Moving Electrons At Molecular, Nanometer Scales Possible applications for solar cells and other small-scale circuits

Learning how to control the movement of electrons on the molecular and nanometer scales could help scientists develop small-scale circuits for many applications, including more efficient ways of storing and using solar energy.

Research in this field by Marshall Newton of BNL’s Chemistry Department is funded by the Office of Basic Energy Sciences, Division of Chemical Sciences, Geosciences & Biosciences; within DOE’s Office of Science. On March 14, Newton presented a talk at the 229th National Meeting of the American Chemical Society, in San Diego, California, highlighting the theoretical techniques used to understand the factors affecting electron movement.

“Electron donor/acceptor interactions govern a huge number of microscopic processes that everything and everybody is dependent upon,” says Newton, “from the movement of electrons in electronic devices to the separation of charges necessary for life processes such as nerve cell communication and photosynthesis.”

Theoretical chemists like Newton work to understand how to reengineer these interactions in molecular systems, where complex molecules with arbitrary shapes communicate electronically over long distances. Measuring the electronic conductance, or the strength of electron transfer, is one essential part of understanding how the electrons move.

Newton is particularly interested in learning how the atomic nuclei that exist in the surrounding environment affect the electrons’ flow. “The nuclei produce what we call vibronic interactions, which can inhibit or facilitate the flow of the electrons,” Newton says. “So we need to understand the effect of the electrons’ ‘environment’ if we want to control the flow.”

For example, Newton says, “If you are trying to move charge or energy down a wire, you ideally want it to move down a particular linear pathway. If you understand what factors aid or hinder conductance, it should be possible to align the conducting properties in one direction and inhibit them in other directions to achieve that goal.”

Through collaborations with experimentalists colleagues, among them, John Smalley and Steve Feldberg of BNL’s Chemistry Department (see, for example, “A Nanowire With a Surprise,” in the Bulletin of March 25), Newton regularly has a chance to test his theoretical analyses against actual experimental results.

“The more we look into these processes theoretically and experimentally, the more we realize that we are on the right track,” he says. Newton says. “With that understanding, it might be possible to design molecular systems to achieve particular goals, such as improving upon photosynthesis — a research initiative actively supported by DOE’s mission to secure America’s future energy needs. One of the first steps in photosynthesis is getting charges separated, using that energy to make chemical energy you can store for later use. But surpassing nature’s design remains a major challenge.”

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To join Mioduszewski for dinner at an off-site restaurant after the talk, contact Jo-Ann Nasta, Ext. 8594, or nastaja@bnl.gov.

Saskia Mioduszewski presents ‘Probing the Matter Created at RHIC’

Physicists from around the world are using the Relativistic Heavy Ion Collider (RHIC) to explore some of nature’s most basic and intriguing ingredients and phenomena.

At RHIC, two beams of gold ions (atoms that have had their electrons stripped off) travel at nearly the speed of light — what Einstein called relativistic speeds — in opposite directions around RHIC’s 4.2-mile, two-lane “ractrack.” At six intersections, the lanes cross and ions collide at such high speeds that fascinating things happen.

It is the conditions that are created as a result of these collisions — conditions that exist for only a brief period (approximately 10-22 seconds) following each collision — that physicists are interested in studying.

To learn how and why researchers analyze these collisions, join Saskia Mioduszewski, an associate scientist in the Physics Department, on Wednesday, April 20, at 4 p.m. in Berkner Hall, where she will present the 403rd Brookhaven Lecture, “Probing the Matter Created at RHIC.” Mioduszewski will introduce you to Sally Dawson, Acting Chair of the Physics Department.

In her talk, Mioduszewski will discuss the results from RHIC’s experimental collaborations and how researchers hope to create a form of matter in which the basic building blocks of matter — quarks and gluons — interact freely in what is called quark-gluon plasma. Researchers believe that quark-gluon plasma existed at the birth of the early universe.

As Mioduszewski will explain, characterizing the state of matter produced in the collisions is challenging because of its very short duration. She will describe the sophisticated probes that researchers have developed to meet this challenge.

Mioduszewski received B.S. degrees in physics and mathematics from North Carolina State University in 1994, and a Ph.D. in nuclear physics from the University of Tennessee in 1999. In January 2000, she came to BNL as a postdoctoral research associate to work on the PHENIX experiment at RHIC. And, in 2004, Mioduszewski received the Presidential Early Career Award for her research on the PHENIX experiment.

To join Mioduszewski for dinner at an off-site restaurant after the talk, contact Jo-Ann Nasta, Ext. 8594, or nastaja@bnl.gov.


## BSA Distinguished Lecture, 4/18

On Monday, April 18, at 4 p.m. in Berkner Hall, James Barber, Imperial College, London, will talk about photosynthesis and future energy needs in a BSA Distinguished Lecture. All are welcome to attend this free public lecture, which is sponsored by BSA. Visitors to the Lab of 16 or older must carry a photo ID.

## BWIS Talk on Cancer Research Studies, 4/26

Sponsored by Brookhaven Women in Science, Lisa Diedrich, Assistant Professor of the Women’s Studies Program at Stony Brook University, will give a talk titled “Complexity and Cancer: Towards an Interdisciplinary Methodology,” on Tuesday, April 26, at noon in Berkner Hall. This talk will discuss an interdisciplinary methodology that has emerged from her training in three fields of study: women’s studies, cultural studies, and science.

All BNLers are welcome to the talk. For more information, call Lynne Ecker, Ext. 2538.

## Two Talks on Cancer Awareness, 4/27, 5/3

The Health Promotion Program of the Human Resources & Occupational Medicine Division is sponsoring two talks on cancer. Register for either talk with Michael Therin—490 or mtherin@bnl.gov:

- **Testicular Cancer & Self-Exam, 4/27**
  
  Howard Adler, M.D., Assistant Clinical Professor of the School of Medicine & Clinical Assistant Professor of the School of Nursing, will give a talk on “Breast Health and Cancer Awareness: Early Detection Plan,” on Tuesday, May 3, noon-1 p.m. in Berkner Hall, Room B. Time will be reserved for questions and answers. All are welcome, but space is limited. Register early.

- **Research Library Open House, Today, 4/15**
  
  In celebration of National Library Week, April 10-16, all are invited to the Open House. The Research Library, Bldg. 477, for an overview of information resources. For more information, call the Research Library, Ext. 7761 or 3487, and see the Library’s Home Page at www.bnl.gov/isd/reslib/.

## Asian Pacific American Association News

May is National Asian Pacific American Heritage Month. Due to the many meetings at Berkner Hall in May, the BERA Asian Pacific American Association (APAA) will celebrate their heritage from April through May. Events will include:

- **a month-long poster display in Berkner Hall lobby**
- **a joint BERA/APPA bus trip on Saturday, April 30, to the Japanese Cherry Blossom Festival at the Brooklyn Botanical Garden, m.p.m.** This trip is sold out.
- **“Martial Arts Expo,” open to the public, Saturday, May 7, 6:30-9 p.m. at Berkner Hall. All visitors to BNL age 16 and over must show a photo ID. Tickets $10/adult, $5/child.**
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At the Martial Arts Expo, Long Island studios and BNL groups will come together to demonstrate martial arts such as kung fu, tai-chi, ji jitsu, karate, and kendo. Organized in China, Korea, and Japan, the martial arts include various forms of self-defense and physical discipline that include both mental and physical discipline.

The highlight of the event will be a demonstration by BERA Jiu Jitsu Club; BERA Tai Chi Club; Island Ji Jitsu, Inc.; Ken Zen Institute of Long Island; and the Yuan-Ji Society.
From BNL to Italy — Students Learn About BNL’s Research Via Web Conference

I
ino Miceli, an associate physics professor who works at the Laser Electron Gamma Source in the Physics Department, recently explained BNL’s research and his role as a scientist to a fifth-grade class in Lamezia Terme in the southern region of Italy. But Miceli did not have to travel to Italy. With the help of Ora Colson, the Office of Educational Programs’ (OEP) Scott Bronson and Gail Donoghue, Miceli spoke to the students via the web, while the onlookers in OEP were able to see the students and Miceli interact. “It was quite an experience,” Donoghue said. “This is the first time a school like this one in a small town in Italy would be able to connect to the scientific world in real time.” Miceli’s visit was possible because “Physics use this type of web communication all the time, but I thought it would be a good opportunity to help these young students from across the world to learn about science firsthand from a physicist.”

Donoghue participated in the event, which she hopes to duplicate in the future, but adds students in the BNL Science Museum to the web conference. “She believes the event is especially appropriate to celebrate the World Year of Physics. Bronson managed the technical aspects of the program.”

“We used the Virtual Room Video-conferencing System, which can connect many participants simultaneously,” Donoghue said. “This program is only a regular school day at the school, we piloted a web-based high school workshop in support of the Laser Electron Conversion experiment, one of the Rare Symmetry Violating Processes experiments. The workshop hosted teachers and involved West Virginia University, and the University of Houston. The positive interaction and success of that pilot has encouraged us to try innovative educational research experiences like the one today.” — Diane Greberg

BERA Golf Association

The BERA Golf Association is now accepting applications for the 2005 golf league. This year there will be both individual and team divisions.

To apply, visit the club website at web. bnl.gov/bera/activities/golf/ or contact Jeff Williams, Ext. 5587 or Ext. 4626.

Arrivals & Departures

Arrival

Departure

Gail Brown .................. E.S./ATE

Elizabeth Tusa .............. Chl. Fab.

Stanley Duskozew ......... Ctrl. Fab.

Christopher Cleary .......... Ctrl. Fab.

Stanley Doskozew ............ Ctrl. Fab.

Mark Cohen ............. Chl. Fab.

Ora Colson .................. RO/EWMS

Timothy Connolly .......... Chl. Fab.

Thomas Wieland .......... Chl. Fab.

Luis Jaramillo ................. Diversity

Lisa Muench ....................... Chemistry

Bruce Yancey ................. Chl. Fab.

In The Cafeteria...

April’s tastings are Popeye’s favorite spinach on 4/21, and homemade low-fat muffins on 4/28.

International Potluck, Dance, 4/17

In The Center Club...

April’s tastings are from 5 p.m. to 7 p.m.

Take Daughters, Sons to Work, 4/28

Lab community parents of children ages 10-15 are in-

Lifeguard Openings

Lifeguard positions are open for the BNL swimming pool. Qualifi-

Weight Watchers

Register for Weight Watchers on Wednesday, April 20, noon-1 p.m. in the Brookner Center. Each series of 10 weekly meetings costs $89. Meetings are on Wednesday at noon. All are welcome.

Native American Cookbook in BERA Store

Stop by the BERA Store in Berkner Hall to pick up a copy of Writer Darlene L. Saddle, a 70-page, soft bound cookbook filled with Ameri-

Joe Hampton, the king blank that plays a mix of classic rock, blues, and original songs has appeared in many Long Island venues, including the Riverhead Blues Festival, will appear in concert on Friday, May 3, at 8 p.m. in Berkner Hall. The show will be opened by 16-year-old Caitlyn Amanda, recently featured on radio stations WUSB 90.1 and WLIU 88.3 FM. Spon-

Fidelity Investment Counseling, 4/26

A Fidelity Investment representative will be at the Lab on Tues-

BERRA Rifle & Pistol Club Open Shoot, 4/18

Members of the BERRA Rifle & Pistol Club invite all BNLers who are interested to attend the “Open Shoot” event that the club will hold on Monday, April 16, 6-11 p.m., at Smithsonian Veterans Hall. To attend, contact Jim Durnan, Ext. 5993; Rich Conte, Ext. 5741, or Roy D’Alsace, Ext. 3973.

Summer Camp

The BERA/Recreation Office will again offer summer camp for the children of employees living on site, and also from off-site. The program includes an array of recreational activities and will be held at the Recreation Building in the area area, from Thursday, June 13, through Friday, August 31. Children enjoy sports, arts and crafts, daily gym class time, and weekly swimming lessons. You may sign up your 5- to 14-year-old child for any or all of the eight weeks. Space is limited and all applications must be received by Friday, April 15.

BERA/Recreation Swimming Lessons will be held at the BNL pool from Thursday, June 30, to Friday, August 26. The program is open to children and grandchildren of BNL employees and retirees. Children must be a minimum of 42 inches tall to participate. Space is limited and all applications must be received by Monday, June 6.

Fidelity Investment Counseling, 4/26

A Fidelity Investment representative will be at the Lab on Tues-

See Earth Day program on page 4.

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International Potluck, Dance, 4/17

The Hospitality Committee invites all BNLers to join them for an international potluck dinner and dance on Sunday, April 17, 6:30-9 p.m. in the Recreation Building. There will be demonstrations of national foods of international dances, and a chance for every-

One-on-One Retirement Counseling

A TIAA-CREF consultant will meet BNL on Tuesday, April 19, to answer employees’ questions about financial matters such as under-

Calendar (continued)

— WEEK OF 4/18 —

Monday, 4/18

Start of Earth Day Week Celebrations. See page 4. Noon-3 p.m., Berkner Hall lobby. Sponsoring group: Earth Day Committee. Topic: Nice, Wildlife, and Stu-

WEEK OF 5/9 —

Saturday, 5/7

Brooklyn Botanical Garden Bus Trip

BERA/APA Heritage event. Sold out.

— WEEK OF 5/2 —

Saturday, 5/7

A PA Heritage Event, Martial Arts

BERA/APA Heritage event. Visit the BERA Store, Berkner Hall, 1/10 until, 5/15 children. See page 2.

Fridays, 5/1

Hampton & Kings in Concert

BERA/APA Heritage event. Visit the BERA Store, Berkner Hall, 1/10 until, 5/15 children. See page 2.