

Calendar of Events

THIS WEEK

JULY 12-14

ALPhA Laboratory Immersions
Science Education Laboratory

FRIDAY, JULY 15

Public Tour

10:00 a.m. ♦ LSB Lobby

Go to <http://www.pppl.gov/about/tours> to register.

UPCOMING

JULY 20-22

**4th Annual Theory and
Simulation of Disruptions in
Tokamaks Workshop**
Room B318

AUGUST 22-25

**Technology of Fusion Energy
(TOFE) Conference**
Philadelphia

SUMMER SCHEDULE FOR PPPL WEEKLY

The PPPL Weekly will be published every other week during the summer. The next issue will be on July 25.

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Terry Brog, new Deputy Director for Operations, puts excellence first

By Jeanne Jackson DeVoe

When A.J. Stewart Smith, former Princeton University vice president for PPPL, wanted to fill the PPPL deputy director for operations position, he recruited Terry Brog, whom he had met when both served as Brookhaven National Laboratory Board members. Brog was then the chairman of the BNL Operations Committee and a staff member at the Pacific Northwest National Laboratory (PNNL) in Richland, Washington.

Brog began work on June 20 as deputy director for operations and chief operating officer of PPPL, overseeing eight departments. They are Engineering, Business Operations, HR, Communications, ES&H, ITER Fabrication, Best Practices and Outreach, and Information Technology. He joins Michael Zarnstorff, deputy director for research, as deputy to PPPL Director Stewart Prager. Princeton University manages the Laboratory for the U.S. Department of Energy (DOE).



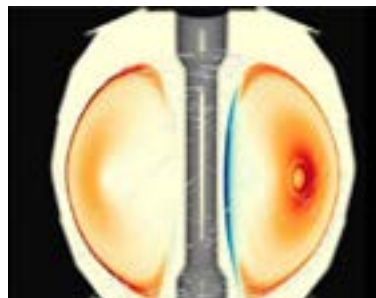
Terry Brog

“It’s fantastic that Terry has joined us,” Prager said. “There are numerous operational challenges and opportunities at the Lab and Terry brings a huge range of experience and judgment to those tasks. The experience and perspective that he brings from his work at PNNL will be of tremendous benefit to us.”

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Scientists challenge conventional wisdom to improve bootstrap current predictions

By John Greenwald



Simulation shows trapped electrons at left and passing electrons at right that are carried in the bootstrap current of a tokamak. (Image courtesy of Kwan Liu-Ma, University of California, Davis)

Researchers at PPPL have challenged understanding of a key element in fusion plasmas. At issue has been an accurate prediction of the size of the “bootstrap current” — a self-generating electric current — and an understanding of what carries the current at the edge of plasmas in doughnut-shaped facilities called tokamaks. This bootstrap-generated current combines with the current in the core of the plasma to produce a magnetic field to hold the hot gas together during experiments, and can produce stability at the edge of the plasma.

The recent work, published in the April issue of the journal *Physics of Plasmas*, focuses on the region at the edge in which the temperature and density drop off sharply.

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PPPL celebrates first plasma on first Latin American stellarator

PPPL helped celebrate the first plasma of the first Latin American stellarator with Dr. Iván Vargas-Blanco, head of the Plasma Laboratory for Fusion Energy and Applications at the Costa Rica Institute of Technology (TEC), which designed and built the Stellarator of Costa Rica 1 (SCR-1).

Students, researchers, and others gathered with Vargas-Blanco to watch the ceremony and first plasma in Costa Rica, and a video camera captured Vargas-Blanco and the PPPL audience cheering. "Today is a very special day for us - a day that should be recorded in history not only for Costa Rica but also for Latin America," Vargas-Blanco said in pre-taped remarks shown at the ceremony. The physicist is doing research at PPPL through the end of July.

The ceremony at the Arts Auditorium at the TEC in Cartago also featured pre-taped congratulations by Robert Wolf, director of the Department of Stellarator Heating



An image of the first plasma in the Stellarator of Costa Rica 1 (SCR-1).

and Optimization at the Max Planck Institute for Plasma Physics in Greifswald, Germany and chairman of the IEA (International Energy Agency) Stellarator-Heliotron Technology Collaboration Program; as well as from Stewart Prager, director of PPPL; Michael Zarnstorff, deputy director for research; Hutch Neilson, head of advanced projects; and David Gates, stellarator physics leader.



Ivan Vargas-Blanco gives a thumbs up as PPPLers applaud in an image captured in the live stream from PPPL to Costa Rica.

The small stellarator took six years and \$500,000 to build and makes Costa Rica the sixth country in the world to develop a stellarator to research fusion energy. The live stream of the first plasma can be viewed on YouTube at <https://www.youtube.com/watch?v=E92MiZp-vco>.



Ivan Vargas-Blanco watches pre-taped greetings from Michael Zarnstorff, deputy director for research.

The 2016 issue of Quest magazine is now available

The fourth annual issue of Quest, the glossy research magazine of PPPL produced by the Office of Communications, has hit the newsstands. Featured on the cover is a plasma produced in the National Spherical Torus Experiment-Upgrade with the headline "Here Comes the Sun." The publication is filled with highlights from wide-ranging activities and collaborations, and features descriptions of many research items. "This magazine shows the exciting and potentially world-changing nature of the research that is done here," said Science Editor John Greenwald, who edited the publication and wrote many of the articles.



The 24-page publication covers everything from fusion experiments and theoretical discoveries to plasma science research and awards that staff members have won. Accompanying the articles are color photos of researchers and their work. Writers include Communications Specialist Jeanne Jackson DeVoe and Science Writer Raphael Rosen. Photographer Elle Starkman took most of the photos.

The publication goes to all readers of the Princeton Alumni Weekly (PAW), which mails Quest to alumni, faculty and professional staff with the July issue of its own magazine. More than 90,000 PAW readers received Quest this year. The Office of Communications also sends copies to media, political figures, U.S. Department of Energy staff, fusion scientists, and other researchers around the world. Copies will also be available for PPPL staffers at mail stops throughout the Laboratory.

Terry Brog

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Prager said the Laboratory was “extraordinarily fortunate” to have John DeLooper, head of Best Practices and Outreach, serve as interim deputy director for operations for seven months. DeLooper filled the vacancy created by the resignation of Adam Cohen, who left PPPL in November to become deputy undersecretary for Science and Energy of the DOE. DeLooper’s work “has been intensive and extensive with superlative results,” Prager said. “We all owe him a big debt of gratitude for his *tour de force* effort during this time.”

Passionate about PPPL’s mission

Brog brings with him decades of experience in senior leadership positions in operations, project development, research and development management, and fiscal management. Brog said he came to PPPL seeking a new challenge and he is passionate about PPPL’s mission. “We are all very fortunate to work at a national laboratory,” Brog said.

He has been meeting with employees to explain his philosophy, which is focused on the DOE and PPPL’s mission and his vision of “operational excellence.” Brog said he believes in “individuals creating value for the DOE and PPPL. I’m a huge fan of operational excellence, team performance, individual contributions to team performance, efficiency and effectiveness, and meeting commitments and deadlines,” he said. “I have a very high level of expectations for employees and for me,” he said.

Learned about national laboratories as a child

Growing up in Columbus, Ohio, Brog wanted to follow in his father’s footsteps to become a nuclear engineer. He learned about many of the national laboratories when his father, Ken, was working for Battelle Memorial Institute, which manages several national laboratories. The job brought the elder Brog to Argonne, Oak Ridge, and Brookhaven national laboratories, and to PNNL.

Terry Brog was a high school athlete who went on to play football for Kenyon College in Gambier, Ohio. A Nov. 11, 1976, article in the Kenyon Collegian describes how “versatile Terry Brog turned from receiver to quarterback” to lead the team to a 17 to 7 victory over Case Western Reserve.

Looking back, Brog said his coaches were a strong influence. But he credits his father and his mother, Betty, with instilling his drive to succeed and to pursue higher education. Both parents set very high expectations.

Brog graduated with honors from Kenyon with a bachelor’s degree in physics. He pursued graduate studies at the University of Michigan, receiving dual master’s degrees in metallurgical engineering and nuclear engineering in 1982 (Crack Growth Retardation in Inconel 600) and a doctorate in metallurgical engineering in 1986 (Mechanical Properties of High Temperature Structural Ceramics).

He started his professional career with a position working for Champion Spark Plug, then located in Toledo, Ohio. He

went on to work at Coors Ceramics Co. (now CoorsTek) in Golden, Colorado, and other Colorado and California technology companies.

Leadership positions at several companies

A top manager at several companies, Brog helped lead Nytrox Systems Inc., a Boulder City, Nevada, company that makes cooling towers, out of bankruptcy as CEO and chairman of the board of directors. He helped double revenue at AlphaTRAC, Inc., a Westminster, Colorado, consulting firm specializing in risk assessment and emergency management. Brog also led the significant increase in both revenue and profitability at Ceramics Processing Technology, Inc. in Oceanside, California

Brog became the chief operations officer for PNNL’s Energy and Environment Directorate in 2008 and was responsible for operational oversight of this directorate with a staff of 900 people and a budget of \$235 million. His most recent position at the laboratory was manager of the Strategic Projects Division within the Facilities and Operations division. In addition to his PNNL duties, Brog was also chair of the Operations Committee for Brookhaven National Laboratory and a Battelle/Stony Brook board member.

Brog and his wife, Jill, an early learning specialist, have been married 34 years. The couple holds local board positions with several charitable organizations, including The Children’s Reading Foundation, The Boys & Girls Club, March of Dimes, and Catholic Families. They have two grown sons, Shaun and Ryan, both of whom live in Washington and work in the finance industry.

Brog has retained his strong interest in sports and is a fan of the Denver Broncos. He enjoys golf, working out, riding bicycles, and coaching sports teams when he has the time.

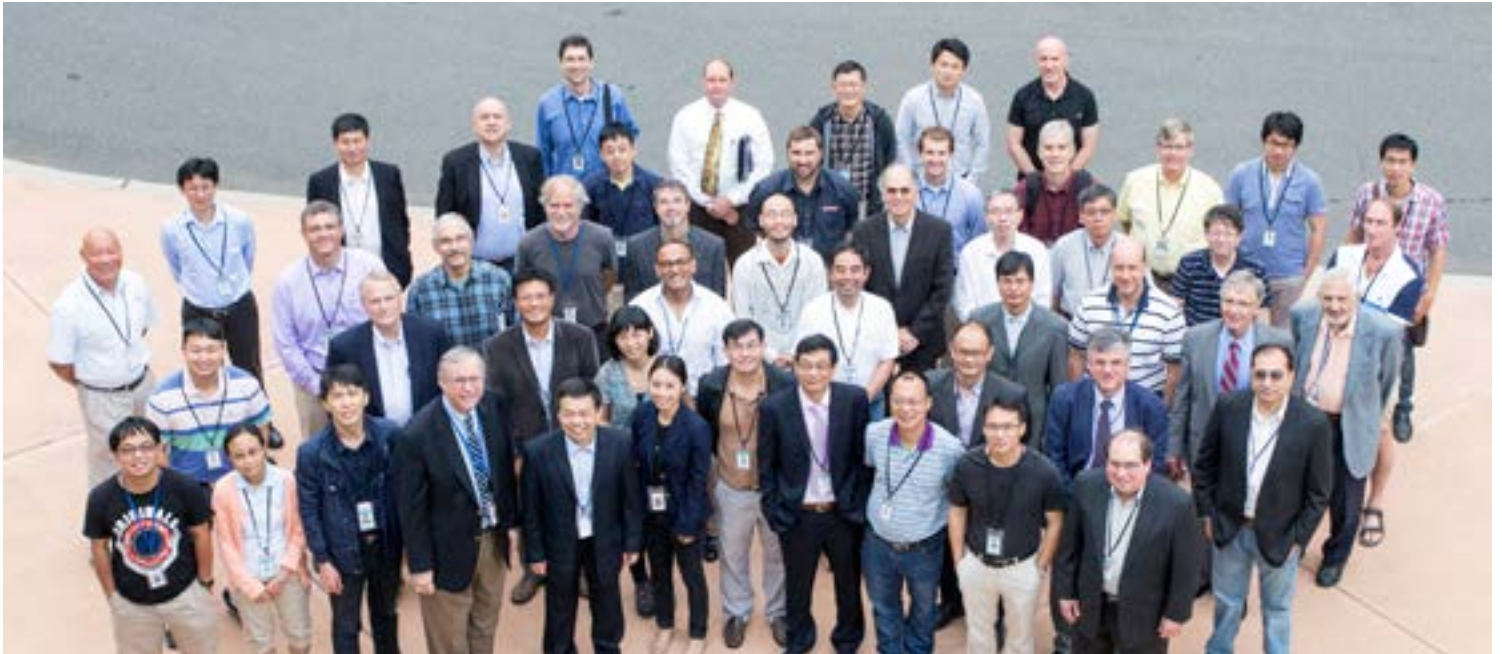
An emphasis on teamwork

His background as an athlete has given him a lifetime appreciation for teamwork, Brog said. “I want people to start focusing more on teams and team performance,” Brog said. “I’m far more interested in team performance than I am in individual performance.”

He takes seriously the trust that the public has put in PPPL as a national laboratory and wants all employees to feel the same responsibility. “We have the opportunity to impact everybody every day across the United States, and the world,” he said. “We really are quite fortunate. Who wouldn’t want to do that?”

PPPL’s new deputy director said he has an open-door policy. And employees throughout the Laboratory shouldn’t be surprised to find him stopping by to see how things are going. “I love going out on the floor,” he said. “I think initially people were surprised to see my face but everybody’s getting used to it.” 📍

Successful U.S.-China workshop on fusion research



Participants in the U.S.-China workshop on fusion research outside the Lyman Spitzer Building.

The biennial workshop on collaboration between the United States and the People's Republic of China (PRC) that PPPL hosted last month proved successful and effective for programs in both countries. The June 28-30 event, which brought together some 75 leading scientists, provided "very good discussion of opportunities for both China and the U.S. for further collaboration over the next two years," said Rich Hawryluk, head of the ITER and Tokamaks Department and local organizer of the event with administrative assistant Marilyn Hondorp. Topics during the workshop ranged from future experiments on China's Experimental Advanced Superconducting Tokamak (EAST) and the HL-2A facility to joint theory and nuclear science programs between the countries. Included during the three-day event was a poster session, a banquet and a tour of the Laboratory, in addition to presentations in the MBG Auditorium.

Volunteers needed at October Boy Scouts STEM Fair

Calling all Boy Scouts and friends of Boy Scouts. Please sign up to volunteer for PPPL's second Boy Scout Science & Technology Merit Badge Fair in October to help some 300 area Scouts get badges in science and engineering topics ranging from robotics to nuclear science.

Organizer Robert Sheneman estimates he will need 60 volunteers for the event on Saturday, Oct. 22. They will help out with registration, lunch, and other logistics, and lead the science and technology programs. The volunteer sign-up form is available [here](#).

Sheneman said engineers and physicists are especially needed to serve as subject area experts to work with Scout Merit Badge counselors to plan the requirements and hands-on activities or demonstrations for the programs and to lead



Steve Raftopoulos speaks to a group of Scouts at the 2013 Boy Scout STEM fair, which 250 Scouts attended.



A group of Scouts concentrates intently on constructing their robotic vehicle made from a Lego® Mindstorm kit.

the programs the day of the event. The activities have to be planned well in advance of the event so that Scouts can sign up for the badges and complete requirements before the event.

"The main objective here is to provide the kids an opportunity to earn a badge that isn't readily available," said Sheneman, a Boy Scout leader and lifetime Scout, who is organizing the event with the Washington Crossing Boy Scouts Council and organized a 2013 event. The Council encompasses Hunterdon and Mercer counties, and a little bit of Middlesex County, New Jersey, as well as Bucks County, Pennsylvania. The event is open to Boy Scouts throughout the area. 📍

PPPL to host worldwide conference on plasma-surface interactions in 2018

By John Greenwald

PPPL has been selected to host the 2018 biennial Conference on Plasma-Surface Interactions in Controlled Fusion Devices, the premiere conference on a critical fusion topic that will attract some 500 scientists from around the world. The event, scheduled for June 18-22, 2018, will take place in Richardson Auditorium on the main campus with support from the U.S. Department of Energy, Princeton University, the Massachusetts Institute of Technology and the University of California-San Diego.

Controlling plasma-surface interactions is a major challenge for the development of fusion energy. Plasma that is too hot at the edge can melt or damage tokamak walls and kick up impurities that cool the core of the plasma and halt fusion reactions. The walls themselves must be able to withstand the hot plasma particles that reach them.

“How do you keep the core hot and the edge plasma cool? That is a crucial question,” said physicist Rajesh Maingi, who submitted the Laboratory’s conference proposal to an international selection panel and chairs the local organizing committee. Physicists on the committee include Charles Skinner, deputy chair; Professor Egemen Kolemen, deputy chair and Princeton University point of contact; and Michael Jaworski. Also on the committee are Controller Svetlana Drapkin, Administrative Manager Carol Austin, Travel Administrator Robin Chang and Staff Accountant Helen Wotjenko.

Physicists will present some 100 orals at the conference and display about 400 posters. The many topics will include physics processes at the plasma-material interface, transport and control of impurity sources, and plasma edge and first-wall diagnostics, as well as presentations on liquid metal



Rajesh Maingi

boundaries, a PPPL strategic emphasis. Also included will be a banquet, excursion opportunities and soccer, with commemorative T-shirts provided to soccer participants.

In addition to the conference, a satellite meeting on “Hydrogen Isotopes in Fusion Reactor Materials” will be held at the University of Tennessee in Knoxville the week before or after the PPPL event. Brian Wirth, a Governor’s Chair professor in the nuclear engineering department at the University of Tennessee, will host the satellite conference. 📍

Composting discontinued except in cafeteria and restrooms

PPPL is no longer collecting composting in green bins throughout the Laboratory except in the cafeteria and lunchroom due to users discarding plastic trash and even knives and forks in the composting bins and contaminating the composting.

Composting facilities cannot use composting that contains plastic and other trash because they are unable to sell compost when it is contaminated and companies wind up throwing contaminated compost in the trash, said Margaret Kevin-King, Building and Grounds supervisor.

“Although there is a reduction in our compost collection, we are determined to continue to collect food waste for composting,” said Kevin-King. “We will monitor the café food waste and encourage staff to put only what’s required in the composting.”

PPPLers should continue to discard food and paper goods from the cafeteria in green composting bins in the cafeteria. Cardboard coffee cups and other dinnerware from outside the Laboratory should be discarded in the trash since it may be coated with plastic.

Paper towels from the restrooms will also continue to be composted, so PPPLers should avoid discarding anything but paper towels in the paper towel containers in restrooms. 📍



Plastic tops for coffee cups and soup containers, straws, and plastic knives and forks should be discarded in the trash. Clear plastic soda cups from the cafeteria should be discarded in recycling.

Bootstrap

continued from page 1

In this steep gradient region — or pedestal — the bootstrap current is large, enhancing the confining magnetic field but also triggering instability in some conditions.

The bootstrap current appears in a plasma when the pressure is raised. It was first discovered at the University of Wisconsin by Stewart Prager, now director of PPPL, and Michael Zarnstorff, now deputy director for research at PPPL. Prager was Zarnstorff's thesis advisor at the time.

Essential for predicting instabilities

Physics understanding and accurate prediction of the size of the current at the edge of the plasma is essential for predicting its effect on instabilities that can diminish the performance of fusion reactors. Such understanding will be vital for ITER, the international tokamak under construction in France to demonstrate the feasibility of fusion power. This work was supported by the DOE Office of Science.


The new paper, by physicists Robert Hager and C.S. Chang, leader of the Scientific Discovery through Advanced Computing project's Center for Edge Physics Simulation headquartered at PPPL, discovered that the bootstrap current in the tokamak edge is mostly carried by the "magnetically trapped" electrons that cannot travel as freely as the

"passing" electrons in plasma. The trapped particles bounce between two points in the tokamak while the passing particles swirl all the way around it.

Challenge to conventional understanding

The discovery challenges conventional understanding and provides an explanation of how the bootstrap current can be so large at the tokamak edge, where the passing electron population is small. Previously, physicists thought that only the passing electrons carry the bootstrap current. "Correct modeling of the current enables accurate prediction of the instabilities," said Hager, the lead author of the paper.

The researchers performed the study by running an advanced global code called "XGCa" on the Mira supercomputer at the Argonne Leadership Computing Facility, a DOE Office of Science User Facility located at the Department's Argonne National Laboratory. Researchers turned to the new global code, which models the entire plasma volume, because simpler local computer codes can become inadequate and inaccurate in the pedestal region.

Numerous XGCa simulations led Hager and Chang to construct a new formula that greatly improves the accuracy of bootstrap current predictions. The new formula was found to fit well with all the XGCa cases studied and could easily be implemented into modeling or analysis codes. 

PPPL'ers help out at Girl Scout STEM Conference



Atiba Brereton shows Girl Scouts a magnet.

PPPL volunteers helped out with a STEM Conference hosted by the Girl Scouts of Central and Southern New Jersey at Princeton University's Frick Chemistry Laboratory on June 25. Volunteers included Shannon Greco, Atiba Brereton, Jacob Maddox, Matt Parsons, Jacob Schwartz, a graduate student, and Angelica Ottaviano and Hanna Schamis, both SULI interns.



One of the Scouts has fun with the Van de Graaff generator.



Matthew Parsons does plasma demonstrations with Girl Scouts.

Engineering a picnic



PPPL's Engineering staff enjoyed burgers and hot dogs on the lawn of the Lyman Spitzer Building during the annual Engineering & Infrastructure picnic on June 24.



The event included a car show by PPPL employees. Pete Titus, right, shows off his 1930 Series 40 Buick to Ali Zolfaghari.



Engineers Hans Schneider, left, and Mike Mardenfeld are all smiles after helping themselves to food and soda.

(Photos by Raphael Rosen)

2016 Annual PPPL Fishing Trip Bottom Fishing for Fluke/Sea Bass

Date: Sunday July 24th 2016

Departure: 7:30AM SHARP!!!

Location: Belmar Marina Hwy. 35, Belmar, NJ 07719

Cost: \$80 Per person ALL INCLUSIVE

Cost includes everything Rods, bait, fish cleaning, food, beverages, All you need to do is show up!

Money due by Friday July 15th NO REFUNDS

Note: There will be a separate Bluefishing trip in September details to follow soon

**Contact Andy Carpe ext. 2118 acarpe@pppl.gov
Bob Tucker Jr. ext. 3190 rtucker@pppl.gov**



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 July 11	Tuesday July 12	Wednesday July 13	Thursday July 14	Friday July 15
COMMAND PERFORMANCE Chef's Feature	OTA- Ya Sushi	Ravioli Puttanesca with Olives, Capers, Red Onion, Garlic & Basil	Loaded Baked Potato Bar	Beef Stroganoff served over Egg Noodles	Pub Style Fish & Chips
Early Riser	Potato Skins with Egg, Bacon & Swiss Cheese	Steak, Egg & Cheese Quesadilla	Ham & Bacon Breakfast Strata	Ham Steak with White Country Gravy, 2 Eggs & Biscuit	2 Eggs Choice of Breakfast Meat & Tater Tots
Country Kettle	Chicken Gumbo	Spinach Tortellini Tomato	Italian Wedding Soup	Split Pea	Manhattan Clam Chowder
Grille Special	Corn Beef Reuben on Rye	Pork Roll, 2 Eggs & Cheese on a Kaiser with Tater Tots	Chicken Cacciatore Sub	BBQ Chicken, Cheddar Cheese, Onion Straws, Lettuce & Tomato on Kaiser Roll	Crab, Asparagus & Roasted Pepper Quesadilla
Deli Special	Tofu Burger	Italian Chopped Antipasta Wrap	Italian Hot Dog with Peppers, Onions & Potatoes	Shrimp Salad on Multigrain Bread	Chicken Parmesan Sub
Panini	3 Cheese Panini: Cheddar, Swiss & Blue Cheese with Bacon & Tomatoes on Sourdough	Mediterranean Fish Sandwich	Teriyaki Chicken with Grilled Pineapple, & Swiss Cheese on a Kaiser Roll	Asparagus, Sun-dried Tomatoes, Roasted Peppers & Mozzarella Cheese Wrap	Teriyaki Chicken, Peppers & Onions Quesadilla

	Monday July 18	Tuesday July 19	Wednesday July 20	Thursday July 21	Friday July 22
COMMAND PERFORMANCE Chef's Feature	Zesty Orange Chicken & Broccoli over Rice	Vegetarian Chili over Rice with Cornbread	Create your own Burrito Bar	Baked Macaroni with Ham served with Stewed Tomatoes	Linguine with Red Clam Sauce
Early Riser	Breakfast Club Sandwich	Greek Egg White Omelet with Spinach, Tomato, Peppers & Feta Cheese	Breakfast Pizza with Ham, Bacon & Sausage	Omelet Florentine with Spinach, Tomato & Mozzarella	Breakfast Tacos
Country Kettle	Mushroom Barley Kielbasa	Pasta Fagioli	Chicken & Quinoa	Tomato Spinach Lentil	Seafood Bisque
Grille Special	Colossal Burger with 2-5.3 oz patties, American Cheese, Lettuce, Tomato & Onion	Pepperoni Pizza Steak Sandwich with Fries	Tuna Melt on Rye served with Onion Rings	Taco Dogs	Spinach Salad with Turkey Bacon, Hard-Cooked Egg, Mushrooms & Raspberry Vinaigrette
Deli Special	Stacked Veggie Sandwich with Guacamole	French Dip with Swiss Cheese, Caramelized Onion & Horseradish Cream served with Potato Wedges	Prosciutto, Pesto, Roasted Peppers & Arugula on Ciabatta	Krabby Kake on a Kaiser with Lettuce & Tomato	Buffalo Chicken Wings with Blue Cheese, Fries & Celery
Panini	The Cubano	Popcorn Chicken & Mashed Potato Bowl topped with Seasoned Corn & Country Gravy	Southwest Turkey, Peppers & Cheddar with Jalapeno Ranch Spread	Tomato & Fresh Mozzarella on Ciabatta with Basil, Red Onion & Arugula	Turkey French Dip with Swiss Cheese

MENU SUBJECT TO CHANGE WITHOUT NOTICE

HEART HEALTHY

VEGETARIAN OPTION

WEEKLY

Editor: **Jeanne Jackson DeVoe** ♦ Layout and graphic design: **Andrew Matlack** ♦ Photography: **Elle Starkman**
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The PPPL WEEKLY is published by the [PPPL Office of Communications](#) on Mondays throughout the year 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 ♦ PPPL WEEKLY is archived on the web at: <http://w3.pppl.gov/communications/weekly/>.