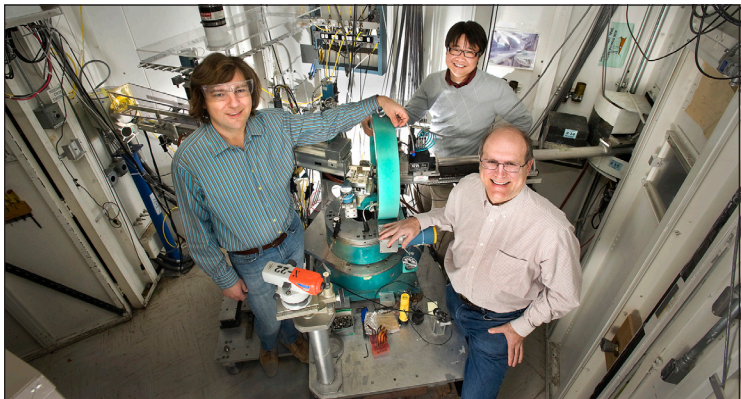




BNL's Alexei Tkachenko, Htay Hlaing and Ben Ocko at an experimental end station at the National Synchrotron Light Source.

Expanding the Degrees Of Surface Freezing

As part of the quest to form perfectly smooth single-molecule layers of materials for advanced energy, electronic, and medical devices, researchers at BNL have discovered that the molecules in thin films remain frozen at a temperature where the bulk material is molten. Thin molecular films have a range of applications extending from organic solar cells to biosensors, and

understanding the fundamental aspects of these films could lead to improved devices. The study, which appears in the April 1, 2011, edition of *Physical Review Letters*, is the first to directly observe "surface freezing" at the buried interface between bulk liquids and solid surfaces.

"In most materials, you expect that the surface will start ...
See Surface Freezing on p. 2



Supercritical Carbon Dioxide-Materials Interactions Group

Energy and Environment Meet at BNL Workshop

By Lynne Ecker, Nuclear Science & Technology Department; Lars Ehm, Photon Sciences Directorate; and Jeff Fitts, Environmental Sciences Department

BNL's Global & Regional Solutions, Environment & Life Sciences, and Photon Sciences Directorates, along with Stony Brook University, hosted a workshop on "Supercritical

Carbon Dioxide-Materials Interactions." Supercritical carbon dioxide is a key component of several advanced energy technologies, including carbon capture and sequestration (CCS) and Enhanced Geothermal Systems (EGS).

More than 50 workshop participants from industry,...
See BNL Workshop on p. 3

Eight BNL Scientists Receive Tenure

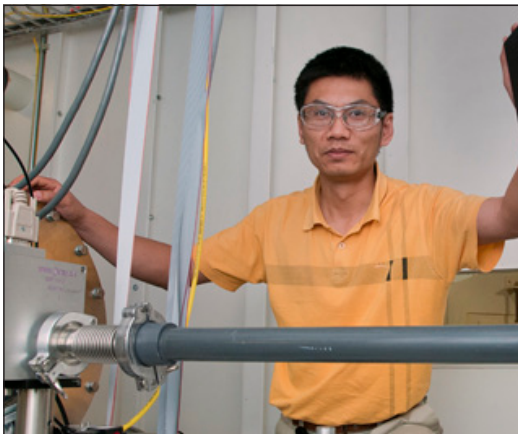
Brookhaven Science Associates (BSA) granted tenure to eight BNL scientists, effective December 1, 2010. The scientists are Elke Aschenauer, Physics Department; Mary Bishai, Physics Department; Vasilis Fthenakis, Sustainable Energy Technologies Department; Peter Petreczky, Physics Department; Vadim Ptitsyn, Collider-Accelerator Department; Jianwei Qiu, Physics Department; Jian Wang, Environmental Sciences Department; and Lin Yang, Photon Sciences Directorate.

Tenure appointments are made after a rigorous selection procedure culminating in a comprehensive review of each tenure case by the Brookhaven Council, an elected body that advises the Director on matters of concern to the scientific staff. The BSA Science & Technology Steering Committee oversees the tenure process and makes final recommendations to the BSA board. The newly tenured scientists have been featured in alphabetical order; the contributions of Jian Wang and Lin Yang are summarized at right.

Lin Yang

Physicist Lin Yang of the Photon Division in the Photon Sciences Directorate was granted tenure based on his research in the field of membrane biophysics as reflected in his publications and his creativity and productivity with regard to design, development, and innovation in X-ray scattering techniques and beamline facilities.

Said Associate Laboratory Director for Photon Sciences Steven Dierker, "Lin is equally accomplished in his significant research contributions and also his innovative technology design and construction. He is recognized as one of the leaders in his field of biophysics and as an outstanding resource in serving the synchrotron soft matter community. He is a wel-



Joseph Rubino D3850911

come addition to our tenured scientists."

Yang received his Ph.D. in physics in 2001 from Rice University, and joined BNL's National Synchrotron Light Source (NSLS) as a postdoctoral research associate that year. His published papers on his thesis research involving membrane pore formation have had a major impact in the biophysics community and have been cited over 1,000 times. After joining BNL, he continued...

See Lin Yang on p. 2

Antimatter Atoms Successfully Stored For the First Time

The following article is part of a news release distributed by Lawrence Berkeley National Laboratory, describing how the ALPHA collaboration, an international team of researchers working at the Antiproton Decelerator (AD) at CERN, Switzerland, trapped and stored atoms of antimatter for the first time. The demonstrated trapping of antihydrogen atoms by the ALPHA collaboration was recognized as a Physics Breakthrough of the Year for 2010 by *Physics World* magazine. Sharing this honor was the AD's Antiprotonic Atom Formation and Spectroscopy collaboration, which produced antihydrogen in a new type of device that could lead to in-flight studies of the anti-atoms. In addition, the American Physical Society news staff named the ALPHA trapping of antihydrogen as one of the top 10 physics-related news stories of 2010.

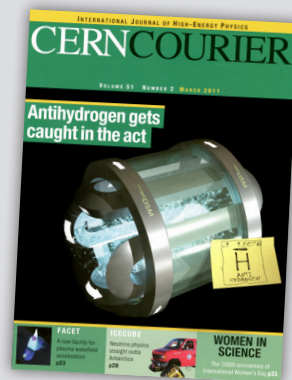
Atoms of antimatter have been trapped and stored for the first time by the ALPHA collaboration, an international team of scientists working at CERN, the European Organization for Nuclear Research near Geneva, Switzerland. Scientists from Lawrence Berkeley National Laboratory and the University of California at Berkeley (UCB) made key contributions to the international effort.

ALPHA stored atoms of antihydrogen, consisting of a single negatively charged antiproton orbited by a single positively charged anti-electron (positron). While the number of trapped anti-atoms is far too small to fuel the Starship Enterprise's matter-antimatter reactor, this advance brings closer the day when scientists will be able to make precision tests of the fundamental symmetries of nature. Measurements of anti-atoms may reveal how

Antimatter-catching BNL-built Magnet Featured in CERN Courier

The March edition of the CERN Courier has a familiar magnet on its cover. The octupole (eight-magnetic-pole) magnet — fabricated in Brookhaven Lab's Superconducting Magnet Division (SMD) in 2006 — recently helped an international team of scientists working on the ALPHA collaboration at CERN trap and store a significant amount of antimatter atoms for the first time. The magnet is the main component of the bottle-like, antimatter-catching device, which is called a minimum magnetic field trap. The octupole's magnetic fields keep the antimatter away from the walls of the trap, preventing them from annihilating. As part of the fabrication, the Brookhaven team used a specially developed 3D winding machine in the SMD to build the magnet directly onto the outside of the trap.

Said Peter Wanderer, SMD Head, "Several special features of the coil design and winding



machine contributed to the success of this magnet. For example, the magnet generates a very pure octupole field. Also, the materials of the support structure provide a minimal barrier between the region where the antihydrogen is stored and the detectors. We were surprised but pleased that the magnet has withstood so many cycles of rapid quenching."

— Kendra Snyder

the physics of antimatter differs from that of the ordinary matter that dominates the world we know today.

Large quantities of antihydrogen atoms were first made at CERN eight years ago by two other teams. Although they made antimatter, they could not store it, because the anti-atoms touched the ordinary-matter walls of the experiments within millionths of a second after forming and were instantly annihilated — completely destroyed by conversion to energy and other particles.

The ALPHA collaboration succeeded by using a specially

designed magnetic bottle called a minimum magnetic field trap. The main component is an octupole (eight-magnetic-pole) magnet whose fields keep anti-atoms away from the walls of the trap and thus prevent them from annihilating.

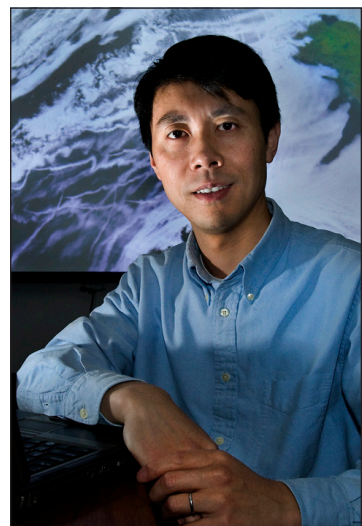
ALPHA team member Joel Fajans, a scientist in Berkeley Lab's Accelerator & Fusion Research Division (AFRD) and a professor of physics at UCB, and his colleagues in AFRD and UCB proposed, designed, and tested the octupole magnet, which was fabricated at BNL. ALPHA team...

See Antimatter on p. 2

Jian Wang

Scientist Jian Wang, Environmental Sciences Department (ES), was granted tenure for his significant scientific contributions in the fields of aerosol and cloud microphysics. Specifically, he developed and implemented new techniques for measuring concentrations and size distributions of aerosol particles and for determining climate impacts of aerosols from different causes.

Wang is recognized for developing original instruments that rapidly measure atmospheric aerosol concentrations and size distributions used in studies of climate, environment, health, and engineering. His seminal contribution was the design and construction of the Fast Integrated Mobility Spectrometer (FIMS), which takes measurements in one second as opposed to the one-to-two minutes previously needed. He developed a second-generation FIMS that extends size distributions from the 40-to-100 nanometer range to a 10-to-1,400 nanometer range, also on the



Roger Stoutenburgh D00101510

timescale of seconds. A patent has been issued for FIMS, and a second is pending.

Said ES Chair Peter Daum, "Jian has not only developed extraordinary instrumentation, but he has also made important contributions to our understanding of the role of aerosols in determining the microphysical properties of clouds. He is widely regarded as an outstanding experimentalist in the field of atmospheric aerosols."

Wang joined BNL in 2002 as a GoldhaberFellow, having earned...

See Jian Wang 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.
- Additional information for Hospitality may be found at www.bnl.gov/hospitality/calendar.asp.
- The Recreation Building #317 (Rec. Hall) is located in the apartment area.
- Events flagged with an asterisk (*) have an accompanying story in this week's Bulletin.

— 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 & Thursdays: 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, rusek@bnl.gov.

Tues.: Hospitality Welcome Coffee
10:30 a.m.–noon. Rec Hall (Bldg. 317). Meet over coffee. Children welcome. Ext. 2873.

Tuesdays: Zumba
Noon–1 p.m., in the gym (Bldg. 461). Registration required, Ext. 2873.

Tuesdays: Knitting Class
2–4 p.m. Rec Hall (Bldg. 317). Learn to knit/crochet — all skill levels. Free. Ext. 2873.

Tuesdays: Toastmasters
Two monthly meetings: 1st & 3rd Tuesdays, 5:30 p.m., Bldg. 463, Room 160. Guests and visitors welcome. <http://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. Pat Flood, Ext. 7886 or flood@bnl.gov.

Tues., Wed., & Thurs.: Rec Hall Activities
5:30–9:30 p.m. in Bldg. 317. General activities, TV, ping pong, chess, games, socializing. Christine Carter, Ext. 5090.

Tuesday & Thursday: Aqua Aerobics
5:30–6:30 p.m., Pool (Bldg. 478). Registration required, Ext. 2873.

Wednesdays: Ballroom Dance
5:15 p.m., 6:15 p.m., and 7:15 p.m. N. Ballroom, Brookhaven Center (Bldg. 30). <http://www.bnl.gov/bera/activities/dance/default.asp>.

Wednesdays: Pilates
5:30–6:30 p.m. at the Rec Hall (Bldg. 317). Registration required, Ext. 2873.

Wednesdays: Play Group
10 a.m.–noon. Meet 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). Sugg. don. \$5. Tom Baldwin, Ext. 4556.

Fridays: Family Swim Night
5–8 p.m. Pool (Bldg. 478). \$5/family. Ext. 2873.

Lin Yang from p. 1

...to publish in this field and is now exploring X-ray scattering methods for elucidating the structure of membrane proteins. His research achievements, which provide new insight into the biophysical mechanisms by which lipid membranes and transmembrane proteins assemble and function, are at the leading edge of his field.

In addition, Yang contributed substantially to the research productivity of the NSLS by constructing a combined transmission and grazing incidence X-ray scattering instrument on the X21 wiggler beamline that enabled key discoveries in organic transistors, nanoparticle self-assembly, and proteins in solution. More recently, he led the development of a state-of-the-art, microbeam-capable X-ray scattering facility on the new X9 undulator beamline, a premier facility for nanoscience and life sciences research.

— Liz Seubert

Center Moriches Students Win Top Honors At Brookhaven Lab's Maglev Contest

Center Moriches Middle School students won eight of the 21 trophies awarded at the annual Middle School Maglev Contest held at BNL on March 23. Students from Longwood Junior High School won four awards, and Albert G. Prodell Middle School students won three.

Gordon Danby and James Powell, retired BNL scientists who invented and patented maglev — the suspension, guidance, and propulsion of vehicles by magnetic forces — were honored guests at the contest. Powell gave a brief talk to the students, in which he predicted that, within the next 20 years, a maglev network would be in place in the U.S. that would allow passengers to travel anywhere in the nation at a speed of 300 miles per hour. He also

predicted that one day maglev might be used to launch rockets into space.

About 200 students from 12 Long Island middle schools entered the contest, in which they were required to design and construct model maglev vehicles according to engineering specifications in their choice of seven categories: electrified track, wind power, gravity, self-propelled balloon, self-propelled other, futuristic, and scale-model design. Judging was based on speed, efficiency, appearance, and the students' written design process.

Robert Moses Middle School students won two prizes, and Great Neck South, Hicksville, Mineola, and Northport Middle School students each won one prize.

— Diane Greenberg



Roger Stoulenburgh D5810311

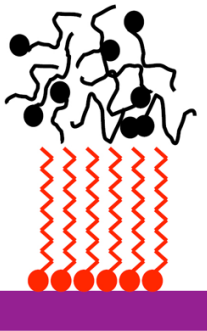
With maglev inventors James Powell (seated, left) and Gordon Danby (seated, right), and Ken White (back, right), manager of Brookhaven Lab's Office of Educational Programs, are the first-place winners of Brookhaven Lab's 2011 Middle School Maglev Contest: (from left) Paige Monaco, Center Moriches Middle School; Scott Noethiger, Albert G. Prodell Middle School; Kevin Albert, Center Moriches; Devon Mockridge, Center Moriches; Christopher Ferguson, Center Moriches; Stephen Spinelli, Prodell; and Chris Lico, Longwood Junior High School.

Surface Freezing from p. 1

...to disorder and eventually melt at a temperature where the bulk remains solid," said Ben Ocko of BNL's Condensed Matter Physics & Materials Science Department, who collaborated on the research with scientists from the European Synchrotron Radiation Facility (ESRF), in France, and Bar-Ilan University (BIU), in Israel. "This is because the molecules on the outside are less confined than those packed in the deeper layers and much more able to move around. But surface freezing contradicts this basic idea. In surface freezing, the interfacial layers freeze before the bulk."

The DOE Office of Science and the U.S.-Israel Binational Science Foundation funded this study, which was authored by Ocko, Htay Hlaing, Paul Jepsen, Sumit Kewalramani, and Alexei Tkachenko of BNL; Diego Pontoni and Harald Reichert of ESRF; and Moshe Deutsch, BIU.

In the early 1990s, two independent teams (one at Brookhaven) made the first observation of surface freezing at the vapor interface of bulk alkanes, organic molecules similar to those in candle wax that



surface frozen

Schematic representation of the alkanol monolayer when frozen (left) and melted (right).

contain only carbon and hydrogen atoms. Surface freezing has since been observed in a range of simple chain molecules and at various interfaces among them.

"The mechanics of surface freezing are still a mystery," said Deutsch. "It's puzzling why alkanes and their derivatives show this unusual effect, while virtually all other materials exhibit the opposite, surface melting, effect."

In the most recent study, the researchers discovered that surface freezing also occurs at the interface between a liquid and a solid surface. In a temperature-controlled environment at beam-



surface melted

line X22A at BNL's National Synchrotron Light Source and at the ESRF, the group made contact between a piece of highly polished sapphire and a puddle of liquid alkanol — a long-chain alcohol. The researchers shot a beam of high-intensity x-rays through the interface and by measuring how the x-rays reflected off the sample, the group revealed that the alkanol molecules at the sapphire surface behave very differently from those in the bulk liquid.

According to Pontoni, "Surprisingly, the alkanol molecules form a perfect frozen monolayer at the sapphire interface at temperatures where the bulk is

still liquid." At sufficiently high temperatures, about 30 degrees Celsius above the melting temperature of the bulk alkanol, the monolayer also melts.

The temperature range over which this frozen monolayer exists is about 10 times greater than what's observed at the liquid-vapor interfaces of similar materials. According to Tkachenko, a theoretical physicist who works at BNL's Center for Functional Nanomaterials, "The temperature range of the surface-frozen layer and its temperature-dependent thickness can be described by a very simple model that we developed. What is remarkable is that the surface layer does not freeze abruptly as in the case of ice, or any other crystal. Rather, a smooth transition occurs over a temperature range of several degrees."

Said Ocko, "These films are better ordered and smoother than all other organic monolayer films created to date."

Deutsch added, "The results of this study and the theoretical framework which it provides may lead to new ideas on how to make defect-free, single molecule-thick films."

— Kendra Snyder

Antimatter from p. 1

...member Jonathan Wurtele of AFRD, also a professor of physics at UC Berkeley, led a team of Berkeley Lab staff members and visiting scientists who used computer simulations to verify the advantages of the octupole trap.

In the November 17, 2010 issue of *Nature*, the ALPHA team reports the results of 335 experimental trials, each lasting one second, during which the anti-

atoms were created and stored. The trials were repeated at intervals never shorter than 15 minutes. To form antihydrogen during these sessions, antiprotons were mixed with positrons inside the trap.

Then, the superconducting magnet producing the confining field is abruptly turned off — within a mere nine-thousandths of a second. This causes the magnet to "quench," a quick return to normal conductivity that

results in fast heating and stress.

As soon as the trap's magnet was quenched, any trapped anti-atoms were released, and their subsequent annihilation was recorded by silicon detectors. In this way the researchers recorded 38 antihydrogen atoms, which had been held in the trap for almost two-tenths of a second.

"Millisecond quenches are almost unheard of," Fajans says. "Deliberately turning off a su-

perconducting magnet is usually done thousands of times more slowly, and not with a quench. We did a lot of experiments at Berkeley Lab to make sure the ALPHA magnet could survive multiple rapid quenches."

For the full press release, see http://www.bnl.gov/bnlweb/pubaf/pr/PR_display.asp?prID=1202 and for the CERN *Courier* account, go to <http://cerncourier.com/cws/article/cern/45129>.

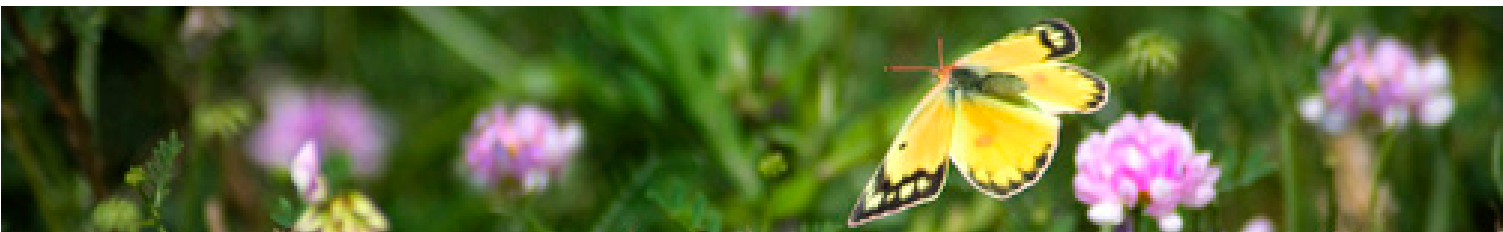
— Kendra Snyder

Elder Law & Estate Planning Update, 5/2

A talk on Elder Law and Estate Planning will be given by Elder Law Attorney Nancy Burner on Monday, May 2, at noon in Berkner Hall, Room B. Please register with Michael Thorn at mthorn@bnl.gov or Ext. 8612.

TIAA-CREF One-on-One Retirement Counseling

A TIAA-CREF consultant will visit BNL on April 29; May 5, 23, 26, and 31; and June 8 and 16 to answer employees' questions about their financial matters. For an appointment, call 1-800-732-8353 or go online at www.tiaa-cref.org/bnl and select "set up a meeting."



R.S. D0840710

Arrivals & Departures

— Arrivals —

Stephanie Hamilton ... Global & Reg
Thomas Sidik Lab Protec
Nathan Triplett Physics
Shengyu Wang..... Photon Scis

— Departures —

Hengjie Ma..... Photon Scis
Marco Pigni..... NS&T

AdoptaPlatoon
Plant Sale, 5/5,6

The AdoptaPlatoon group of the Brookhaven Veterans Association will host a plant sale on the Thursday and Friday before Mother's Day, May 5 and 6, in the parking lot outside Berkner Hall from 11 a.m. until 1 p.m. In case of rain, the sale will be moved to the lobby of Bldg. 400. All proceeds go towards supporting troops in Afghanistan.

Camera Club, 4/28

The next Camera Club meeting, will be held on Thursday, April 28, at noon in Building 400's conference room 2. Contact Joe Gettler: jgettler@bnl.gov.

Shipping/Receiving
Facility Changes

Work has begun on expanding the Lab's Shipping & Receiving Facility, Bldg. 98, located along the west side of Rochester Street.

Traffic should not be affected as the project continues, but all are asked to use caution and obey all safety personnel as well as posted barricades, warnings, and signs when in the area.

To keep the facility's rapidly changing inventory secure and organized, and to prevent anyone from getting hurt, access to the facility will be restricted and members of the Lab community will no longer be able to pick up their own packages at the facility — during the expansion and into the future.

"With forklifts driving around and all the packages that come in and go out, we can only allow authorized employees into the facility now," said Donna King, Property Manager for the Procurement and Property Management Division.

Approximately 190 packages pass through the facility each day. King and her crew strive to ensure that each piece arrives at its next stop as quickly as possible. They also know that, sometimes, with certain experiments and projects, "Now!" is the only option.

"There will always be times when a package must get somewhere immediately for an experiment or meeting," King explained. "Shipping and Receiving is ready for those times, too."

With access to the Shipping and Receiving Facility now restricted, inquire about an important incoming or outgoing shipment by calling Procurement and Property Management supervisors Pat Jencius, Ext. 2300, or Janet Soper, Ext. 2325.

Yankees, Mets Tickets

Purchase tickets at the BERA Store, which is open Monday through Friday from 9 a.m. until 3 p.m. Prices include ticket, bus transportation, and drivers' tip. Buses will leave BNL at 4 p.m. and leave to return after the game at about 11 p.m.

New York Yankees: Thursday, July 7; Wednesday, August 10; Tuesday, September 20. \$20 per person. Yankees tickets go on sale Friday, May 6.

New York Mets: Friday, May 27 (\$40 per person); Friday, July 15, and Friday, August 5 (\$45 per person).

And Baby Makes Three!

Employee benefits from Lab's Adoption Assistance Program

If you ring the doorbell of the lovely home of Lab employee Raju Venugopalan and his wife Laura you would feel warmth — the welcoming warmth of family — the minute the door opens.

Venugopalan, who works in the Physics Department, married Laura in 2002. They already have a happy and fulfilling life, but decided they would like to share that life with a child.

"Laura and I decided we would like to adopt a child from India," said Venugopalan. "I mentioned our plans to my coworker Rob Pisarski, who is a member of the Lab's Family Friendly Committee, and he suggested I look into the benefits offered through the Lab's Adoption Assistance program."

The adoption process

Venugopalan explained that adopting a child is a rigorous and costly endeavor. "It took many months of interviews and tons of paperwork. The entire process took about 18 months," he said. "It was also costly and we are extremely grateful for the financial assistance we received through the Lab's Adoption Assistance program to help defray some of the cost."

Venugopalan said it was worth all the effort because when they laid their eyes on little Anjali for the first time, they instantly fell in love with her. "She is beautiful and we are ecstatic," he said. "Anjali has added a new dimension to our happiness."

Enjoying the new family addition

In the nine short months since Anjali joined them, the family



Raju and Laura Venugopalan, with their daughter Anjali

has already bonded and is enjoying a daily routine that includes swimming lessons for three-year-old Anjali. "It didn't take too long before our house was filled with toys," said Venugopalan. "She is a happy little girl, and she certainly keeps us smiling. We are thoroughly enjoying parenting."

Venugopalan said he and his

wife would be happy to share their experience and encourages BNLees considering adoption to contact him at Ext. 2341, or by email, rajuv@bnl.gov.

For more information on the Lab's Adoption Assistance Program, contact Denise DiMeglio in the Human Resources Division, Ext. 2881. — Jane Koropsak

BNL Workshop from p. 1

...academia, and national labs gathered to brainstorm about how synchrotron-based x-ray methods — especially the advances enabled by the Lab's National Synchrotron Light Source II (NSLS-II) project — might be used to understand better some of the fundamental chemical and physical processes that may ultimately determine if new energy systems being developed to reduce carbon dioxide emissions will be safe and cost effective.

Supercritical carbon dioxide has properties midway between a gas and a liquid and forms at temperatures and pressures above its critical point (31.1 degrees Centigrade and 72.0 atmospheric pressure). It can extract heat from hot rocks more efficiently than water due to its physical properties at the temperatures and pressures typical of geothermal applications.

In contrast to traditional large-scale geothermal power systems, which pump water from natural hot springs, enhanced geothermal systems that circulate supercritical carbon dioxide through dry 'hot' rocks are being developed to tap into the

greater geographic abundance of these materials. Workshop discussions with regard to these enhanced systems focused on the strength and chemical resistance of cements and steel within the injection and extraction wells that cycle the supercritical carbon dioxide. One industry participant reported the injection of carbon dioxide caused rapid erosion of well cements used in traditional geothermal systems.

The term of carbon capture and sequestration is shorthand for the process of capturing carbon dioxide emissions in a power plant stack, compressing it into its high density supercritical phase, and then pumping it underground into porous geologic formations at a depth greater than one kilometer so that it remains supercritical. This process is a major component of the energy mix in many energy system forecasts by the United States, China, and international organizations. Given how much fossil fuel we extract and mine and the widespread distribution of power plants, the process will have to be done on an industrial scale. The development of resistant materials for injection

wells is also of interest for carbon capture and sequestration development.

Much of the discussion related to carbon capture and sequestration, however, focused on the geochemical and physical processes that will determine how supercritical carbon dioxide will behave within geologic formations. Computational science results indicate that reactions occur based on complex relationships between rock, fluid composition, and flow rate. The high spatial resolution of x-ray imaging techniques available at NSLS-II will be paramount to sorting out these complex relationships.

We would like to thank the many individuals across the Laboratory who helped organize this event, especially Simer Gill, Research Associate for Nuclear Sciences and Technology in the Global & Regional Solutions Directorate, and Gretchen Cisco, Deputy User Administrator in the Photon Sciences Directorate.

Presentations and follow up will be posted and updated on the workshop website, www.bnl.gov/scco2/.

(Note: From Monday Memo, 4/11)

CALENDAR

— WEEK OF 4/25 —

Mon.-Sat., 4/25-30

*Earth Week Events

See www.bnl.gov/earthweek/.

Take the Earth Day Sustainability Quiz at <http://training.bnl.gov/course/earthday/>. BNL wildlife photos and environmental posters will be displayed in Berkner Hall lobby all week. You can contribute to the Foundation for Ecological Research in the Northeast at BNL's Environmental Pledge Tree, 11:30 a.m.-1:30 p.m.

Monday, 4/25

Earth Week Office Swap

11 a.m.-1 p.m. Berkner Hall lobby. Bring unwanted office supplies, swap for supplies from other Lab offices, or just take what you need. All supplies must be used at the Lab.

N.Y. Innovation Marketplace

1-2:30 p.m. Brookhaven Center. Overview of the "New York Innovation Marketplace" website, part of BNL's and the Long Island Forum for Technology's Entrepreneurs' Foundation Workshop Series.

IBEW Meeting

6 p.m. Centereach Knights of Columbus Hall, 41 Horseblock Rd., Centereach. A meeting for shift workers will be held at 3 p.m. in the union office. The agenda includes regular business, committee reports, and the president's report.

Tuesday, 4/26

*Earth Week Office Swap

11 a.m.-1 p.m. Berkner Hall lobby. See 4/25 above.

Talk: Save on Home Heating Costs

Noon. Berkner Hall, Room B. Tom Butcher, Sustainable Energy Technologies Department, will talk on "Home Heating, How Much Can I Save?" All are welcome. See story, p.4.

Wednesday, 4/27

Environmental Vendor Fair

11:30 a.m.-1:30 p.m. Berkner Hall lobby. More than 20 local vendors display "green" products, energy and ecological conservation methods.

Dance Social: All Welcome

5:30-8:30 p.m. Brookhaven Center, N. Ballroom. All are welcome to come, dance to DJ music. \$5 donations appreciated. For more information, call Vinita Ghosh, Ext. 6226, Kathy Tuohy, Ext. 3845.

Thursday, 4/28

Environmental Poster Art Awards

4 p.m. Berkner Hall. Awards for winning art posters by local school children, on environmental theme. All are welcome.

Friday, 4/29

Hybrid Vehicle Display

10 a.m.-2 p.m. Berkner Hall parking lot. Local car dealers display hybrids. Open to the public. Visitors to the Lab of 16 and older must carry a photo ID.

Bird Watching Walk on Site

Noon-1 p.m. Berkner Hall upper lobby. Meet the group, be taken to watch birds with Lab ecologist Tim Green and birder Ernie Lewis. Wear appropriate clothes and shoes. Group will return to Berkner by 1 p.m.

Saturday, 4/30

BNL at Suffolk Earth Day Festival

All day family event. Scully Estate on the Great South Bay, Islip. BNL's Environmental Protection Division will host a booth, with interactive displays, giveaways. "Green" fun for all, activities for children.

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

07 TOYOTA COROLLA – 45K mi. 4cyl, 4dr, a/t a/c cd c/c 1 yr warr, full service history orig owner, v/gd/cond. \$9,750. Ext. 2851.
05 NISSAN ALTIMA S – 32K mi. 4dr, 4cyl, 2.5L fwd, a/t, a/c, am/fm/cd, orig owner, vgd/cond, low mi. \$10,000 neg. Ext. 5254.
03 CHEVY CORVETTE – 18.95K mi. Conv. blk top, a/t, 50 anniv ed, heads-up display, car cover incl, \$28,385 neg. Ext. 3687.
02 NISSAN ALTIMA – 122K mi. Impecc. blk, 4-cyl, a/t, pw, pl, cc,am/fm/cd, new batt, new brakes. \$5,200. Ext. 2947, 374-0172.
02 KAWASAKI VULCAN 1500 CLASSIC FI – 11K mi. red/silver,fuel injected, sissy bar, lgge rack, mch more. \$5,700 neg. 331-7048.
99 HYUNDAI ACCENT – 144K mi. manual trans, 1.5, 4/cyl eng, crank windows, no a/c. \$1,200 neg. brookhaven@optonline.net.
98 LINCOLN CONTINENTAL – 74K mi. mint, continental, m/roof, leather, cruise, all pwr, gar, landau roof, 8cyl. \$4,500 neg. 654-5689.
95 MAZDA 626 – 160K mi. Runs v.well. Price neg. Must go soon. Pics & VIN on request. \$1,800 neg. Ext. 7240, nnambiar@bnl.gov.
94 OLDSMOBILE CUTLESS CIERA S – 88K mi. 4 yr old trany, new batt & fr brakes, gd cond, Bk val. \$1500, ask/\$1,000. 839-6327.
88 CHEVY K5 BLAZER – 131K mi. solid K5 blazer, w/strg 350tbi, new trans/trnsfr case/brakes, some rust, \$1,500, neg. 484-9888.
HARDTOP – from a '95 jeep wrangler, ask/\$450 great cond. 291-0245.

Boats

25' CAPE DORY CD25 – 3' draft full keel, 1978 '08 full battend main, 2 reef pts, new sails, genoa & eng, more, \$5,000 neg. Ext. 4708.
23' O'DAY 1974 – cnvrble centerbrd, Shoal Keel C/B 2'5' draft, VHF, OB, Roller Furling, sails, P/Potti, stve. \$3,000 neg. Sal, Ext. 5055.
14' SEANYNPH BOW – aluminum seany-nph boat motor & trailer, motor is 8hp Johnson. \$650. Robert, 466-7139.

Furnishings & Appliances

5PC WOOD KITCHEN SET – Rnd Table w/ blt-in leaflet that opns to seat 6-8, w/4 chrs, buyer must pick it up, ask/\$300. Ext. 2431.
AIR CONDITIONER – Fredericks 28K Btu, excel cond, ask/\$400. 281-5505.
CRIB – Bought from Behr's light wood, drawer beneath. Lt oak, excel cond, pics. Best offer - you pick up, Middle Island. Ext. 4000.
SOFA – Dk brwn Ashley 84" w/recliner sctns each end. Used <1yr. Currently disassembled for easy transport. Ext. 2824.

Audio, Video & Computers

IPHONE 3G – unlocked iPhone 3G running iOS 4.2.1. car/wall chrger, USB charging cable,more,\$220/neg. nnambiar@bnl.gov.
MAC COMPUTER – Mdl 6400 Video editg editn, OS 8&9, 40 GB HD,w/net card, inc.kbd, mon, trkball, sftwr txles, \$150/obo. Ext. 2253.
NINTENDO DSI XL – burgundy w/orig pkg, w/Brain Age games preloaded/charger, barely used/\$140. Renee, Ext. 8278.
PHOTO & NEGATIVE SCANS – scans & color corrcs slides, etc., converts to DVD. Music also, www.pictureperfectscans.com 928-6469.
XBOX 360 ELITE – w/2 controllers, 120 gb hd, 11 games, orig cases, headset new \$300/neg, thank you. Shayn, 887-9027.

Sports, Hobbies & Pets

BOWFLEX – sport bowflex ask/\$150 v/gd cond, will take apart. Bobbi, Ext. 2332.
EXERCISE BIKE – Sears Pursuit 310CS, like new, cust wide/lg seat, digital speed/time/distce/cal cnter \$40 obo. 821-2586.
G.I. JOE ACTION FIGURES – Authentic, Excel cond. Some 1960s. Accessories also avail. Ext. 4931, signorel@bnl.gov.
MALTESE/SHIH TZU DOG – white/gray, 20 mo old, under 10 lbs, great w/kids, other pets, playful, v/well trained, has chip & papers +, must sell, gd home only, \$425/neg. 445-4027.
POOL TABLE – \$200, great shape. Rich, Ext. 8186.
WETSUIT – Youth size 12, pd/\$110, ask/\$50, excel cond. Ext. 7235 or fitz@bnl.gov.

Tools, House & Garden

POOL FILTER & PUMP – Hayward Perflex EC40 agp, DE Filter Sys w/pump, pd. \$900, used 1/seasn, ask/\$450. 264-5473.
POWERWASHER – DeWalt 3750 PSI-13hp Honda engine - used v little, \$1000 new - asking \$450 call John. 365-4815.

Happenings

THEME BASKET AUCTION – St. Andrew's Episcopal Chuch, E. Main St., Yaphank, Sat., April 30. noon, \$5 admission. info@standrewsyaphank.org.

Miscellaneous

BABY'S ITEMS – Safety 1st Rocking Jitter Buggy, \$10, pic upon request. Rachel, Ext. 3500 or irachel@bnl.gov.
HOOKED ON PHONICS – vols 2-5, all still sealed in orig pkg, \$50. slattuca@bnl.gov.
MISC – sm Singer uprt vacuum/\$15, Portable hair dryer/\$5, Igloo Cooler/\$20, Wall Clock/\$15, Framed Abstr. Pic/\$30, 281-4459.

VIOLA – 16" Viola for Sale. Gd Condition. Made in 2000. Silver wound bow and case included. \$1600. David, Ext. 5203.

Free

HEARING AID BATTERIES – 7 +10 hearing batteries, (opened pkg, wrong sz, cannot exchange). Joann, Ext. 5209.
ROYAL ELECTRIC TYPEWRITER – May need some maint., extra ribbons. 924-5220t.
TV/VCR/FM RADIO – 15" Panasonic w/ built in VCR, remote. David, Ext. 2604.

Wanted

SINGLE ROOM/ROOMMATE – Visiting grad student seeks bdrm, 5/1-8/31, \$400 -600, and ride to Lab at the beginning, I don't have car. 412-886-6142, yug9@pitt.edu.
APT RENTAL – 1/bdrm apt less than 10min from BNL. Luozhou, 347-277-4904 or oe05071lz@gmail.com.
BABY'S SWING – in gd cond. Barbara, 924-5220 or bbosshard@optimum.net.
D&D PLAYER – group of 3 men needs 4th D&D player, plays Wednes. nights, Riverhead. c/o Ext. 4807 or mgoodsell@bnl.gov.
DONATIONS OF DOG/CAT FOOD – For pets of struggling families/elderly or Kent Animal Shelter. Collectn bins: Bldgs.134, 400, 510 (X5864), 725, 901, 902. Ext. 3161.
FIREWOOD – cut downed hardwd logs oak/ maple, etc 14"-20", split or non split pcs, will remove free nr Rocky Pt. 849-2329.
GLASS JARS – Hellmann's mayonnaise 1 quart glass jars. Rich, Ext. 7013 or derocher@bnl.gov.
GOOD RUNNING CAR – looking for a used reliable car for my daughter, no gas eaters, 4-6 cyl, \$2000-\$2500. 834-6956.
UTILITY TRAILER – sm w/4 sidewalls, 2" hitch, for camping gear. Al, 456-2270.

For Rent

WEEKI WACHEE, FL – priv Gulf Coast Ranch, 70m Orlando, 3bdrm, 2ba, d/r t/p, 2x gar, shed, nr beach, fly Islip dir, screen/ igp, trees, pics. \$950/mo neg. 344-5537.
BAITING HOLLOW – new studio apt, sep eik, tiled bath, priv ent, util/int/HD incl, no smkg, walk beach, 15 mins to Lab. \$900/ mo. Lisa, 804-8117.
CENTER MORICHES – 1 bdrm apt, up-stairs, priv ent, close to Lab/town, great area, nice size, incl all. \$825/mo. George, 878-1178 or murdock381@hotmail.com.
E. PATCHOGUE – 1 bdrm apt, l/r kitch combo, furn/unfurn, 15 min to Lab, incl all, no smkg/pets, 1 mo sec. \$1,000/mo. Carol, 286-4236.
FLANDERS – lge furnished bdrm in beaut house & n'hood, share lr, bath,kit all utilities included, no smoke/pets, quiet BNL employee ONLY. \$700/mo. 445-4027.
MANHATTAN – Upper east side studio apt, sep kitch, newly renov kitch/bath. \$1,250/mo. Ext. 4531, 331-3785.
MASTIC BEACH – 2 bdrm on quiet block, eik, lg, l/r, 2 car gar, fenced yd 1 mo sec. \$1,300/mo. Kenny, 775-6003 or aichroth@bnl.gov.
MIDDLE ISLAND – lg 1 bdrm bsmt apt, pvt ent, phone, cable, int, strictly no smkg/pet, all incl, BNL employee only, 1 mo sec. \$800/mo. Ext. 7020, 672-2451.
MIDDLE ISLAND – 1 bdrm at 2nd flr (quiet), lake view, balcony, a/c, 12 min to Lab, no smkg/pet. Avail 5/1. \$800/mo neg. Shengliang, 540-204-2910/szhao@bnl.gov.
MIDDLE ISLAND – 1 bdrm, 1st flr, full kitch/ bath, sep ent, no smkg/pets, incl all, quiet prof area 5 mins from Lab, 1 mo sec. \$1,000/ mo. 807-5196 or trs234@yahoo.com.
MILLER PLACE – 2 bdrm apt, bath, l/r, kitch, walk-n closets, near LI Sound, util incl w/ w/d, phone & TV extra, non-smkr, no children, no pets. \$1,500/mo. 516-993-5047.
SELDON – 1 bdrm Bi-level apt, kit,l/r main level, bdrm & bath upstairs, sep ent, incils all, no smkg/pets, single occup, avail now, 1st mo rent. \$950/mo. 736-2577.
SHOREHAM – share a hse w/professional, lg furn bdrm, cable, int, no smkg/ pets, 8 mi to BNL, avail now. \$675/mo. 578-0108 or gg19582003@gmail.com.

For Sale

WEEKI WACHEE, FL – Priv Gulf Coast ranch, 70m Orlando, 45m Tmpa, nr beach, scrn/igp, fruit trees, 3bdrm, 2ba, lg dr, fp, 2x gar, shed. \$129,000 neg. 344-5537.
BAYPORT – Grt. S. Bay area, 2,300 sq.ft ranch, nr.1 acre, wooded, priv., 3 bdrm, 2+half ba, den, lr/dr, kit, util rm, scrmd porch, carport. \$2,300/mo. or \$585,000. 617-332-6264.
RONKONKOMA – 5/6 bdrm hi-ranch, 2 ba, 2 kit, laundry, M/D w/permits, 6-car drwy, tax/\$9300, nr LIE/LIRR/lake/shops, fen yd, or rent/\$3,500/mo, \$439,900. 244-7000.

In Appreciation

For those who donated used sneakers, many thanks. View the results of your donation & maybe find your old sneakers! <http://vimeo.com/22293756>. — Colleen Michael

Take Our Daughters & Sons to Work, 4/28

BNL will welcome Lab children to "Take Our Daughters and Sons to Work Day" on Thursday, April 28.

If deemed safe, with supervisory approval, the children will spend the morning with their parent in his or her workplace and then at lunch. To participate in BNL's afternoon tour program, children must have already been pre-registered by the announced April 20 deadline. For additional information, contact Liz Gilbert, Bldg. 400B, Ext. 2315.



Joseph Rubino A0030411

Sustainability Matters at BNL: Earth Week Celebrated 4/25-30

Environmental sustainability at BNL will be on display next week with a full slate of Earth Week events and activities.

"The week demonstrates the Lab's year-round commitment to all levels of supporting environmental sustainability," said George Goode, Assistant Lab Director for Environmental, Safety & Health Directorate. "Sustainability is a major part of the Lab's research mission, which includes alternative energy source research."

Goode will be joined by Lab Director Sam Aronson on Tuesday, April 26, at 9:30 a.m. in the Building 400 lobby to make a sustainability pledge at the annual **Earth Week Pledge Tree**. Pledges last year totaled more than \$2,700 and were donated to the Foundation for Ecological Research in the North-east, known as FERN.

This year's pledges are also going to FERN, said the Environmental Protection (EP) Division's Jason Remien, Earth Week planning team leader. "Much of FERN's research is conducted right here on site and we like to support those efforts as much as we can." Remien also noted the need to raise awareness about supporting sustainability at the Lab year-round.

"Our on-site pollution prevention, conservation, and recycling programs put this Lab at the forefront of sustainable practice among large businesses on Long Island and in good stead with the other labs in the DOE complex — but there's always room for improvement," Remien continued. "The key is to recognize that small changes to our day-to-day activities can make a big difference in reducing our carbon footprint here and at home. You can start making a difference by making a pledge at the Tree to show commitment to environmental sustainability."

EP's Peter Pohlot, BNL Pollution Prevention Coordinator, said that Lab staff is working on all aspects of energy use reduction, from research that will improve operation of the electrical grid to individual home energy efficiency.

"I'm especially looking forward to **Tom Butcher's talk** April 26 at noon in Berkner," Pohlot said. "He's a great resource here at the Lab. Three years ago, I was looking to improve the efficiency in my home. Now, with his advice, I'm using 40 percent less fuel than I was before. He's going to talk about things homeowners can do right now — and with fuel prices going up, this is a very timely topic."

Steve Ferrone, Environmental Compliance Representative for the Facilities & Operations Directorate, organized a team to conduct a waste characterization study, or "**Dumpster Dive**," on three days' worth of garbage from some of the larger research and support facilities in the lead-up to Earth Week.

The result of their garbage adventure was captured on video and can be viewed on the Earth Week 2011 web page, www.bnl.gov/earthweek. Ferrone said he, Pohlot, and the rest of the dumpster dive team made some interesting discoveries, including a large amount of recyclable items finding their way into the Lab's trash bins.

"One recyclable container being thrown away doesn't seem to be a big deal," said dumpster diver Debbie Bauer, also of EP. "But when you start looking at the entire Lab population, close to 3,000 people, each throwing away just one container, well, that does become a big deal, doesn't it?"

EP's Karen Ratel said she's committed to helping the Lab be a good neighbor to the surrounding community. She coordinates the "Your Environment" **art contest awards** ceremony, which will be held Thursday, April 28, at 4 p.m. in Berkner Hall. Awards will be presented to children from local schools for their art posters relating to "Your Environment."

"This is a great opportunity for the Lab to reach out to the local community and help promote sustainability awareness for future generations," Ratel said.

With gas prices approaching the highest levels ever seen on Long Island, the Earth Week Planning Team anticipates that this year's **hybrid and electric car display** will be well attended. This event is scheduled for April 29 in the Berkner parking lot and is organized by Jeff Williams, BNL's Employee Transportation Coordinator. Williams also manages the Lab's ride share effort. "I encourage all Lab employees to reduce their commuting carbon footprint by ridesharing or by trading up to a high mileage hybrid vehicle," he said. Learn more about ride sharing at www.bnl.gov/earthweek.

Remien believes Earth Week 2011 will be a big hit with the Lab community. He was especially grateful to EP's Earth Week planning team, including Ratel, Pohlot, Williams, Bob Lee, Tim Green (who, with Ernie Lewis of the Environmental Sciences Department, is leading a noontime **bird watch** on Friday, April 28), Kathy Schwager, and Jennifer Higbie, who organized the pledge tree this year. Remien also noted the help his team received from Ruth Comas and Danielle Bulcock of the Staff Services Division, who helped coordinate the **Vendor Fair** to be held Wednesday, April 27, in Berkner Hall lobby; the Waste Management Program's Francine Donnelly, who helped coordinate the **Office Swap** to be held Monday and Tuesday, April 25 and 26, in Berkner Hall lobby, and Christine Carter, Quality of Life & Recreation Supervisor, who helped with a wide range of Earth Week planning. — Will Safer