PPPL PRINCETON PLASMA PHYSICS LABORATORY
A Collaborative National Center for Fusion & Plasma Research
U.S. DEPARTMENT OF ENERGY
WEEKLY
June 6, 2016

Calendar of Events

JUNE 6–10

SULI program begins with one-week course for students

TUESDAY, JUNE 7

PPPL Research Seminar
9:30 a.m. ◆ B318
The direct drive program and possible future scenarios for laboratory high energy density physics
Dr. Michael Campbell, University of Rochester

WEDNESDAY, JUNE 8

Inventors Recognition Dinner
6 p.m. ◆ Prospect House

UPCOMING

WEDNESDAY, JUNE 15

PPPL Colloquium
4:15 p.m. ◆ MBG Auditorium
Wendelstein 7-X: Highlights from the First Operational Phase of the New Optimized Stellarator
Dr. Oliver P. Ford, Max-Planck Institut für Plasmaphysik, Greifswald/Garching, Germany

MONDAY, JUNE 20

Mandatory All-Hands Safety Meeting
See page 7 for details.

JUNE 28–30

US-PRC Magnetic Fusion Collaboration Workshop

INSIDE

Physicists Sabbagh and Berkery receive Landau-Spitzer Award

By John Greenwald

Steven Sabbagh and Jack Berkery, Columbia University physicists on assignment to PPPL, have received the 2016 Landau-Spitzer Award for outstanding contributions to plasma physics. Also sharing in the award are Holger Reimerdes of the École Polytechnique Fédérale de Lausanne in Switzerland and Yueqiang Liu of the Culham Centre for Fusion Energy in the United Kingdom. The award is named for Russian physicist Lev Landau, a 1962 Nobel laureate, and Princeton astrophysicist Lyman Spitzer, founder of PPPL.

The biennial honor, which is presented by the American Physical Society (APS) and the European Physical Society (EPS) and includes a $4,000 total honorarium, recognizes outstanding research that also advances collaboration and unity between U.S. and European scientists. This year's award, to be given in July at the EPS 43rd Conference on Plasma Physics in Leuven, Belgium, honors advances in experimentally validated understanding of the stability of resistive wall modes (RWMs)—a type of instability that can limit high plasma pressure, an essential ingredient for fusion reactions in tokamaks.

The award recognizes "nearly a decade of publications on research investigating and validating kinetic resistive wall mode stability theory," said Sabbagh, principal investigator for research on magnetohydrodynamic (MHD) stability on the National Spherical Torus Experiment-Upgrade (NSTX-U); the field treats plasma as an electrically charged fluid. Adds Berkery, who leads the macroscopic stability topical science group on the NSTX-U: "We want to operate tokamaks with greater stability. Understanding how to do that is very important."

continued on page 2

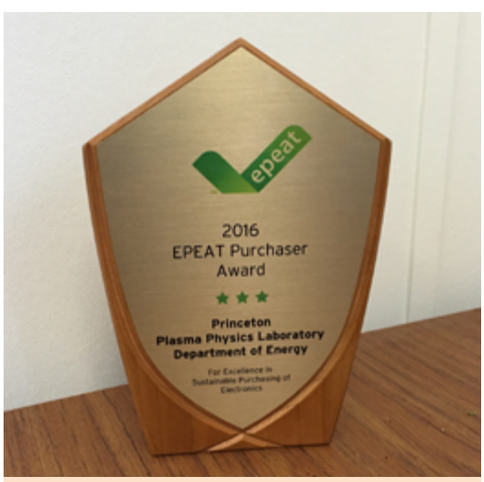
PPPL wins awards for its green purchasing program

By Jeanne Jackson DeVoe

PPPL has received two national awards for its green purchasing program, adding to the long list of honors the Laboratory's environmental program has received over the past several years.

The U.S. Department of Energy (DOE) gave PPPL a silver Green Buy Award in April for its green purchasing program, while the Green Electronics Council gave PPPL a three-star EPEAT Purchaser Award for the Laboratory's efforts to purchase environmentally sustainable electronics.

"We are very pleased to receive the awards as recognition of the Lab's continued focus on sustainable purchasing," said Robert Sheneman, head of the Environmental Services Division.



PPPL received the EPEAT award for its sustainable electronics purchases. (Photo by Leanna Meyer)

continued on page 3

Landau-Spitzer Award

continued from page 1

The award winners' research has transformed the understanding of ways to stabilize RWMs. For example, scientists had thought that rapid plasma rotation was sufficient for stabilization, but Sabbagh and Berkery showed that the situation was more complex. While high rotation can enhance stability, they found that RWMs can be unstable at significant plasma rotation, and that some plasmas can be stable at lower rotation rates. Their experiments and associated theory demonstrate and explain how this can happen.

A similar condition applies to collisionality—a term that refers to the frequency with which particles collide and bounce off one another in tokamak plasmas. Sabbagh and Berkery found that reduced collisionality doesn't necessarily lead to reduced stability, as had long been thought. The relationship between rotation and collisionality must also be taken into account, and the new theory shows that plasmas can indeed have greater stability at reduced collisionality.

Such findings are relevant to high-pressure fusion facilities like ITER, the international tokamak under construction in France to demonstrate the feasibility of fusion power, which will operate with reduced plasma rotation and collisionality.

The research of Reimerdes and Liu has corroborated this work and provided essential theory. Reimerdes developed a technique called MHD spectroscopy to probe the stability of plasmas in the DIII-D National Tokamak Facility that General Atomics operates for the DOE in San Diego. This technique was used in both DIII-D and the National Spherical Torus Experiment—the predecessor to the NSTX-U—to confirm the initial Sabbagh and Berkery results.

Steven Sabbagh, left, and Jack Berkery

Liu also developed and evolved a kinetic RWM theory, and the four researchers worked together to solve outstanding issues during this research. Liu created a computer program called MARS-K, which calculates RWM stability in a manner similar to Berkery's MISK code. Berkery developed MISK from an original University of Rochester effort by physicists Bo Hu and Riccardo Betti.

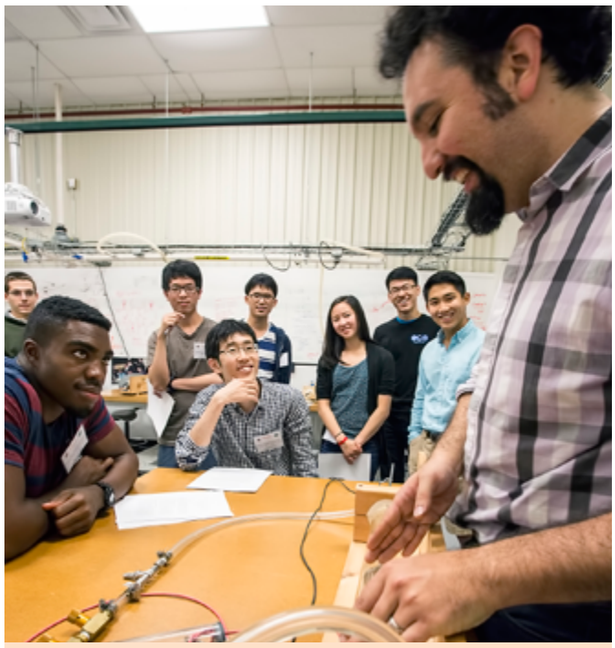
Liu and Berkery led a multi-year effort, with other physicists, to benchmark calculations of the MARS-K and MISK codes against each other. Both codes produced similar findings, giving confidence in the results.

Sabbagh and Berkery are now using this knowledge to find ways to avoid disruptions, a task presently thought of as the next "grand challenge" for fusion research in the leading confinement device – the tokamak. The physicists plan experiments on NSTX-U and on the Korea Superconducting Advance Research (KSTAR) facility, where Sabbagh is a principal investigator for MHD stability research.

Learn about plasma physics online by streaming SULI course

If you've always wanted to know more about plasma physics, you can pop in to an introductory course being held at PPPL this week by streaming the course online. Just go here to "attend" the SULI Introductory Course in Plasma Physics. The course has an impressive roster of speakers. On the first day, Nat Fisch will give an introduction at 9:30 a.m., followed by an introduction to magnetic confinement by Rob Goldston at 11 a.m. There will be afternoon talks on Monday by Cami Collins, a researcher at General Atomics; Antoine Cerfon, of the Courant Institute at New York University; and Matthew Kunz, of Princeton University's Department of Astrophysical Sciences. There will be several other notable speakers each day of the course. A full agenda is available here.

A video of the course will also be available online in a few weeks. The 2015 course is available here.



Science Education's Arturo Dominguez, who organized the course, gives a plasma demonstration during last year's SULI course.

EPEAT award

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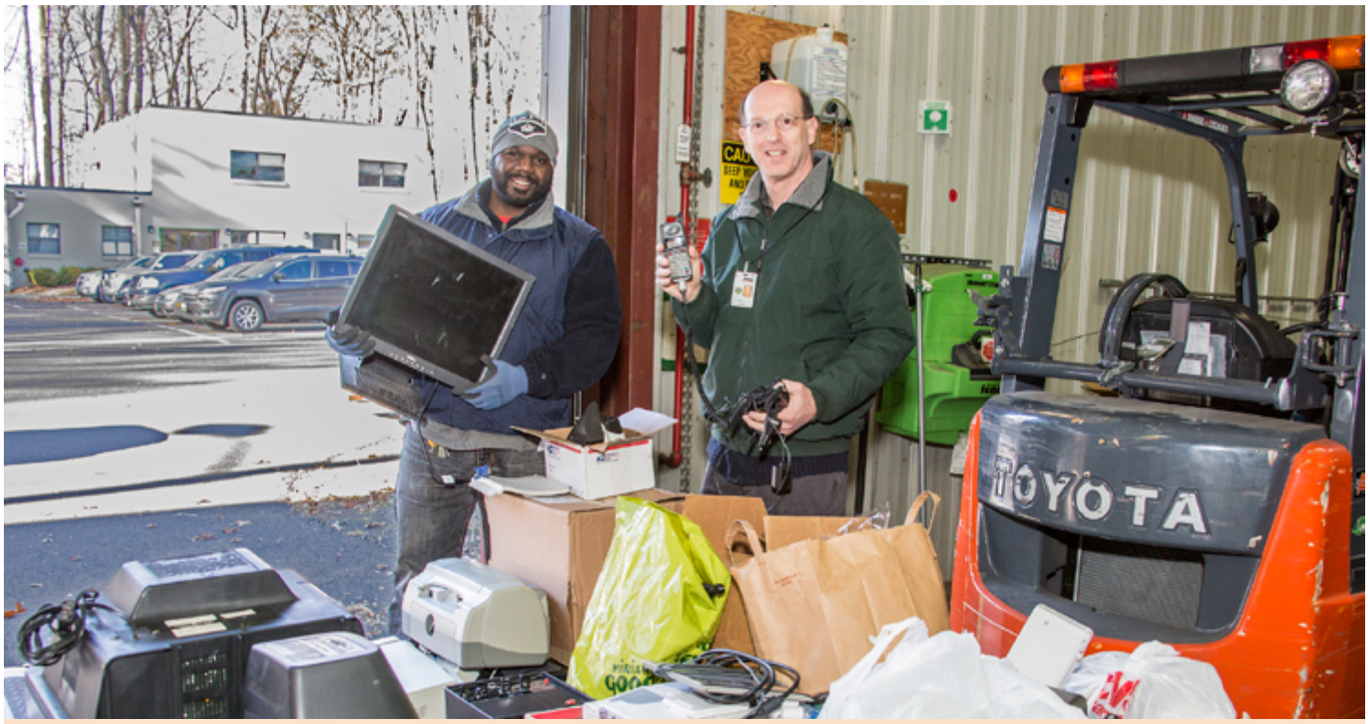


Kyron Jones, left, collects home electronics from Eliot Feibush in 2015. PPPL collected 674 pounds of electronics during its home electronics collection in April through Unicor.

PPPL and other national laboratories funded by the Department of Energy are required to meet federal standards set by Executive Order 13693, signed by President Obama in February of 2015, to reduce greenhouse gas emissions by 2025. The executive order replaces a previous one that set goals to reduce greenhouse gases by 2015. PPPL is required to report on its initiatives to reduce energy, cut down on 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.

PPPL received the EPEAT award last week. It was the second year the Laboratory was honored for its purchase of green electronics that not only use less energy but also can be reused or recycled when they have outlived their usefulness. Every printer purchased last year meets the standards of EPEAT, a worldwide rating system developed by the Green Electronics Council, based in Portland, Oregon.

Sheneman said his division works with PPPL's IT Department to find greener electronics and track the purchases. "We're always looking for ways to incorporate some of these things into how we do business, but we're not going to ask the Laboratory to spend more money than they would otherwise unless it makes sense," Sheneman said. "These products are very cost-competitive with traditional products."

All purchased electronics met EPEAT standards

All of the 332 electronic items purchased last year for offices, including laptops, desktops, workstations, monitors, and tablets, printers, scanners and televisions, met EPEAT standards. Almost 91 percent of computer equipment met EPEAT's gold standard. PPPL also recycled 674 pounds of electronics during its home electronics collection on April 20 through its contract with UNICOR.

The certificate for the award states that PPPL's green electronics purchases will avoid disposing of the equivalent of 286 kilograms of hazardous waste and will eliminate enough waste to equal one U.S. household's waste for eight months, the equivalent of 1,195 kilograms.

The energy saved by the products will also have the following effects on the environment, according to the Green Electronics Council:

- Save $10,995 in energy costs.
- Save 120,900 kWh of electricity – enough to power nine U.S. homes for a year.
- Avoid 187 kilograms of water pollution emissions.
- Reduce 20.95 metric tons of greenhouse gas emissions—the equivalent of taking 15 average U.S. cars off the road.

The silver Green Buy purchasing award that PPPL received in April recognizes the Laboratory's purchase of numerous green products as well as its composting and recycling program. PPPL purchases a wide variety of such products. Last year, 95 percent of cleaning products purchased for the Laboratory were bio-based, according to Leanna Meyer, a PPPL environmental scientist. The Laboratory also uses bio-based fuel for some vehicles and requires Brock, the company that runs the cafeteria, to purchase compostable plates and dinnerware. Half of all food served in the cafeteria is from local sources.

"Facility and Site Services continues to include the purchase of bio-based products, non-toxic paints, and recycled content products in its plan as an effort to ensure that Executive Order 13693 is in place at PPPL," said Margaret Kevin-King, building and grounds supervisor. "The purchase and use of these environmentally preferred products in the janitorial and facility group ensures environmental safety and enhances health, wellness and productivity."

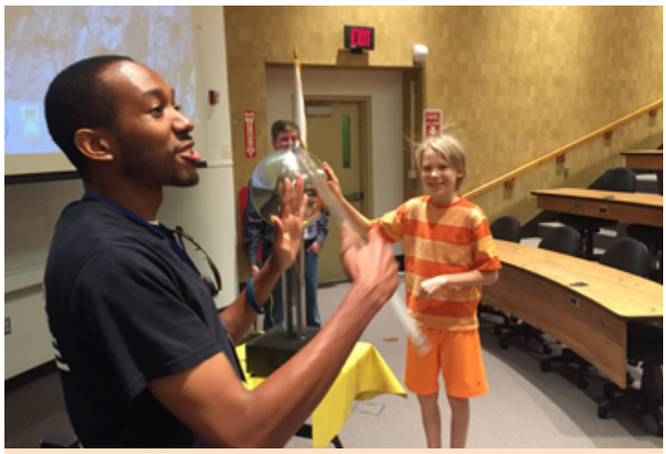
The Laboratory's overall recycling rate for fiscal year 2015 was 84 percent of municipal solid waste and construction and demolition debris, with just 16 percent of waste going to landfills. Some 44 tons of the waste is paper, bottles or cans that are recycled. Another 22 tons food waste was composted.

PPPL received a gold Green Buy award in 2013 and has received numerous honors for its environmental program, including being recognized by the New Jersey Department of Environmental Protection as the state's top environmental steward in 2013 and receiving the U.S. Environmental Protection Agency's 2012 EPA WasteWise Program's Federal Partner of the Year award.

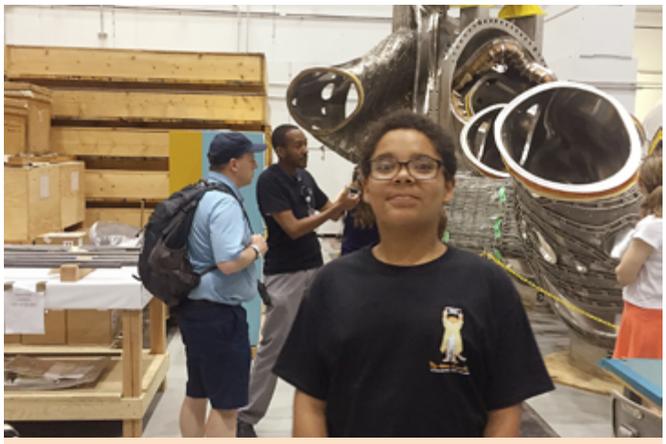
Princeton alumni give rave reviews to PPPL tours

PPPL hosted two tours of about 35 people each on May 27 for Princeton University alumni and their families as part of the University's reunion weekend events. After viewing videos and plasma demonstrations in the MBG Auditorium, visitors toured the National Spherical Torus Experiment-Upgrade test cell. They had a top-notch contingent of tour guides that included Erik Gilson, Devon Battaglia, David Gates, Russ Feder, Charles Swanson, Stuart Hudson, Atiba Brereton, and Jacob Schwartz. Brereton and Schwartz did double duty, serving as guides for both tours. Visitors filling out surveys gave the tours and tour guides rave reviews. "The tour guide was great! Cool equipment to see!" said one visitor. "I learned a lot about NSTX, fusion energy, and plasma," said a 12-year-old. "The tour guides were thorough and even added some jokes!"

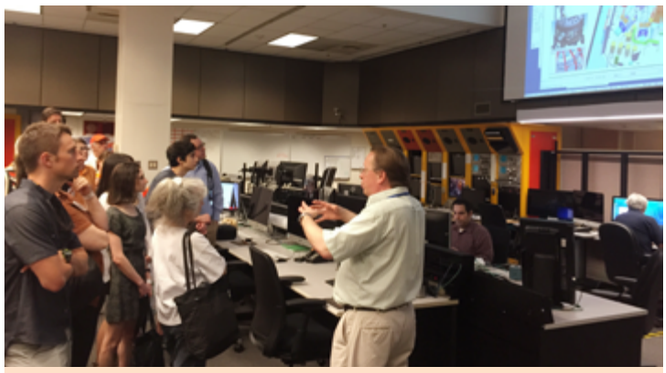
Photos by Atiba Brereton, Jeanne Jackson DeVoe, and Raphael Rosen



Erik Fagerstrom, 11, of Virginia, shows the crowd the effects of the Van de Graaff generator as Atiba Brereton gives plasma demonstrations.

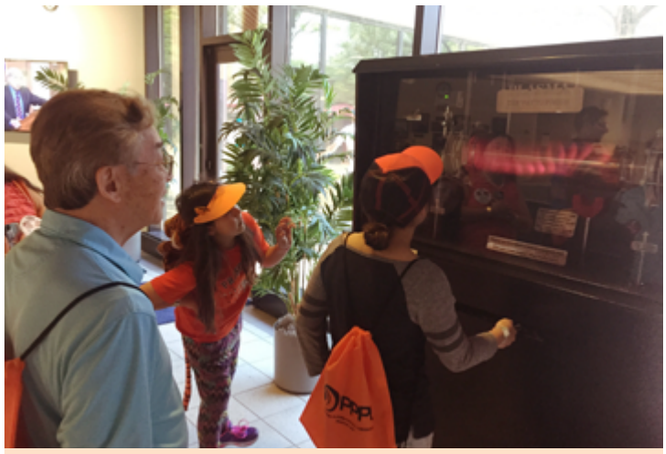


Howard Biggee, 14, of Chicago, in front of QUASAR.

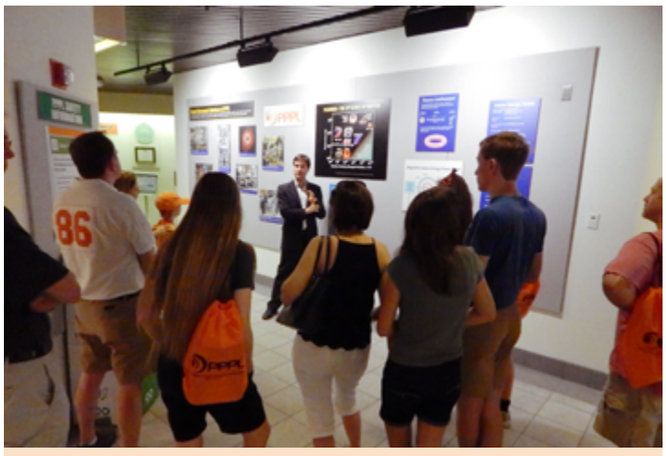


David Gates gives an overview of the NSTX-U in the NSTX-U Control Room.

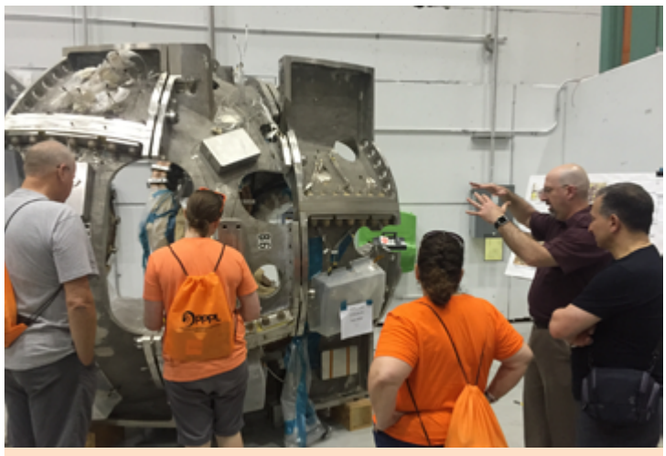
Devon Battaglia shows visitors the NSTX-U test cell.



Visitors check out the plasma demonstration device in the LSB Lobby.



Stuart Hudson starts off his tour in the NSTX-U lobby.



Russ Feder discusses stellarators with visitors.

Honoring long-term employees at 2016 Service Recognition Luncheon

Dozens of PPPL'ers were honored for their years of service to the Laboratory at a Service Recognition Luncheon on May 24 in the NSTX-U Control Room. The event was hosted by the Human Resources Department and organized by Kate Harkness of HR with help from several members of the Social Committee.

Among those honored was Don McBride, of the Engineering Department, who recently retired after 45 years at PPPL.

Four PPPL'ers were honored for 40 years of service: Jeffrey Bennett, David Johnson, Kenneth Tindall Sr., and Sylvester Vinson Jr. Nearly 30 employees were honored for 35 years of service at the Laboratory, five were honored for 30 years and two were honored for 25 years.

Photos by Chris Cane.

Don McBride, left, who received an award for 45 years of service, with Richard (Rick) Van Kirk, right, Elmer Fredd, back left, and Steve Jurczynski, all 35-year employees.

Tom Bogdan, 15 years, raises a bottle of Perrier at right. Next to him is Jeff Bennett, who was honored for 40 years at PPPL. At left front is Tim Conwell, 10 years, and John Mazukewicz, 15 years.

Helping with the party were from left to right: Neil Gerrish, party organizer Kate Harkness, Carol Ann Austin, Atiba Brereton, Larry Bernard, Pamela Serai, and Sue Hill.

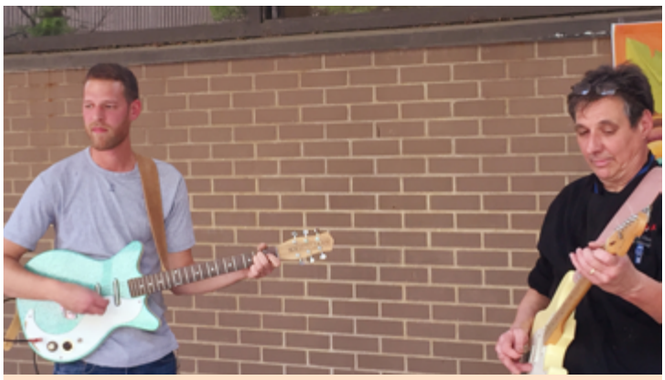
Mike Zarnstorff, deputy director for research, standing front left, with Ron Jaworski, who celebrated five years at PPPL, along with clockwise from left around the table: Mary Payne, executive assistant to Stacia Zelick; Zelick, chief information officer; John Mazukewicz, standing, 15 years; Chris Minervini, 15 years; and Phil Efthimion, head of the Plasma Science and Technology Department.

Fran White, head of Site Protection, and Gerrit Kramer, a 15-year employee, enjoy the luncheon with several other employees.

Shannon Greco, left, celebrating 10 years as a Princeton University employee, with Virginia Finley, right, a 25-year employee. Next to Greco is Philip Efthimion, and Larry Bernard, head of the Office of Communications. Next to Finley is Jerry Levine, head of Environment, Safety, and Health, and Cathy Saville, 30 years.

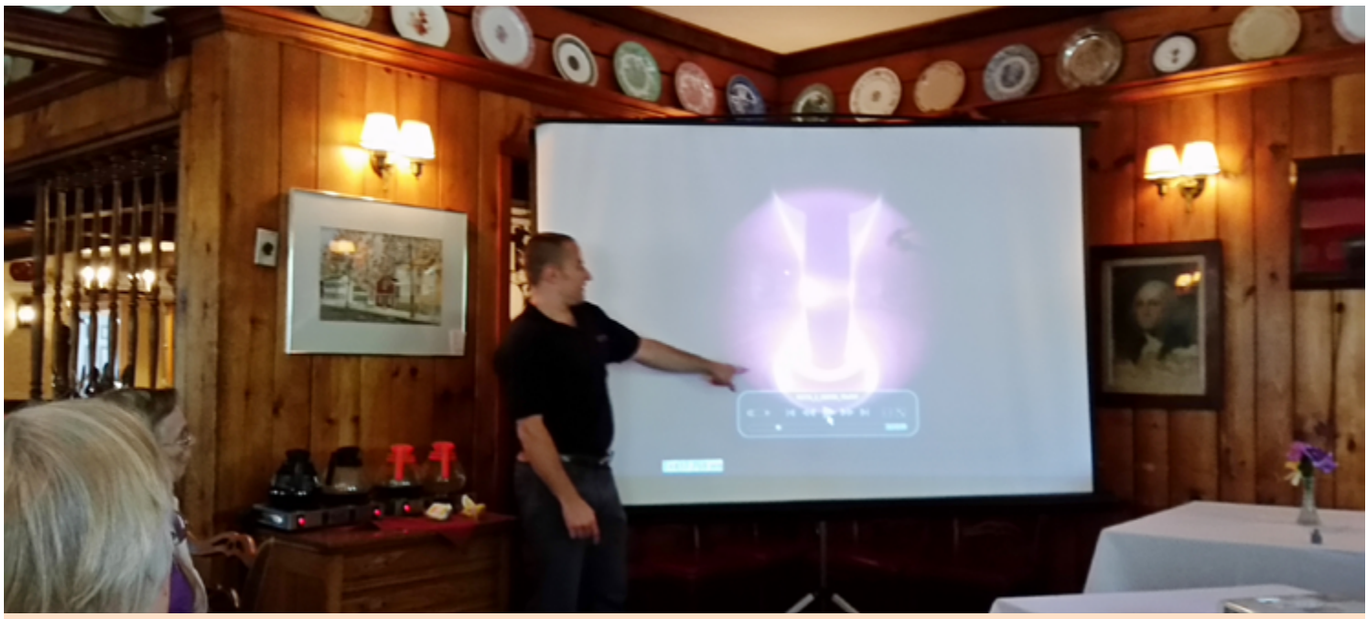
Lunchtime music courtesy of the Café's "BBQ Jam"

Dana Eckstein performs during a "BBQ Jam" hosted by Mark Gazo of the PPPL Café.



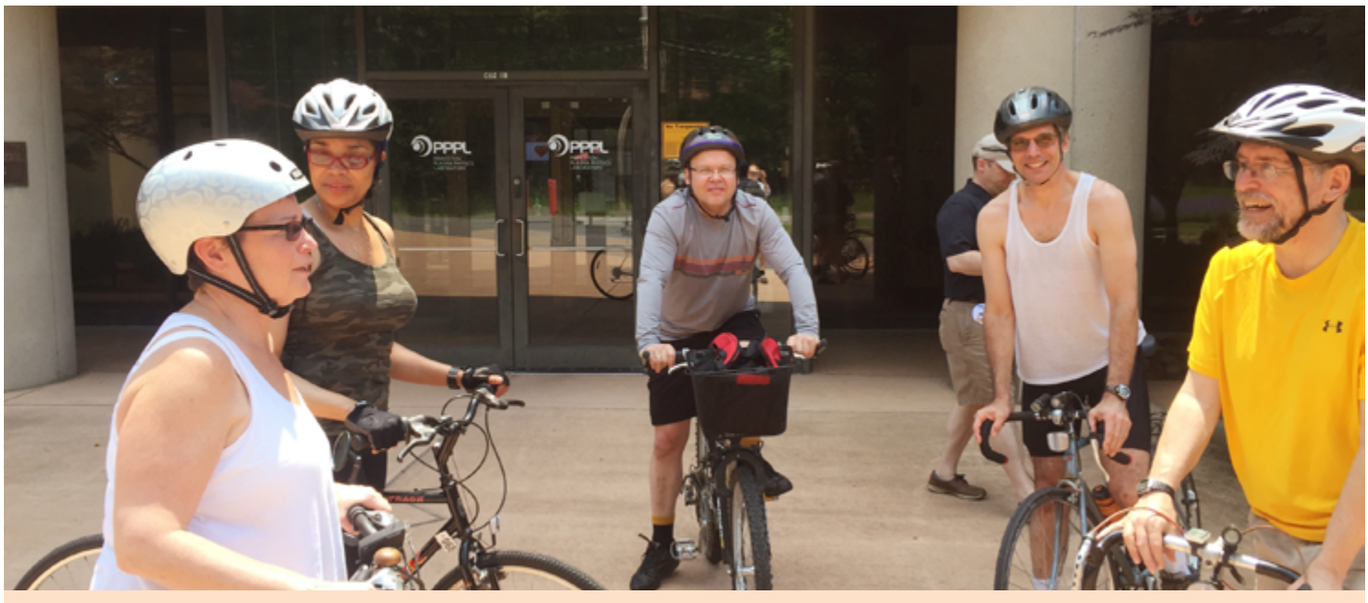
Elliott Baer, left, jams with cafeteria manager Mark Gazo.

Fusion energy talk for seniors



Physicist Walter Guttenfelder discusses fusion energy with some 60 members of the Senior Breakfast Club of the Cranbury Presbyterian Church at the Cranbury Inn on May 26. (Photo by John Dellas, Senior Breakfast Club)

A lunchtime ride as Bike Challenge comes to a close



Some members of PPPL's bike team took a lunchtime ride on May 27, one of the final days of the National Bike Challenge. From left to right: Kathleen Lukazik, Carol Ann Austin, Andrei Khodak, Marc Sibilia, and Michael Zarnstorff, a team captain.

Mandatory all-hands safety meeting on Monday, June 20

There will be a mandatory all-hands safety meeting on Monday, June 20 from 1 to 2:30 p.m. in the MBG Auditorium.

Betsy Dunn, director of Environment, Safety & Quality Assurance at Argonne National Laboratory, will discuss a fatal accident that occurred last October at the Florida State University National High Magnetic Field Laboratory. Dunn led the team that investigated the accident. There will be time for questions and answers and staff will participate in an exercise based on the discussion.

Everyone at the Laboratory is expected to participate, so please plan accordingly.

Inventor Recognition Dinner

PPPL's Inventor Recognition Dinner will be held on Wednesday, June 8th, from 6–9 p.m. at Princeton University's Prospect House.

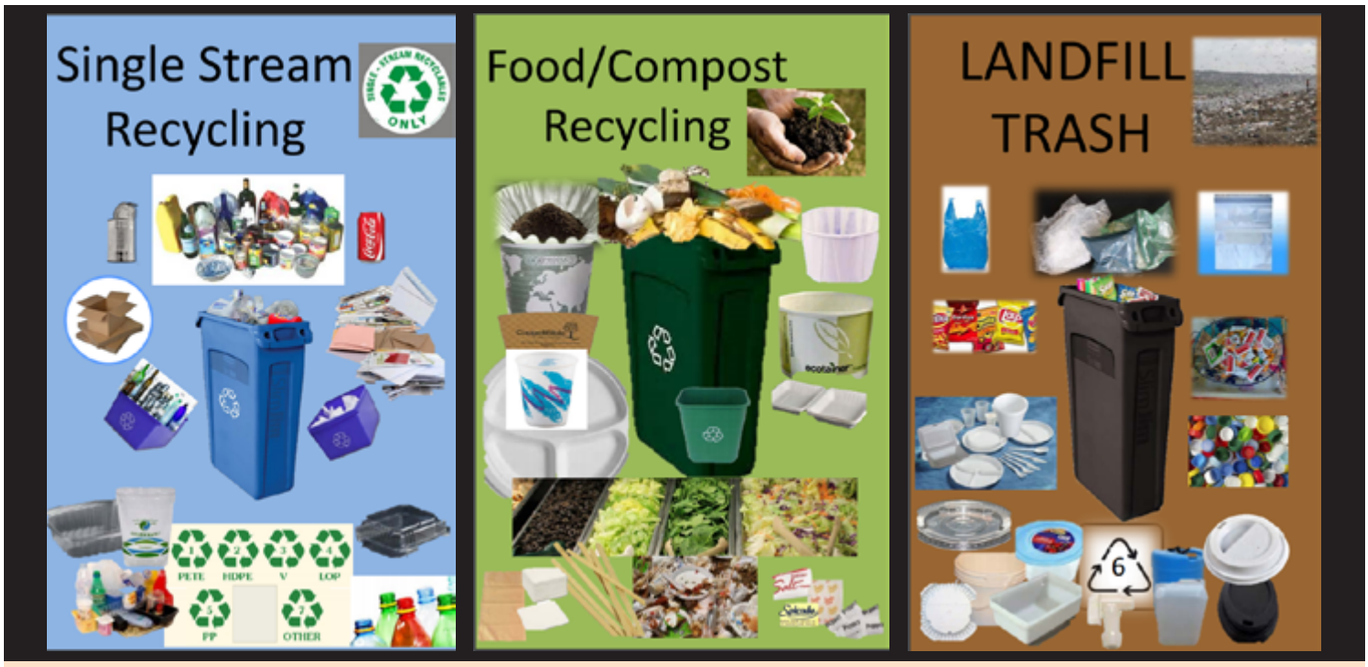
If you have questions, please contact Laurie Bagley, x2425, lbagley@pppl.gov.

Robotics coaches needed for all-girls robotics teams

PPPL's Science Education team is looking for volunteer coaches for a new all-girls FIRST Lego League Robotics team (ages 9 to 13) and the new FIRST Tech Challenge Team (ages 13 to 18) being organized in collaboration with the YWCA-Princeton.

Please call Shannon Greco ASAP to volunteer: sgreco@pppl.gov, 609-243-2208.

New signs provide guidance when you toss



Wondering which items to recycle, which to compost, and which to throw in the trash? These new signs will point you in the right direction.

BROCK

MARK GAZO
Chef Manager

Café at PPPL

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 June 6	Tuesday June 7	Wednesday June 8	Thursday June 9	Friday June 10
COMMAND PERFORMANCE **Chef's Feature**	**Crunchy Potato Chip Chicken** served with Macaroni & Cheese	**Baked Stuffed Shells** served with Tomato Cucumber Salad & Garlic Bread	COMMAND PERFORMANCE **Create your own Burrito Bar**	**Carved Flank Steak** with Roasted Potatoes & Carrots	LUNCH & A MOVIE— FRIED GREEN TOMATOES **Fried Catfish** with Tomatoes, Okra, Tartar Sauce & Rice
Early Riser	**Vegetable Breakfast Burrito**	**Scrapple** with 2 Eggs any style & Potatoes	**Strawberry French Toast**	**Ham, Egg & Cheddar Croissant**	**Spaghetti** with Bacon & Eggs
Country Kettle	**Chicken Noodle**	**Tomato Tortellini Bisque**	**Corn Chowder** with Bacon, Cheddar & Potato	**Black Bean Cilantro**	**Chicken Vegetable Soup**
Grille Special	BURGERLICIOUS **As Gouda As It Gets Burger** Grilled Beef Burger smothered with smoked gouda, caramelized onions, and garlic-roasted wild mushrooms topped with Applewood bacon jam on a grilled brioche roll (Available All Week)	**Potato Skins** Stuffed with Bacon, Broccoli, Cheddar Cheese & Sour Cream	**Homemade Tuna Burger** served on a Wheat Roll	**Sausage, Peppers & Onion Torpedo**	**Turkey Burger** with Cheddar Cheese, Avocado & Guacamole on a Kaiser Roll
Deli Special	**Egg Salad Wrap** with Avocado	**Veggie Burger** on a Wheat Roll with Hummus, Lettuce & Tomato	**Salami & Fontina Panini** with Tomato & Banana Peppers	**Corned Beef,** Swiss Cheese, Cole Slaw & Russian Dressing on Pumpernickel	**Italian Hoagie** Cut from a 6-footer!!
Panini	**The Cubano** Roast Pork, Ham, Swiss, Pickles & Dijonnaise on a Ciabatta	**Chicken Breast** with Artichokes & Mushrooms on French Bread with Parmesan Cream Sauce	**Breaded Chicken Cutlet** on Ciabatta Bread with Ham, Salami, Provolone & Marinated Roasted Peppers	**Chicken Salad** with Bacon & Swiss Melt on Ciabatta	**Flank Steak Quesadilla**

MENU SUBJECT TO CHANGE WITHOUT NOTICE

VEGETARIAN OPTION

WEEKLY

Editor: **Jeanne Jackson DeVoe** ◆ Layout and graphic design: **Kyle Palmer** ◆ Photography: **Elle Starkman**
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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/.