

## Modeling Plant Metabolism To Optimize Oil Production

**Computational studies aim to increase use of plant oils as renewable resource**

Scientists at BNL have developed a computational model for analyzing the metabolic processes in rapeseed plants — particularly those related to the production of oils in their seeds. Their goal is to find ways to optimize the production of plant oils that have widespread potential as renewable resources for fuel and industrial chemicals.

The model, described in two “featured articles” in the August 1, 2011, issue of the *Plant Journal*, may help to identify ways to maximize the conversion of carbon to biomass to improve the production of plant-derived biofuels. This work was supported by the DOE Office of Science.

“To make efficient use of all that plants have to offer in terms of alternative energy, replacing petrochemicals in industrial processes, and even nutrition, it’s essential that we understand their metabolic processes and the factors that influence their composition,” said Jorg Schwender, Biology Department, who led the development of the model with postdoctoral research associate Jordan Hay, also of Biology.

In the case of plant oils, the scientists’ focused attention on seeds, where oils are formed and accumulated during development.

“This oil represents the most energy-dense form of biologically stored sunlight, and its produc-



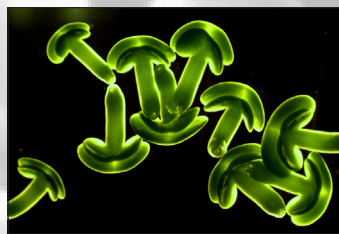
Jorg Schwender and Jordan Hay

tion is controlled, in part, by the metabolic processes within developing seeds,” Schwender said.

One way to study these metabolic pathways is to track the uptake and allotment of a form of carbon known as carbon-13 as it is incorporated into plant oil precursors and the oils themselves. But this method has limits in the analysis of large-scale metabolic networks such as those involved in apportioning nutrients under variable physiological conditions.

“It’s like trying to assess traffic flow on roads in the United States by measuring traffic flow only on the major highways,” Schwender said.

To address these more complex situations, the Brookhaven team constructed

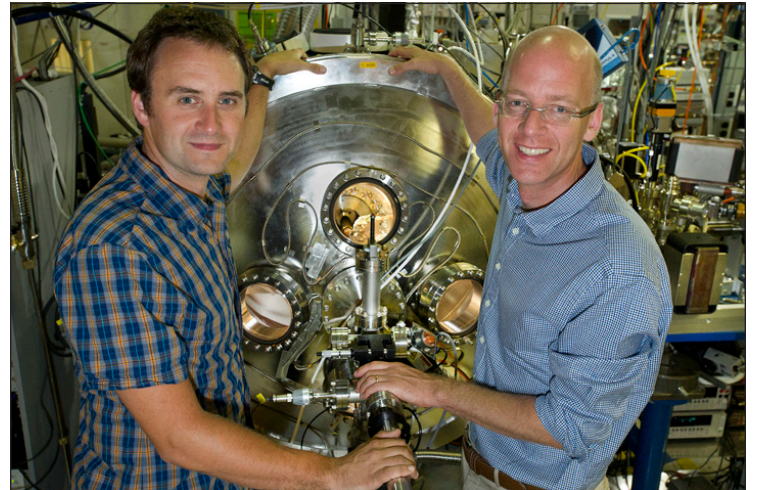


Developing embryos after being excised from a growing rapeseed plant. Embryos accumulate seed oils, which represent the most energy-dense form of biologically stored sunlight, and have great potential as renewable resources for fuel and industrial chemicals.

a computational model of a large-scale metabolic network of developing rapeseed (*Brassica napus*) embryos, based on information mined from biochemical literature, databases...

See *Plant Oils* on p. 2

Roger Stoulenburgh 02670711



Brookhaven physicists Stuart Wilkins (left) and John Hill at NSLS beamline X1A2, where their research was performed with a new soft x-ray scattering facility.

## Rare Coupling of Magnetic And Electric Properties In a Single Material

Researchers at BNL have observed a new way in which magnetic and electric properties — which have a long history of ignoring and counteracting each other — can coexist in a special class of metals. These materials, known as multiferroics, could serve as the basis for the next generation of faster and energy-efficient logic, memory, and sensing technology.

The researchers, who worked with colleagues at the Leibniz Institute for Solid State and Materials Research in Germany, published their findings online in *Physical Review Letters* on July 25, 2011. This work was supported by the DOE Office of Science.

Ferromagnets are materials that display a permanent magnetic moment, or magnetic direction, similar to how a compass needle always points north. They assist in a variety of daily tasks, from sticking a reminder to the fridge door to storing information on a computer’s hard drive. Ferroelectrics are materials that display a permanent electric polarization — a set direction of charge — and respond to the application of an electric field by switching this direction. They

**New multiferroic mechanism could lead to next-generation memory and sensing devices**

are commonly used in applications like sonar, medical imaging, and sensors.

“In principle, the coupling of an ordered magnetic material with an ordered electric material could lead to very useful devices,” said one of the paper’s authors, Stuart Wilkins of BNL’s Condensed Matter Physics & Materials Science Department (CMPMS). “For instance, one could imagine a device in which information is written by application of an electric field and read by detecting its magnetic state. This would make a faster and much more energy-efficient data storage device than is available today.”

See *Multiferroic Device* on p. 2

## North, South, East, West — Students Study What Rides the Wind Over Long Island

Five college students from around the country have traded the lazy, hazy days of summer for an opportunity to analyze the haze itself.

During their 10-week internship in programs administered by BNL’s Office of Educational Programs, these students participated in a campaign to measure the concentration, chemical composition, size, shape, and optical properties of tiny particles in the atmosphere called aerosols. This work at BNL is supported by DOE’s Atmospheric Radiation Measurement (ARM) program.

Aerosols arrive in the atmosphere from many different starting points — both natural and anthropogenic. They come from the burning of fossil fuels, from ocean mist and desert dust, from factory emissions, and from volcanic activities. Some are formed directly in the atmosphere from plant and human emissions.

“Aerosols are neither altogether good nor bad, but they’re very important for environmental scientists to try and understand,” says Danielle Weech, University of Illinois, a Science Undergraduate Laboratory Internship (SULI) stu-



Students who studied aerosols and the environment with mentors Stephen Springston (second from left) and Art Sedlacek (right) are: (from left) Danielle Weech, Tony Aguirre, Erica Schreiber, Stephanie DeJong, and Agossa Segla.

dent. “On one hand, aerosols play a major role in causing cloud formation and reducing solar radiation, which helps provide an overall ‘cooling’ effect for our planet. But on the other, some types of aerosols contribute to global warming by absorbing the sun’s heat rather than bouncing it back to space.”

Currently, atmospheric scientists know a lot more about how greenhouse gases like carbon dioxide and methane affect the environment than they do about the role — that is, the

many roles — aerosols play.

“Some aerosols act as direct influences on climate change by limiting or enhancing solar radiation, but others have a more indirect effect,” says Erika Schreiber, a SULI student from Cornell University. “Aerosols provide particles for water droplets to cling to in the air, which is how clouds form, and clouds deflect sunlight. Then, if too many particles are concentrated in the same cloud, water molecules can’t form droplets big enough to rain down. This...

See *Aerosol Study* on p. 3

Roger Stoulenburgh 00790811

## BSA Distinguished Lecture, 9/8 Using the Sun’s Energy To Power the World

Daniel Nocera, a Massachusetts Institute of Technology (MIT) professor whose recent research focuses on solar-powered fuels, will give a BSA Distinguished Lecture titled “Harnessing Energy from the Sun for Six



Billion People — One at a Time,” on Thursday, September 8, at 4 p.m. in Berkner Hall. BSA Distinguished Lectures are sponsored by BSA, the company that manages BNL, to bring topics of general interest before the Lab community and the public. The lecture is free, and no preregistration is required. Visitors to the Lab 16 and older must bring a photo ID.

Nocera will explain that the world population is expected to double by 2050, increasing to about six billion people, mainly

from developing nations. Global energy consumption is expected to rise from 14 to 30 terawatts, or trillion watts.

Nocera suggests that building small, “personalized” energy systems that rely on the sun’s energy will be an economical, efficient, and environmentally friendly way to meet these ever-increasing energy needs.

He and his research team have found a way to harness solar energy through artificial photosynthesis — mimicking the way plants turn sunlight into energy. They have developed a device called an “artificial leaf” that can be used to power a home in the developing world. Made of nickel, silicon, and cobalt, the device is smaller than an oak leaf.

See *BSA Lecture* on p. 3

## CALENDAR

• 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 & 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](mailto:rusek@bnl.gov).

**Tues.: Hospitality Welcome Coffee**  
On hold until September.

**Tuesdays: Zumba**  
On hold until September.

**Tuesdays: Knitting Class**  
On hold until September.

**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**  
On hold until September.

**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**  
On hold until September.

**Wednesdays: Ballroom Dance**  
On hold until September.

**Wednesdays: Pilates**  
On hold until September.

**Wednesdays: Play Group**  
On hold until September.

**Wednesdays: Yoga**  
Noon–1 p.m., B'haven Center (Bldg. 30). Free. Ila Campbell, Ext. 2206, [ila@bnl.gov](mailto: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](http://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.



Joseph Rubino 08A0611

## BNL's Most Recent Spotlight Award Honorees

*For extending extraordinary efforts in response to the needs of their departments or divisions, the following 239 BNL employees, including those pictured above, were among those honored with Spotlight Awards during 2010:*

**Basic Energy Sciences Directorate:** Rita Nicholaides

**Biology Department:** Kathryn Folkers, James Jardine, Eileen Kasmarcik, Irene Rosati, Grace Shea-McCarthy, Tao Wang, Ke-Wei Zhang

**Budget Office:** Donna Chiossone, Shantilata Subudhi

**Center for Functional Nanomaterials:** Ed Baker, Lois Caligiuri, Pam Ciufio, Lorraine Davis, David Elling, Donald Elliott, Arthur Piper, Joann Tesoriero, Judith Thompson, Grace Webster

**Chemistry Department:** Linda Sallustio, Lee Walcott

**Collider Accelerator Department:** John Addressi, Zeynep Altinbas, Edward Bajon, Oluwafemi Bamgbose, Jack Barry, Charles Bloxon, Tracy Blydenburgh, Steve Bubka, Patrick Bynum, Marty Candito, Richard Conte, Timothy Costanzo, Tony Curcio, Gary Danowski, Roger Davis, Joe DeCicco, Mitch DeLaVergne, Lynanne DiFilippo, Richard DiFranco, Anthony DiLieto, Frank Donato, Joseph Drozd, Bill Eisele, Arthur Fernando, Jesse Fite, Stephen Gill, Stefano Giorgio, Kenneth Hartmann, Marion Heimerle, Gregory Heppner, Terry Higgins, Robert Hulsart, Stephen Jao, Ben Johnson, Robert Karl, Kyle Kulmatycki, Ann Lambert, Chuyu Liu, Dave Loughlin, Daniel McCafferty, Kevin Mernick, Christine Meyer, George Murdock, Frank Naase, David Nace II,

Thomas Nolan, Pat O'Grady, Robert Olsen, John Pomaro, Al Ravenhall, Guillaume Robert-Demolaize, Erik Rydout, Steve Savatteri, Frank Scheifele, Vincent Schoefer, Robert Schoepfer, Kirk Sinclair, Ciro (Lee) Sirio, Charles Trabocchi, Vic Usack, Joel Vasquez, Jeffrey Wilke, Dan Wilson, Paul Ziminski, Christopher Zimmer, Peter Zimmerman

**Community, Education, Government & Public Affairs Directorate:** Rick Backofen, Nora Detweiler, Kahille Dorsinvil, John Galvin, Elaine Lowenstein, Catherine Osiecki, Kendra Snyder, Karen McNulty Walsh

**Computational Science Center:** Claire Lambert

**Condensed Matter Physics & Materials Science:** Anthony Bollinger, Maxim Khodas, Jonathan Rameau, Arlene Rementer, William Schoenig, Jing Tao

**Director's Office:** Liz Flynn, Lillian Kouchinsky, Darcy Mallon, Doris Rueger

**Energy Sciences & Technology Department:** Lynda Fitz, Manuel Miranda, Damon Turney

**Environmental Restoration Division:** Sonya Kiss

**Environmental Sciences Department:** Larry Miliian, William Robert Nettles

**Environmental Services Division:** Joy Haskins, Richard Lagattolla, Lawrence Lettieri, Robert Metz, James Milligan, Melanie Theisen, Susan Young

**Facilities & Operations Directorate:** Nelson Cause, Antonio Hammil, Claudia Hattton, Cheryl Ann Kuhn, Phyllis Lucas, Pamela Yerry

**Finance Directorate:** DJ Greco

**Fiscal Services Division:** Marge Desmond, Linda Jones, Sophia Marneris, Debra Pettit

**Global & Regional Solutions Directorate:** Louis Gerlach, Robert Lake, Jeanne Madaia, Lisa Morello, Maria Ohlsen

**Human Resources & Occupational Medicine Division:** Leesa Allen, Louisa Barone, Melissa Bittroff, Peter Esposito, William Fortunato, Mary McGrath, Rick Morales, Starr Munson, Darlene Peragine, Christina Sanfillippo

**Information Services Division:** Lee Akras, Anastasia Kuczewski, Carmit Pelleg

**Information Technology Division:** Christine Caruso, David Cortijo

**Instrumentation Division:** Mary Brathwaite, Gene Von Achen

**Laboratory Protection Division:** Louis Figueroa

**Legal Office:** Carmen Alvarado

**Maintenance & Fabrication Services Division:** Joseph Stanisci

**Medical Department:** Angela Kim, Elena Shumay, Laura Thompson, Donald Warner

**Modernization Project Office:** William Bockelmann, Laurie Casarole, Thomas Sperry

**National Synchrotron Light Source Department:** Mary Anne Corwin, Christopher Danneil, Peter Davila, Joseph Papu, Mihai Radulescu, Wayne Rambo, Leonard Santangelo, Robert Scheuerer, Michael Schwarz, Anna Sweet

**National Synchrotron Light Source II Project:** Mary Carlucci-Dayton, Joseph Cosentino, Michael Davidsaver, Christine Herbst, Barbara Moebes,

Robert Petkus, Lydia Rogers, Bruno Semon, Yuke Tian, Patrick Zoccoli

**Nonproliferation & National Security Department:** Cheryl Christie, Donna Gill, Lori Happick, Thomas Roberts, Cindy Salwen, Josh Tackentien

**Nuclear & Particle Physics Directorate:** Elaine Zukowski

**Physics Department:** Maureen Anderson, Dmitry Arkhipkin, Babak Azmoun, Wayne Betts, Pamela Esposito, Bridget Geib, Christopher Hollowell, Jim La Bounty, Cynthia McQuiken, Jacqueline Mooney, Penka Novakova, Robert Pisani, Fern Simes, Kelly Smith

**Procurement & Property Management Division:** Michelle Barsalona-Orlando, Phil Bernath, Jennifer Cafiero, Roseann Callister, Michael Canavan, Linda Commander, Cheryl Eleazer, Elise Forrette, Phil Gardner, Michelle Holbrook, Larissa Roupe, Janet Schlock

**Quality Management Office:** Joyce Fortunato, Sabine Kessler

**Radiological Control:** Gregory Condemi, Beth Lettieri, Pat Sullivan, Frank Zafonte

**Safety & Health Services Division:** Amber Aponte, Deborah Cubillo, Linda Services

**Site Services Division:** Mel Bonanno, Martha Bryant, Joanne Rula

**Superconducting Magnet Division:** Raymond Ceruti, Sebastian Dimaiuta, William McKeon, Dan Oldham, Dan Sullivan

**Waste Management Division:** Dan Blakely, Edward Gavin, Allen Jones, Steve Klerk, Holly Olsen, Joe Pavlak  
**Congratulations to all the honorees!**

### Multiferroic Device from p. 1

But multiferroics — magnetic materials with north and south poles that can be reversed with an electric field — are rare in nature. Ferroelectricity and magnetism tend to be mutually exclusive and interact weakly with each other when they coexist.

Most models used by physicists to describe this coupling are based on the idea of distorting the atomic arrangement, or crystal lattice, of a magnetic material, which can result in an electric polarization.

Now, scientists have found a new way that electric and magnetic properties can be coupled in a material. The group used extremely bright beams of x-rays at the National Synchrotron Light Source (NSLS) to examine the electronic structure of a metal oxide made of yttrium, manganese, and oxygen. They determined that the magnetic-electric coupling is caused by the outer cloud of electrons surrounding the atom.

"Previously, this mechanism had only been predicted theoretically and its existence was hotly debated," Wilkins said.

In this particular material, the manganese and oxygen electrons mix atomic orbitals in a process that creates atomic bonds and keeps the material together. The

researchers' measurements show that this process is dependent upon the magnetic structure of the material, which in this case, causes the material to become ferroelectric, i.e. have an electric polarization. In other words, any change in the material's magnetic structure will result in a change in direction of its ferroelectric state. By definition, that makes the material a multiferroic.

"What is especially exciting is that this result proves the existence of a new coupling mechanism and provides a tool to study it," Wilkins said.

The researchers used a new instrument at NSLS designed to answer key questions about intriguing classes of materials such as multiferroics and high-temperature superconductors, which conduct electricity without resistance. The instrument, developed by Wilkins and engineers D. Scott Coburn, Photon Sciences, and William Leonhardt and William Schoenig, both of CMPMS, will ultimately be moved to the National Synchrotron Light Source II (NSLS-II), a state-of-the-art machine under construction. NSLS-II will produce x-rays 10,000 times brighter than at NSLS, for studies of materials' properties at even higher resolution.

— Kendra Snyder

### Plant Oils from p. 1

...and prior experimental results that set limits on certain variables. The model includes 572 biochemical reactions that play a role in the seed's central metabolism and/or seed oil production, and incorporates information on how those reactions are grouped together and interact.

The scientists first tested the validity of the model by comparing it to experimental results from carbon-tracing studies for a relatively simple reaction network — the big-picture view of the metabolic pathways analogous to the traffic on U.S. highways.

At that big-picture level, results from the two methods were largely consistent, providing validation for both the computer model and the experimental technique, while identifying a few exceptions that merit further exploration.

The scientists then used the model to simulate more complicated metabolic processes under varying conditions — for example, changes in oil production or the formation of oil precursors in response to changes in available nutrients (such as different sources of carbon and

nitrogen), light conditions, and other variables.

"This large-scale model is a much more realistic network, like a map that represents almost every street," Schwender said, "with computational simulations to predict what's going on." Continuing the traffic analogy, he said, "We can now try to simulate the effect of 'road blocks' or where to add new roads to most effectively eliminate traffic congestion."

The model also allows the researchers to assess the potential effects of genetic modifications (for example, inactivating particular genes that play a role in plant metabolism) in a simulated environment. These simulated "knock-out" experiments gave detailed insights into the potential function of alternative metabolic pathways — for example, those leading to the formation of precursors to plant oils, and those related to how plants respond to different sources of nitrogen.

"The model has helped us construct a fairly comprehensive overview of the many possible alternative routes involved in oil formation in rapeseed, and categorize particular reac-

tions and pathways according to the efficiency by which the organism converts sugars into oils. So at this stage, we can enumerate, better than before, which genes and reactions are necessary for oil formation, and which make oil production most effective," Schwender said.

The researchers emphasize that experimentation will still be essential to further elucidating the factors that can improve plant oil production.

"Any kind of model is a largely simplified representation of processes that occur in a living plant," Schwender said. "But it provides a way to rapidly assess the relative importance of multiple variables and further refine experimental studies. In fact, we see our model and experimental methods such as carbon tracing as complementary ways to improve our understanding of plants' metabolic pathways."

The scientists are already incorporating information from this study that will further refine the model to increase its predictive power, as well as ways to extend and adapt it for use in studying other plant systems.

— Karen McNulty Walsh

## Meet Emily Ruppel, the Science-Writing Caricaturist

During the past three months, Emily Ruppel has been writing about BNL's ongoing science programs and many other aspects of life around BNL.

An intern in the Lab's Media & Communications Office — through DOE's Graduate Research Internship Program (GRIP), which is administered by BNL's Office of Educational Programs — Ruppel's told the stories of students at the NASA Space Radiation Lab on site working toward solutions to protect astronauts from naturally occurring space radiation. She has also written about students training as International Atomic Energy Agency inspectors at BNL's decommissioned Medical Research Reactor, scientific breakthroughs made at DOE laboratories, and BNLers helping those less fortunate in the Town of Brookhaven and around the world.

And if you happen to see the cubicle where Ruppel has been churning out these articles for BNL's Bulletin and website, you'll see from a collection of drawings tacked to the wall that she is also a talented caricaturist. In fact, Ruppel has been drawing caricatures for seven years and even did it professionally before pursuing a master's program in science writing at Massachusetts Institute of Technology (MIT) in 2010.

"Many people have a misconception and think of caricaturists trying to bring out the worst in



Roger Stouenburgh 03/06/2011

people by drawing them with big ears and huge noses," Ruppel said. "I don't do that. There's something unique and wonderful about every person's face. When I'm drawing someone, my intention is to make the drawing look more like they do than they do."

Hailing from Louisville, Kentucky, Ruppel has been drawing for most of her life, but she didn't start making caricatures until she worked as a cartoonist for her college newspaper at Bellarmine University. In someone's last minute scramble to find a caricaturist for a graduation celebration, she got that gig and many more after that.

"Whether I'm writing about science or drawing a caricature, I'm trying to represent something as truthfully and engagingly as

possible, but the way I reach the finished product is different," Ruppel explained. "Once I know what the story is about when I write, I think about getting all the details right and then compile them into the whole. When I draw a caricature of someone's face, I start with the basic shapes and then work in the details."

As Ruppel's internship at BNL's Media & Communication Office draws to a close, she is on track to complete her master's program from MIT in October. She has accepted a job as a science writer for the American Scientific Affiliation, a nonprofit organization in Boston, Massachusetts, and will begin in September.

See more of her caricatures at her website: <http://smilelines.weebly.com/>. — Joe Gettler

### BSA Lecture from p. 1

Nocera will show a brief film to demonstrate how the device works. The artificial leaf is placed in a glass of water and is irradiated by the sun. A specially designed catalyst in the device enables it to split water into hydrogen and oxygen gases. The gases can then be combined in a fuel cell to create clean fuel and electricity. Nocera says this simple method can power a home in a developing nation, using two bottles of water.

Nocera earned a B.S. in chemistry from Rutgers University in 1979 and a Ph.D. in chemistry from the California Institute of Technology in 1984. He joined the faculty of Michigan State University in 1983 and moved to MIT as a chemistry professor in 1997. He is currently MIT's Henry Dreyfus Professor of Energy, and the director of both the Solar Revolutions Project and the Eni Solar Frontiers Center at MIT. In 2008, Nocera founded Sun Catalytix, a company committed to bringing

personalized energy to the developing world.

A member of the American Academy of Sciences and the U.S. National Academy of Sciences, Nocera was named in 2009 as one of *Time* magazine's "100 Most Influential People in the World." He is a frequent guest on television and radio, and he is regularly featured in popular print publications. Nocera has been an organizer to and primary author of the DOE Basic Research Need workshops on hydrogen, solar energy, energy storage, and catalysis. He was also the lead author of several reports on energy for DOE and MIT. Nocera has won numerous awards for his energy research, including, most recently, the American Chemical Society's Inorganic Chemistry Award (2009), the United Nations Science and Technology Award (2009), and the American Crystallographic Association's Elizabeth Wood Award (2010).

— Diane Greenberg

### Aerosol Study from p. 1

...inability to precipitate increases cloud lifetime and brightness — good news for global warming — but it also disrupts the water cycle, which can have a major impact on the weather in urban environments and places with a lot of industry or volcanic activity."

To test theories of how aerosols contribute to global climate change, researchers at BNL designed and built four mobile laboratories capable of conducting long-term measurements anywhere in the world. Three of these "SeaTainers" are deployed in BNL's meteorological field, part of a science measurement program and system "shake-out."

The ARM summer students are important players in a joint project between BNL and environmental researchers around the world, as they've been test-

ing the equipment that will help scientists develop better models of how aerosols affect the environment. Since late June, they've maintained a wide variety of the instruments in the SeaTainers and collected and analyzed data on the aerosols in the atmosphere over BNL.

"The point of putting all these instruments together in one place is to help scientists gather more of the puzzle pieces they need to see the bigger picture," says Tony Aguirre, an electrical engineering student from City College of New York, a Faculty & Student Team (FaST) program member. "We're looking at what's in the atmosphere, where it came from, and how it got there. This is a great study to do on Long Island because the air quality really changes based on the intensity of the wind and where it's coming from. Ocean

### BERA Trips

Get tickets at BERA Store, Berkner Hall, weekdays, 9 a.m.-3 p.m. See also [www.bnl.gov/bera/](http://www.bnl.gov/bera/).

**Tue. 9/6.** US Open, Flushing. Men's Round/Women's Quarterfinal, \$70. Dep. 8:30 a.m.

**Sat. 9/10.** Cabela's, Hamburg, PA. \$20. Sports, outdoors shopping. Dep. 7 a.m.

**Sat. 10/1.** BIG E State Fair, W. Springfield, Mass. \$30 includes all but Midway carnival of rides and games, \$20. Early start.

**Sun. 10/2/** NASCAR Sprint Cup. Dover, Delaware. 40 tickets, \$100/ea. Dep. 5 a.m.

### Pool Open and Free, 8/29 – 9/2

The swimming pool (Bldg. 478) will be open for children and their parents to swim for free from 2 to 5 p.m. from August 29 until September 2. Parents must remain at the pool with their children.

aerosols have a lot of minerals, whereas wind from the city contains more carbon from emissions, and wind from the northeast brings biogenic material from plants and animals."

"Each student has been working on a different aspect of this project," says Arthur Sedlacek, a project supervisor. "They've been doing pretty much everything on their own and are well on their way to becoming real atmospheric scientists."

The students, who include SULI's Stephanie DeJong of Trinity Christian College and FaST's Agossa Segla of New York City College of Technology, used this data to help researchers at BNL characterize Long Island aerosols and test model robustness. Several plan to continue analyzing data they collected for their own projects when they return home.

— Emily Ruppel

## DOE Launches Updated Website: Energy.gov

The U.S. Department of Energy (DOE) has announced the next step of its comprehensive website reform, making [Energy.gov](http://Energy.gov) a cutting-edge, interactive information platform and saving taxpayers more than \$10 million annually.

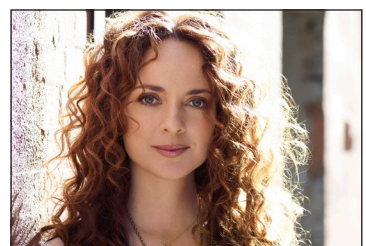
### Service Anniversaries

The following employees celebrated a service anniversary during March 2011:

- 40 Years —  
John Nicoletti ..... C-AD
- 35 Years —  
Cleveland Dodge ..... C-AD  
Laurence Milian ..... Env. Scis  
James Lemley ..... NNS  
David Millener ..... Physics  
Francine Donnelly .... Waste Mgmt
- 30 Years —  
Diane Cabelli ..... Chemistry  
Linda Hanlon ..... BES Dir.  
Sharol Busby ..... Lab Prot.  
Kathleen Walker ..... Lab Prot.  
Ralph Vega ..... Lab Prot.
- 25 Years —  
Joseph Brennan ..... C-AD  
Barbara Carreras ..... Bus. Ops.  
Robert Lombardi ..... Lab Prot.  
Matthias Harrington ..... Lab Prot.  
Arthur Bamonte, Jr. .... Lab Prot.  
Leonard Butera ..... Lab Prot.  
Richard Ruggiero ..... Physics  
Michael Fulkerson .... Photon Scis  
Scott Bud ..... Photon Scis  
Daniel Carneiro ..... Site Svcs
- 20 Years —  
Wuzheng Meng ..... C-AD  
Michael Hamilton ..... C-AD  
Donald MacKay ..... Lab Prot.  
Michiko Miura ..... Medical  
Terrence Buck ..... HRM  
Hyon-Joo Kehayias ..... Physics  
Charles Butehorn ..... Physics  
Giuseppe Mondini ..... Site Svcs  
Joseph Nubile ..... Site Svcs  
Ulysses Tapley ..... Site Svcs
- 10 Years —  
Stephen Ferrone ..... Env. Prot.  
Chris Ogeka ..... Mod. Proj.  
Jerome Laurent ..... Physics  
Marc Allaire ..... Photon Scis.  
Catherine Connor ..... Rad. Contr.  
Kenneth Caccavalla .... Site Svcs  
Susan Santana ..... Staff Svcs

- 10 Years —  
Stephen Ferrone ..... Env. Prot.  
Chris Ogeka ..... Mod. Proj.  
Jerome Laurent ..... Physics  
Marc Allaire ..... Photon Scis.  
Catherine Connor ..... Rad. Contr.  
Kenneth Caccavalla .... Site Svcs  
Susan Santana ..... Staff Svcs

- 10 Years —  
Stephen Ferrone ..... Env. Prot.  
Chris Ogeka ..... Mod. Proj.  
Jerome Laurent ..... Physics  
Marc Allaire ..... Photon Scis.  
Catherine Connor ..... Rad. Contr.  
Kenneth Caccavalla .... Site Svcs  
Susan Santana ..... Staff Svcs



### BSA Noon Recital, 8/24

#### Vocalist Melissa Errico

Broadway vocalist Melissa Errico, fresh off an exciting summer playing opposite Jeremy Irons in *Camelot*, will sing on Wednesday, August 24, at noon in Berkner Hall. Sponsored by BSA, the concert is free and open to the public. Visitors to the Lab 16 and older must bring a photo ID.

Tony nominee Errico will be accompanied by her father, pianist Michael Errico, in a program that includes classical musical theater songs by Rodgers and Hammerstein, Irving Berlin, and Stephen Sondheim, as well as treasures by Michael Legrand from her upcoming recording *Legrand Affair* (produced by Phil Ramone, release date: October 18, 2011 on Ghostlight Records). Other songs will recall her starring roles in such Broadway musicals as *Les Miserables* and *My Fair Lady*. — Jane Koropsak

## CALENDAR

### — WEEK OF 8/21 —

#### Wednesday, 8/24

##### \*BSA Noon Recital

Noon. Berkner Hall. Vocalist and Broadway star Melissa Errico will sing. Sponsored by Brookhaven Science Associates, the concert is free and open to the public. Visitors of 16 and older must carry a photo ID. See below.

### — WEEK OF 8/29 —

#### Monday, 8/29

##### 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.

### — WEEK OF 9/5 —

#### Monday, 9/5

##### Labor Day, Lab Closed

The Lab will close today for the Labor Day holiday. No Bulletin will appear on Friday, 9/9.

#### Thursday, 9/8

##### \*BSA Distinguished Lecture

4 p.m. Berkner Hall. Daniel Nocera, Massachusetts Institute of Technology, will talk on "Harnessing Energy From the Sun for Six Billion People — One as a Time." The lecture, sponsored by BSA, the company that manages BNL, is free and open to the public. Visitors to the Lab 16 and older must carry a photo ID. See p.1.

Note: This calendar is updated continuously and will appear in the Bulletin whenever space permits. Submissions must be received by the preceding Friday at noon to appear in the following week's Bulletin. Enter information for each event in the order listed above (date, event name, description, and cost) and send it to [bulletin@bnl.gov](mailto:bulletin@bnl.gov). Write "Bulletin Calendar" in the subject line.

## Arrivals & Departures

### — Arrivals —

David Biersach .....ITD  
David Brown ..... ES&T  
Yan-Qing Ma ..... Physics

### — Departures —

Gabriella Carini ..... Photon Scis  
Christopher Dudley ..... C-AD  
Fanglei Lin ..... Physics  
Lisa Whitehead ..... Physics

## Pencils, Books, and Cans of Food

The back-to-school supply drive is running through August 25. Please donate notebooks, calculators, markers, etc., in the designated bins in Bldg. 400 lobby. Too many children of Brookhaven Town are in need of supplies.

The BNL Food Drive collects food all year round for Long Islanders in need. Bins are found in most major buildings on site.

## BNL Play Group Needs Volunteers

The BNL Children's Play Group, open to all children of BNL parents & grandparents, meets on Wednesdays from 10 a.m. to noon. Helpers are needed to be part of the "team." If you are interested, please call Christine Carter, 344-5090.

## Discounts Galore!

BERA sponsors discounts to Splish Splash, Atlantis Marine World — now called the Long Island Aquarium and Exhibition Center — and various movies theaters. Find out more at <http://intranet.bnl.gov/bera/recreation/> or stop by the BERA Store in Berkner Hall, weekdays, 9 a.m.-3 p.m.

