

THIS WEEK

WEDNESDAY, FEB. 1

PPPL Colloquium

4:15 p.m. ♦ MBG Auditorium

[Are You Living In A Simulation?](#)

Silas Beane, University of Washington
Seattle

FRIDAY, FEB. 3

Public Tour

10 a.m. ♦ LSB Lobby

SATURDAY, FEB. 4

Science on Saturday

9:30 a.m. ♦ MBG Auditorium

[Imperative of Vaccination Nationally and Globally](#)

Adel Mahmoud, Princeton University

UPCOMING

WEDNESDAY, FEB. 8

PPPL Colloquium

4:15 p.m. ♦ MBG Auditorium

[Princeton Campus Development 1756-2017](#)

Joshua E. Linkov, Princeton University

SATURDAY, FEB. 11

Science on Saturday

9:30 a.m. ♦ MBG Auditorium

[Meat, Monkeys, and Mosquitoes: A One Health Perspective on Emerging Diseases](#)

Laura Kahn, Princeton University

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PPPL receives two awards for green programs

By Jeanne Jackson DeVoe

PPPL received two awards from national agencies for its green buying practices and its composting and recycling program, the latest in a long list of honors the Laboratory has received for its environmental programs over the past several years.

One of the awards is a gold Green Buy Award from the DOE for the Laboratory's green buying program in fiscal year 2016, the fourth such award the Laboratory has received in the past six years. PPPL received a silver award last year and a gold award in 2013 and in 2012.

It also received a U.S. Environmental Protection Agency (EPA) Region 2 Food Recovery Challenge Award for fiscal year 2015 for the Laboratory's composting program.



Leanna Meyer, left, an environmental scientist at PPPL, with Margaret Kevin-King, a buildings and grounds supervisor, accept the Food Recovery Award on behalf of PPPL from John Filipelli, Director of the EPA Region 2's Clean Air and Sustainability Division. (Photo courtesy of EPA Region 2)

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Culham engineer to head NSTX-U Extent of Condition Committee

By Jeanne Jackson DeVoe

PPPL's National Spherical Torus Experiment-Upgrade (NSTX-U) Recovery Team appointed Tom Todd, the retired chief technologist at the Culham Centre for Fusion Energy, as the head of the committee reviewing any possible gaps in the rebuilding of the device.

The Extent of Condition Committee will incorporate the findings of 12 separate design verification and validation reviews (DVVRs) into a corrective action plan that will be submitted to the U.S. Department of Energy (DOE). Les Hill, head of the Infrastructure and Operational Improvements (IOI) project, is investigating underlying causes of problems with the machine related to policies and procedures.

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PPPL physicist uncovers clues to mechanism behind magnetic reconnection

By Raphael Rosen

PPPPL physicist Fatima Ebrahimi has published a paper showing that magnetic reconnection — the process in which magnetic field lines snap together and release energy — can be triggered by motion in nearby magnetic fields. By running computer simulations, Ebrahimi gathered evidence indicating that the wiggling of atomic particles and magnetic fields within electrically charged gas known as plasma can spark the onset of reconnection, a process that, when it occurs on the sun, can spew plasma into space.

That plasma can eventually interact with magnetic fields surrounding the Earth, endangering communications networks and power systems. In fusion facilities, reconnection can help start and confine the plasma that fuels fusion reactions. This research was funded by the DOE's Office of Science and was published in the December issue of *Physics of Plasmas*.

Using a computer code developed by researchers at universities and fusion labs, Ebrahimi simulated plasma circulating within a vessel shaped like a doughnut. The vessel mimicked the doughnut shape of fusion facilities called tokamaks. The simulated facility had an opening in its floor for physicists to inject magnetic field lines that would balloon in the tokamak's interior and initiate the fusion process.




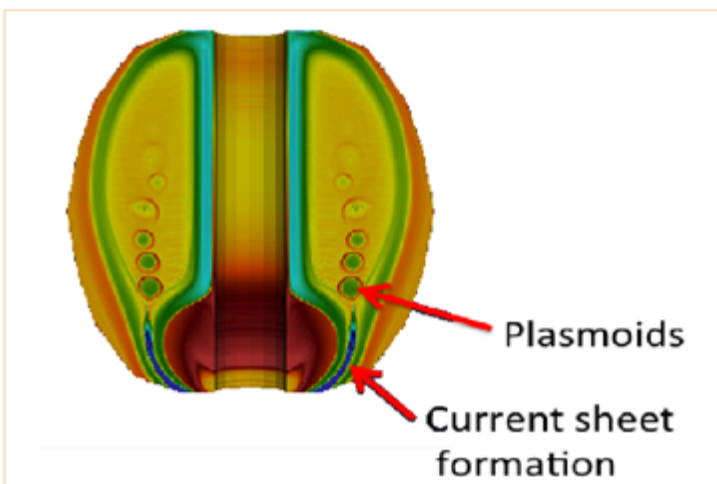
Fatima Ebrahimi (Photo by Elle Starkman)

Reconnection occurred in the following way. The field lines forming the balloon created an electric current that produced three-dimensional wiggles and wobbles that pushed the open end of the balloon until it closed. At that point, magnetic reconnection occurred and turned the magnetic balloon into a magnetic bubble called a plasmoid that carries electric current.

Ebrahimi is now expanding that research. She is currently looking into how to harness the current to create and confine a fusion plasma without using a large central magnet called a solenoid.

Different conditions can set off the reconnection process. "If the strength of the field lines associated with the original magnetic balloon is not enough on its own to instigate reconnection," Ebrahimi said, "the secondary magnetic wiggles can amplify the magnetic fields at the reconnection site, triggering the event." She is also investigating the amplification of magnetic fields through these secondary three-dimensional magnetic and fluid wiggles known as the dynamo effect.

These findings on the effect of magnetic fields can have a broad impact. "The analysis and the modeling can help us better understand how the reconnection process that is triggered by magnetic perturbations in plasmas can lead to the detachment of magnetic loops on the surface of the sun, or efficient startup for fusion plasmas," Ebrahimi said. 



Current sheets and plasmoids are formed during the simulation of a process called coaxial helicity injection, which could produce effective startup current-drive in spherical tokamaks.

COLLOQUIUM

Are You Living In A Simulation?

Silas Beane
University of Washington Seattle



Wednesday, Feb. 1
4:15 p.m., M.B.G Auditorium, Lyman Spitzer Building

Renovation begins on LSB Annex as work continues in the C Site Motor Generator building

By Jeanne Jackson DeVoe

Contractors are erecting metal frames for new office cubicles on the third floor of the Lyman Spitzer Building Annex as work continues on the \$26 million Infrastructure and Operational Improvements (IOI) project.

The demolition of the interior of the first three floors of the Annex building has been completed and all that remains is a small amount of work in the basement. Most of the mounds of demolition debris, including metal and piping, have been removed and recycled.

“We’re now in the process of rebuilding and renovating,” said Les Hill, the head of the IOI project. “It’s an important milestone for us.”

Each floor of the building has an open floor plan where there will be a combination of open space and new office cubicles that are “very nicely appointed and furnished,” Hill said.



Workers erect metal frames for office cubicles on the third floor of the LSB Annex. (Photo by Elle Starkman)



A bulldozer and jackhammer dig holes in the soil in the C Site-MG building basement. (Photo by Elle Starkman)



Wooden frames for the concrete foundations of steel pillars that will hold up the cement slab filling in the first floor. (Photo by Elle Starkman)



Les Hill, the head of the IOI project, on the second floor of the LSB Annex. (Photo by Elle Starkman)


Workers from Whiting-Turner, the project’s contractor, have been performing scan surveys that will be used to complete detailed plans for ductwork and piping systems that will be installed in the LSB, Hill said. The building will have new plumbing, lighting, and HVAC systems.

Meanwhile, workers are jackhammering rock and using backhoes to dig pits in the basement of the C Site-Motor Generator (MG) building. They are excavation holes where workers will pour concrete foundations for dozens of steel pillars that will hold up a new concrete slab on the first floor. The first floor will house a new area for technical shops, which will move from the Research Storage and Assembly (RESA) building.

The project had a slight setback when workers found that there was a layer of rock underneath the soil. Contractors brought in heavy machinery, including a backhoe and a jackhammer, to break up and remove the rock. The soil and rock is being disposed in an industrial landfill because some of the soil showed the presence of very low levels of PCBs, Hill said.

Workers are nearly finished dismantling a large metal enclosure on the first floor that once housed electrical equipment that powered old experiments at PPPL.

The IOI project is slightly ahead of schedule, and Hill said he is happy with the job the contractors and subcontractors are doing. Everyone is following regulations and wearing personal protection equipment (PPE) at all times, he said. “They continue to perform extremely well and safely,” Hill said.

The renovation of both buildings is expected to be completed by the end of the year. This will allow staff members currently housed in office trailers to move back into their new offices. Staff from Mod 6 will also move into the LSB Annex, while technicians currently at the RESA building will move to the MG Building. 



A metal structure on the first floor of the MG building is being disassembled. (Photo by Elle Starkman)

DVVR

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Charles Neumeyer, head of engineering for the NSTX-U Recovery Project, said he worked with Todd in an ITER design review. "He's very well known as a great reviewer," Neumeyer said. PPPL has included three or four external reviewers on each of the DVVRs, he said.

Todd is an engineer with almost 40 years of experience in the fusion energy field. He retired in 2014 from the Culham Centre in Oxfordshire, England, which oversees the operation of both the Jet European Torus (JET) and the Mega Amp Spherical Tokamak (MAST) fusion facilities. He was chief technologist for three years and previously served as chief engineer for seven years. He has since served as a consultant on the international fusion experiment ITER and other experiments.

Todd will head the Extent of Condition Committee when it meets in early March and again in May, and will sit in on some of the DVVRs that are taking place weekly at PPPL, Neumeyer said. He visited the Lab last week and participated in the DVVR for integrated design. He will return to PPPL in early February.



Charles Neumeyer, far left, the engineering head of the NSTX-U Recovery Project, was the main presenter at the design, validation and verification (DVVR) review for integrated systems Jan. 24 to 25, and physicist Stefan Gerhardt, far right, the deputy engineering director for the Recovery Project, chaired the committee. Next to Gerhardt is Steve Raftopoulos, a responsible engineer on the project. At left, front to back, with their backs to the camera are Ron Parker, of MIT, Brian LaBombard, of MIT's Plasma Science and Fusion Center, and Jon Menard, head of NSTX-U research. (Photo by Elle Starkman)

DVVR on integrated systems

Meanwhile, the Recovery Team held its second DVVR of the systems that make up the device last week. Reviewers focused on the integrated systems design: how the physics goals for the device translate into the design of the device.

Jon Menard, head of NSTX-U Research, gave an overview of the physics requirements of the machine. The NSTX-U was designed to produce stronger magnetic fields and higher temperatures than its predecessor. It would do this by using a more powerful central magnet assembly and a second neutral beam. The neutral beam induces a current in the plasma in addition to heating it.

The goal is to double the plasma current and yield a higher performance of up to five seconds per plasma experiment or "shot," quintuple the length of previous experiments on the NSTX. This would allow researchers to study whether spherical tokamaks like NSTX-U, which is shaped like a cored apple, would be a "potentially cost-effective path to fusion energy," and "contribute to development of ITER advanced operating scenarios," Menard explained.

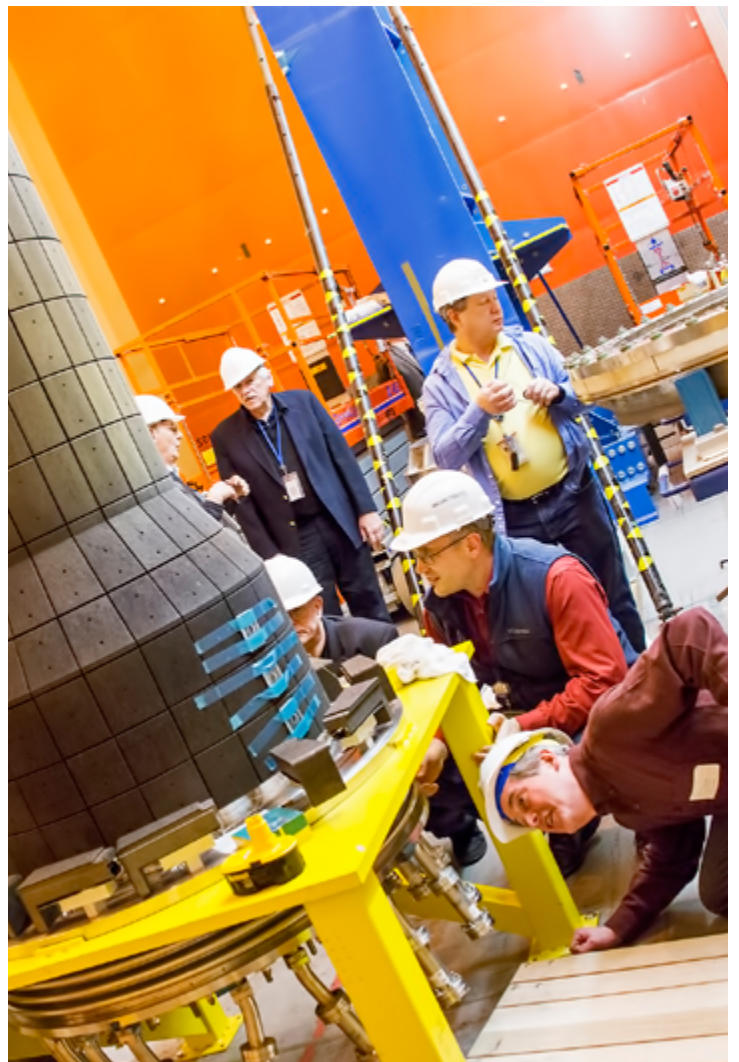
The physics goals for the machine must translate into numerous engineering requirements to accomplish those goals. The engineering requirements then lead to the design of the systems and components that make up the device.

Neumeyer, the main presenter, traced the history of the NSTX-U, which began about 18 years ago in 1999 when the NSTX had its first plasma. It operated for 12 years before being shut down for the upgrade. Both the NSTX and the NSTX-U used components from the previous experiment at PPPL, the Tokamak Fusion Test Reactor (TFTR), which is 35 years old, he said.

Because the NSTX-U was not a brand new project, the engineers documented the requirements for the changes to the project, but did not go back and redo the documentation for the entire project. The NSTX-U Project team is developing a comprehensive set of documentation. The overall project requirements were the focus of the review.

The review committee was chaired by Stefan Gerhardt, deputy head of engineering for the NSTX-U Recovery Project. The committee included several PPPL responsible engineers, as well as external reviewers, including Todd, Ron Parker, an emeritus professor of nuclear engineering and electrical engineering and computer science at MIT, and four members from MIT's Plasma Science and Fusion Center: physicist Brian LaBombard, engineers David Terry, Jim Irby, and Rui Vieira, who participated via video conference call.

Valeria Riccardo, PPPL's new head of engineering, will lead the next DVVR on heating systems, which will meet Jan. 30 and 31. 📷



Brian LaBombard, of MIT's Plasma Science and Fusion Center, examines the bottom of the NSTX-U center stack, with physicist Stefan Gerhardt, deputy head of engineering for the Recovery Project. (Photo by Elle Starkman)

Green awards

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“The awards are a recognition of PPPL’s sustained commitment to improving its environmental performance,” said Robert Sheneman, head of PPPL’s Environmental Services Division. “Purchasing environmentally-preferred products and diverting waste from landfills is only a small portion of our environmental stewardship program. Those things have really become a part of how we do business here at the Lab.”

PPPL received the award for making significant green purchases of 11 green products in six categories. These include bio-based cleaning products, recyclable office supplies, bio-based fuels for vehicles, green electronics, and green flooring and roofing. The cafeteria is required to serve locally-grown food and purchase green utensils and dining ware, and all of PPPL’s furniture purchases were green.

PPPL has received numerous awards for its environmental programs over the last several years. The Laboratory’s main office building, the Lyman Spitzer Building was U.S.-LEED Gold certified in 2011. PPPL received a DOE Federal Sustainability Award for reducing greenhouse gas emissions and was named an EPA Waste-Wise Federal Partner of the Year in 2012.

PPPL and other national laboratories funded by the DOE are required to meet federal standards set by Executive Order 13693, signed by then President Obama in February 2015, to set goals to reduce waste, save energy and cut greenhouse gas emissions in federal agencies by 2025. The executive order replaces a previous one that set similar goals with a 2015 deadline. PPPL is required to report on its initiatives to reduce energy and waste, and increase its purchases of green products. Both awards are based on data from PPPL’s sustainability plan, which it submits to the DOE each year.

“We’re constantly looking at what we’re buying to make sure it’s green,” said Margaret Kevin-King, the buildings and grounds supervisor. “We look at that equipment, sanitary products, liners and bio-based products we use for cleaning.”

“We met goals in almost every product category for Green Buy,” said Mark Hughes, an environmental engineering assistant who compiled the statistics. “We did really well across the board.”



Kyron Jones, left, with an old television set donated by Howard Yuh, during a UNICOR electronics recycling drive last November. (Photo by Elle Starkman)

The EPA award for composting recognizes that PPPL composted 24 tons of waste in fiscal year 2015. PPPL composted or recycled 84 percent of all municipal solid waste and construction and demolition debris in fiscal year 2015, including 44 tons of paper, bottles or cans that were recycled.

Leanna Meyer, an environmental scientist at PPPL, noted that PPPL’s composting rate has gone down because the new contractor cannot collect compostable plastic cups as the previous contractor did and cannot remove the large amount of contaminants from the composting. PPPL has also had to curtail collections at sites outside the cafeteria because some people were throwing trash in the composting bins.

King and Meyer accepted the award in a Jan. 11 ceremony at the World Trade Center in New York.

“I think it’s a testament to people doing the right thing, going the extra mile and putting it in the right bin,” said Meyer. “We encourage people to compost their food waste and to drive the numbers up that way.” 🍌

Volunteers wanted for Mercer Science and Engineering Fair

Organizers of the Mercer Science and Engineering Fair are looking for scientists and engineers to volunteer as judges of fourth to twelfth-grade science projects during the fair in March at Rider University.

Students from Mercer County schools show off their original science projects at the fair from March 12 to March 15. Judging takes place March 12 to 13.

Additional information about the fair is available at <https://mercersec.org/about/msef>.

To volunteer, go to <http://mercersec.org/help/BecomeAJudge> or contact volunteers Kevin Lamb, klamb@pppl.gov or Hans Schneider, hschneid@pppl.gov.

Ronald E. Hatcher

Science on Saturday LECTURE SERIES

Feb. 4

Imperative of Vaccination Nationally and Globally

Adel Mahmoud, Princeton

Feb. 11

Meat, Monkeys, and Mosquitoes: A One Health Perspective on Emerging Diseases

Laura Kahn, Princeton

Feb. 18

Cities in the 21st century: the nexus of the climate, water, and energy challenges

Eli Bou-Zeid, Princeton

Saturdays at 9:30 a.m., MBG Auditorium

Application opens for presenters at 2017 Princeton Research Day

Applications are being accepted through Feb. 20 for non-faculty researchers at Princeton University, such as undergraduates, graduate students and postdoctoral researchers, to present at the second annual 2017 Princeton Research Day on May 11.

The application is available at <https://researchday.princeton.edu>.

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

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

American Red Cross Blood Drive at PPPL March 15

The need for blood is constant. One pint of donated blood can save up to three lives. Please donate to the American Red Cross Blood Drive at PPPL on March 15.

Science Bowl Volunteers Needed: Feb. 24 and 25

PPPL will host 48 teams of middle and high school students (about 250 students total) on Friday, Feb. 24 and Saturday, Feb. 25 for the New Jersey Regional Middle and High School Science Bowls.

We need your help! Please volunteer to help out as moderators, science/rules judges, time/score keepers, lunch attendants etc. Lunch will be provided for competition day volunteers.

Please contact Deedee Ortiz at dortiz@pppl.gov or ext. 2785 to sign up or for more information.

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 January 30	Tuesday January 31	Wednesday February 1	Thursday February 2	Friday February 3
COMMAND PERFORMANCE Chef's Feature	Beef Chili with Cornbread and Assorted Toppings	Baked Manicotti with Garlic Bread	Chipotle Chicken Burrito with Cilantro Lime Rice and Oven-Roasted Corn	Pizza Day with Tossed Salad	Fish and Chips
Early Riser	Bacon, Egg and Cheese English Muffin	Mexican Breakfast Burrito	Potato, Roasted Pepper & Sundried Tomato Casserole with 2 Eggs any Style	Cinnamon-Raisin Pancakes with Homemade Apple Compote	French Toast Sticks
Country Kettle	Manhattan Clam Chowder	Sweet Potato Bisque	Chicken Noodle	Tomato Soup	Chili Bean
Deli Special	Turkey Bruschetta on Ciabatta	Asiago Roast Beef with Grilled Onion, Tomato & Horseradish on Pumpernickel	Southwest Ham Ciabatta	Turkey Sloppy Joe	Super Bowl Lunch Party: 3 Specials, One Price
Grill Special	Grilled Ham and 3 Cheeses on Challah Bread	Fried Salami and Cheddar on a Kaiser	Cheese Calzone with Marinara Sauce	Knockwurst & Sauerkraut with German Potato Salad	Hand-Tossed Wings
Panini	Pastrami and Swiss Flatbread	Fried Fish Torpedo with Cheddar, Tomato & Tartar Sauce	Breaded Chicken Cutlet with Ham, Swiss Cheese, Lettuce & Honey Mustard on Ciabatta	Curried Lentil & Brown Rice Wrap	Georgia Pulled Pork with Fried Pickles

MENU SUBJECT TO CHANGE WITHOUT NOTICE

HEART HEALTHY

VEGETARIAN OPTION

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

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