

Roger Stoulenburgh D3870312

Erdong Wang Wins IEEE/NPSS Award

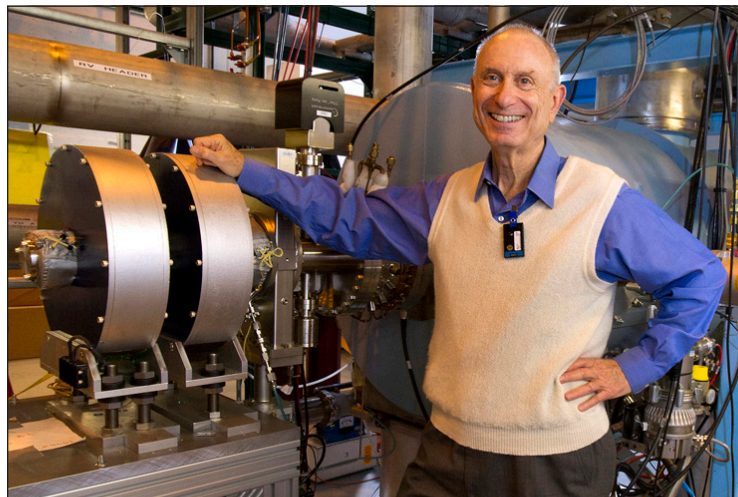
The Institute of Electrical & Electronics Engineers (IEEE) Nuclear & Plasma Science Society (NPSS) has awarded the 2012 Particle Accelerator Science & Technology Doctoral Student Award to BNL physicist Erdong Wang for his contributions to the physics of high quantum-efficiency photocathodes. The award recognizes a student's technical contributions to particle accelerator science and technology, as evidenced in his or her doctoral thesis.

"When I heard I'd received this award, I knew I did solid work," said Wang. "I really appreciate being nominated. I am grateful for the great research environment at Brookhaven. I also want to express my gratitude to my advisor Kui Zhao at Peking University for his kind support and advice. I am sincerely thankful for this recognition by IEEE/NPSS."

Wang's thesis research focused on developing photocathodes for superconducting radiofrequency (SRF) electron guns, a technology that will play a key role in an energy-conserving particle accelerator called an Energy Recovery Linear Accelerator (ERL, see story, right). A small ERL is currently being built at BNL as a prototype for future accelerator technologies.

See *Erdong Wong* on p. 2

Energy Recovery Linear Accelerator: Unique Accelerator Reclaims Energy



Roger Stoulenburgh D3190112

'Green' ERL poised to play prominent role individually and as a support for larger scientific accelerators

Particle accelerators are hardly known for their minimal energy requirements. But by the end of 2013, BNL's Collider-Accelerator Department (C-AD) will have completed an Energy Recovery Linear Accelerator (ERL), a unique type of accelerator that reclaims the energy it uses to accelerate electrons.

An ERL, like many linear accelerators, produces a dense particle beam with high brightness, or high-density packing in multi-dimensional space. This beam is created by an electron-producing photo-cathode, and is then injected into a superconducting radio frequency cavity to accelerate the beam from its initial energy. In a traditional linear accelerator, also called a LINAC, this beam would be accelerated and strike a target, while the abundant leftover electrons and all of their energy would be subsequently absorbed in a massive beam dump.

"If the current and energy of the LINAC are very high, it means that you are wasting a lot of power," said Ilan Ben-

Photo above: Ilan Ben-Zvi with the soon-to-be-completed .02 GeV Energy Recovery LINAC

Zvi, head of C-AD's Accelerator R&D division and leader of the ERL project.

Greatly Less Energy

An ERL avoids the waste of dumping a fully energized beam. In a simple ERL, the beam is injected into a superconducting accelerator. Once the beam is used, typically having been circulated around a ring with the help of magnets, its energy can be recovered by using the same superconducting cavities to decelerate the leftover beam electrons before they are dumped. In a complex, high-energy ERL, the beam circulates multiple times among a series of accelerators, each of which is specifically phased to elevate the beam to an incrementally higher energy. By passing the beam multiple times through these accelerator sections — the number of times depends on the ERL's desired...

See *ERL* on p. 2



BNL Helps Depts. of Energy & State Encourage EcoPartnerships in China

BNL's Vatsal Bhatt, working in the Sustainable Energy Technologies Department of the Global & Regional Solutions Directorate, has facilitated an EcoPartnership between the U.S. city of Columbus, Ohio, and Chinese city of Hefei, Anhui Province. This newest EcoPartnership was announced by the U.S. Department of State (DOS) on the occasion of the visit of Chinese Vice President Xi Jinping in February 2012. Bhatt serves on the DOS established Secretariat of EcoPartnerships under the U.S.-China Ten Year Framework for Cooperation on Energy and Environment (TYF). The purpose of the EcoPartnerships program is to encourage U.S. and Chinese sub-national stakeholders to share best practices, foster innovation, and promote sustainable economic development. Since the TYF agreement was signed in 2008, 15 EcoPartnership agreements have been signed between U.S. and Chinese cities and organizations.

Bhatt has been working with Columbus-Hefei since 2007, when DOE funded his proposal to establish US-India-China Cities Partnerships for Energy and Environment, pairing eight U.S. cities to eight Indian cities and seven Chinese cities, to enable sharing best practices and planning and deploying technologies for

Photo above: Vice Minister Qiu (third from right) of China's Ministry of Housing, Urban and Rural Development presenting opening remarks at a BNL-organized workshop on Clean Energy for Sustainable Cities in Beijing with the U.S. Mayors' delegation in December 2011. BNL's Vatsal Bhatt is second from left.

energy efficiency and renewable energy. In addition to the Columbus-Hefei partnership, he facilitated the signing of an EcoCities memorandum of understanding (MOU) between the U.S. city of Chicago and the Chinese city of Shanghai in September 2010 and another MOU between the U.S. city of Atlanta and the Indian city of Ahmedabad in March 2008. These partnerships focus on programs such as green buildings, renewable power, alternative fuel vehicles, recycling, efficient water supply and sanitation, and green government purchasing.

Last December, Bhatt was among those accompanying a delegation of U.S. mayors and other officials to Beijing for a week-long visit that exposed the officials to opportunities for collaboration and attracting future Chinese investment in U.S. cities. The visit was part of an exchange program supported by DOE's Office of Energy Efficiency & Renewable Energy (EERE) —...

See *EcoPartnerships* on p. 2

New Microscope at NSLS Captures Nanoscale Structures in Dazzling 3D

A new x-ray microscope, developed and commissioned at BNL's National Synchrotron Light Source (NSLS), probes the inner intricacies of materials smaller than human cells and creates unparalleled high-resolution three-dimensional (3D) images. By integrating unique automatic calibrations, scientists at BNL are able to capture and combine thousands of images with greater speed and precision than any other microscope. The direct observation of structures spanning 25 nanometers — or 25 billionths of a meter — will offer fundamental advances in many fields, including energy research, environmental sciences, biology, and national defense.

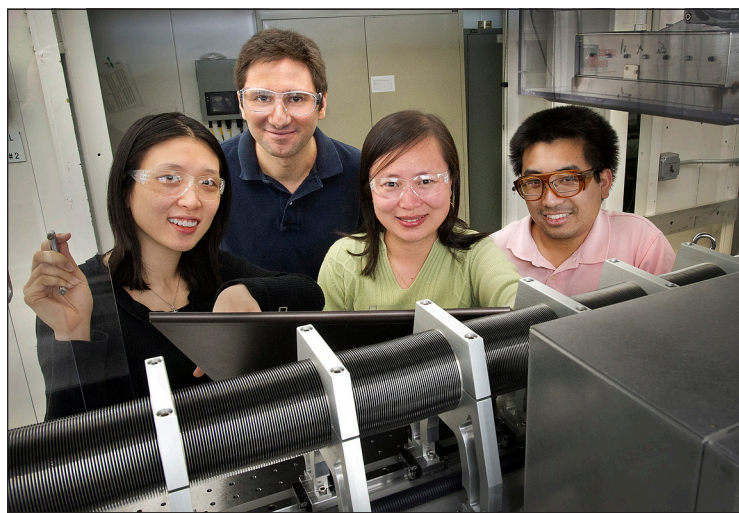
This innovative full field transmission x-ray microscope (TXM) was funded by the American Reinvestment and Recovery Act. It provides the x-ray source needed to capture images on the nanoscale. A new paper published in the April 2012

Applied Physics Letters details the experimental success of a breakthrough system that rapidly combines 2D images taken from every angle to form digital 3D constructs.

"We can actually see the internal 3D structure of materials at the nanoscale," said Brookhaven physicist Jun Wang, lead author of the paper and head of the team that first proposed this TXM. "The device works beautifully, and it overcomes several major obstacles for x-ray microscopes. We're excited to see the way this technology will push research."

Wang's team examined, for example, a 20-micrometer electrode from a lithium-ion battery — as thin around as a human hair. The internal interaction of pores and particles determines the energy performance of the battery, and examining that activity requires precise knowledge of the nanoscale structure.

Wang's team took 1,441 2D



Roger Stoulenburgh D1580412

Collaborators from Photon Sciences and Sustainable Energy Technologies stand behind the new transmission x-ray microscope (TXM) at Brookhaven's National Synchrotron Light Source. From left: BNL's Yu-chen Karen Chen-Wiegart, Can Erdonmez, Jun Wang (team leader), and Christopher Eng.

pictures of the electrode as a machine rotated the tiny material specimen to capture every possible angle. The challenge then becomes converting those separate images into a single 3D structure — one in which every nanometer makes a difference. On this scale, the usual one-micron wobbles are similar in scale to taking a portrait and having the subject leap several feet to either side.

Before this new system, sci-

entists had to align every single image manually or use software to slowly interpret the shifts. This had two major limiting effects on the process: first, the sample has to have sharp internal features or be marked to provide guidelines, which can limit material types; and second, manual alignment demands so much time that the total image count peaks in the hundreds. Brookhaven's TXM changes that.

For the first time, the speci-

men is mounted on top of a platform with three sensors that measure nanometer shifts in any direction as the battery rotates and the microscope takes pictures. The computer recording the images, after calibration using a gold sphere, then automatically compensates for any shifts and accurately assembles the images into the final three-dimensional construct. The entire process takes only four hours, and that owes more to the x-rays available from the NSLS than to the microscope or computer.

The Future of 3D

BNL's National Synchrotron Light Source II (NSLS-II), scheduled to come online in 2015, will exploit the capabilities of this TXM on an even more radical scale. Imaging that lithium-ion battery took 10,000 seconds on NSLS, but with the new light source's higher beam flux, or x-ray brightness, it will be 1,000 times faster, dropping that time to only 10 seconds.

In addition to direct structural observation, the TXM will also advance elemental and chemical understanding of materials.

See *New Microscope* on p. 2

CALENDAR
OF LABORATORY EVENTS

• The BERA Store in Berkner Hall is open weekdays from 9 a.m. to 3 p.m. For more information on BERA events, contact Andrea Dehler, Ext. 3347, or Christine Carter, Ext. 2873.

— REGULARLY —

Weekdays: Free English for Speakers Of Other Languages Classes

Beginner, Intermed., Adv. classes, various times. All welcome. Learn English, make friends. See <http://www.bnl.gov/esol/schedule.asp> for schedule. Jen Lynch, Ext. 4894.

Mondays: Yogalates

Noon–1 p.m. at the Rec Hall (Bldg. 317). Registration required, Ext. 2873.

Mon. & Thurs.: Kardio Kickboxing

\$5 per class. 12:15–1:15 p.m. in the gym (Bldg. 461). \$5 per class. Ext. 2873.

Mon., Tues., Thurs., & Fri.: Tai Chi

Noon–1 p.m., B'haven Cntr (Bldg. 30), N. Rm. Adam Rusek, Ext. 5830, ruseka@bnl.gov.

Tuesdays: Hospitality Welcome Coffee

10:30 a.m.–noon. Rec Hall (Bldg. 317). Meet over coffee. Children welcome.

Tuesdays: Pilates

Noon–1 p.m. at the Rec Hall (Bldg. 317). Registration required, Ext. 2873.

Tuesdays & Wednesdays: Zumba

Tuesdays: Noon–1 p.m., in gym (Bldg. 461). Wednesdays: 5:15–6:15 p.m., at the Rec Hall (Bldg. 317). Registration required, Ext. 2873.

Tuesdays: Toastmasters

Two monthly meetings: 1st & 3rd Tuesdays, 5:30 p.m., Bldg. 463, Room 160. Guests and visitors welcome. www.bnl.gov/bera/activities/toastmasters/.

Tuesdays & Thursdays: Aerobic Fitness

5:15–6:30 p.m. in the Rec. Hall (Bldg. 317). \$5 per class, or 10 classes for \$40. Kathy Schoenig, Ext. 2818.

Tuesday & Thursday: Aqua Aerobics

5:30–6:30 p.m., Pool (Bldg. 478). Registration required, Ext. 2873.

Wednesdays: Ballroom Dance

5:30, 6:30, 7:30 p.m., Brookhaven Center (Bldg. 30). Vinita Ghosh, Ext. 6226.

Wednesdays: Play Group

10 a.m.–noon at Rec Hall (Bldg. 317). Parents meet while infants/toddlers play. For events, see <http://www.meetup.com/BNL-Playgroup>, or call Ext. 2873.

Wednesdays: Yoga

Noon–1 p.m., B'haven Center (Bldg. 30). Free. Ila Campbell, Ext. 2206, ila@bnl.gov.

1st Wednesday of month: LabVIEW

1:30–3 p.m., Bldg. 515, 2nd fl. Seminar Rm. Free technical assistance from LabVIEW consultants. Ext. 5304, or Terry Stratoudakis, (347) 228-7379.

Thursdays: BNL Cycletrons Club

5 p.m., Brookhaven Center. First Thurs. of month. Andy Mingino, Ext. 5786.

Thursdays: Reiki Healing Class

Noon–1 p.m., Call for location. Nicole Bernholz, Ext. 2027.

Thursdays: Postdoc Social Night

6:30 p.m. ASAP Lounge (Bldg. 462). www.bnl.gov/asap.

Thursday: Judo Class

7:30 p.m. Gym (Bldg. 461). Tom Baldwin, Ext. 4556.

Fridays: Family Swim Night

5–8 p.m. Pool (Bldg. 478). \$5/family. Ext. 2873.

Arrivals & Departures

— Arrivals —

Donald Sullivan, Jr. Site Res
Yu Xie Env. Scis
Diane Zhong Chemistry

— Departures —

Zhong-Bo Kang Physics
Kotaro Kondo C-AD
Konstantinos Nikolopoulos. Phys.
Michael Rickert, Jr. Site Res

EAP Lunchtime Talk:
Achieving Professional
Success, 5/9

“Achieve Professional Success Via Emotional Intelligence” is the title of a talk sponsored by the Employee Assistance Program (EAP) to be held on Wednesday, May 9, at noon in Berkner Hall, Room B.

Emotional intelligence is a mind and skill set that includes emotional engagement with correct boundaries, empathy, social skills, ability to regulate one’s own mood and emotional reactivity, self-awareness and skills in communication.

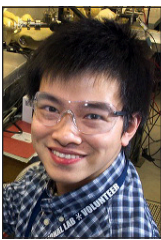
To attend the talk, register with Nancy Losinno, EAP Manager, Ext. 4567 or nlosinno@bnl.gov.

Erdong Wong
from p. 1

An electron gun’s function is largely dependent on its photocathode, a negatively charged probe that emits electrons when exposed to light to create an electron beam. A high current beam is created when the photocathode’s small investment of electrons is amplified by hydrogen-treated diamond in a superconducting cavity. This amplifier in a superconducting cavity supports an electron beam with a high average current and low beam degradation, as compared to beams produced by a traditional cathode.

For his thesis, Wang worked on gallium-arsenic (Ga-As) photocathodes for a superconducting gun to produce polarized electron sources. Specifically, he focused on photocathode preparation techniques and conducted systematic studies of photocathode quality. He also performed tests of the cathode using a SRF gun. Wang performed beam dynamic simulations and theoretical studies to hypothesize the electron bunch length, which affects the strength of the beam, and the effect of electron back-bombardment, a phenomenon that degrades the cathode and beam quality.

Polarized electron cathodes might be used in a proposed electron-ion collider (EIC) at Brookhaven’s Relativistic Heavy Ion Collider, an “atom-



smasher” that accelerates and collides beams of heavy ion and/or protons to recreate and explore the conditions of the early universe. The idea is to use a beam of electrons to collide with RHIC’s heavy ion or proton beams to open new avenues of research.

Another facet of Wang’s thesis research was his work with diamond amplifiers, little diamond capsules that are incorporated into the gun’s structure to help produce a dense electron beam. For this construction, Wang developed a technique to create and reproduce diamond amplifiers, having studied the application of hydrogen-treated diamonds. Wang’s hypothesis, that the electron beam emission from the diamond surface depends on the applied field, was supported by experimental data and led to new information about the energy spread of the electrons inside the diamond.

The results of Wang’s research have impacts beyond the scope of his thesis, as diamond-amplified photocathodes are likely to be essential for future electron guns.

The award Wang received includes \$2,000 and a plaque that will be conferred at a ceremony on Thursday, May 24, during the 2012 International Particle Accelerator Conference in New Orleans. Wang will also present his results at the conference.

Wang received his Ph.D. at Peking University. Having completed his thesis at Brookhaven, he is continuing his research at the Lab as a research associate.

— Natalie Crnosija

Safety makes science possible
at Brookhaven National Laboratory
<http://intranet.bnl.gov/safety>

New Microscope from p. 1

Maintaining constant magnification during spectroscopic imaging, which examines the unique ways that matter interacts with radiation, scientists will be able to identify the individual chemical configurations within samples. Research is currently under way by Wang’s team to demonstrate this capability.

Nanoimaging for Industry
and National Security

The TXM was purchased with support from the American Recovery and Reinvestment Act, designed to spur economic activity and create jobs. Xradia, a California-based company that specializes in 3D X-ray microscopy, built the new device. Brookhaven Lab physicists worked in close collaboration with Xradia engineers, explaining their specific research goals and performance needs.

“This has been a very successful collaboration, and Xradia has been our critical partner in this project,” said Wang. “We are still in frequent contact to provide them with feedback on the microscope’s performance, so that future design innovations can be made.”

While the focus for the new TXM will likely be on alternative energy fuels and storage solutions, the fundamental insights have already been applied to plant root structures, catalysts,

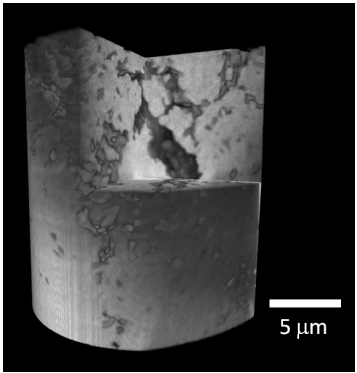


Image above: This 3D reconstruction of a lithium-ion battery electrode, composed of 1,441 individual images captured and aligned by the TXM, reveals nano-scale structural details to help guide future energy research.

and advanced electronics. The demonstrated success of the 3D imaging system has already attracted the interest of commercial users, with major corporations such as UOP and IBM scheduling time at the TXM. The Defense Advanced Research Projects Agency (DARPA) also plans to use the new microscope to probe the intricate structures of imported microchips in the interest of national security.

NSLS-II and the TXM research are funded through DOE’s Office of Science, which is the single largest supporter of basic research in the physical sciences in the United States, and is working to address some of the most pressing challenges of our time. For more information, please visit science.energy.gov. — Justin Eure

EcoPartnerships from p. 1

...Clean Energy for Sustainable Cities: Sharing Best Practices and Technologies.

The initiative, also supported by the Sister Cities International, the Alliance to Save Energy and DOE Labs like Brookhaven and Oak Ridge, was designed to build partnerships between Chinese and American government cities and private sector representatives to support low carbon development. Mayors and officials from San Francisco, Birmingham, Columbus, Denver, Fort Worth, Honolulu, and Charlotte were part of the group who met with central and local government officials and representatives from China’s academic and research institutions and technology companies.

“Now Hefei is learning from Columbus and vice versa,” Bhatt said. “We help these cities share knowledge and technologies for leapfrogging to advanced infrastructure and create economic opportunities and jobs in U.S. For example, Hefei is inviting Columbus-based green building experts to help make Binhu district near-zero energy development. Similarly, Hefei’s GuoXuan Battery Company is exploring production of batteries for electric vehicles in Columbus, in collaboration with Ohio State University’s Center for Automobile Research



ERL from p. 1

...maximum energy — a highly energized beam can be generated without requiring a high initial energy from the beam injector. Thus, significantly less energy is needed up-front to create the beam. The complex ERL follows the same beam deceleration process after the beam’s use, saving a substantial amount of energy.

This level of energy conservation is more typically found in storage rings, which circulate a beam of particles for long periods of time without losing much energy. In storage rings, however, beam brightness is determined by an equilibrium process balancing synchrotron radiation — a byproduct of particle acceleration that causes beam energy loss — with the continual add-back of energy from the beam passing through the accelerating cavities on each turn around the ring. The beam brightness from a good electron gun can be higher.

Beam Quality Maintained

“The great advantage of an ERL is that it allows you to maintain the beam quality of a straight LINAC but maintain current and energy as storage rings do, so it combines sort of the best of all worlds,” said Ben-Zvi.

An ERL’s energy efficiency is also due to the presence of superconducting radio frequency cavities in the accelerators, a technology that is fundamental to modern accelerators. Superconducting cavities allow the generation of large accelerating fields with a miniscule investment of power. The cavities can serve multiple purposes — accelerating the beam, maintaining the beam bunch sizes, and also making up for the energy lost to synchrotron

and a Cleantech incubator.

In a partnership established in May 2011 between Charlotte, North Carolina and the City of Langfang, Hebei Province, a Chinese company is exploring installing solar panels on a city-owned building in Charlotte.

“These types of international exchanges and collaboration are vital to solve global problems,” said Paul Friley, leader of the Energy Policy & Technology Group.

“One of the real accomplishments of the EcoPartnerships is to leverage the US Sister Cities program to forge meaningful connections between U.S. and Indian Cities in energy efficiency and energy management,” said Sustainable Energy Department Chair Pat Looney. “This has made this program particularly strong, with benefits that include direct access for U.S. business to the Chinese and Indian markets.”

“More than half the world’s population is now urban, and, according to the United Nations, about 90 percent of future growth will take place in cities,” Bhatt said. “It is vital to focus research and collaboration on pressing urban issues like energy and environmental quality, since city activities are responsible for nearly 75 percent of world greenhouse gas emissions.” — Kay Cordtz

radiation. The cavities, crafted from niobium and maintained at about two degrees Kelvin, are able to carry current with extremely low resistance, thereby minimizing energy loss and reducing the cost of using such accelerators.

The soon-to-be-completed, small-scale, .02-billion-electron-volt (GeV) single-pass ERL is the first of its kind at BNL. But in a decade or so, a powerful multi-pass, up-to-30-GeV ERL could be a key electron source for an electron-ion collider, such as the one proposed for construction at the Relativistic Heavy Ion Collider, known as eRHIC.

“If eRHIC is to be a success, it needs the ERLs and, therefore, ERLs are very much part of the future of Brookhaven,” explained Ben-Zvi. “What we’re trying to create is an Energy Recovery LINAC much, much more powerful than anything that exists or is even planned anywhere.”

The ERL technology might also be applied to another accelerator project designed to “cool” RHIC’s ions and protons. This cooling condenses the beam, which then produces more luminous collisions — and more data.

“As part of my work on eRHIC, I realized that the luminosity would be much improved if you used electron cooling at RHIC,” said Ben-Zvi. “And electron cooling would also require an ERL. So the ERL was just everywhere in this machine. There are multiple applications in many fields of science for such a device.”

The .02 GeV ERL’s construction is being supported by the Department of Defense’s Joint Technology Office and Office of Naval Research, DOE’s Office of Nuclear Physics, the Small Business Innovation Research program and Brookhaven Science Associates patent revenue funding. — Natalie Crnosija

Patchogue-Medford High School Triumphs At BNL’s Bridge Building Contest

Patchogue-Medford High School seized the top three spots and the Aesthetic Award at BNL’s 2012 Bridge Building Contest on March 31.

William Cheung took first place at the competition, while Hanna Lazio and Alexandra Smaldone won second and third places, respectively. Nicholas Tully won the Aesthetic Award for his visually appealing design. They were recognized at an April 16 awards ceremony in BNL’s Science Education Building.

The object of the competition was to design and construct efficient bridges within prescribed parameters, which necessitated the study and application of physics and engineering principles.

Following specific material restrictions, like using only basswood, and structural requirements, like having a minimum clearance and maximum bridge height, the students got a taste of life as an engineer. To be tested, the bridges were loaded with weights on specific



Brookhaven National Laboratory 2012 Bridge Building Contest winners (from left): Aesthetic Award: Nicholas Tully; Second Place: Hanna Lazio; First Place: William Cheung; and Third Place: Alexandra Smaldone, all from Patchogue-Medford High School.

locations on the bridge. The bridges were loaded with a minimum of 50 kilograms.

At the competition, 210 bridges were entered. One hundred and nine were disqualified and 101 went on to be tested for their weight-bearing capacity. Bridges were disqualified if they were constructed out of or fortified with unapproved materials, or did not obey design specifications.

The winning, most structurally efficient bridges were awarded based on a numerical formula — the weight of the load the bridge supported divided by the mass of the bridge itself.

First and second place winners Cheung and Lazio will compete in the Thirty-Fifth International Bridge Building Contest in Las Vegas, Nevada on May 4. — Natalie Crnosija

Brookhaven Advocacy Council Looking for New Members: Stop by in Berkner, learn more, 5/2

If you are a good listener who can maintain confidentiality, remain impartial, and base your judgment on fact rather than emotion, consider becoming a Brookhaven Advocacy Council (BAC) member. BAC members have the opportunity to participate in establishing an atmosphere of trust between BNL management and its employees.

The BAC is a key component of BNL’s system of ensuring a respectful, fair, and equitable workplace. The members advise and make recommendations to the Lab Director on resolving employee/guest/user concerns or issues that are brought to the BAC’s attention. The BAC functions independently of the Human Resources & Occupational Medicine Division, reporting directly to the Lab Director.

Members of the BAC will host a table in Berkner Hall lower lobby on Wednesday, May 2, from 11 a.m. to 1:30 p.m. To learn more about the BAC, or if you are interested in becoming a member, stop by to chat, or visit www.bnl.gov/bac.



At the table above is one of the many groups of old friends and former colleagues who met and chatted at last year’s retiree luncheon. Join in, come with friends or solo for this summer’s get-together!

BREA Annual Luncheon, 6/7 Retirees: Come join the great get-together!

The annual BNL retiree luncheon will be on Thursday, June 7, when the Brookhaven Retired Employees Association (BREA) will celebrate its annual social get-together. The Bellport Country Club will host BREA members and guests for an afternoon of good food, good company, and good fun — a perfect occasion to reunite with old friends and former colleagues.

The menu will feature appetizers, followed by a four-course meal with starter, salad, choice of entrée, dessert, coffee or tea, and unlimited wine, beer, and soda, all for \$40. The luncheon is open to BREA members and their spouse or guest(s). If you no longer live on Long Island, this is a great reason to come for a visit and see former associates.

To make a reservation, send a note to BREA, BNL, Bldg. 421, Upton, NY 11973-5000, with a check made out to BREA for \$40 per person. Please include your name and the name of your spouse or guest(s), and your address, telephone number, and e-mail address (if applicable). Also, note any special requests, such as help needed with transportation. For more information, please contact Ken Mohring at 631-929-6744 or kenwadingriver@gmail.com.

Join the Veggie Club!

Join the Community Supported Agriculture (CSA) group to get fresh produce from an organic farm in Water Mill, where the Halsey family grows 350 varieties of fruits and vegetables. If you join, for 26 weeks, June 7 to November 20, freshly picked seasonal produce will be delivered weekly to BNL for you to pick up. The fee is \$420, due at sign-up, by May 18. For more information, brochures are in the BERA Store in Berkner Hall, or contact Ruth Comas, comas@bnl.gov or Ext. 3545.

BERA Fitness Class Sessions for May, June

Advance registration is required for the following classes. Please make checks payable to BERA and mail to: Recreation Office, Bldg. 400A.

Aqua Aerobics: 8-week session. \$32 for once a week, \$60 for twice a week. 5:30-6:30 p.m. at the Pool. Tuesdays and Thursdays, May 1 until June 21.

Pilates: 8-week session. \$40 for once a week. Noon-1 p.m. Rec Hall, Bldg 317. Tuesdays: May 1 until June 19.

Yogalates: 10-week session, now already begun, 8 weeks remain. Classes cannot be prorated. \$50 for once a week (re-posting). Noon-1 p.m. Rec Hall, Bldg 317. Mondays until June 18.

Zumba: 8-week session. \$40 once a week, \$80 twice a week. Tuesdays: May 1 until June 19 from noon to 1 p.m. at the Gym, Bldg 461. Wednesdays: May 2 until June 20 from 5:15 to 6:15 p.m. at the Rec Hall, Bldg 317.

Camera Club, 5/3

The Camera Club meeting that was scheduled for Thursday, April 26, has been rescheduled for Thursday, May 3, at noon in one of the conference rooms on the first floor of Bldg. 400. Those who plan to attend should email three recent photos to jgettler@bnl.gov.

Upcoming BERA Trips

Purchase tickets at the BERA Store in Berkner Hall, Monday through Friday, 9 a.m.-3 p.m. BERA trips are a BNL benefit and tickets are for BNL employees and retirees, those with guest appointments, and their families. Buses leave from the Brookhaven Center. For more information, see www.bnl.gov/bera/recreation/events.asp or call Ext. 2873.

NY City Do-As-You-Please Bus Trip: Sat., May 5. Depart BNL at 10 a.m. for drop off near Bryant Park in midtown. Leave NYC at 7 p.m. \$15/person. Children under 2 are free if they sit on your lap.

Trump Taj Mahal Casino, Atlantic City: Sat., May 5. Depart BNL at 9 a.m., leave casino 8 p.m. \$30/person, includes \$20 slot play money. Must be at least 21 years of age for this trip, photo ID required at casino.

Racing @ NHRA Toyota Supernationals, NJ: Friday, June 1. Races at Englishtown, NJ. Depart BNL at 11 a.m., leave track at 9 p.m. \$55/person, includes reserved seat in Section 3 at starting line/pit side, coach bus, driver tip. Must use an approved vacation day. Trip is not suggested for young children.

Belmont Stakes: Sat., June 9. Depart BNL at 11 a.m., leave Belmont at approximately 7:30 p.m. or 30 minutes after last race. Dress code: shirts with collar, no jeans. \$60/person includes ticket, grandstand reserved seating in Section 2AA group area (under overhang), admission to the Clubhouse, and coach bus, driver tip.

NASCAR Race: Sun., September 30. Depart BNL at 5 a.m., leave Dover, Delaware, at 6 p.m. Only 40 tickets. \$200/person, includes party chalet, catered food and beverages, great seats, program, as well as souvenir, coach bus, and driver tip.

Quitting Smoking? Webinar, 5/18

The Employee Assistance Program, headed by Nancy Losinno, has arranged for a series of health-related “webinars” — seminars on the web — that you can watch on your computer. The webinars are open to BNL employees and their family members.

The last of the present series is titled, “Are You Prepared to Quit Smoking?” It will be held 1- 2 p.m., Friday, May 18. To participate, send an email in advance to nlosinno@bnl.gov and you will receive the web link as well as the call-in number along with the webinar handouts. Or call Losinno, Ext. 4567.

CALENDAR Sunday, 4/29

***Heckscher State Park Festival**
10 a.m.-4 p.m. Join Lab staff in celebrating the Earth Day spirit at Heckscher Spring Festival, bring the kids, learn about wildlife, conservation, etc. See p.4.

— WEEK OF 4/30 — Wednesday, 5/2

***BAC Membership Drive**
11 a.m.-1:30 p.m. Berkner Hall lobby. Brookhaven Advocacy Council will host a table and explain what it takes to be a member of the council. See notice, left.

— WEEK OF 5/7 — Wednesday, 5/9

***EAP Talk on Professional Success**
Noon-1 p.m. Berkner Hall, Room B. “Achieve Professional Success Via Emotional Intelligence,” talk sponsored by the Employee Assistance Program. Register with Nancy Losinno, nlosinno@bnl.gov. See p. 2.

Thursday, 5/10

***Plant Sale for AdoptaPlatoon**
11 a.m.-1 p.m. Berkner Hall parking lot, Bldg. 400 if rain. Buy plants to benefit troops abroad. See notice below.

Friday, 5/11

***Plant Sale for AdoptaPlatoon**
11 a.m.-1 p.m. Berkner Hall parking lot, Bldg. 400 if rain. Buy plants to benefit troops abroad. See notice below.

—WEEK OF 5/14 — Friday, 5/18

***‘Webinar’ on Quitting Smoking**
1-2 p.m. At your computer. “Are You Prepared to Quit Smoking?” is the title of this webinar. See notice below.

TIAA-CREF One-on-One Retirement Counseling

A TIAA-CREF consultant will visit BNL on May 9 and May 29 to answer employees’ questions about their financial matters.

To make your one-on-one appointment, call 1-800-732-8353 or go on-line at www.tiaa-cref.org/bnl and select “set up a meeting.”

AdoptaPlatoon Event: Plant Sale, 5/10, 11

Save some plant-buying this spring until May 10 and 11, when the Brookhaven Veterans Association’s AdoptaPlatoon members will hold a plant sale — just in time for Mother’s Day on May 13. The sale will be held 11 a.m.-1 p.m. in Berkner Hall parking lot, or in Bldg. 400 lobby in case of rain. All proceeds will go towards supporting troops in Afghanistan.



Joseph Rubino D1980412

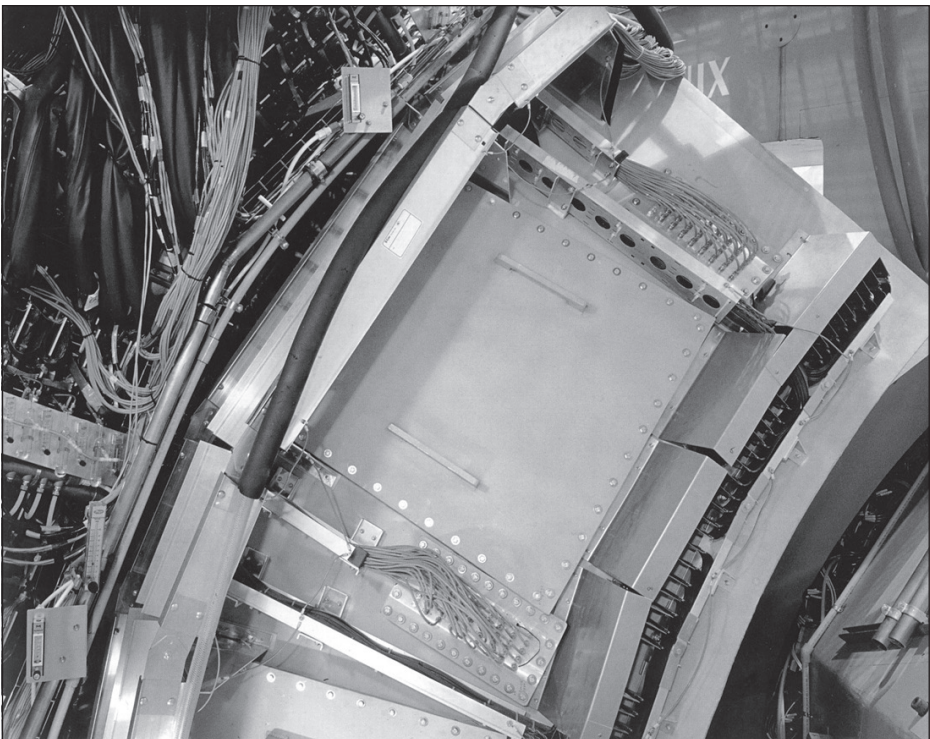


Photo by Stanley Greenberg



Photo by Stanley Greenberg

Time Machine, Particle Detector, or Fine Art? All of the Above

In his latest book, *Time Machines*, New York-based photographer Stanley Greenberg seems to capture the soul of particle physics with black-and-white images, including shots that showcase the mass of intertwining wires and piping inside the PHENIX (above left)

and STAR (above right) detectors at BNL's Relativistic Heavy Ion Collider.

Greenberg traveled the world to gather images of high-tech scientific gadgetry and complex machines — including accelerators, colliders, detectors, and spectrometers — built

to explore fundamental physics. Images include machinery designed to recreate conditions of the Big Bang, reveal the Higgs boson particle predicted by the Standard Model, and delve into the world of muons, neutrinos, and quarks.

Photos by Greenberg have

been exhibited at the Metropolitan Museum of Art, the Whitney Museum of American Art, and the Art Institute of Chicago.

Reviews of Greenberg's work have appeared in *The Wall Street Journal*, *The New York Times*, and *The New Yorker*. He is also

the author of *Invisible New York*, *Waterworks*, and *Architecture Under Construction*.

Greenberg will give an illustrated lecture on his book, *Time Machines*, at the Brooklyn Observatory, on May 3, 7:30 p.m. (see <http://observatoryroom.org/>).

— Jane Koropsak

Classified Advertisements

Current job openings and a statement of job placement policy at BNL are available on the homepage at www.bnl.gov/HR/careers/. To apply for a position, go to www.bnl.gov and select "Search Job List." For more information, call Ext. 2882.

Motor Vehicles & Supplies

09 KIA SPORTAGE – 35K mi. 4cyl 2L 2wd, a/t, blk,gd cond. \$12,500 neg. Alex, 217-549-4075 or gyakubova@bnl.gov.

08 HONDA CIVIC – 46K mi. end of '08, 4cyl, 4dr, a/t, a/c, p/s, p/w, p/l, am/fm, MP3, cd, tilt wheel, eng, abs brakes, excel cond, v/gd tires. \$12,334 neg. 339-3444.

08 JEEP GRD CHEROKEE LAREDO – 40K mi. V6, excel, dealer-maint incl 30K svce, orig owner, avail mi-June. \$19,000 neg. 995-0816 betw 10a-7p, jingostar1980@hotmail.com.

08 MAZDA 3I – 61K mi. black, excel cond, manual trans, new brakes, a/c, CD player. \$9,000. Kevin, 864-650-3496.

05 JEEP WRANGLER 4X4 – 85K mi. A/C, C/C, 6 spd man. trans., hardtop, running boards, tow pkge, chrm light covrs. Warr. till 5/2013. \$12,900 neg. Wayne, Ext. 5711, 872-8962.

04 SUBARU FORESTER – 63K mi. xs sport util. 4d green v/clean, 25 mpg, always garaged, \$12,500 neg. 903-9469 or mrau@bnl.gov.

03 HONDA ACCORD V6 COUPE EX-L – 84K mi. fully loaded, pwr sunroof, heated leather seats, new batt/brakes/tires/wipers. \$8,500. Ext. 5873.

00 CHEVY SILVERADO – 54K mi. 2500HD 4wd, leather, trailering extended cab locking tonneau, email for photo. \$9,000. scotttrott@aol.com.

97 DODGE NEON – 83K mi. 4 cyl white w/gray int, timing belt at 60k mi, tuned w/oil, runs and drives like new. \$2,500 neg. Charlie, 681-9800.

95 HONDA ACCORD COUPE – 204K mi. gold colr, new tires, m/roof, runs well, reg serviced. \$2,500 neg. Steven, Ext. 7862.

83 HONDA 650 SILVERWING INTERSTATE – 53K mi. gd cond, runs well, all new wind shield/bags/radio/mp3 player/batt, extras. \$1,100. 821-3320, dlynch@bnl.gov.

BRIDGESTONE TIRES – 4 Blizzak snow tires w/rims, fit 2010 or newer Camaro, 20" 8" rims, blkcl alum spokes, tires 245/45R20, approx 6k mi, new/\$2250, ask/\$600. 553-2477.

BRUNO SCOOTER LIFT – for car/van, easy to install, comes w/remount, used once, \$1250. Michael, Ext. 4548.

LEER TOOPER CAP – for '04-'12 Ford Crew Cab, v/gd/cond. 375-2980.

MISC – set smoked halo led headlights for '02 Jeep Grd Cherokee Laredo/\$125; Python alarm & rem start w/backup batt sys, digital tilt & audio sensor. 882-1807.

RIKEN TIRES – 2 Raptor ZR, ultra high perform., 225/40R18, 92w #82151, pics avail, \$100/both. Ext. 7432, cscholl@bnl.gov.

THREE-IN. LIFT KIT – for Jeep Grd Cher. Lredo, w: old man Emu springs, Bilstine 5100 shocks, Rancho steerg stabilizer, JKS adj track bar & discnct. \$800. 882-1807.

TRUCK TIRES – used Radial, set of 4 Continental Contitrac TR LT275/70R18, 125/122 ms, off a '08 Ford F250, ask/\$100/set/obo. 404-8109.

Boats

18' REGAL CUDDYCABIN – full, red canvass, 4 cyl, iron Duke, I/O, runs well. \$1,500. Mike, 516-993-4313.

14' VANGUARD LASER 2 SAILBOAT – like new. Main & Jib are in great shape, road trailer incl, must sell. \$3,100. John, Ext. 3406 or trunk@bnl.gov.

Furnishings & Appliances

BLENDER, TOASTER, LAMPS – Black'n Dckr blender, sev. spds, blends ice, \$40; sandwich toaster, wrks well/\$25; 2 IKEA flr lamps, 2 dsk lamps, \$20/ea. jpereiro@bnl.gov.

ENTERTAINMENT CENTER & ARMOIRE – must sell asap, w/motorized drs, cust. lighting w/remote, matchg Armoire w/glass drs, made Italy, ask for pics. Ext. 3411, prvivoj@bnl.gov.

FREEZER – Imperial Heavy Duty Commercial, 20.8 cu ft, excel cond/\$750. Ext. 4753 or dgordon@bnl.gov.

MOVING SALE – Whirlpl drier & fabric freshener, printr, chr, cooler, baby stuff, kitchenware, more, price, pics: <http://tinyurl.com/7fco3jf>. jingostar1980@hotmail.com, 995-0816 10a-7p.

PANASONIC AIR CONDITIONER – w/remote, old but still works, 7800 BTU/h, make offer, Model# CW-XC82YU. Mike, 365-9405 or mlopez@bnl.gov.

REFRIGERATOR & STOVE – Magic Chef Refrg 4.0 cu \$150 Mdl # MCBR415S purchased/\$239 stnls steel look, 2 dr refrig/freezer, Whirlpool Estate stove, \$350. 289-2122.

Audio, Video & Computers

CAMERA – Minolta Maxxum 7000; AF/M 35-135MM 1.4-.5.6. sigma i zoom, \$600/obo. Alexandru, 317-9485.

CANON 40D CAMERA KIT – DSLR kit, mint, super low shutter counts, <4K, kit lens 28-135mm IS, w/HOYA HMC UV, protector, more/\$800. 995-0816,10a-7p.

CANON LENSES – 18-55 mm IS kit Lens + free 58mm UV prtctr, new in box, \$110; Canon 70-300 mm IS USM Lens, like new, w/BW UV prtctr, \$410. 995-0816 10a-7p.

COMPUTER & MONITOR – e-machines EL1352 w/Low profile 1Gb graphic card/\$200; 23" HP monitor w2338h/\$100. Juan, Ext. or jpereiro@bnl.gov.

SONY 40-INCH LCD – w/wall mount, used-like new, less than a yr old w/2 yrs of Costco warr, full HD 1080p, \$450. Jayesh, Ext. 3612 or jshah@bnl.gov.

Sports, Hobbies & Pets

BICYCLE STORAGE RACK – wall mount rack, holds 2 bikes, folds away, 19" w 12.6" h, 20" d, never used, \$20. <http://tinyurl.com/778lswj>. Wayne, Ext. 5936.

DIAMONDBACK VIPER – BMX style bike, '99, barely used, \$75. Mark, Ext. 3970 or mwahlert@bnl.gov.

DOG – 2 yrs old female, shepard mix, needs gd home, up to date shots/spayed. Ext. 7040 or patty@bnl.gov.

ELECTRIC GUITAR – Epiphone Special II, Ebony, new, never used, autographed by Joe Bonamassa/\$250; Bowflex Motivator w/lat pulldown & leg extension/\$325. 878-1303.

GARMIN ETREX LEGEND GPS – Hand-held unit powerd 18 hrs on 2 AA batt, w/America basemap, 1000 waypoints, 10 navig tracks, more, \$45. Phil, Ext. 5669.

INVISIBLE DOG FENCE – Innotek IUC-4100, 1 dog, brand new in box, \$250. Mark, Ext. 3970 or mwahlert@bnl.gov.

JETS TICKETS – will give notorized recpt for games until tics come in \$340, 3 seats +prkg pass, Face value, sec 344 row7 seat 12-13-1. Ed, Ext. 2372, 626-3724 or egranger@bnl.gov.

SKATEBOARDS/PAINTBALL GUNS – 3 skt-brds; 1 ZooYork/Deck only, 1 Enjol, 1 Plan B full brd, \$125/all; Tippman Gryphon & Tippman 98 Custm, like new, \$150/both. tlazar@bnl.gov.

SURBOARD – Roxy, 7.5', lt blue w/pink detail, cushioned, non-slip surface, leash, excel cond, \$400. 219-7196.

WETSUIT – youth size 12, like new, pd/\$105, ask/\$50. Lynda, Ext. 7235 or fitz@bnl.gov.

Tools, House & Garden

PLANTS – blue cornflower, white daisies, blanket flower, lemon drop plants, and sm shoots of burning bush, \$3/pot. Sabine, Ext. 4340 or skessler@bnl.gov.

SAMSUNG 64 1080I TV – works well, comes w/remote/owners instructions, must pick up in Ridge, \$400/obo. 404-8109.

TOBI STEAMER \$20 – w/telescoping stand, shoulder strap, lint, pet hair attachment & upholstery brush; 15x11x8.5", 50" hose & 52" h, telescoping hanger, 8 lbs, 10 oz. 404-8109.

Free

CAT – female, short hair blk/white, about 3-4 yrs old, fixed, in gd health, pic on <http://tinyurl.com/cfo5sgm>. Warren, Ext. 2080 or wejappe@gmail.com.

FIRE WOOD – mixed from yd clean-up in Sound Beach area, u-pic-up. Tom, Ext. 3085, 872-8992.

PRICKLY PEAR CACTUS – must pick up in Ridge. 404-8109.

TV – 19" CRT. SONY. No remote. Works fine. Ext. 8209 or fidelf@bnl.gov.

Miscellaneous

AUDI & VOLKSWAGON REPAIR – Certified VW tech w/7 yrs dealer experience, all types of repairs. Dealer parts only, Call for estimate. William, 484-9888

MISC – Little Tykes Picnic Table and Umbrella, Dora the Explorer Doll House w/accessories. 258-460.

STEREO ITEMS – Kicker Solobaric L5 sub woofers set, in ported box w/1000 watt MTX thunder amplifier/\$400; AND Hifonics Titian 4 chnnl car stereo amplifr - \$100. 882-1807.

TRANSPORT WHEEL CHAIR – mint cond, padded arm/ft rests, compact light weight, easy to fold, bought from Lewis, ask/\$65. Michael, 744-7852.

TRUNK HATCH DOOR – for a Jeep Grand Cherokee Laredo, black, missing wiper, \$50. Travis, 882-1807.

Yard & Garage Sales

CALVERTON – April 28, 8a-4p, N. end of Sunny Line Dr, Multi-fam., something for all! bldg mtls, clothes, shoes, yarn, games, records, bottles, exercise equipment. 727-5646.

Community Involvement

CRAFT FAIR & FLEA MARKET – Vendors Wanted at The Big Duck, 9a to 4p, Saturday, 5/19, rain date Sunday, 5/20, 10x10' spot \$50, Info:727-0593, bigduck.org. Ext. 8962.

Happenings

KARA'S HOPE 5K RUN/WALK – Join us for our 2nd Annual 5K Run/Walk for Scholarships on Saturday, May 19 at Southaven Park. Register online @ www.karashopefoundation.org. Jeff, Ext. 5587 or jwilliams@bnl.gov.

Farewell Gathering

MEMORIAL CELEBRATION OF VICKI MCLANE'S LIFE – Saturday, May 12, 2-5 p.m. at Shoreham Village Hall. Peter Kahn, husband of the late Vicki McLane, will host the event for family and friends. All are invited to attend, share memories

Wanted

BABY CAR SEAT – used but in gd cond. ccardone@bnl.gov.

MAN'S BIKE – looking for a used Mountain Bike that fits a 6' man, not more than \$150. Caitlin, Ext. 7432, cscholl@bnl.gov.

SOFTBALL PLAYERS 48 AND OLDER – Thursday nights 7pm league, competitive, lots of fun, email Ed for more details. Ed, Ed. Hawkeye@hotmail.com.

For Rent

WEEKI WACHEE, FL – priv ranch on Gulf, 70m Orlando, 45m Tampa, fly Islip direct, near beach/tennis/park, SW architecture, 3/bdrm, 2/bath, d/r, f/p, 2gar, igrp in lanai, fruit trees, see review.oktane.net/House-Tour. \$450/wk. 344-5537.

BELLPORT VILLAGE – 1 bdrm 1st flr apt in 2-Fam Home; prvt drwy & ent, newly renov, wood flrs, enclsd back porch, use of yd, village amenities, uttl incl, no smkrs or pets, avail May 1. \$1,350/mo. 275-0745.

CTR MORICHES – 3 bdrm hse w/2 f/bath, new kitch, cac, w/d, wooded bckyd w/ deck & shed, priv beach & boating rights, only 9 mi to BNL, no smkg/pets. \$1,950/mo neg. Ext. 3116.

EAST MORICHES – 1/bdrm, kitch l/r combo, full bath, cable/heat/cac, above grd apt w/priv ent, no pets/smkr, all incld, avail 6/15. \$1,000/mo. Peter, 487-5864.

LAKE GEORGE, NY – Lakefront cottage, fully furn, 3 bdrm, 1 bath, 2 decks, gas grill, screen prch, outdr f/p, dock, canoe, Huletts Landing, avail 8/11-9-1. \$1,850/wk. 518-747-7821.

MANORVILLE – 2-acre lot w/ priv rd, Victorian, fam. rm, lib, frml d/r, kitch, 1/ lg master bdrm, 3 add'l bdrms, 3/baths, bsmt, attic, 2/car gar, more. \$4,000/mo neg. 973-460-8337.

Hecksher State Park Spring Festival, 4/29

Join Lab staff at the Hecksher Park Spring Festival, 10 a.m.-4 p.m. on Sunday, April 29, to learn more about Long Island wildlife, groundwater models, household hazardous wastes, and more. Bring your family and friends and show your support for BNL and the Earth Day spirit.

MIDDLE ISLAND – 2 bdrm, 2 bath condo, upper flr, 1300 sq ft, w/d, eik, 8 min to BNL, avail end of May. \$1,450/mo neg. 646-409-9715 or icesnowyew@gmail.com.

MORICHES – ranch, 1/3 acre property, l/r, d/r, kitch, master bdrm w/full bath, 3 add'l bdrms, 2nd full bath, bsmt, yd. \$2,500/mo neg. Rob, 603-5758.

MT. SINAI – 1/bdrm, furn bsmt apt, priv ent/drwy, waterfront st, incls all utils. \$975/mo. mongie1@gmail.com.

SHIRLEY – Cape, 6 rms, 4 bdrms, 2 full ba, full bsmt, 7 min to BNL, huge fenced prop, big deck, pets allowed, no smkrs, utls not incl. \$2,250/mo. 516-433-5777.

For Sale

WEEKI WACHEE, FL – priv ranch on Gulf, 70m Orlando, 45m Tampa, fly Islip direct, near beach/tennis/park, SW architecture, 3/bdrm, 2/bath, d/r, f/p, 2gar, igrp in lanai, fruit trees, see review.oktane.net/House-Tour. \$120,000 neg. 344-5537.

CENTER MORICHES – Victorian 5 bdrm, 3.5 bath, jacuzzi, lg kit w/bkfst nook, fr w/fp; hwd, cer flrs, fin bsmt/attic, 2 car gar, prof garden, 0.83 acres. \$569,000. 766-7189.

PORT JEFF STATION – lg upper 1 bdrm, 1 bath Co-op, eik, new appls/windows, a/c, d/w, Indry/pool on site; pet friendly. \$98,000. Megan, 828-2743.

RIDGE – Colonial w/4 large bdrms, new roof, windows, kitchen, baths; wood floors, fireplace in den, Crown molding, 2-car garage, beautiful grounds. \$374,990. Ray, Ext. 3541.

SAYVILLE – Co-op upstairs unit, 1 bdrm, 1 reno'd bath, spacious l/r, d/r, kitch, bike to downtown/FI ferries, tons of storage. \$109,000 neg. 750-6082.

SHOREHAM – 3 bdrm 1.5 bath Colonial on cul de sac, updated kitch w/stainless applis, updated bath, new w/d, lg deck, wood shed, bsmt, gar, 10 min to Lab. \$349,000. Andrea, Ext. 3347, 744-8793.

In Appreciation

A big thank you to everyone for all your thoughts, condolences and support during the passing of my mother. — Chuck

I would like to thank everyone for all your thoughts and condolences during the passing of my mother. — Wally Shaffer