Activated Graphene in Supercapacitors
For Superior Energy Storage

New material combines high storage capacity with quick energy release and unlimited recharge

Scientists at BNL have helped to uncover the nanoscale structure of a novel form of carbon, contributing to an explanation of why this new material acts like a super-absorbent sponge when it comes to soaking up electric charge. The material, which was recently created at The University of Texas - Austin (UT), can be incorporated into “supercapacitor” energy-storage devices with remarkably high storage capacity while retaining other attractive attributes such as superfast energy release, quick recharge time, and a lifetime of at least 10,000 charge/discharge cycles.

See Supercapacitors on p.2

SBU, Exxon Research at BNL’s NSLS May Lead to Better Auto Tires

Scientists from Stony Brook University (SBU) and Exxon Mobil, working at BNL’s National Synchrotron Light Source (NSLS), have investigated a material that may lead to greatly improved tires for cars and other vehicles. Their study is an example of how incorporating nanoparticles into a regular substance can produce a material with superior properties — in this case, increased durability and strength.

The work, which was funded by the National Science Foundation and Exxon Mobil, was published in the October 15, 2010, edition of the journal Polymer.

The research team focused on a material that could serve as the inner polymer lining of tires. At the NSLS, they used x-rays to investigate how incorporating nanoparticles of a chemically modified clay material into a very thin layer of a polymer may achieve tires that last longer than those currently on the market.

“By enhancing the properties of the polymer, there could be significant improvements in tire performance and significant savings in gasoline consumption, perhaps up to 30 percent,” said SBU scientist Ben Hsiao, who led the study.

In particular, the researchers wanted to find out how adding the nanoparticles would affect the polymer film’s gas permeability — that is, how well (or poorly, in this case) molecules can pass through it. Gas permeability is one way to gauge how a material will hold up over time.

They learned that the combination of the particles’ shapes and the varied ways they orient within the film create a “tortuous pathway” for permeating molecules, causing them to zigzag through the film. As a result, they have to travel a longer distance over a longer period of time to cross it.

The group introduced different concentrations of clay nanoparticles into several polymer film samples and studied each sample using both x-ray scattering at NSLS beamline X27C and electron microscope imaging. In combination, these...

See Research for Tires on p.2

50 Future Crystallographers
Drawn to the NSLS by RapiData 2011

About 50 students gathered at the National Synchrotron Light Source (NSLS) on April 3-8 for RapiData 2011, a weeklong crash course designed to introduce participants to the best and latest equipment and techniques for macromolecular x-ray crystallography. RapiData allows students to meet and learn from the leading developers of software in the crystallography field, and then actually to use NSLS beamlines to collect data.

This year marked the 13th consecutive year of the popular course, which is offered by BNL’s Biology and Structural Chemistry department and reflects an educational component of the PXRR (Macromolecular Crystallography Research Resource), funded jointly by the National Center for Research Resources — a branch of the National Institutes of Health (NIH) — and DOE’s Office of Biological & Environmental Research.

X-ray crystallography allows scientists to determine the arrangement of atoms within a crystallized material based on the way x-ray light bounces off its electrons. This is especially important in determining protein and nucleic acid structures, which are needed to establish a fundamental understanding of life processes and for developing drugs and treatments for disease.

The course began with three days of lectures and tutorials taught by an international team of scientists from BNL, industry, academia, and other national labs. Next, the students were divided into groups and guided through a marathon data-collection session of two-and-a-half-days on eight NSLS beamlines. At the same time, many tutorials were under way, run by the lecturers themselves. Half the students brought their...

See Research for Tires on p.2

Physicist & Former BNL Director Maurice Goldhaber Dies at 100

Maurice Goldhaber, a prominent physicist and a former director of BNL, died on May 11 after a short illness.

Goldhaber had celebrated his 100th birthday in April, 2011. He was born in Austria, and earned his Ph.D. in physics at Cambridge University in 1936. In 1938 he came to the U.S. as a faculty member of the University of Illinois. He joined BNL in 1950, along with his wife, the late nuclear physicist Gertrude Scharff-Goldhaber. At the Lab, he served as chair of the Physics Department from 1960 to 1961, and as Laboratory Director from 1961 to 1973. Goldhaber’s research in the fields of nuclear physics and fundamental particles included experiment, systems, techniques, and theory. He made numerous significant contributions that helped to establish parts of the theory of...
Coming Up, 6/20-24
2011 RHIC/AGS Users Annual Meeting:
The RHIC & eRHIC Long Range Plan
This year marks the start of the second decade of the Relativistic Heavy Ion Project (RHIC), a major research program, and a critical moment when major decisions about the future of RHIC are being made.

The Users’ Meeting will be dedicated to a set of workshops focusing on the future of RHIC and eRHIC science and the detectors and machine upgrade needed to do the science.

More details on the program will be announced in the Bulletin once the program is finalized. Watch for more information please go to: http://www.bnl.gov/aum/.

Research for Tires
The Bulletin May 20, 2011
Goldhaber from p. 1
Supercapacitors from p. 1

Goldhaber from p. 1. 
Supercapacitors now known as the standard model. In 1934, with James Chadwick from the Cavendish Laboratory at Cambridge, he was the first to measure accurately the mass of the atomic particle known as the neutron, showing that it was not a compound of a proton and an electron as was believed at the time, but a new particle. In addition to measuring the mass of the neutron, he contributed to the discovery of the nuclear photo-effect, the role of spin in nuclear reactions, observed the helicity of the neutrino, and a wide variety of additional physical research.

With some reservations, he also put forward some speculations, including what became known as the Goldhaber—Christlike model (which has been proven correct and used in modern models), the notion of the doubling of fermions, which has his name. He was also helping to search for the second neutrino, and the notion of the confinement of two particles together produced, the “cosmic” and the “anti-cosmic,” which has been described as a precursor to ideas of the multiverse current variety.

As Lab Director, Goldhaber instigated and presided over an extraordinary period of productive scientific activity at Brookhaven. He was during his tenure resulted in major discoveries in physics, theory, and was eventually garnered Nobel Prizes. Medical research that indicated the role of sodium in the development of hypertension and the value of the drug L-dopa to treat Parkinson’s disease were made possible and characterized at the Lab during that time. Goldhaber retired in 1985, but he continued his research at the laboratory until he was well into his 90’s. He told those who worked with him working long hours in his later years, “I don’t have time to age.” To acknowledge his significant contributions to physics, he was named Distinguished Scientist Emeritus at the Laboratory after his retirement.

Lab Director Sam Aronsen said, “Maurice Goldhaber was a valued leader within the Lab community. His insight, intellectual curiosity, and wit will be sorely missed, but the influence he had on the Lab remains.”

For many years the Harvard Physics Department has awarded annual prizes to distinguished graduate students in the names of Gertrude and Maurice Goldhaber. In 2001, BNL created the annual Gertrude and Maurice Goldhaber, Distinguished Postdoctoral Fellowships at the Lab.

In 2008, the Lab held the “Neutrino Helix at 50” symposium to celebrate the half-century-old Goldhaber-Grodzins-Sunyaev experiment on neutrino helicity, a landmark among elegant table-top experiments that had a major impact on particle physics. In 2009, Magdalene College, Cambridge University, established the Maurice Goldhaber Prize for Natural Sciences or Mathematics, in honor of alumnus Maurice Goldhaber, and in 2011 the Physics Department established a graduate student prize in his name.

Goldhaber’s productive career has won him numerous awards and citations including the Bonner Prize in Nuclear Physics in 1971, the J. Robert Oppenheimer Memorial Prize in 1983, the National Medal of Science in 1983, the Wolf Prize in Physics in 1991, and the Enrico Fermi Award in 1999.

Goldhaber was a member of the National Academy of Sciences and a fellow of American Academy of Arts & Sciences, the American Association for the Advancement of Science, and the American Physical Society, of which he was president in 1982. Survivors include his sons Alfred Schaff Goldhaber and Michael H. Goldhaber; his grandchildren, David Goldhaber-Gordon and Sara Goldhaber-Fiebert; and four great-grandchildren, Zev and Shira Goldhaber-Gordon and Lyra and Miriam Goldhaber-Fiebert.

— Diane Greenberg

The CNF provides access to scientists around the world to solve cutting-edge problems in nanoscience and nanotechnology. This work is exactly what this facility was established to do.” Eric Stach of Brookhaven Lab’s CNF

Messages from colleagues:
Maurice Blume, Professor Emeritus, a former BNL Deputy Director and retired editor-in-chief of the American Physical Society, said that Maurice Goldhaber was a unique icon in the annals of physics. “I was happy that I had the opportunity to work with him, and that I learned from him, particularly during our discussions on physics and many other matters when I drove to BNL — his house in Rayport was a short distance from mine in Sayville. This lasted for a decade and was a most interesting time, although he became more frail (but I didn’t realize it at the time). It was good that he made it to his 108th birthday.”

Peter Road, Senior Advisor to the Director said, “I fondly recall my interactions with Maurice over the years. I greatly enjoyed his reminis-
cences of the physics greats of the early 20th century. One of the great perks of being a nuclear physicist was from Nobel Prize recipi-
cent Georges Charpak, who described the most beautiful experiment he knew. Perhaps as impressive to me was how Maurice could talk in many fields that allowed him to ask penetrating questions and to guide us into new areas. Coupled to his continual creative ideas were his famous quotas — one of my favorite was ‘Physics teaches old things to new people.’”

In speaking of Mau-
riere Goldhaber’s long history of productivity and creative scientific output, Professor Rob Myers of the Department of Philosophy at Stone Brook University (SBU), noted that son, his son Alfred Schaff Goldhaber, Professor of Physics at SBU’s C.N. Yang Institute of Theoretical Phys-
ics, very recently coauthored a paper explaining that many different phe-
nomena conspire together to make observing a neutrino with positive helicity practically impossible. “The notion of a ‘neutral’ helicity, Gold-

RapiData from p. 1—own specimens with the goal of solving the structure of a particu-
some of the other halflife observed and helped.

During the data-collection session, the students gathered each afternoon, and then on the final morning, to discuss their results. They produced mini lectures about their data and scientific subject, announcing the results. “These are exciting little meetings, almost extemporane-
ous, but they provide an opportunity for some of the younger Soares of Biology, coordinated the course. “The enthusiasm of the students about their work, and for the new skills they are learning, is pal-

table.”

In addition to DOE and NIH funding, a special grant was provided for students in a project under the auspices of the Union for Crystallography to assist seven Latin American students in attending the course.

Additional support was provided by Brookhaven Science Associates, the NSLS, and several equipment vendors and drug companies.

More information, go to: www.bnl.gov/RapiData/

The CFN provides access to scientists around the world to solve cutting-edge problems in nanoscience and nanotechnology. This work is exactly what this facility was established to do.” Eric Stach of Brookhaven Lab’s CFN
BNL's Terrence Buck Named GEM Standing Chair

Terrence Buck, principal human resources representative for the Physical Society, has been named Standing Chair, Human Resources Committee, for the American Physical Society. GEM stands for the National Consortium for Graduate Degrees for Students of Color in Engineering and Science.

GEM's goal is to increase the participation of historically underrepresented groups (African Americans, American Indians, and Hispanic Americans) at the master's and doctoral levels in engineering and science. Sponsored by a consortium of universities and employer members, GEM offers fellowships to selected students. BNL's Diverse Office administered the program at the Laboratory. The GEM students work as paid summer interns for two to three summers with scientific and engineering staff.

Buck will be one of three members from BNL's Human Resources (HR) Standing Committee. The objective of the GEM Human Resources Committee is to ensure that the right people are in the right place at the right time to meet the goals and objectives of the consortium.

The expected outcomes are executive strategic planning, roles and responsibilities, clear definitions, and quality implementation of the larger executive committee objectives.

At BNL, Buck will continue to recruit GEM students as summer interns while planning social activities for the students and mentoring their progress to ensure that they are successful in reaching the goals they set out to accomplish.

“I am honored to have been chosen for this new position with GEM,” Buck said. “I will be able to assist the GEM organization with its HR policies, and help both GEM students and BNL in their personal growth to be placing some of the GEM students in positions at BNL to gain new and enhanced knowledge of BNL as it grows in the future.”

The GEM program at BNL has grown from two students in 1999 when Buck first became involved with it to eleven years ago. Buck has strongly influenced the lives of students so that this year the program will have a total of 15, including seven new students from seven universities.

Founded in 1976, GEM has connected more than 3,000 students with over 150 top-rated universities, national laboratories, and leading corporations. Buck has recruited City College of New York (CCNY) and Stony Brook University as GEM members. Also, two GEM students who were interns at BNL last summer competed against 100 students nationally to win first- and third-place at the GEM Fellows Technical Presentation Competition during the annual Board of Directors meeting last year. Buck was honored last year for his own contributions to GEM as “GEM Employer Representative of the Year.”

Buck earned a B.S. in business public management from the State University of New York at Utica, and an M.S. in Human Resources Management and an MBA from St. John Bosco College. Buck began his career in BNL’s Contracts and Procurement Division as an intern, later becoming a buyer and assistant contracts specialist in the division. He moved to the HR Division in 2000 as a HR representative. He became a senior HR representative in 2002 and is a principal HR representative in 2007.

In addition to his hiring and career counseling duties and his role as an intern’s mentor and leader, he also recruits research associates and scientific staff, and he administers the High School Co-op program on campus programs.

-Diane Greenberg

Science Student at BNL Wins $100,000 Scholarship

BNL Biology student Won (Ryan) Lee (Center), reviews protein structures with BNL biology department researchers Wally Mangel (Right) and Bill McGrath. Lee was awarded a $100,000 Buck Scholarship and plans to study physics and chemistry at Harvard next year.

Even if you aren’t an avid basketball fan, you can imagine the excitement of high school student Won (Ryan) Lee of the Academy for the Advancement of Science and Technology in Hackensack, New Jersey when he received complimentary tickets from BNL to attend the “Final Four” championship game of the National College Athletic Association. Lee, who has been working on a biology research project with Lab scientist Wally Mangel, said he was even more excited during halftime at that game when he was presented with a $100,000 scholarship from the Buck Achievers Scholarship Program.

Accomplished student piqued interest of BNL

Normally, Mangel does not accept high school students to work in his lab. “They don’t have much background on a research project and by the time you have trained them on Lab info and the code, you kind of off load it to college,” he said. But Mangel realized that Lee was not your typical student. Before he even contacted Mangel about working in his lab, Lee had read papers on how to model a protein from the Lab and Mangel’s web site, and knew what project he wanted to work on. Lee informed Mangel that he could work full-time for 10 weeks in the summer and during his senior year at City College come in from New Jersey every Wednes- day to work in the lab. As a high school student, Lee knew how to model a perfect score (2400) on the SAT, including scores on 800 scores or higher in Advanced Placement Level II. He had also completed a lot of college level coursework, was the principal violin in the school orchestra, and head of the debate team. So Mangel invited him to an interview. The interview was a success, and Mangel accepted Lee into his lab.

Let the research begin

Lee first worked with Lab researcher Bill McGrath, who taught him the techniques he needed to use in his project — a characterization of a mutant of a viral enzyme. “Everyone in our lab became impressed with Ryan,” said Mangel. “He not only knew a lot of science, but knew how to apply his knowledge while working in the lab. Many students can do well on exams, but only a few can use the information they know to solve real problems.” Lee is currently writing up his research for publication in a major biochemistry journal. The paper will include the crystal structure of a protein he solved by himself from data he collected at the National Synchrotron Light Source.

When Lee was asked what was most valuable to him in his work at BNL, he replied, “The Mangel lab has daily morning meetings to discuss the previous day’s results and plan experiments for the day. Everyone knows what everyone else is doing, and they all help each other. I have learned how to do experimental science, how to focus on what is important, how to formulate questions to answer experimentally, how to design single variable experiments and determine information from good and bad data, especially bad data. I am grateful to Dr. Mangel and the Lab for the experience. I know this training will prove useful to me in any field I choose in the future.”

On the road to Harvard

Lee was accepted to MIT, Yale, Princeton, and Stanford, but plans to attend Harvard this fall where he will continue his studies in physics and chemistry. The Buck scholarship will allow him to focus more on academics. Lee hopes to be a research professor some day.

“I am really glad that BNL was able to do this,” Mangel said it was nice to see the system reward a student who worked so hard. “Ryan is the perfect student,” he said. “We gave him an important research project. We spent three weeks training him in laboratory techniques, he then used those techniques to complete the project, and a major publication will be the result.”

“I congratulate Ryan and look forward to following his accomplishments at Harvard and beyond,” said Mangel. “And, I must add that I enjoyed learning about Korean food from the Lee family — it is so good!”

-Jane Koposch

Correction

The Bulletin greatly regrets that the BNL Plant Manager scholarship winner announced last week was misspelled. BSA scholar Talay Lastar, daughter of Miled Wie- ner and Jonathon Lastar, Collider Accelerator Department, will at- tend the University of Maryland. Congratulations again, Talay.

Arivales & Departures

-Arrivals- 
Margaret Sullivan HR/OMC 
-Job Appointments-
-Departures- 
John Amabile 
Lab Prot 
Susan Evans-Singleton Site Res 
Deborah Stoner-Neave Site Res 
Brian Sullivan Site Res 
BERA Trips

Parking tickets at the BERA Store in Berkley, weekdays, 9 a.m.-3 p.m. 
NRHA at Raceway Park: Sat., June 11, NHRA at Summit Point and Vendor set up 8 a.m. Workshops and seminar. 8 a.m.-3 p.m. 
Note: BERA has sold out of Yankee and Mets tickets. BERA will now sell only parking tickets, but you can still add your name to the wait list.

Want to join in the social scene at BNL with people in sports, discussion, travel, camping, and much more? See www. bnl.gov/hras/recreation/ labs.asp.
Talk on ‘Physics and Consciousness,’ 6/3

On Friday, June 3, at noon, in Berkner Hall, Swami Pavitrananda, head of the See Ganga Mahath Abhay Ashram in Gujarat, India, will talk “All are conscious. All can talk!” This is a free talk. Pavitrananda will discuss how modern quantum physics theories compare to the Vedanta school of Indian philosophy, delving into the concept of consciousness. This talk is part of a broader background that includes a degree in electrical engineering from the National Institute of Technology, Bhilai, India, and Master's degrees in Indian philosophy and Genetics from Sir J. R. 3rd University. He has given presentations on both topics in Indian and U.S. universities.

Register Your Child for BNL Summer Camp

BNL employees are invited to register their children for the 2011 Summer Camp Experiences Program, a free offering from the Science Learning Center (SLC). The three-day camp will be held on Tuesday, June 21, through Thursday, June 23. The camp is intended for children entering 4th to 6th Grades. During the first two days, students will investigate energy transfer through hands-on activities. On the third day, camp culminates in a morning of presenters’ presentations.

Safety Advocacy is a Full-Time Job For Dan Galligan of E&S

Dan Galligan joined BNL 18 years ago and safety has been on his mind every day since then. "I started here as a refrigeration engineer, became a shop steward in 1996, and since 1999 I’ve been one of the two IBEW 2230 safety representatives here at the Lab," Galligan explained. "I’ve never had a week where I wasn’t focusing on safety. It made me hire people to work, to work to help workers be safer on their jobs," he said.

For Dan Galligan, attending morning planning meetings nearly every day, and visiting work sites all around the Lab, means he’s always focused on getting ahead.” This means Galligan is out in the field, visiting work sites and teams constantly. “Out in the field, you have to work with people in real situations, facing real risks, and making real decisions that affect their lives,” he said.

But he also notes that his role is not to point a finger or act as a ‘safety cop.’ “I’m an advocate, first and foremost,” he explained. “As the union safety representative, I’m in a position to make real change happen around the Lab, to help people work plan in safer ways.”

Classified Advertisements

Motor Vehicles & Supplies

05 2008 FORD CROWN VICTORIA - 125K, city, 4 dr sedan, 3.0L, auto, sunroof, a/c, e/c, new tires, $4,500. Exe. 9301 or gwilliams@bnl.gov.

06 MAZDA MAZDA6 - Get Tracking Convertible, 2011, 62K mi, city, 4 dr, cloth interior, new tires, new paint, $15,000. Exe. 2222 or cwhelton@bnl.gov.

06 2000 LINCOLN LS - In great condition, 1 owner, no accidents, new tires, great overall, $7,000. Exe. 3715 or mgerard@bnl.gov.

05 KAWASAKI VX500 C5 - 0.3K, ex platform, top speed, great condition, a/c, e/c, km/tacho, new tires, needs valve job, $2,000 asking. Exe. 7825 or mward@bnl.gov.

04 FORD Taurus HSE TURBO – 61K, 4 dr sedan, cloth interior, new tires, sunroof, great overall, $7,000 asking. Exe. 3920 or cwhelton@bnl.gov.

08 FORD FOCUS – 4 dr, sunroof, new tires, great overall, $5,000 asking. Exe. 7825 or mward@bnl.gov.

08 TOYOTA TACOMA – Great condition, new tires, great overall, $11,000 asking. Exe. 3920 or cwhelton@bnl.gov.

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BOYS BICYCLE – 20” go at 30 miles, in good condition, $50. Exe. 3710 or thodge@bnl.gov.

GALLAGHER KRIEGER 20SP, AR – for gun shop, will deliver in local area, $550. Exe. 3715 or mgerard@bnl.gov.

POWER/CHILL – Hot/Cold Thermoelectric cooler, 40 qt, $50. Exe. 3710 or thodge@bnl.gov.

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SMOKE-FREE. Pics avail. Make offer. 523-7870.

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SEPARATION 7 TIPS AND TRICKS FOR A SMOOTH SEPARATION: STETSON! Exe. 3900 or nchesney@bnl.gov.

CD storge rack; glass case w/light; 2/encl drawers, deep oak, maple, etc, split/non split, will remove, $350. Kathleen, Ext. 3161 or kratto@bnl.gov.

KING BED & SET OF 4 NIGHT STANDS – great cond, $750. Kathleen, Ext. 3161 or kratto@bnl.gov.

HANGING on your kitchen, $40/for all pics. Wen, if you don’t eat, you burn calories. Do it! Just try it! $450. Bobbi, 291-0245, bmicari@bnl.gov.

04 MERCURY SABLE LS – 92K mi. 4dr, 6 spd, p/s, p/l, a/c, e/c; runs well, no accidents, $3000-$6000. Exe. 2222 or cwhelton@bnl.gov.

JOIN the Community Supported Agriculture (CSA) group to get fresh produce from a local organic farm. For 26 weeks, June 2 to November 22, freshly picked seasonal produce of 350 varieties will be delivered to BNL for members to pick up. The fee is $420. Pay immediately or in two installments of $215 on sign up. By May 20, with one post-dated check for $315, post-dated for July 13, 2011. For more information, contact Ruth Comas, rcomas@bnl.gov or Ext. 3545.

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KING BED, 2/dressers, 2/ngt stands w/drwrs, great cond, $700. Kathleen, Ext. 3161 or kratto@bnl.gov.

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