

At PPPL THIS WEEK

FRIDAY, APR. 3

Deadline for Green Machine Award Nominations

Fill out a form at <http://tinyurl.com/m5feqnd> or email Margaret King (mking@pppl.gov) or Leanna Meyer (lmeyer@pppl.gov).

Open Public Tour

10 a.m. ♦ LSB Lobby

Email jjackson@pppl.gov to register

UPCOMING

WEDNESDAY, APR. 8

Colloquium

4:15 p.m. ♦ MBG Auditorium

[Dawn, the Asteroid Redirect Mission, and the Future of Solar Electric Propulsion](#)

Dr. John Brophy, NASA Jet Propulsion Laboratory

WEEK OF APR. 13

Lab-wide office cleanup

FRIDAY, APR. 17

Open Public Tour

10 a.m. ♦ LSB Lobby

Email jjackson@pppl.gov to register

TUESDAY, APR. 21

Grounds Cleanup

10:30 a.m.

Lunch for volunteers

April 23 rain date

WEDNESDAY, APR. 22

Earth Day Celebration at PPPL

Exhibits, Earth Day video, and special Earth Day colloquium

THURSDAY, APR. 23

Laboratory Management Meeting

SUNDAY, APR. 26

[Communiversities at Princeton University and downtown Princeton](#)

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PPPL data may play role in first NASA space probe dedicated to magnetic reconnection

By Raphael Rosen

At 10:44 p.m. on Thursday, March 12, NASA launched the Magnetospheric Multiscale mission (MMS), a set of four spacecraft that will study the magnetic fields surrounding Earth. Sent into space aboard an Atlas V rocket from Cape Canaveral, the craft mark the first NASA mission dedicated to investigating magnetic reconnection, a mysterious phenomenon that gives rise to the northern lights, solar flares and geomagnetic storms that can disrupt cell phone service, black out power grids and damage orbiting satellites.

The 2.5-year mission may employ data provided by PPPL, which operates the Magnetic Reconnection Experiment (MRX), the world's leading laboratory facility for studying reconnection. Results of the MRX research could elucidate the space probes' findings, said Masaaki Yamada, principal investigator of the MRX project.



The Atlas V MMS is rolled out to the launch pad. (Photo courtesy of NASA)

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Young women find fun and inspiration at PPPL's Young Women's Conference

By Jeanne Jackson DeVoe

Twelve-year-old Puja Vengadasalam was having a full day. She had toured a Princeton University machine shop and was having fun taking part in science activities at PPPL's Young Women's Conference. She particularly enjoyed watching PPPL's 3-D printer make plastic chains and other objects.

Puja's eyes lit up when she talked about all she had done that day. And that's exactly what the conference is about. The goal of the yearly event is to ignite girls' interest in science and technology. The hope is that spark of interest will lead girls to consider STEM fields and to aim high in their careers. But some girls like Puja already have set



Alex Millet-Ayala, a SULI intern at PPPL from the University of Puerto Rico, looks on as a student tries out the Van de Graaff generator.

lofty goals for themselves. When asked what she wants to be when she grows up, Puja didn't hesitate. "I'd like to be president," she said. "That's my main plan."

Puja was just one of 450 7th to 10th grade girls from 60 middle and high schools throughout New Jersey and from Pennsylvania and as far as Maryland attending the March 19 conference at Frick Chemistry Laboratory at Princeton University, which was the largest in PPPL's 14-year history of hosting the event.

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Magnetic Reconnection

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The Atlas V MMS launched on March 12.
(Photo courtesy of NASA)

Reconnection takes place when the magnetic field lines in plasma merge and snap apart with violent force. But NASA is flying blind in a sense when seeking such events, since mission operators don't know precisely where reconnection will occur in space or what the data it produces will look like. And since the explosive events occur in milliseconds, the MMS craft, orbiting in tight formation at an average speed of some 20,000 miles per hour, will have only fleeting moments to detect and measure the phenomena.

The MRX data could facilitate such detection. Comparing the data with signals from space will enable instruments aboard the craft to spot actual instances of reconnection taking place. "In space, you come across magnetic reconnection by chance," said Hantao Ji, a Princeton professor of astrophysical sciences who works with Yamada on the MRX. "In the Lab, however, the environment is carefully controlled so we know exactly when and where reconnection happens."


NASA scientists aware of MRX research

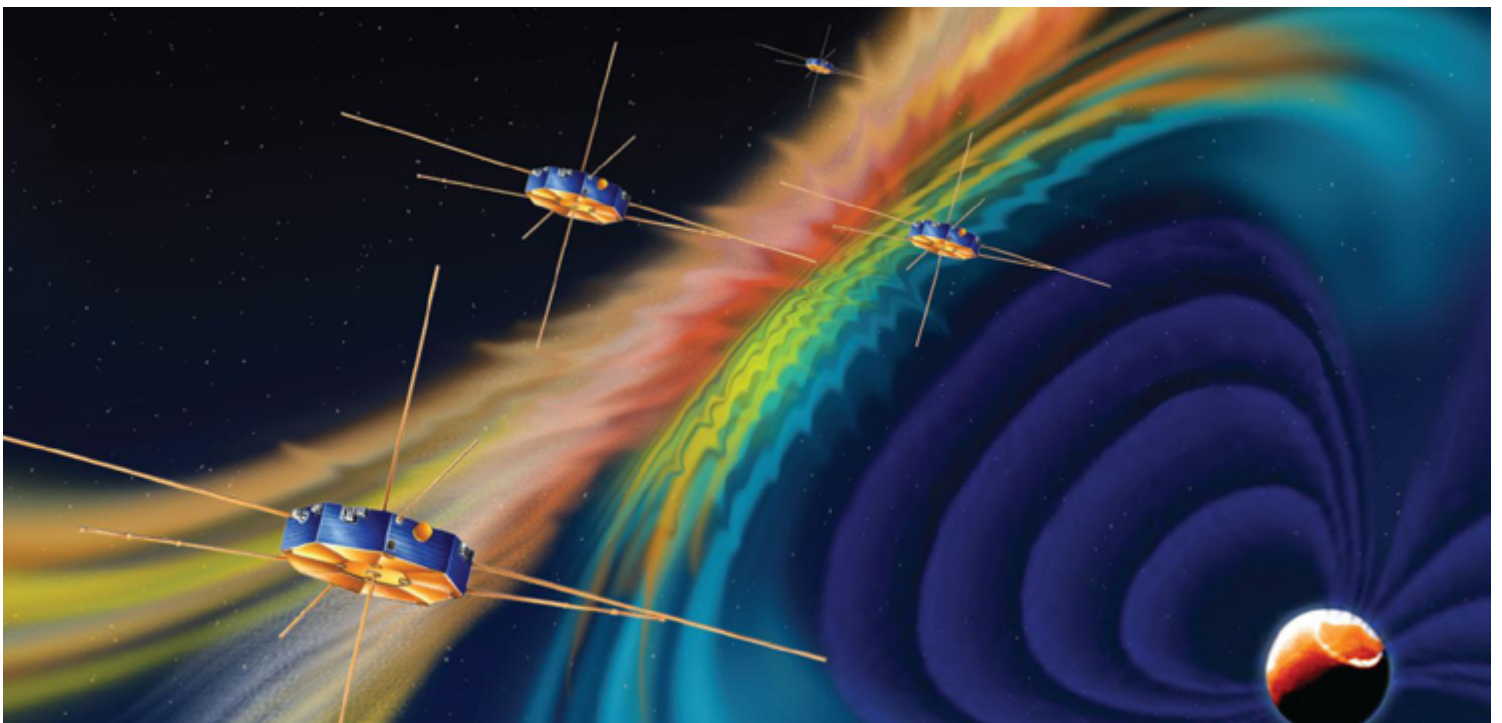
NASA scientists are aware of the Laboratory's findings. "I talk with the MRX guys at PPPL a lot and they have made some fundamental discoveries," said Jim Burch, principal investigator for the \$1.1 billion MMS mission. "Up until now it's been a one-way street since we haven't collected any space data. But once we do that I definitely would like to make use of the MRX data."

Better understanding of magnetic reconnection could lead to better methods of defending mankind's electrical infrastructure from powerful reconnection events, as well as a clearer understanding of the universe's physical processes. And since reconnection can also take place in, and drain energy from, fusion plasmas such as those in PPPL's National Spherical Torus Experiment, increased understanding can lead to better control of fusion reactions that researchers are studying as a clean fuel for generating electricity.

Results of the MMS mission could also be used to validate computer simulations of magnetic reconnection that are being performed at PPPL. Among those attending the launch in person last week was Amitava Bhattacharjee, head of the PPPL Theory Department and co-director of the Princeton Center for Heliospheric Physics, which is developing a computer code to model as precisely as possible the role of reconnection in geomagnetic storms.

"The lift-off was spectacular," said Bhattacharjee, who watched the launch from a set of bleachers. "It is amazing that the entire mission is dedicated to understanding the physics of reconnection, and that is an opportunity of a lifetime for many."

Data from the mission could further prove useful for the next generation of MRX called the Facility for Laboratory Reconnection Experiment, or FLARE, with Ji as principal investigator. When completed in 2016, the powerful new PPPL device will enable scientists to better replicate reconnection in nature. Such findings could then be compared with results of NASA's MMS probes for the benefit of both the Earth-bound and space projects. 



An artist's rendition of the MMS spacecraft in the magnetosphere. (Image courtesy of NASA)

Young Women's Conference

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Inspiring young women to consider STEM careers is particularly important given how women continue to lag behind men in many STEM fields. According to statistics compiled by the National Science Foundation, 25 percent of the total number of computer and math scientists in 2013 are female. Women compose a small percentage of other fields as well: 15 percent of engineers are women and 12 percent of all physicists and astronomers are female.

The seventh- to tenth-grade girls attending the Young Women's Conference got to try out hands-on experiments at 25 exhibits, tour laboratories and hear panel discussions about women in science. The day culminated with a keynote speech by astrophysicist Kerstin Perez, who studies dark matter. She discussed how her passion for physics led her to a career in which she can explore uncharted territory. In her case, that exploration involves understanding what composes the universe.

Perez noted that just one out of five people earning physics degrees are female. "I walk into a room or go to a conference and everyone knows who I am," she said. "I really applaud this conference for doing something to turn this around."

A talking robot highlights activities

The girls enjoyed hands-on activities that involved FBI investigators, alternative energy, plasma demonstrations – including a plasma speaker, PPPL's 3-D printer—and a robot that danced the Macarena.

Nicole Allen, an engineer at PPPL, was one of 60 volunteers from PPPL and Princeton University. She helped out with PPPL's MINDS (Miniature Integrated Detection System) exhibit. Allen said she enjoyed speaking to the students about her own career. "I think it's good to talk to the girls about engineering because seeing someone who's doing it is helpful," Allen said. "They asked me why I went into it when I knew it was hard. I said I knew it was hard but I have a really active mind and I'd rather do something that's difficult all the time and that challenges me than be bored."

Students also toured the chemistry, neurology and psychology, and geoscience and oceanography laboratories and a machine shop. They heard panel discussions with female researchers from Bristol Myers Squibb and from Celvive, a company developing regenerative pharmaceuticals. "It's awesome,"



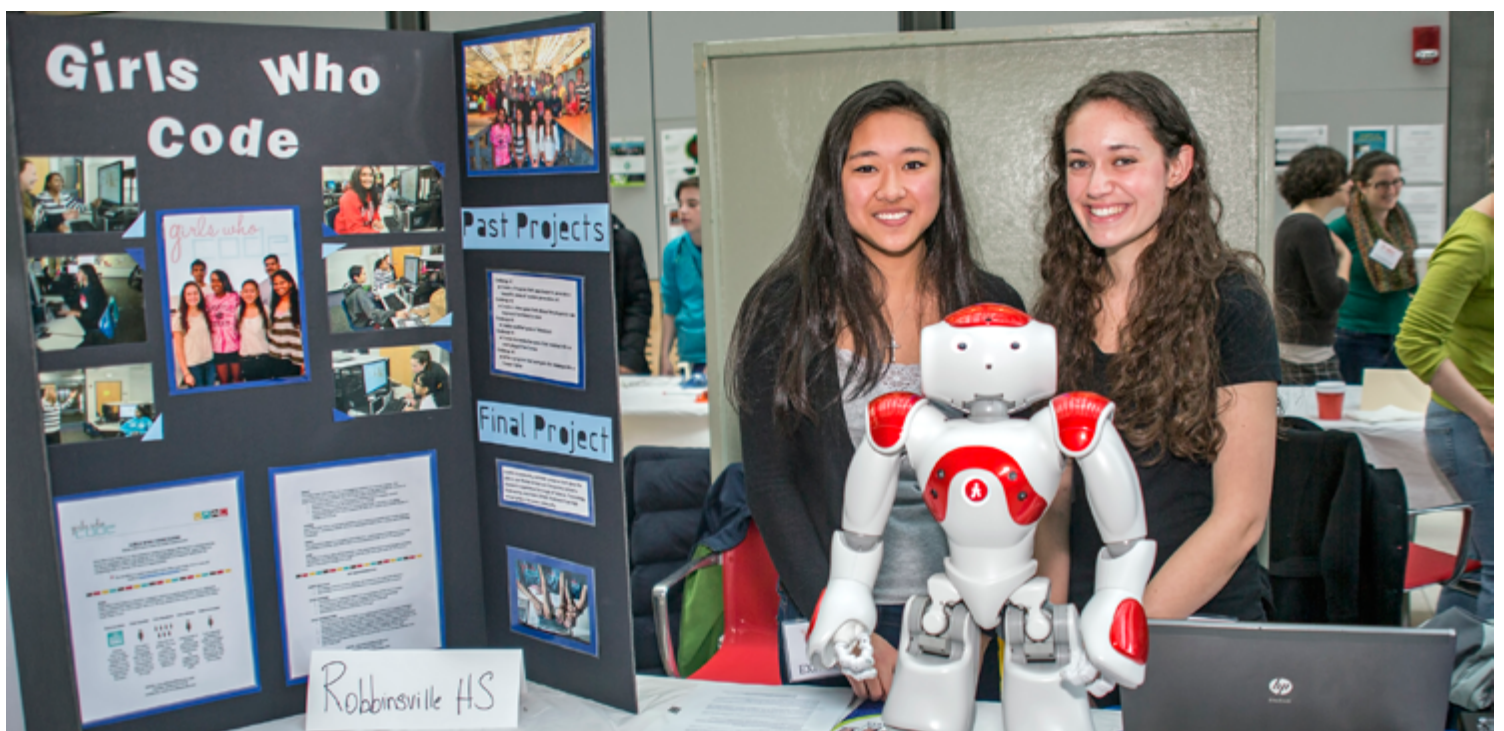
Nicole Allen, a PPPL engineer, demonstrated the MINDS project at the conference.

said Dallas Noble, a ninth grader from Hopewell Township who is home schooled. "There's so much stuff here!"

Winnie Daloba, from Highsdale Middle School's honors program, said she loves science and math but many of her friends don't share her passion. "Not all my friends like science," she said. "I think it would help if they would come here."

Andrew Zwicker, head of Science Education, told the girls it was great seeing them enjoy various activities at the conference. "We're trying to make an energy source at PPPL and if we could bottle your energy source, we'd be done," he joked.

He led the group in giving a huge cheer and a round of applause for Science Education Program Administrator Deedee Ortiz, who organized the tour. "She is the reason why this event is so successful," Zwicker said. "She is the reason why more and more students are coming from more and more places."



Members of Girls Who Code, a club at Robinsville High School, display the robot that they programmed to dance and do Tai Chi.

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Young Women's Conference



Two girls show off DNA models at the RCSB Protein Data Bank (Photo by Carol Ann Austin)

Finding inspiration in physics for the real world

In her keynote speech in Princeton's Richardson Auditorium, Perez discussed not only the obstacles she has faced but also her inspiration. As a girl growing up in West Philly, she was "an indoor kid" who had two major interests: art and "building things." While she was always a good math student, it wasn't until her junior year in high school that she discovered how math could be translated in physics to make predictions about "the real world." "I could take a ball and let it go and using that math I could tell you exactly when it would hit the stage," she said. "This was a revelation that I could take this abstract math and translate it into the real world."

But as an undergraduate studying physics at Columbia University, Perez said she experienced self-doubt that seems to be all too common among female scientists. As the science and the predictions get more accurate, they also get harder, she said, "and you actually start to question, 'Am I really good at this?' You look around the room and you think everyone else is really smart and you're like, 'They have no problem. Maybe I should stop and do something else.'"



Science Education Program Administrator Deedee Ortiz organized the conference.

Perez said female scientist friends whom she asked to give advice for the speech remarked on the same phenomenon and said the male students never seemed to doubt themselves even when maybe they should have. "The dudes all think they're going to be the next Einstein," said Gurtina Besla, a physics professor at the University of Arizona. "The guys would be saying, 'I got this,' even if they don't, whereas the women would have it and say, 'I don't know.'"

Perez said she found her calling in physics when she learned about dark matter, the mysterious material that makes up the universe. She said she was amazed that there is so much mankind doesn't know about the universe. "No one ever told me that there are these huge open questions, fundamental things that we don't know about," she said.

After graduating from the California Institute of Technology, Perez worked on ATLAS at CERN in Switzerland where she helped prepare for the first Large Hadron Collider experiments.

Perez said she was one of 8,000 scientists from dozens of different countries working at CERN. But while the work was exciting, Perez said she decided she would rather work on something on a smaller scale. She then worked on the GAPS experiment in Japan, which uses a large balloon to explore



Keynote speaker Kerstin Perez, an astrophysicist who studies dark matter, dispensed advice about a career in the sciences.

evidence of new particle interactions. She went on to work on analyzing high-energy X-ray signals from the Galactic Center with the NuSTAR satellite telescope array to look for exotic particle physics processes. She is continuing her research as a professor at Haverford College in Lancaster, Pennsylvania.

During a question and answer session after the speech, a student asked Perez if she was ever treated differently from male researchers. Perez said she never felt any overt discrimination but she did see evidence of unconscious bias at times. When she was out with a male colleague and he told people he was a physicist, people would say, "That's really hard!" or "That's really cool!" Perez recalled. "When I said I was a physicist people would ask, 'Why?' I didn't match what they thought a physicist should be."

Another student asked whether Perez ever doubted herself because she was surrounded by so many men. "I never consciously thought, 'I'm a woman I can't do this,'" Perez said. "But I did struggle with doubt. One piece of advice is believe people when they compliment you. In my brain, I would be like, 'They're just being nice.' When people give you an A, it's because you did a good job." 📌

Young Women's Conference



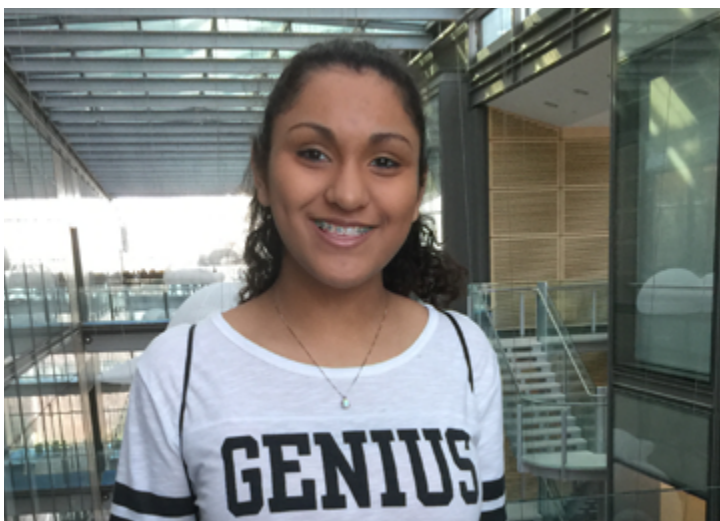
Brianna King, far left, the daughter of Margaret Kevin-King, and her friends from Marlton, New Jersey, are all smiles at Princeton's Richardson Auditorium.



An overhead shot of PPPL exhibits, which included a 3-D printer, center.



Girls try on firefighter gear at PPPL's Emergency Service Unit's exhibit at the Young Women's Conference.



Diana Richards, an eighth grader at Melvin H. Kreps Middle School in East Windsor, pauses for a photo during a tour of the Frick Chemistry Laboratory. (Photo by Kitta MacPherson).



Winnie Dalobi, right, an eighth grader, came all the way from Maryland to attend the conference.

Green Machine Award nominations

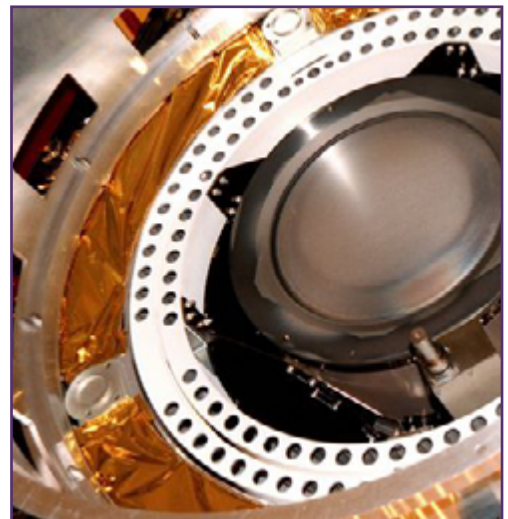
Please submit nominations for PPPL'ers who are helping to keep PPPL green by filling out a form at <http://tinyurl.com/m5feqnd> or emailing Margaret King (mking@pppl.gov) or Leanna Meyer (lmeyer@pppl.gov).

The application deadline is April 3.

COLLOQUIUM

Dawn, the Asteroid Redirect Mission, and the Future of Solar Electric Propulsion

Dr. John Brophy
NASA Jet Propulsion Laboratory



Wednesday, April 8
4:15 p.m. (coffee/tea at 4 p.m.)
M.B.G Auditorium, Lyman Spitzer Building

Brock & Co. Presents The Celebrity Guest Chef Series

Some of the biggest names in the business, from Gordon Ramsey to Paula Dean, will be right here at The Brock Café... Kind of.

Each month we will feature some of the favorite dishes of some of today's brightest culinary stars, preparing the recipes from the "Guest Chef's" own cookbook.

Everyone who purchases the featured special will not only enjoy a wonderful meal, but will also be entered into a drawing to win one of several of the "Guest Chef's" cookbooks that will be given away that day.

APRIL: Alton Brown
"Feasting on Asphalt"

MAY: Anthony Bourdain
"Les Halles"

JUNE: Paula Dean
"Southern Cooking Bible"

BROCK

MARK GAZO
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 March 30	Tuesday March 31	Wednesday April 1	Thursday April 2	Friday April 3
COMMAND PERFORMANCE Chef's Feature	Fried Chicken Macaroni & Cheese with Peas	CELEBRATING NATIONAL CLAM DAY Choice of Pasta with Red or White Clam Sauce	COMMAND PERFORMANCE Carla's Pasta Bar	Beef Empanadas Served with Rice & Salsa	White Seafood Lasagna Served with Garlic Bread
Early Riser	Bacon & Cheddar Cheese Omelet Wrap	Bacon, Pea & Goat Cheese Frittata	Raisin Bread French Toast	Chocolate Banana Pancake Breakfast Casserole	Broccoli Cheddar Breakfast Pizza
Country Kettle	Tomato Fresh Basil Soup	New England Clam Chowder	Lentil Soup	Chicken Rice	Cream of Mushroom with Sherry
Grille Special	Patty Melt-Hamburger, Caramelized Onions and Swiss on Rye	Italian Sausage, Broccoli Rabe, Roasted Peppers and Provolone on French Bread	Fried Catfish with Mango Tango Black Bean Salsa Served with Hushpuppies	Chicken Tender Po' Boy with Cajun Remoulade & Hushpuppies	Caesar Salad Made to Order
Deli Special	Grilled Vegetable Antipasto	French Dip Sandwich	New Orleans Muffaletta	Tuna Salad & Provolone French Bread Hoagie	Fish Parmesan Sandwich
Panini	Roast Beef, Ham, Provolone and Roasted Peppers on Ciabatta with Pesto Mayonnaise	Buffalo Chicken Quesadilla	Turkey, Ham & Swiss Melt on Ciabatta	Portobello Mushroom, Roasted Pepper, & Spinach on Ciabatta Bread	Asian Salad with Beef

MENU SUBJECT TO CHANGE WITHOUT NOTICE

Menu Item is in keeping with American Heart Association (AHA) and U.S. Department of Agriculture (USDA) guidelines.

VEGETARIAN OPTION

WEEKLY

Editor: **Jeanne Jackson DeVoe** ♦ Layout and graphic design: **Kyle Palmer**

Photography: **Elle Starkman** ♦ Science Editor: **John Greenwald** ♦ Webmaster: **Chris Cane**

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/>.