

Calendar of Events

THE MONTH OF MAY

National Inventors Month

SUNDAY, MAY 1

Bike Month Challenge begins!
[See page 7 for details.](#)

WEDNESDAY, MAY 4

PPPL Colloquium
11 a.m.-12:30 p.m. ♦ MBG Auditorium
[Modern Surgical Technology](#)
Chuck Pell, Physicist

UPCOMING

MAY 11-12

PPPL Advisory Committee

WEDNESDAY, MAY 17

PPPL Colloquium
4:15 p.m. ♦ MBG Auditorium
[ITER Status](#)
Dr. Mark Henderson, ITER Organization

FRIDAY, MAY 27

**Princeton University
Reunions Tours**
10-11:30 a.m., 1:30-3 p.m.

JUNE 6-10

**SULI program begins with
one-week course for students**

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Robotics Coaches Needed **7**

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Congressman is enthusiastic about fusion and PPPL

By Jeanne Jackson DeVoe

U.S. Rep. Rodney Frelinghuysen (R-11), New Jersey's senior member of the House Appropriations Committee, toured PPPL's National Spherical Torus Experiment-Upgrade (NSTX-U) and met with early career physicists and graduate students during a visit to PPPL on April 22.

Frelinghuysen, an 11-term Congressman who serves a North Jersey district that includes communities in Morris, Sussex, Passaic, and Essex counties, has been a long-time supporter of fusion energy and of PPPL. He was enthusiastic about PPPL's work during his tour. Frelinghuysen said the \$94 million NSTX-U "puts us in a good shape. This machine is the most important machine of its type," he said.



U.S. Rep. Rodney Frelinghuysen, center, with Stewart Prager, left, PPPL director and Christopher L. Eisgruber, Princeton University president. Second row from left to right is Jonathan Menard, program director for NSTX-U, Michael Zarnstorff, deputy director for operations, and Dave McComas, Princeton University vice president for PPPL. Third row: Stefan Gerhardt, head of experimental research operations for the NSTX-U, left, and Pete Johnson, U.S. Department of Energy Site Office Manager for PPPL.

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No sharks in the tank but plenty of inventions at first Innovation Discovery Event

By Jeanne Jackson DeVoe

Two PPPL inventors and a Princeton University inventor "swam with the sharks" recently when they presented their inventions to a panel of scientists, entrepreneurs, business people, and a student during the inaugural PPPL and Princeton University Innovation Discovery Event on April 21.

Like the television reality show, "Shark Tank," the event was focused on innovative ways to develop the scientists' inventions. But the similarity ended there, since the Innovation Discovery Event focused solely on the positive with no sharks in sight. And that was the intention of Mike Reilly, and his partner Brian Metzger from TechLink in Bozeman, Montana, who have organized more than a dozen such events.

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PPPL honors PPPL'ers' green efforts with Green Machine awards

PPPL extended the Earth Week celebration into last week with a celebration of PPPL staff members who help keep the Lab green and other events last week.

The Green Machine awards on May 27 featured the awards presentation and a short video, "The Story of Stuff." Audience members received cupcakes and "dirt cups," (chocolate pudding and gummy bears) and office plants. Several green vendors also had free giveaways and information in the lobby prior to the event. Green Machine award winners received green suncatchers.

Green Machine recipients were:

Dana Eckstein for her work as an active member of the PPPL Green Team and a sustainability advocate. She has come up with innovative ways, like the Recycled Fashion Show, to promote recycling and composting to PPPL employees.

Timothy Stoltzfus-Dueck for making sure he is commuting green with either his bike or his electric car. His green commute saves about 2,500 miles per year in hydrocarbons to and from PPPL.

Material Services staff members for coordinating internal use of property and excess property from DOE sites and federal agencies. In fiscal year 2015, the program led to the acquisition of 3,400 items of excess property valued at more than \$3 million. Fran Cargill, Shanda Carmichael, Kyron Jones, Adam Salmon, Jason Wohlberg, Margaret Carpe, Marisol Ovalles, Jim Conover, Pattie Potts, Jose Rodriguez.

Members of the C-Site MG 101 Demolition team for recycling nearly 7 million pounds of concrete and more than 118,000 pounds of steel, thereby saving an estimated 1,836 cubic yards of landfill space. Chi Man Cheung, Erik Perry, Dick Yager, Dave Moser, Fredy Rabanales, Rob Miller, Keith Rule, Rick Horner, Mark Swanek & Akeem Robinson.

Andrew Zwicker and a team of engineers and technicians who upgraded the electrical system and rigging components in the Power-In-A-Box, a shipping container fitted with working solar panels and wind turbine that can be used for research and to demonstrate alternative energy to students and visitors. Zwicker, Art Wise, John Lacenere, Craig Shaw, Fred Simmonds, Doug Voorhees, Chad Ennis and Glenn Anderson. 🌱



Garry Stevens talks to a vendor about biodegradable products.



Christopher Roames, Yonghong Wu, and Ambica Nandanavanam check out the plants given to Green Machine Award audience members.



PPPL'ers took a nature walk along the D&R Canal led by Stephanie Fox, a N.J. Department of Environmental Protection naturalist on April 26. From left to right: Dana Eckstein, Mark Hughes, Leanna Meyer, Andrea Moten, Virginia Finley, Mark Swanek, Liang Xu, and Adolfo Amaya. (Photo by Stephanie Fox)



Celebrating the Green Machine awards are: Front row, left to right: Akeem Robinson, Ewa Kontor, Dana Eckstein, Margaret Carpe, Marisol Ovalles, Shanda Carmichael, Patti Potts, and Fran Cargill; second row left to right: Fredy Rabanales, John DeLooper, Jose Rodriguez, Dave Moser, Kyron Jones, and Craig Shaw. Back row left to right: Rob Miller, Rick Horner, Timothy Stoltzfus-Dueck, Mark Swanek, Jason Wohlberg, Adam Salmon, Glenn Anderson, John Lacenere, Chad Ennis, Andrew Zwicker, and Rob Sheneman.

Rodney Frelinghuysen visits PPPL

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First stop on the tour was the NSTX-U Control Room where Jonathan Menard, program director for NSTX-U, and Stefan Gerhardt, principal research physicist and head of experimental research operations for the NSTX-U, gave him an overview.

“It’s a big improvement,” Menard said of the \$94 million upgrade, which was completed last year. “We want to thank you very much for your constant support in making this experiment possible.”

Menard explained that the upgrade includes a new center stack and a second neutral beam. The machine has doubled the magnetic field and doubled the plasma current to double the length of the pulses or “shots” to two seconds. Eventually, the pulses will be five seconds, Menard said. “This is significant for higher temperatures and much closer to fusion conditions,” he said.

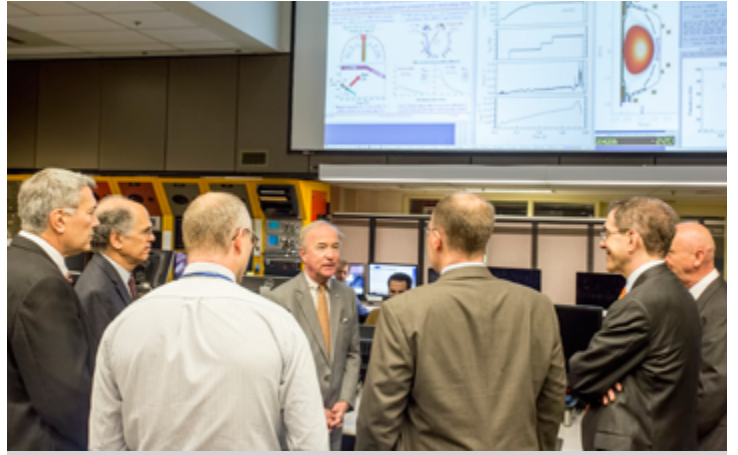
The NSTX-U is a spherical tokamak that could provide a model for future fusion power plants, Menard said. One of the main goals of NSTX-U, Menard explained, is to “see if we can do fusion more efficiently in a smaller and more compact device.”

The potential of fusion energy is worth the investment and effort, said Princeton University President Christopher L. Eisgruber, who accompanied the congressman on the tour. “The end payoff is one that’s world-changing,” he said.

Stewart Prager, PPPL director, noted that NSTX-U’s center-stack was built in-house at PPPL. Gerhardt said the upgrade makes use of a neutral beam and other components from the Tokamak Fusion Test Reactor, the experiment that was operating in the 1990s.

A highlight of the visit was a tour of NSTX-U led by Menard, Gerhardt, and John DeLooper, acting deputy director for operations. The welding alone accounts for 800 to 1,000 pounds of the machine, Menard said, pointing out the steel supports.

The NSTX-U’s electricity use is provided by a dedicated trunk line, which PPPL shares with New Brunswick and Trenton, Menard said. PPPL also makes use of two giant motor generators, he said. “There is 5,000 homes worth of heating power coming into the machine,” he said.



Rodney Frelinghuysen, center, visited the NSTX-U Control Room with from left to right: David McComas, Stewart Prager, Stefan Gerhardt, Jonathan Menard, Christopher L. Eisgruber, and John DeLooper, acting deputy director for operations.

Fusion energy would not only be clean and abundant, Menard said, it would also be relatively safe since failed reactions simply fizzle out. “A fusion reaction is more like an engine,” he said. “As soon as you take away the fuel, it ends.”

At the conclusion of his tour, Frelinghuysen stopped Joe Winston, a technician who works at NSTX-U, and asked him how long he had been at the Laboratory. He was impressed by the answer. “This gentleman has been here for 47 years!” he said.

Frelinghuysen later met with early career scientists and staff and graduate students. He appeared very interested in the scientists’ research and in PPPL’s work with the international fusion experiment ITER in Cadarache, France, said Shannon Greco, a program leader in Science Education. “I think he’s generally very supportive of the Lab and of ITER, and of science education,” she said.

Frelinghuysen said he remains a big fan of PPPL. “I only have a positive view of the Laboratory,” he said after the tour. “There’s a tendency in this state not to recognize what a center for brain power and ingenuity lies here.”



Rodney Frelinghuysen, second from left, talks to John DeLooper, left, Christopher L. Eisgruber, and Jonathan Menard at NSTX-U.

Innovation Discovery Event

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"I call it 'Guppy Tank,'" Reilly joked. "It's like being nibbled to death by guppies. The idea is not to talk at each other but to exchange ideas and support the technologies."

The event was hosted by PPPL and by Princeton University's Office of Technology Licensing, with technology transfer professionals from other universities and government laboratories invited. Panelists and guests had to sign a non-disclosure form about the technologies. Inventions presented were: a technique to use plasma to sterilize bottles and other objects presented by physicist Philip Efthimion; an advanced liquid centrifuge presented by physicist Erik Gilson; and a technique to detect and identify chemical compounds using a new type of spectroscopy by Arthur Dogariu, a research scholar and lecturer in the Mechanical and Aerospace Engineering Department at Princeton.

"Our work has given us expertise in a lot of areas," said PPPL Director Stewart Prager, who welcomed the group. Those areas include vacuum technologies, material science, codes for supercomputers, and "big high-voltage systems," he said. There are also numerous applications for plasmas from rocket thrusters to semiconductor chips to medical applications, he said



Mike Reilly, of TechLink, the emcee of the event, had panelists and audience members think up cartoon captions to initiate the brainstorming process.

The brainstorming sessions works this way: The inventor comes in and gives an overview of the technology and answers questions to help the panelists understand the technology. The inventor then sits down and the panel is given a few minutes to brainstorm on their own – with no idea considered too wild or unfeasible. The panel shouts out ideas and Metzger, who served as stenographer, writes them down in categories and displays them as virtual sticky notes on a big screen for everyone to see.

Reilly serves as master of ceremonies and encourages the panelists to spin out ideas in the category of, say, industrial applications. The panelists create new categories and Reilly also takes suggestions from the audience. Then the panel votes on how well the invention fits with the broad categories, the economic value to those categories, and the market size for the invention in those categories. After the session is over, Reilly and Metzger put the information together and issue a report summarizing the sessions, which Laurie Bagley, head of technology transfer at PPPL, and Michael Tyerech, a senior licensing associate in the Princeton Office of Technology Licensing, will share with the inventors and come up with a plan to use the ideas.

Bagley said PPPL and Princeton University plan to continue offering the event every six months to a year and will alternate venues and hosts. The University will host the next discovery event featuring two University inventors and one PPPL inventor.



Phil Efthimion presents a plasma sterilization technique invented by former head of technology transfer Lew Meixler and physicist John Schmidt, who died in 2013.

Plasma sterilization for bottles and containers

The first to present was Efthimion, head of the Plasma Science and Technology Department, who presented a technology invented by Lewis Meixler, the former head of technology transfer, and physicist John Schmidt, who died in 2013. The technology uses a low-temperature plasma that sterilizes objects using ion bombardment in which ions accelerated by a high voltage pulse kill the bacteria. The current technology for bottles, Efthimion said, uses hot steam to sterilize bottles. This means that the bottling industry must use glass, polymers that can withstand high temperatures, or metal containers. The process takes 10 minutes and requires that bottles be dried and produces wastewater, he said.

The plasma sterilization method would allow the beverage industry to replace more expensive bottles with cheaper plastics. The plastic bottles are placed in a metal container and electrodes are inserted into the bottle. A radio frequency antenna is used to produce a plasma and the ions produced in the plasma kill the bacteria, Efthimion said. When the technology was tested on 10,000 samples of bacteria spores, the spore instantly exploded. "There's no survival rate, the spores are all annihilated," Efthimion said.

Efthimion said the technology could be used in the beverage industry, including beer, in the cosmetic industry or with medical equipment. "What's not to love," said Katherine Kish, the executive director of Einstein Alley, a non-profit economic development group in Princeton.

The panel then went to work, discussing a variety of uses. "Throw out any ideas that occur to you," Reilly told them. "The quantity of ideas is more important than the quality. The ideas do not need to be fully developed: the wilder the better," he said. The ideas ranged from medical instruments to food processing equipment, hotel linens, pharmacy equipment, pet cages, and even toilet seats.

A variety of uses for advanced liquid centrifuge

Next, Gilson presented technology for "improved separation using a low-turbulence centrifuge," invented by Gilson, Hantao Ji, Adam Cohen, Efthimion, and Eric Edlund. Gilson explained that centrifuges could play an important role in areas such as removing waste water from pharmaceuticals, extracting oil from polluted oil sands, processing bilge water from ships to stop invasive species, and many other uses. The advanced centrifuge speeds up the separation rate and increases the amount of separation by making the centrifuge spin faster. The inventors did this by making the inner

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Innovation Discovery Event

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Erik Gilson explains his advanced liquid centrifuge at the Innovation Discovery event.

cylinder speed faster than the outer cylinder of the centrifuge, which separates the materials better. Rings on the top and bottom surfaces control the flow of materials inside the inner chamber.

When the technology was tested with silver glass beads, it worked better than standard centrifuges, easily separating the beads from the surrounding liquid. More importantly, it showed promising initial results in separating nano-sized particles. "That's where the cutting edge is in centrifuge technology," Gilson said. "If you can show you can do that, that's very interesting to a lot of people." The technology could be used to retrofit existing centrifuges, he said.

Again, the panelists came up with a variety of applications for the invention. One panelist thought it could be used to purify water in fish farms. Tom Regino, of Crossroads Innovation Support Consulting, suggested it be used for milk, while Kef Kasdin, the executive-in-residence at Princeton University's Office of Technology Licensing, said it could be used to separate microbeads in cosmetics. Gold mining, making algae into biofuels, the list went on and Reilly urged the panelists to keep thinking creatively. "Take a deep breath and say, 'Om' because there's some evidence if you don't think about it for a little while, ideas will flow into your head," he said.

Gilson said he felt very relaxed about the presentation because it was not highly technical. While some ideas, like creating a small version that could be used in a home garbage disposal, might not be feasible, he said he enjoyed



Panelist Kef Kasdin, the executive-in-residence at Princeton University's Office of Technology Licensing, discusses an application idea. To her left is Gilad Arwatz, CEO of Instrumems, Inc. Taking notes at right is TechLink's Brian Metzger.

seeing the process. "It was neat to watch. They came up with a lot of ideas and I'm excited to see what the report looks like, and to see if there's anything we could use," he said.

"It was energizing, it was very positive," said Kish. "We're building on each other's ideas. The ideas are just better when you bounce off each other."

A method to instantly identify chemicals

The third invention was from Dogariu, a researcher and lecturer in the Mechanical and Aerospace Engineering Department at Princeton. Dogariu's technology can detect, identify and image the molecular structure and composition of even trace amounts of chemicals in real time, using a type of optical spectroscopy called Coherent Anti-Stokes Raman Scattering or CARS. Dogariu said the technology gives faster and stronger results than those obtained with traditional Raman detection technology. In contrast to traditional CARS, which requires powerful lasers and heavy equipment, the new technology uses just one laser. It is smaller, less expensive, uses less energy and could even be portable, he said.

The technology is licensed for defense applications, so those applications could not be discussed at the session. But Dogariu said the technology could also be used in several other areas such as a non-invasive technique of monitoring blood or even detecting cancers.

The panelists again came up with a multitude of suggestions. "A whole other category is the food safety category," Kasdin said. Building on that, Dennis Jamilkoswki, a retired distinguished research fellow from Johnson & Johnson, suggested it could be used in food preparation facilities. "If you've got a food processing facility, every night they have to clean everything," he said. "Being able to scan that and see how well they did would be very useful." Among numerous other suggested applications were detecting minerals on trips to Mars, drug scanning, and counterfeit detection.



Arthur Dogariu, a research scholar and lecturer in Mechanical and Aerospace Engineering at Princeton University, discusses his invention to detect and image chemicals in real time.

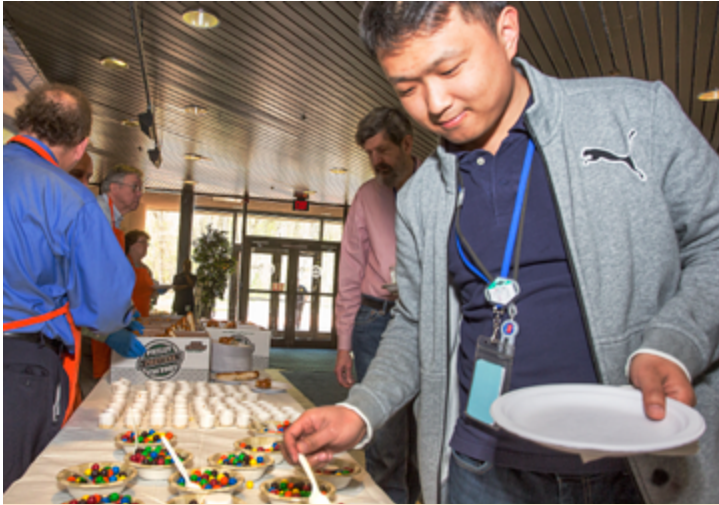
A good place to start

"I'm very pleased with how it went," Bagley said. "The panel was the right panel. They had terrific ideas. The diversity of the panel added a lot of dimension to the ideas."

"The idea is to give you a place to start and that's pretty much what we've done here," Reilly said. "If you look at all of these you'll see we've identified two or three areas that I think are a good place to start. The hard part is that it's like drinking from a fire hose because it all looks good. Hopefully one of the things we can generate is where to focus." 📌

PPPL's plow into pretzels for National Pretzel Day celebration

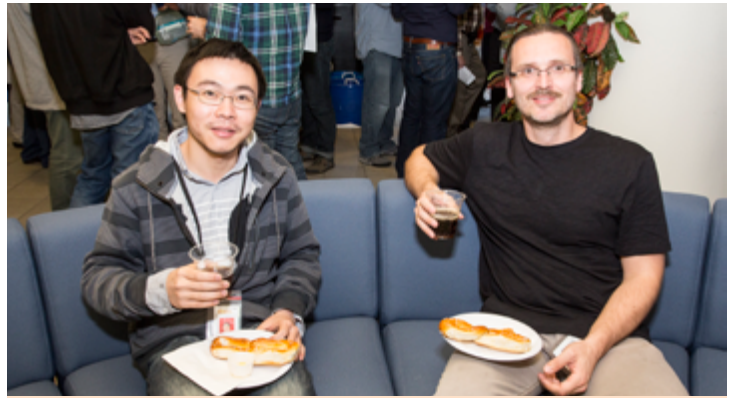
PPPLers picked up plenty of pretzels during PPPL's first celebration of National Pretzel Day on April 26 in the LSB lobby. Members of the Lab Council served salted and unsalted pretzels, pretzel M&Ms, macaroons, and some root beer or water to wash it down. 🍷



Guangzhou Hao helps himself to some M&Ms.



Masa Ono, left, and Jon Menard are armed with pretzels.



Tianyuan Huang, left, and Vladislav Vekselman enjoy some root beer and a pretzel.



Serving pretzels with a smile were from left to right: Michael Zarnstorff, Larry Bernard, John DeLooper, and Rich Hawryluk.



Nakia Townsend with a salted pretzel and some M&Ms.



Drina Duryea and Neil Gerrish take a break from pretzel serving.

Join a PPPL bike team to compete in the Federal Bike Challenge this month

PPPL'ers can bike to work, to the grocery store, or anywhere else they can think of as PPPL once again joins the Federal Bike Challenge in honor of National Bike Month in May.



[You can register for a PPPL team here.](#) One of four team captains will contact you with registration information. Then all you have to do is log your cycling miles during May for all your bike rides at home and to work.



Some members of last year's PPPL Bike Challenge team take a lunchtime ride last year.

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.

The teams will meet throughout the fall semester and there are lots of events throughout the spring and summer to engage everyone. The program welcomes volunteers with all kinds of skills. This includes not only those with engineering, robotics, and building skills, but also volunteers with the ability to mentor students and help build leadership, teamwork, research, and social engagement skills. Coaching the teams is a rewarding experience that is, as one of the teams' founders put it, "the hardest fun you'll ever have!"

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

COLLOQUIUM

Modern Surgical Technology



Chuck Pell
Physcient

Wednesday, May 4

11 a.m.-12:30 p.m., M.B.G Auditorium, Lyman Spitzer Building

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 May 2	Tuesday May 3	Wednesday May 4	Thursday May 5	Friday May 6
COMMAND PERFORMANCE Chef's Feature	Chicken-Fried Chicken Steak with Country Gravy, Okra, Mashed Potatoes & Biscuit	Roast Chicken Served with Buttered Rice & Vegetables	COMMAND PERFORMANCE Create your own Pasta Bar	CELEBRATING CINCO DE MAYO 3 Beef Tacos with all the Fixin's served with Yellow Rice & Black Beans	LUNCH & A MOVIE— MYSTIC PIZZA Assorted Pizza (2 Slices) Served with Caesar Salad
Early Riser	Kielbasa & 2 Eggs any style	Coconut Banana Steel Cut Oatmeal	Steak & Eggs with Seared Tomatoes	2 Eggs any style with Corned Beef Hash	Veggie Omelet with Home Fries
Country Kettle	Curried Cauliflower Soup	Spring Pea Soup	Chicken Gumbo	Potato Leek	Manhattan Clam Chowder
Grille Special	BURGERLICIOUS My Big Fat Greek Turkey Burger Grilled Turkey burger with melted feta cheese, tomato, red onion, banana peppers & spinach topped with cucumber sauce on a grilled whole wheat roll (Available All Week)	Grilled Salmon Burger with Lettuce & Tomato	Tuna Steak with Asian Slaw	Chicken Fajita served with Rice & Beans	Grilled Seafood Salad & Cheese on Texas Toast
Deli Special	American French Bread Hoagie with Cooked Salami, Bologna & American Cheese	Flank Steak Caesar Salad	New Orleans Muffuletta	Fried Ravioli served with Grilled Vegetables	Glazed Ham on a Ciabatta Roll
Panini	French Bread Panini with Fresh Mozzarella, Pesto, Peppers & Provolone	Italian Panini with Prosciutto, Provolone, Salami, Banana Peppers, Tomatoes & Red Onion on Focaccia	Cajun Chicken on a Kaiser Roll with Peppers, Onions, Pepperjack, Tomato & Chipotle Mayo	Baja Chicken Panini with Pepperjack, Pico de gallo Cheddar & Chipotle Ranch Wrap	Smoked Turkey Chipotle Club with Bacon, Tomato, Smoked Gouda & Chipotle Ranch

MENU SUBJECT TO CHANGE WITHOUT NOTICE

VEGETARIAN OPTION

WEEKLY

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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/>.