at NSLS beam lines operated by BNL's Biology Department and the NSLS. From those data, the structures were determined to the resolution of five angstroms, about one ten-thousandth the thickness of a human hair.

To date, the ribosome is the largest and most complex cellular component to have its structure successfully determined using x-ray crystallography. Composed of protein and ribonucleic acid (RNA), each ribosome consists of two subunits, one approximately twice as large as the other.

A collaboration led Venki Ramakrishnan of the Medical Research Council in England published a structure of the smaller of the two ribosome pieces, what is called the 30S subunit, which was extracted from the bacterium *Thermus thermophilus*. A former BNL employee, Ramakrishnan had performed this research while on the staff of the University of Utah.

A structure for the larger piece of the ribosome, the 50S subunit, of the bacterium *Haloarcula marismortui* is described in *Nature* by a collaboration led by Yale University researchers.

"These two independent research efforts are each a tour de force," says Biophysicist Malcolm Capel of the Biology Department, who is a coauthor of both *Nature* articles. "And they point the way toward the future emphasis of biological crystallography: to the study of other large, multi-subunit, functional complexes made up of proteins and nuclei acids."

As Capel explains, this research is (continued on page 2)

Employee Reminder: Meet With Marburger Next Thursday, Sept. 9

Next Thursday, September 9, the Lab community is invited to Berkner Hall at 11 a.m., to hear Laboratory Director John Marburger discuss the state of the Lab, the latest news on budget for the fiscal year 1999, and more.

Brookhaven-Patented Inventions Transferred to Industry

Right now, thanks to Lab inventors and the Office of Economic Development & Technology Transfer Office (OTT), five departments and divisions have ten products being marketed by industry under patent licenses from BSA. While these products differ widely — they range from red-blood-cell-labeling kits to mirror surface-profiling interferometers to asbestos remediation — they are alike in their practical value to the world and the respect for BNL's accomplishments that they engender.

"The scientists and engineers at Brookhaven are wonderfully creative and inventive," said Robert Bari, Interim Associate Laboratory Director for Applied Science & Technology. "Our challenge is to identify and nurture those concepts that may lead to patents and commercial products which will benefit our economy and the national well-being."

To this end, Bari and OTT Manager and Laboratory Patent Counsel Margaret Bogosian strongly encourage BNLers to report their inventions to OTT so that, if commercial potential exists, then the inventions may be patented and licensed to industry.

"We want to expand the Lab's intellectual property portfolio to foster commercial development of Lab technologies," explained Bogosian. "By increasing the number of patent and license actions and equity business deals, not only does BNL benefit, but also BNL contributes to local and national economic development." The Lab and the individual inventors are both beneficiaries of income received (continued on page 2)

Patent No. 5,926,772 Encapsulating Hazardous Wastes

To contain wastes more effectively and inexpensively, Paul Kalb, Department of Advanced Technology (DAT), and DAT retiree Peter Colombo have improved on their previous patent, which was the second received for what is called polyethylene microencapsulation. Now, the third patent for this process has been awarded. Wastes are classified as: radioac-

tive waste; hazardous waste, which includes toxic substances; or mixed waste, a combination of radioactive and h a z a r d o u s waste. For safe handling, storage, and final disposal, wastes require treatment. Some of these (cont'd, page 2)





Paul Kalb, DAT, holds jars of recyclable plastic, which can be used in the polyethylene microencapsulation technique that he invented with DAT retiree Peter Colombo. (From left) Richard Ferrieri, David Schlyer, and Conrad Koehler, Chemistry Department, are seen with their accelerator target, developed for use with low-energy, high-current particle beams.

U.S. Patent No. 5,917,874

New Target Reduces Health Costs

David Schlyer, Richard Ferrieri, and Conrad Koehler, all of the Chemistry Department, have invented a new accelerator target that is aimed at bringing down the cost of producing radioisotopes. Specifically, they have developed a target in which to produce radioisotopes that are essential in the widely used medical-imaging technique called positron emission tomography (PET).

Radioisotopes may be made by putting a sample of a material in a suitable holder, or target, and irradiating the sample with a high-energy beam (continued on page 2)

Ribosomal Subunits (cont'd)

the culmination of years of work on the ribosome at BNL, much of which was performed at the Lab's facilities best suited for structural biology: the High Flux Beam Reactor, the Scanning Electron Transmission Microscope, and, of course, the NSLS (see story, below).

According to Capel, the recent findings are a giant step on the road to understanding how living organisms make proteins. This research can be applied, for instance, to the development of new antibiotics that work by inhibiting the production of ribosomes in bacteria.

Body of Work

Comprised of the 30S small subunit and the 50S large subunit, a ribosome is itself made up of many different proteins and three RNA molecules.

In the case of bacteria, the 30S ribosomal subunit contains 21 different proteins and one RNA molecule, which is about 1540 structural units, or nucleotides, in length. The 50S subunit contains 33 different proteins and the remaining two RNA molecules, which are, respectively, 120 and 2900 nucleotides in length.

To synthesize proteins, ribosomes "translate" coded instructions, contained by what is called a messenger RNA, into chains of amino acids that



At NSLS beam line X12B, where much of the data on the ribosomal subunits' structures were collected, are Malcolm Capel (left) and Dieter Schneider of BNL's Biology Department. Not pictured is Bob Sweet, also of the Biology Department.

make up proteins. During this process, the 30S subunit has the job of ensuring that the translation is accurate, that is, decoded into the specified amino acid in the proper sequence. The 50S subunit works with what is called transfer RNA to couple amino acids to the growing polypeptide chain.

Since the regularly repeating arrangements of atoms and molecules within a crystal are most easy to use for structural studies, the researchers first crystallized purified solutions of ribosomal subunits.

To help map the structures, the scientists then modified the crystals by adding organic clusters of heavy metals, which function as a kind of road marker. Specifically, clusters containing tungsten and osmium were used, and the latter, since they are not available commercially, were made for these studies by Bruce Brunschwig and Mei Chou of BNL's Chemistry Department.

To protect the crystallized ribosomes from radiation damage in the course of data collection, they were flash frozen to 100 Kelvin, which is -173°C. The scientists next took their crystals to the NSLS x-ray ring's beam lines: X12B and X12C, which are operated by the Biology Department and overseen, respectively, by Malcolm Capel and Robert Sweet; and X25, which is run by the NSLS under the jurisdiction of Lonny Berman.

Directing the NSLS's intense xrays at their crystals to study the ribosomal subunits, the researchers employed the phenomena called diffraction, which is the spacial redistribution of the intensity of light waves due to the presence of their samples in the path of the x-rays. The results of the diffraction experiments were tens of thousands of spots recorded by a computerized imaging detector.

After measuring the position and intensity of each spot, the collaborators then calculated what is called the electron density of the two subunits. It was from the electron density maps that molecular models of the two ribosomal subunits emerged. — Marsha Belford & Diane Greenberg

BNL's Long-Term Investment in Structural Biology Pays Off

The proposed structures of the bacterial ribosome that were published in last week's *Nature* (see story, starting on page 1) are a culmination of years of work at BNL on the ribosome. For much of this research, the Lab's big machines best suited for structural biology and the complementary data that they generate were crucial.

In the 1970s and 80s, two of the present studies' authors, Malcolm Capel and Venki Ramakrishnan, worked at the High Flux Beam Reactor (HFBR) with collaborators from Yale, using neutron diffraction to determine the three-dimensional configuration of the 21 proteins of the 30s subunit of the ribosome within the bacterium *Escherichia coli*. This was done with the ribosomes in solution, at HFBR beam line H9B, which was operated by BNL's Biology Department and under the supervision of Deiter Schneider. According to Capel, the spacial information within the 30S neutron map was key in interpreting Ramakrishnan's current x-ray diffraction data and, thus, in producing the just-published detailed, high-resolution model of the 30S ribosomal subunit.

To study how a ribosome itself is synthesized and assembled from its components, RNA and protein, Joe Wall in BNL's Biology Department and collaborators such as the late Miroslav Buoblik of the Roche Institute used the Lab's Scanning Transmission Electron Microscope (STEM). Their observations have been used to understand how proteins interact with ribosomal RNA in assembling a complete ribosome.

Using x-ray crystallography at the National Synchrotron Light Source in the early to mid-90s, Ramakrishnan and former BNL employee Stephen White determined the molecular structures of a number of proteins within the small and large subunits of the ribosome that they had isolated and crystallized.

With the structure of the bacterial ribosome revealed, what is left to do, says Capel, is: locate the remaining ribosomal proteins not currently in the x-ray crystallography map, determine how these proteins are oriented and folded within the ribosome, and ascertain the fold of the entire 16S ribosomal RNA.

Finally, the biochemical mechanisms in each stage of protein synthesis remain to be correlated with detailed molecular models of the ribosome and its complexes — including transfer and messenger RNAs and elongation factors.

According to Capel, completing this work is going to be difficult, but will be made possible by using facilities such as BNL's NSLS. — Marsha Belford

Inventions Transferred

from patent licensing. After all expenses associated with patenting and licensing an invention are recovered, the individual inventors are given a share of the licensing income received by BSA after the invention is licensed to private industry.

After distribution to the inventors, the remaining net licensing income is distributed to the research departments and divisions, with 40 percent of the income shared among those that generated it. These funds are used to support cooperative research and development (R&D) projects with U.S. industry, technology transfer activities, and new R&D initiatives (see list of products, right).

"So inventors benefit in two ways," said Bogosian. "They get a personal share, and they know that their efforts win licencing income for their departments or divisions to reinvest in more research."

Those researchers who want to explore filing an invention

Products Marketed Under BNL License

These commercialized technologies were invented by current and former BNL employees:

- Apparatus and method for biological purification of wastes - Eugene Premuzic and Mow Lin, Department of Applied Science (DAS).
- Asbestos remediation Toshifumi Sugama and others, DAS.
- Autogenes encoding RNA polymerases - F. William Studier, Biology Department.
- Cytoplasmic bacteriophage display system - F. William Studier, Biology Department.
- Fast repetition-rate fluorometers and method for measuring fluorescence and photosynthetic parameters - Zbigniew Kolber and Paul Falkowski, DAS.
- Polyethylene encapsulation of wastes Paul Kalb, Department of Advanced Technology (see story, page 1).
- Recombinant plasmids for encoding restriction enzymes DpnI and DpnII of Streptococcus pneumoniae
 Sanford Lacks, Biology Department.
- Red blood-cell labeling kit for selectively labeling whole blood with Tc-99m - Suresh Srivastiva and George Meinken, Medical Department.
- Surface-profiling interferometers for accurately measuring irregularities in the surfaces of mirrors and lenses - Peter Takacs and Shinan Qian, Instrumentation Division.

disclosure may contact Margaret Bogosian, Ext. 7338. Two recent patents granted to BNLers are featured starting on page 1. — Liz Seubert • **T7 gene expression system, vectors,** and protein products produced with the **T7 system** - F. William Studier and John Dunn, Biology Department.

Encapsulation

(cont'd)

wastes need to be solidified in a matrix to reduce the chance of contaminants dispersing or leaching from them over time. Conventional technologies, which use cement or thermosetting polymers, rely on a chemical reaction to solidify the wastes and are limited by chemical interactions with the wastes.

Developed within the Environmental & Waste Management Group in DAT's Environmental & Systems Engineering Division, the BNL process involves mixing a broad range of waste types together with virgin or recycled polyethylene to form a homogenous solid matrix. This form of matrix significantly reduces the potential for releasing the stored waste into the environment. Performanceenhancing additives and a clean, outer polymer layer are also used to help ensure the integrity of the waste.

In addition to improving performance, this BNL technology saves expense. The process is not susceptible to chemical interactions with the wastes, so more waste per unit volume can be encapsulated. About 50 to 70 percent of the total weight of each BNL-designed polyethylene-encapsulated container is waste, while conventional cement solidification containers hold only 15 to 30 percent waste.

Envirocare of Utah, the largest commercial mixed-waste treatment company in the U.S., has signed a license agreement with BNL and is currently using this new process (see Brookhaven Bulletin, June 20, 1997). — Liz Seubert

New Target

of particles from an accelerator. Production costs are high, so the use of low-power accelerators which create low-energy particle beams is being explored. To retain the required beam density, however, the beam intensity must be increased to a relatively large current of about 100-150 microamps.

The increased intensity made the conventional targets inefficient. So Schlyer, Ferrieri and Koehler developed a target to use with low-energy, high-current particle beams, making it possible to produce lower cost radioisotopes at many more facilities. The target was developed under a Cooperative Research and Development Agreement (CRADA) with AccSys Technologies, Inc., a manufacturer of low-energy, high-current accelerators.

In PET, a radioisotope is attached to a compound that is then administered to a patient. A PET machine can detect and image the gamma rays produced by positron particles emitted by these short-lived radioisotopes. So physicians and researchers can study the images to learn the distribution and location of the compound in the patient over time, "seeing" what is happening in the body or brain.

BNL research to study the brain using PET has resulted in discoveries on aging, schizophrenia, Alzheimer's and Parkinson's diseases, brain tumors, drug action, and substance abuse. — Liz Seubert

(cont'd)

Finance, Administration ALD Gives Blood; How About You? Shall

All three BSA corporate officers — BSA President and Lab Director John Marburger, BSA and BNL General Counsel Greg Fess, and Brian Sack, who is BSA Chief Financial Officer and the Lab's Assistant Laboratory Director (ALD) for Finance & Administration — give blood. This is the final story in a series of three discussing their reasons for being blood donors (see Brookhaven Bulletin, December 4, 1998, and May 28, 1999).

In his position since February of this year, Brian Sack has authority over the Lab's Budget Office plus four divisions: Contracts & Procurement, Financial Services, Information Services, and Staff Services. As the Lab's and BSA's chief financial officer, he is responsible for, respectively, BNL's approximately \$400-million annual budget provided primarily by DOE and the \$2-million BSA budget for Laboratory costs that cannot be charged to DOE or another agency.

As a result of his role, Sack's day is full of "lots of meetings and lots of interactions with people on familiar as well as new topics, which makes it all the more challenging and fun," Sack says.

While it is not one of his everyday duties, Sack takes being an on-the-job blood donor seriously. "To me, donating blood is in many ways similar to making any charitable contribution, whether it be money or time to any worthwhile cause," explains the ALD for Finance & Administration. "It is just the right thing to do."

In the case of donating blood, however, "There are additional benefits," adds Sack. "Since we have yet to invent anything that takes the place of donated blood, blood donors can save lives."

A consistent blood donor since after college, Sack has been able to donate "by setting my priorities: I just find the time, such as by moving my schedule

around, taking a short lunch, or doing whatever it takes."

Sack first donated at the Lab last spring, during the first drive for which he was on site. He comments, "I was impressed with the professionalism of all those involved, and with the facility that we are able to provide for this activity. Where else could you go to give blood that is so convenient?"

For the convenience of all potential blood donors from the Lab community, BNL's late-summer Blood Drive will be held on Thursday, September 9,



(Right) Brian Sack, at last spring's Blood Drive

from 9:30 a.m. to 3 p.m. in the Brookhaven Center. Those eligible to donate are employees, retirees, facilityusers, other Lab visitors, and their family members and friends who are in good health and between the ages of 17 and 76, and who have not donated blood in the past 56 days.

To make an appointment, contact BNL Blood Drive Chair Susan Foster, Human Resources Division, Ext. 2888, or e-mail donate blood@bnl.gov. Include your name, extension, and preferred time to donate.

Arrivals & Departures

Arrivals

Thomas Barragato Plant Eng. Wayne S. Goldenberg App. Science Robert F. Schoepfer AGS Connie J. Simiele Waste Manage.

Free Flu Shots

The Occupational Medicine Clinic (OMC) has again begun offering free flu shots to employees, to precede the winter influenza season.

For more information about flu shots or to make an appointment to be vaccinated, call OMC, Ext. 3670.

Plan Your Estate 9/15

On Wednesday, September 15, 5:30-7 p.m. at Berkner Hall, learn about estate-planning principles, tax advantages, wills, and more, at "Estate Planning — Explore the Options," a seminar by American Express Financial Advisors Inc., as part of the Money Talks financial and retirement planning seminar series organized by the Human Resources Division.

To attend, complete and return the form sent to all employees, or send your name and department or division to Joyce Wund, Bldg. 185, by Tuesday, September 7.

Shall We Dance?

Spaces remain available in the 5:30 p.m. beginner cha cha and fox trot class, and the 6:30 p.m. beginner swing and jive class, which start on September 15 and are offered on Wednesdays by the BNL Ballroom, Latin & Swing Dance Club.

Members from last year are also invited to take the 7:30 p.m. level I and II review class on International samba and Viennese waltz.

Each class is one-hour long, taught over eight weeks on Wednesdays in the North Ballroom of the Brookhaven Center, and costs \$25 per person. BNL employees, retirees, facility-users, onsite contractors, their families, friends, and dance partners are invited to join.

To sign up, come to the first night of classes, or, to guarantee your place in one or more of these classes, sign up now by sending a check payable to the BNL Dance Club to Marsha Belford, club president, Bldg. 134. Include a note with your name, Bldg., Ext., name of the class, and the name of your partner (partners are advised to sign up together). If you do not have a partner, then you will be put on a waiting list until a partner is found, as the club only signs up equal numbers of women and men.

Rifle, Pistol Club

The BNL Rifle & Pistol Club next meets on Wednesday, September 8, at noon in the second-floor conference room of the AGS Department, Bldg. 911. For more information call Ted Robinson, Ext. 5489, or the club's hotline, Ext. 2658; or go to the club's Web page at www.berahome.bnl.gov/ clubs/rpc/rpc.html.

Softball Party

All softball players, their families, and friends are invited to the last BERA Softball League party of the century!

The party will be held at the Brookhaven Center on Friday, October 15, starting at 5:30 p.m. Tickets are \$10 per person and cover: a buffet dinner; two drink coupons for beer, wine, or soda; music by DJ Heart and Soul; and a cash bar.

Everyone must have a ticket, and none will be sold at the door. To purchase tickets, bring or mail checks, not cash, payable to BERA Softball, to Andrea Epple, Bldg. 51M, by October 1. For more information, e-mail softball@bnl.gov.

Volleyball League Organizes New Season

The BERA Volleyball League offers teams for players of every skill, whether they want to play in an open or mixedgender league. For more information, visit the league's Web page at www.vb.bnl.gov, or contact the people listed below or Frank Crescenzo, Ext. 3433 or frankc@bnl.gov.

BERA Bridge Club

The BERA Bridge Club runs a duplicate bridge game on Thusdays every other week. The 1999 fall game schedule is as follows: September 9, 23; October 7, 21; November 4, 18; and December 2, 16. Additional games are being considered. All games start at 7:15 p.m. in the cafeteria, excepting the October 7 game, which will be in the South Room of the Brookhaven Center. For more information, call Morris Strongson, Ext. 4192.

Corrections

In the story "Stand Down Heightens BNL's Security Awareness" in the Brookhaven Bulletin of August 13, 1999, the name of one presenter was inadvertently omitted: she is Sheryl Gerstman of the Safeguards & Security Division, who spoke on classified computer security.

In the caption accompanying the story "Lab Wins DOE's FY98 Corporate Small Business Award," in the Brookhaven Bulletin of August 27, 1999, the man at right in the photograph was incorrectly identified as Robert Gordon, DOE Director of the Administrative & Financial Management Division of DOE's Brookhaven Group. While present at the Washington, D.C., ceremony, Gordon was absent from the photo. The man at right actually is Deputy Secretary of Energy T.J. Glauthier.

Upton Nursery School Opens Enrollment

The Upton Nursery School, a small, parent-run, cooperative nursery school that meets in the Recreation Building in the apartment area, is now accepting registration for children two-anda-half to four years old for the new September-through-June school year.

Children of BNL employees, facility users, guests, on-site contractors, and their families attend classes on Mondays, Tuesdays, and Thursdays, 8:30-11:30 a.m. Tuition is \$110 per month. For more information or to register a child, contact Shelly Shumway, 732-1367, or shelly shumway@yahoo.com.

Dosimetry badges will be exchanged at the end of the workday today, Friday, September 3. Therefore, please place your badge in its assigned rack space before leaving work today.

Benefit Notes

BROOKHANEN BULLETIN

Published weekly by the Media & Communications Office for the employees of BROOK HAV EN NATIONAL LABO RATORY

MARSHA BELFORD, Editor UZ SEUBERT, Assistant Editor

Bidg, 134, P.O. Box 5000 Upton NY 11973-5000 Tel. (516) 344-2345; Fax (516) 344-3368 For more information on the following, contact Muriel Pfeiffer between 8:30 a.m. and 1 p.m. Monday through Thursday in the Benefits Office, Human Resources Division, Bldg. 185, Ext. 2877 or (800) 353-5321.

Qualifying Events

Changes to medical and/or dental coverage may be made only during the annual open enrollment or within 31 days of what is called a qualifying event. Qualifying events include: birth or adoption of a child, marriage, divorce or legal separation, loss of dependent status (for instance, due to graduation), or a spouse's gain or loss of employment.

New 800 Number

In addition to dialing Ext. 2877, BNLers may now reach the Lab's Benefits Office in the Human Resources Division by calling the following tollfree 800 number: (800) 353-5321.

Hospitality Committee

The Hospitality Committee invites all on-site residents, their spouses and friends to join it during the following events. More details are posted in the laundry and on the door of the Recreation Building. For more information, call Julie Kim-Zajonz, 929-0405.

Welcome Coffee

Coffee is served to apartment area residents every Tuesday, from 10 a.m. to 11:30 a.m., in the lounge of the Recreation Building in the apartment area.

Parent-Toddler Group

Parents of two- and three-year-olds are invited to bring the children to the Recreation Building every Wednesday, 9:30-11:30 a.m. For more information, call Sarah Zill, 821-2602.

Form a Team, Join the Pool

For the upcoming 1999-2000 season, newcomers to BERA Volleyball are welcome to form a team or become part of a players' pool. To form a new team, contact Travis Shrey, Ext. 7451 or shrey@bnl.gov. To be added to the players' pool, contact Jeff Mitchell, Ext. 3015 or mitchell@bnl.gov.

First Captains' Meeting

For the 1999-2000 season, the first meeting of volleyball captains is scheduled for noon on Wednesday, September 15, in Room B, Berkner Hall. At that time, team captains must bring their completed rosters. Blank roster forms may be found at www.vb.bnl.gov/ forms/blank_roster.ps.

Coming Up

On Friday, September 24, at 8 p.m. in Brookhaven Center, physicist and motorcyclist Charles Falco, University of Arizona, Tucson, who helped curate "The Art of the Motorcycle" exhibition at the Guggenheim Museum last summer, will present a talk on "The Art and Science of the Motorcycle." All are invited.

Holiday Notes

In observance of Labor Day, the Lab will be closed on Monday, September 6 and there will be no Bulletin on Friday, September 10.

In addition, the Upton Post Office and the on-site Teachers Federal Credit Union will be closed on 9/6. The automatic teller machine in the foyer of Berkner Hall will remain open. The Omega Leisure Travel Office in Berkner Hall will be closed on 9/6&7, reopening on Wednesday, 9/8.

The cafeteria will be open 7:30 a.m.-2 p.m., Saturday-Monday, 9/4-6. The Brookhaven Center will be closed on Sunday evening, 9/5; it will reopen on Monday, 9/6, 5-9 p.m. During September, the cafeteria will remain open on weekends for morning and lunch service.

The swimming pool will be closed Saturday-Monday, 9/4-6. Fall pool hours resume on Tuesday, 9/7. The gymnasium, which has been closed weekends throughout the summer, will reopen 10 a.m.-5 p.m. on Saturdays from 9/11.

To Your Health

The following activities are offered by the Health Promotion Program of the Occupational Medicine Clinic. To register or for more information, call Health Promotion Specialist Mary Wood, Ext. 5923.

A Better You

The "A Better You!" weight-loss program offers participants consultations with a dietitian or nutritionist to customized the program, healthy cooking techniques, dining-out strategies, foodshopping tips, exercise approaches, stress-reduction hints, and more. This ten-session program meets on Thursdays, starting September 9, and costs \$99 per person.

Cardio Kickboxing

By popular demand, cardio kickbox classes will be again offered on site, from noon to 1 p.m. on Mondays and Thursdays, starting Monday, September 13. Each class is \$5 per participant, payable monthly.

Water Aerobics

Water stretching, strengthening and aerobic exercise classes will again be offered at the Lab pool, Bldg. 478, from 5:20 to 6:20 p.m., on Tuesdays and Thursdays. The first classes will be on September 14 and 16, respectively. Water-aerobics classes are free, but participants must pay the pool fee of \$2 a session or show their season pool pass.

TFCU at Berkner 9/15

Representatives from Teachers Federal Credit Union and MEMBERS Financial Services, a financial-management program, will be in Berkner Hall lobby on Wednesday, September 15, 11 a.m.-2 p.m. Stop by for information on accounts and other services.

BERA News

For more information, stop at the BERA Sales Office in Berkner Hall, Tuesday-Friday, 9 a.m.-1:30 p.m., or call Andrea Dehler, Ext. 3347, or M. Kay Dellimore, Ext. 2873.

Walk for Healthier Hearts

Join the fight against heart disease and stroke by participating in the 1999 American Heart Walk on Sunday, October 3. Walkers may choose from two locations, Suffolk County Community College in Riverhead, or the State University of New York at Farmingdale.

Volunteers Wanted for Science, Environment Festival in October

On Saturday, October 16, the Lab will be holding an outdoor Festival of Science & the Environment, which will be open to the public. Similar to last year's successful Environmental Fair, this year's festival will feature more science exhibits and sciencebased activities for the kids.

To volunteer for this event, contact its coordinator, Janet Tempel, Community Relations Office, Ext. 4049 or jtempel@bnl.gov.

Weight Watchers at Work

The next session of the on-site Weight Watchers classes will have its first class on Wednesday, September 15, from noon to 1 p.m. in the Brookhaven Center.

Fall Into Fitness

Starting on September 20, travel to different cities around the world, beginning and ending in New York City — without leaving the area and while getting fit. Do this by joining the fiveweek Fall Into Fitness program. Similar to the annual March Into May activity program, Fall Into Fitness has participants track miles instead of points. Accordingly, 20 minutes of any exercise equals 600 miles of travel.