

## THIS WEEK

THROUGH DEC. 14

**PPPL Food Drive**  
LSB Lobby

DEC. 5-8

**Max Planck Princeton Center  
Workshop 2016**  
Princeton Center for Theoretical  
Science, Jadwin Hall

TUESDAY, DEC. 6

**Chemistry Council of N.J.  
Plant Operations Management  
Workshop**

## UPCOMING

WEDNESDAY, DEC. 14

**PPPL Colloquium**  
4:15 p.m. ♦ MBG Auditorium  
[Princeton University's District  
Energy Approach and Implications  
for Improving Energy Efficiency](#)  
Edward T. Borer, Princeton University

THURSDAY, DEC. 22

**PPPL's Annual Holiday Luncheon**

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# Leaders say PPPL needs 'all hands on deck' to achieve excellence

By Jeanne Jackson DeVoe

The effort to improve the Laboratory's performance and make PPPL's research and operations programs excellent is an "all-hands-on-deck situation" that requires the passionate commitment of each staff member.

That was the message of Princeton University President Christopher L. Eisgruber at a Dec. 1 all-hands meeting.

Eisgruber pledged the University's support after a coil failure in the National Spherical Torus Experiment-Upgrade last summer forced the device to shut down for an undetermined amount of time. "I want to stress my continued belief in the mission of this Laboratory, my continued belief in the importance of plasma physics and my continued belief in the importance of fusion energy; the support continues," he told a packed MBG Auditorium, and staff members in overflow and off-site locations.



Dave McComas, Princeton University vice president for PPPL, at the meeting.  
(Photo by Elle Starkman)

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## Reorganization focuses on challenges

By Jeanne Jackson DeVoe

Changes to the Laboratory Council and several departments are aimed at preparing and overseeing the strategic and tactical plans necessary to assure success in five major areas that everyone must focus on, Terry Brog, PPPL's interim Laboratory director, told staff members at a Dec. 1 all-hands meeting. The five areas are: excellence in research; excellence in operations; the National Spherical Torus Experiment-Upgrade (NSTX-U) recovery; PPPL's contributions to ITER; and the Infrastructure and Operational Improvements (IOI) project, Brog said.

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# All-hands

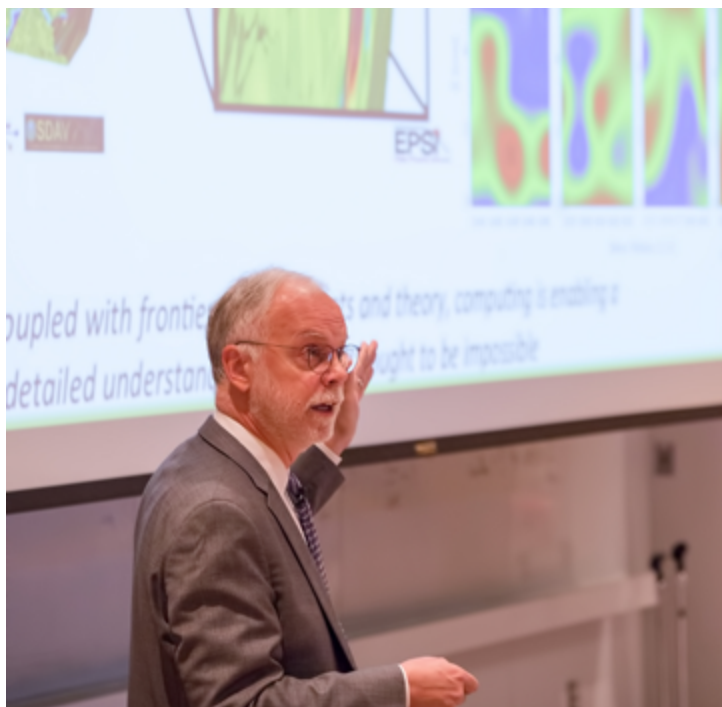
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## Requires a “full-out commitment”

Eisgruber, accompanied by Princeton Provost David S. Lee, noted that the U.S. Department of Energy (DOE) gave PPPL the lowest performance grades of any of the 10 national laboratories in the Office of Science last year, and that the grades are unlikely to improve much this year. “From the standpoint of Princeton University, this cannot be the situation for this Laboratory,” he said. “It has to be a full-out commitment both to science and operational excellence.”

The message was echoed by Dave McComas, Princeton University vice president for PPPL; Terry Brog, PPPL’s interim director; and by Ed Synakowski, associate director for Fusion Energy Sciences in the DOE’s Office of Science.

Brog acknowledged that Eisgruber’s message was “a tough message to hear.” But he said he appreciated Eisgruber coming to the Laboratory to both voice the University’s support and outline its expectations.



Ed Synakowski, associate director for Fusion Energy Sciences in the DOE’s Office of Science, discusses research at PPPL. (Photo by Elle Starkman)

The Lab’s performance over the past two years has been “unacceptable,” Brog said, and everyone starting with top leadership should take that failure extremely seriously. “PPPL’s leadership accepts responsibility for this performance. We all have to accept the responsibility for that,” Brog said. “My request is the entire staff accept the solutions going forward. We must succeed.”

Brog said the reorganization of the Lab’s Leadership Council would allow top managers to focus on the critical challenges facing the Laboratory (See story on page 1). “We made the decision that we need a group of folks to lead this Laboratory going forward in both strategic and tactical leadership,” Brog said. “I don’t want anyone on the Lab Leadership Council who thinks mostly of their department. They have to be engaged across the whole scope of this Laboratory.”

## Becoming competitive with other national labs

As a national laboratory, PPPL must achieve the kind of excellent performance in both its scientific research and its operations that will make it competitive with other national laboratories, Brog said. “To be successful going forward, I need everyone to be passionately committed to these three things: scientific excellence, operational excellence and team performance,” he said.



Princeton University President Christopher L. Eisgruber speaks to staff at the Dec. 1 all-hands meeting. (Photo by Elle Starkman)

Working as a team is important throughout the Laboratory and is vital in getting NSTX-U up and running, and keeping it running until the Laboratory decides to shut it down, Brog said. In addition to its research on NSTX-U, PPPL must be a world leader in its research in other areas, such as the Lithium Tokamak Experiment, the Magnetic Reconnection experiment, and in nanoparticle synthesis. Researchers must continue their international collaborations and their world leadership in diagnostics, Brog said. Looking to the future, the Lab must also lead the international fusion community in producing “a compelling vision of what fusion is going to look like in the next 15 or 20 years.”

From an operational standpoint, PPPL must have a “culture of discipline: disciplined people, disciplined thought, disciplined actions,” Brog said. But while staff must have a “keen sense of urgency” regarding repairs to NSTX-U and other tasks, the Laboratory cannot afford to move too quickly. Instead, the staff must put in place the processes, tools, and systems, to accomplish its goals effectively.

While NSTX-U is the biggest challenge facing the Laboratory, PPPL must also be successful in its contributions to ITER, and in its management of the Infrastructure and Operational Improvements (IOI) project, which will begin construction this month. (See story 7).

## More rigorous engineering

To achieve those goals, PPPL must take steps to make its engineering processes more rigorous and robust, ensuring that each step of a project from design to completion is documented and verified. This performance management must also extend to individual and team performance, Brog said.

McComas also emphasized this point. The failure of the coil indicated a systemic problem, he said. He learned the importance of rigorous engineering verification in designing spacecraft that must be capable of traveling as far as Pluto without breaking down, he said.

Hutch Neilson, head of Advanced Projects, said during the question period that the coil failure at NSTX-U cannot be attributed to one group or individual. He applauded Brog for saying that leadership is ultimately responsible and he urged the Lab to move forward. “The goal is not to make the future look like the past,” he said. “The environment is different now. We have to find a way to be excellent in the future.”

[continued on page 3](#)



# All-hands

continued from page 2



Terry Brog, PPPL's interim director, addresses staff. (Photo by Elle Starkman)

Synakowski, a PPPL researcher for 17 years, said the DOE supports PPPL's efforts to achieve excellence. He reminded staff members of the Laboratory's outstanding achievements of the past, including the then-world record achievement of 10.7 million watts of controlled fusion power in 1994. "This Laboratory has created millions of watts of fusion power and in so doing you've helped challenge a global mindset," he said. "Many now understand that fusion energy is within reach."

He quoted physicist Stephen Hawking, who, when asked at a 2010 conference what problem he wanted to see solved by the end of the century, said, "I would like nuclear fusion to become

a practical power source. It would provide an inexhaustible supply of energy without pollution or global warming."

The Laboratory's mission, its pool of talent, commitment to graduate education, and partnership with Princeton University are among its many strengths, Synakowski said. PPPL offers many promising areas of research in exascale computing and materials science and on the spherical tokamak itself, and has contributed to research worldwide. "What you are pursuing is of the highest societal impact for both its potential practical impact and its scientific beauty," Synakowski said, "and I'm here to tell you that the nation needs you to succeed in this pursuit." 🗨️

## PPPL staffers on US ITER projects detail their work before a key committee

By John Greenwald

**P**PPL teams responsible for two major contributions of hardware that the United States is supplying to ITER presented their work to the US ITER Independent Project Review Committee during the week of Nov. 14. The four-day meeting, held at Oak Ridge National Laboratory, was to enable the committee to decide whether to recommend advancing US ITER projects to the next stage of development for the ITER fusion experiment that is under construction in France.



Russ Feder

Attending the sessions for PPPL were staffers responsible for purchasing some \$40 million of electrical equipment for the ITER Steady State Electrical Network (SSEN), and

for leading development of seven diagnostic instruments and engineering port plugs inside the ITER tokamak. The SSEN procurements are nearly complete and the committee appeared ready to move the diagnostics and port plug project to CD-2, meaning that it is on target to complete design work on an approved cost and time schedule.

The diagnostics and port plugs team spent months preparing for the meeting. "This has been a big step," said engineer Russ Feder, who leads the diagnostic and port plugs effort. "Our staff did a tremendous amount of work."

Joining the meeting was Terry Brog, interim director of PPPL. Representing the SSEN contribution were engineer John Dellas, current head of that project, and former head Charles Neumeyer, now engineering director for the NSTX-U recovery effort. Diagnostics and port plug staffers in addition to Feder included Emil Nassar, planning and control officer; engineer Akita Jariwala; and Dave Johnson, former head of the PPPL ITER Fabrication Department. 🗨️



# Reorganization

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The council will be tasked with finding solutions to the Lab-wide challenges facing the Laboratory. “I don’t want anyone on the Lab Leadership Council who thinks mostly of their department,” Brog said at the meeting ([see story page 1](#)). “They have to be engaged across the whole scope of this Laboratory.” (A copy of the organizational chart is available at <http://www.pppl.gov/orgchart>).

**Brog, Stacia Zelick**, interim deputy director for operations, and **Michael Zarnstorff**, deputy director for research, will continue to serve as PPPL’s directorate, working closely with



Rich Hawryluk is project director of the NSTX-U Recovery Project. (Photo by Elle Starkman)

**Dave McComas**, Princeton University vice president for PPPL, and **Scott Weidner**, University assistant vice president for engineering. Brog appointed **John DeLooper**, formerly head of Best Practices and Outreach, and **Robert Goldston**, a Princeton University professor of astrophysical sciences and former director of the Laboratory, as special advisors reporting to him.

With the focus on getting the NSTX-U up and running, Brog appointed **Rich Hawryluk**, formerly head of ITER and Tokamaks, to head the NSTX-U Recovery Project. Hawryluk was deputy director-general for the

Administration Department of ITER for two years and was head of PPPL’s Tokamak Fusion Test Reactor Experiment from 1991 to 1997 and deputy director of PPPL from 1997 to 2007. **Charlie Neumeyer**, formerly the head of ITER Fabrication, is the engineering director of the project. **Jon Menard** will head the NSTX-U Research Group. Among those serving under Hawryluk and Neumeyer are **Al von Halle** as head of Operations, **Tim Stevenson** as deputy head of Operations and **Doug Loesser** as Outage manager. The group will be in charge of designing and fabricating a new coil or coils for NSTX-U. “We know we have challenges with the coils, and this is a huge effort now,” Brog said. But, he added that we don’t know yet if there are other problems with the machine.

**Raffi Nazikian** will serve as interim head of the ITER and Tokamak group in Hawryluk’s absence. **Hutch Neilson** will continue to head Advanced Projects and will also lead the ITER Fabrication department.

**Valeria Riccardo**, the chief engineer of the UK Atomic Energy Authority, will take over as head of PPPL Engineering in a few weeks. **Larry Dudek** will continue to serve as head until then.



Raffi Nazikian is the interim head of ITER & Tokamaks. (Photo by Elle Starkman)



Charlie Neumeyer is engineering director of the NSTX-U Recovery Project. (Photo by Elle Starkman)

Department, which was part of Best Practices and Outreach, will be merged into the Communications and Public Outreach Department. **Andrew Zwicker**, a physicist and New Jersey assemblyman who is head of Science Education, will head the department. Zwicker will continue to head the Science Education group and **Larry Bernard** will continue to head Communications and is deputy director of the newly merged group.

Other divisions that formerly fell under Best Practices and Outreach will report to different managers. **Laurie Bagley**, head of Technology Transfer, will report to Zarnstorff, and **Fran White**, head of Site Protection, will report to Zelick. **Joel Hosea** will continue to head Research Staff Development, reporting to Zarnstorff.

## Other changes in the organization are:

**Rajesh Maingi** will be the deputy head of the ITER and Tokamaks Department and will head International projects under the department; **Jong-Kyu Park** will be the MHD (magnetohydrodynamics) physics coordinator.

**John Dellas** will take over Charlie Neumeyer’s position as head of Electrical Systems under ITER Fabrication.

**Stuart Hudson** will join **Igor Kaganovich** as deputy head of Theory & Computation. There are also several new divisions under that department: **C.S. Chang** and **Greg Hammett** will head Turbulence and Transport; **Stephen Jardin** will head Macroscopic Equilibrium & Stability; **Guo-Yong Fu** and **Nikolai Gorelenkov** will head Energetic Particles; **Edward Startsev** will head Basic Plasma Science; and **Stephane Ethier** will head High Performance Computing. 📄

**Les Hill** will serve as project manager of PPPL’s IOI project, will also assist with project management oversight on the NSTX-U project. **Jim Graham**, head of Quality Assurance and Quality Control, will report directly to Brog because of the importance of quality assurance on the NSTX-U project, Brog said. **Nat Fisch** will continue as associate director for Academic Affairs, reporting directly to Brog.

Under the reorganization, the Office of Communications, which was a separate office, and the Science Education



Andrew Zwicker is head of a new department, the Office of Communications & Public Outreach. (Photo by Elle Starkman)

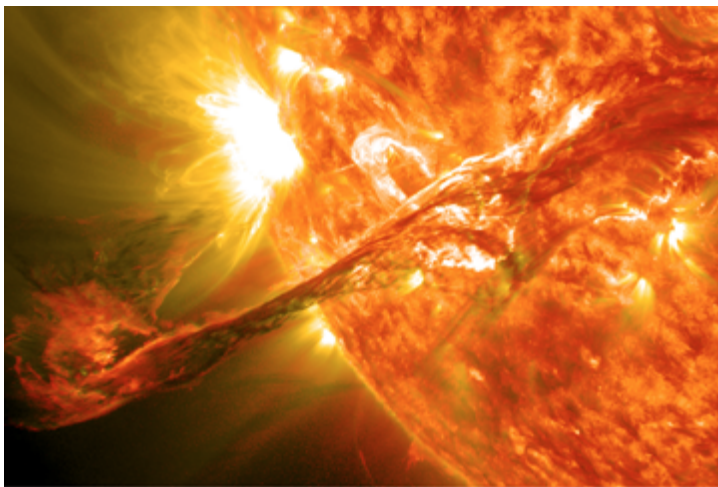
# An explanation for mysterious onset of a universal process

By John Greenwald

Scientists at PPPL and Princeton University have proposed a groundbreaking solution to a mystery that has puzzled physicists for decades. At issue is how magnetic reconnection, a universal process that sets off solar flares, northern lights and cosmic gamma-ray bursts, occurs so much faster than theory says should be possible. The answer could aid forecasts of space storms that disrupt cell phone service, explain several high-energy astrophysical phenomena, and improve plasma confinement in doughnut-shaped magnetic devices called tokamaks designed to obtain energy from nuclear fusion.

Magnetic reconnection takes place when the magnetic field lines embedded in a plasma—the hot, charged gas that makes up 99 percent of the visible universe—converge, break apart and explosively reconnect. This process takes place in thin sheets in which electric current is strongly concentrated.

According to conventional theory, these sheets can be highly elongated and severely constrain the velocity of the magnetic field lines that join and split apart, making fast reconnection impossible. However, observation shows that rapid reconnection does exist, directly contradicting theoretical predictions.



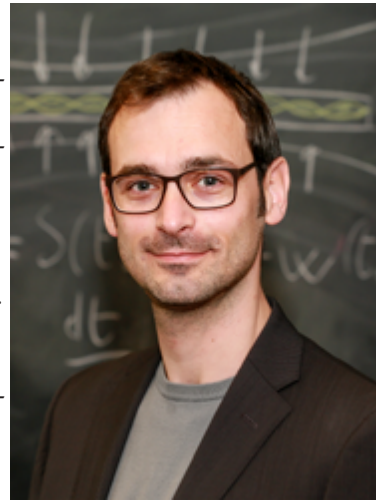
Solar flare triggered by magnetic reconnection  
(Image courtesy of NASA)

## Detailed theory for rapid reconnection

Now, physicists at PPPL and Princeton University have presented a detailed theory for the mechanism that leads to fast reconnection. Their paper, published in the journal *Physics of Plasmas* in October, focuses on a phenomenon called “plasmoid instability” to explain the onset of the rapid reconnection process. Support for this research comes from the National Science Foundation and the DOE Office of Science.

Plasmoid instability, which breaks up plasma current sheets into small magnetic islands called plasmoids, has generated considerable interest in recent years as a possible mechanism for fast reconnection. However, correct identification of the properties of the instability has been elusive.

The *Physics of Plasmas* paper addresses this crucial issue. It presents “a quantitative theory for the development of the plasmoid instability in plasma current sheets that can evolve in time” said Luca Comisso, lead author of the study. Co-authors are Manasvi Lingam and Yi-Min Huang of PPPL and Princeton, and Amitava Bhattacharjee, head of the Theory Department at PPPL and Princeton professor of astrophysical sciences.



Physicist Luca Comisso  
(Elle Starkman)

## Pierre de Fermat's principle

The paper describes how the plasmoid instability begins in a slow linear phase that goes through a period of quiescence before accelerating into an explosive phase that triggers a dramatic increase in the speed of magnetic reconnection. To determine the most important features of this instability, the researchers adapted a variant of the 17th century “principle of least time” originated by the mathematician Pierre de Fermat.

Use of this principle enabled the researchers to derive equations for the duration of the linear phase, and for computing the growth rate and number of plasmoids created. Hence, this least-time approach led to a quantitative formula for the onset time of fast magnetic reconnection and the physics behind it.

The paper also produced a surprise. The authors found that such relationships do not reflect traditional power laws, in which one quantity varies as a power of another. “It is common in all realms of science to seek the existence of power laws,” the researchers wrote. “In contrast, we find that the scaling relations of the plasmoid instability are *not* true power laws – a result that has never been derived or predicted before.”

## It's time to get your flu vaccine!

Influenza is a contagious disease caused by a virus. It can be spread by coughing, sneezing or nasal secretions. By getting the flu vaccine, you can protect yourself from Influenza and may also avoid spreading this illness to others.

Please call the OMO at extension 3200 to make an appointment.



## PPPL's Travel Office staff explains travel approvals and reimbursements

PPPL's Travel Office staff members explained the travel approval and reimbursement process during a Nov. 11 presentation in the MBG Auditorium.

Members of the travel staff first introduced themselves. Robin Chang is in charge of pre-travel approval, Renee Sullivan does post-travel reimbursement and Maria Huber is the accounts payable supervisor in charge of travel reimbursement.

They explained travel procedures, which require PPPL travelers to fill out a travel approval request form for all travel and additional paperwork for foreign travel. Travelers attending a conference may also have to complete a conference request form. (See PPPL's travel website, <http://travel.pppl.gov/> for more information).

Chang helps out with paperwork and approvals but does not make the actual travel arrangements, which are handled through the Graycar Travel Agency, PPPL's subcontractor.

When travelers return from business trips, they submit travel vouchers and receipts to Sullivan, along with a foreign trip report for foreign travelers, before they can be reimbursed. (More information is available at <http://travel.pppl.gov/reimbursements>).



Robin Chang introduces herself. (Photo by Elle Starkman)



Svetlana Drapkin answers a question. (Photo by Elle Starkman)



Veteran traveler Rich Hawryluk works on a travel reimbursement form. (Photo by Elle Starkman)



Renee Sullivan discusses travel reimbursement procedures. (Photo by Elle Starkman)



## IOI contractor sets up office trailer outside D Site

Whiting-Turner, the contractor that will carry out PPPL's \$26 million Infrastructure and Operational Improvements (IOI) project, moved office trailers to an area at the fence outside D Site near the pump house on Dec. 1.

"That's an important step," said Les Hill, head of the IOI. "It's going to be a lot easier having them here on the property. It just opens up communication channels."

The company received a notice to proceed on Nov. 23 and plans to begin demolition of the LSB Annex by mid-December.

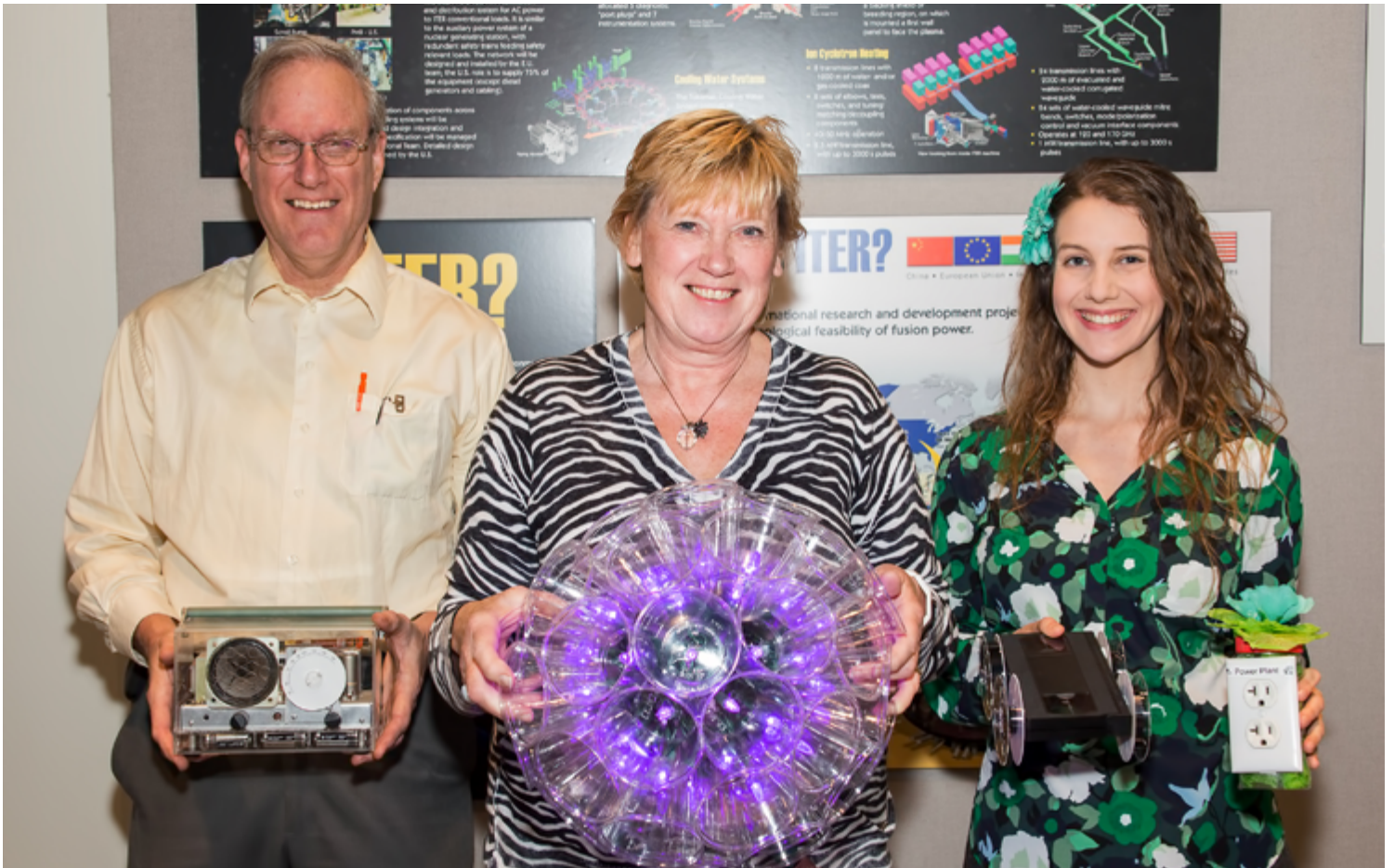
Contractors will work through most of the week before and after Christmas on gutting the LSB building and beginning the renovation of the C Site MG building to create centrally located, modern technology shops.

Some 70 staff members from Business Operations and Engineering moved out of the LSB Annex and into modular offices between the Theory Wing and the lower parking lot before Thanksgiving. 📍



The first of the Whiting-Turner trailers. (Photo by Elle Starkman)

## America Recycles Day Art Contest Winners



First place winner Irene Newman, center, with her "Staying Alive" Disco Sphere Art, along with second place winner Nevell Greenough for his Recycling Radio, and third place winner Dana Eckstein for her Power Plant (and holding her car made of VHS tape). (Photo by Elle Starkman)



## Fiber Optic Training at PPPL



Engineers and technicians attended a two-day training session on fiber optics at PPPL Nov. 22 to Nov. 23. Instructor Garreth Conachy from FiberNext in Concord, New Hampshire, standing at left, gave a one-day seminar followed by a day of hands-on training. The event was organized by Hans Schneider and Kevin Lamb. *(Photo by Elle Starkman)*

## Holiday Food Drive

**Nov. 28 to Dec. 14**

**Supporting Mercer Street Friends Food Bank**

Please bring your donations of canned food and home beauty products to donation bins in the LSB Lobby.



# Application opens for presenters at 2017 Princeton Research Day

Applications are being accepted for presenters at the 2017 Princeton Research Day, the second annual campus-wide celebration of research and creative endeavors by the University's undergraduates, graduate students, postdoctoral researchers and other non-faculty researchers. The May 11, 2017, event offers an opportunity for student and early career researchers and artists to share their work with the community through talks, posters, performances, art exhibitions, demonstrations and digital presentations. Topics will represent the range of research across the University, including the natural sciences, social sciences, engineering, the arts and humanities. More information about the event and the application for presenters is available on the Princeton Research Day website. The application deadline is Feb. 20.

[The link to the Research Day website is available here.](#)  
[The link to the application is available here.](#)

## Thank you for your donations!

PPPL's America Recycles Day clothing drive for the Trenton Rescue Mission was very successful with 1,150 pounds of clothing donated.



Workers load bags of donated PPPL clothing onto a truck. (Photo by Dana Eckstein)



# COLLOQUIUM

## Princeton University's District Energy Approach and Implications for Improving Energy Efficiency



**Edward T. Borer**  
Princeton University

**Wednesday, Dec. 14**  
4:15 p.m., M.B.G Auditorium, Lyman Spitzer Building

**BROCK**

**NICK PETTI**  
Chef Manager



BREAKFAST ..... 7 a.m. • 10 a.m.  
CONTINENTAL BREAKFAST ..... 10 a.m. • 11:30 a.m.  
LUNCH ..... 11:30 a.m. • 1:30 p.m.  
SNACK SERVICE ..... until 2:30 p.m.

	Monday December 5	Tuesday December 6	Wednesday December 7	Thursday December 8	Friday December 9
<b>COMMAND PERFORMANCE Chef's Feature</b>	<b>Bourbon Chicken &amp; Broccoli</b> over Rice	<b>Vegetarian Chili</b> over Rice with Cornbread	<b>Pork Carnitas Burrito</b> with Beans	<b>Beefaroni</b> with Garlic Breadstick	<b>Chicken Cordon Bleu</b> with Roasted Potatoes
Early Riser	<b>Breakfast Club Sandwich</b>	<b>Greek Egg White Omelet</b> with Spinach, Tomato, Peppers & Feta Cheese	<b>Corned Beef Hash and Eggs</b>	<b>Omelette Florentine</b> with Spinach, Tomato & Mozzarella	<b>Breakfast Tacos</b>
Country Kettle	<b>Mushroom Barley</b>	<b>Pasta Fagioli</b>	<b>Chicken &amp; Quinoa</b>	<b>Tomato Lentil</b>	<b>Spinach and White Bean with Sausage</b>
Deli Special	<b>Stacked Veggie Sandwich</b> with Guacamole	<b>French Dip</b> with Swiss Cheese, Caramelized Onions & Horseradish Cream served with Potato Wedges	<b>Prosciutto, Pesto, Roasted Peppers &amp; Arugula</b> on Ciabatta	<b>Tomato &amp; Fresh Mozzarella</b> on Ciabatta with Basil, Red Onion & Arugula	<b>Maple-Roasted Vegetable Wrap</b>
Grill Special	<b>Colossal Burger</b> with 2 5.3-ounce patties, American Cheese, Lettuce, Tomato & Onion	<b>Buffalo Chicken Steak Sandwich</b> with Fries	<b>Tuna Melt</b> on Rye served with Onion Rings	<b>Chicken Zen Sandwich</b>	<b>Spinach Salad</b> with Turkey Bacon, Hard-Cooked Egg, Mushrooms & Raspberry Vinaigrette
Panini	<b>The Cubano</b>	<b>Swedish Meatball Hoagie</b>	<b>Southwest Turkey,</b> Peppers & Cheddar with Jalapeno Ranch Spread	<b>Crab Cake</b> on a Kaiser with Lettuce & Tomato	<b>Turkey French Dip</b> with Swiss Cheese

MENU SUBJECT TO CHANGE WITHOUT NOTICE

HEART HEALTHY

VEGETARIAN OPTION

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The PPPL WEEKLY is published by the [PPPL Office of Communications](#) on Mondays throughout most of the year and biweekly during the summer, except for holidays.

**DEADLINE for calendar item submissions is noon on WEDNESDAY. Other stories should be submitted no later than noon on TUESDAY.**

Comments: [commteam@pppl.gov](mailto:commteam@pppl.gov) ♦ PPPL WEEKLY is archived on the web at: <http://w3.pppl.gov/communications/weekly/>.