PPPL PRINCETON PLASMA PHYSICS LABORATORY
A Collaborative National Center for Fusion & Plasma Research
U.S. DEPARTMENT OF ENERGY
WEEKLY
June 27, 2016

Calendar of Events

THIS WEEK

JUNE 28–30

US-PRC Magnetic Fusion Collaboration Workshop
PPPL

WEDNESDAY, JUNE 29

Live stream of the dedication of Costa Rica's SCR-1 stellarator
1:30–2:30 p.m. ◆ Room 318, LSB

PPPL Colloquium
4:15 p.m. ◆ MBG Auditorium
The Observation of Gravitational Waves from a Binary Black Hole Merger
Dr. Duncan Brown, Syracuse University

UPCOMING

MONDAY, JULY 4

Independence Day
Laboratory closed.

SUMMER SCHEDULE FOR PPPL WEEKLY

The PPPL Weekly will be published every other week during the summer. The next issue will be on July 11.

INSIDE

Florida State University tragedy provides valuable safety lessons

By Jeanne Jackson DeVoe

PPPL employees listened with somber attention at an all-hands meeting on June 20 as an investigator recounted the tragic tale of how multiple safety failures led to the accidental death of a technician at Florida State University's National High Magnetic Field Laboratory (MagLab) in Tallahassee, Florida, last year.

"When such a terrible incident happens, you can imagine its impact," said Stewart Prager, PPPL's director, as he introduced the session. "We should take this moment to learn from the Florida State accident for the benefit of PPPL."

Betsy Dunn presents conclusions from the investigation into the accident. In the front row from left to right are: Stewart Prager, PPPL director; William Slavin, head of Safety, and Jerry Levine, head of Environment, Safety & Health.

continued on page 3

PPPL scientists to celebrate first Latin American stellarator this week

By Raphael Rosen

When the first Latin American stellarator starts up in Costa Rica this week, celebrants will include leaders and researchers at PPPL. The Laboratory has videotaped a message of congratulations for the machine's first official plasma discharge on June 29. Participants in the five-minute video include Stewart Prager, PPPL director; Michael Zarnstorff, deputy director for research; Hutch Neilson, head of advanced projects, and David Gates, stellarator physics leader.

"With this device we can show the rest of the world that it's possible for a university or small research center to use stellarators to perform research," said 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).

continued on page 5

A fusion energy research pioneer in Costa Rica turns to PPPL for stellarator, plasma insights

By Jeanne Jackson DeVoe

As a school child in a one-room schoolhouse in rural Costa Rica, Iván Vargas-Blanco would stay late into the afternoon doing experiments well after all the other children had gone home — so late that his mother would have to come get him for dinner.

Decades later, physicist Vargas-Blanco has retained that same drive and passion as the head of Costa Rica's first plasma laboratory, the Plasma Laboratory for Fusion Energy and Applications. On June 29, the laboratory will initiate first plasma on the Stellarator of Costa Rica (SCR-1) after six years of design and construction. The ceremony will take place at the Arts auditorium at the Costa Rica Institute of Technology (TEC) in Cartago.

The physicist will be at PPPL during the ceremony, which will be live-streamed at PPPL through the website www.tec.ac.cr. The ceremony will feature taped congratulatory messages from Stewart Prager, director of PPPL; Michael Zarnstorff, deputy director for research; Hutch Neilson, head of advanced projects; and David Gates, stellarator physics leader. (See story page 1)

"This is part of my dream to come here," Vargas-Blanco said. "I think it's a big opportunity. It's very important for me because the stellarator concept was invented here."

Vargas-Blanco is working with physicists at PPPL to learn the complex computer codes used to simulate various conditions in plasmas. He plans to use those codes to understand plasma behavior on the SCR-1 Stellarator and MEDUSA-CR spherical tokamak. At the same time, he's looking ahead to creating an optimized design for future stellarators. He'll also use codes for research on MEDUSA-CR, a small spherical tokamak donated by the University of Wisconsin-Madison to TEC.

Vargas-Blanco is also responsible for establishing the first fusion energy program at TEC, where his laboratory is located. The university includes an undergraduate degree and a "Licenciatura" in engineering — a combination that is between a bachelor's and a master's degree. Two students are also pursuing master's degrees at the university.

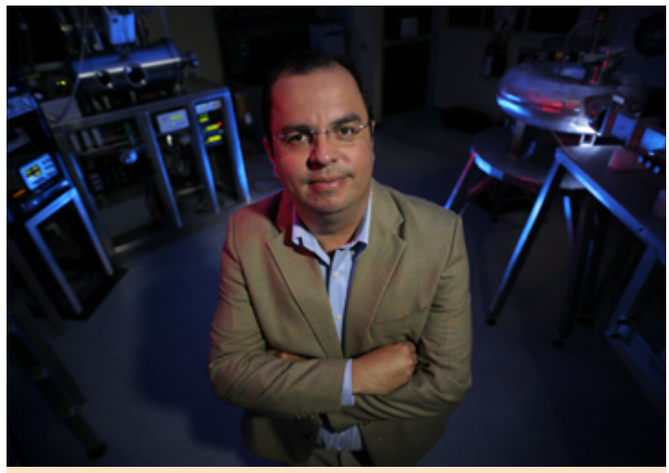
In addition to fusion research, Vargas-Blanco's laboratory focuses on two other areas: how plasma can be used in medical applications, and how it can be used in industrial applications, such as waste treatment. He would like to expand the plasma physics research. "Right now we have good experience in fusion engineering but we need to improve our experience in plasma physics in general," Vargas-Blanco said.

A love of science early on

Vargas-Blanco grew up on a small dairy farm. The second oldest of five children, he had to wake before dawn each day to milk the cows. He discovered early on that he loved science and would often take home one of three science books in the tiny library at his one-room schoolhouse where there were just 10 students. One of those books had a section on fusion energy. "I took this book home and read it again and again and then I took the other science book and read it again and again."

When he got older, he and his older brother walked about two and a half miles to catch a truck that would take them to the high school in a town an hour away. There, Vargas-Blanco continued to pursue his passion for science. At one point, he designed a small rocket with a plasma thruster. He twice won first place in a national science fair in Costa Rica.

He studied physics as an undergraduate at the University of Costa Rica in San Jose and worked his way through that school. When he pursued a graduate degree in plasma physics at the Complutense University of Madrid in Spain, he had



Iván Vargas-Blanco in TEC's Plasma Laboratory for Fusion Energy and Applications near an early version of the SCR-1 vacuum vessel, at right.

to interrupt his studies to apply for additional funding from both Spain and Costa Rica.

Working at the TJ-II Stellarator at the Centro de Investigaciones Energéticas, Medioambientales y Tecnológicas in Madrid, Vargas-Blanco discovered that he "loved" stellarators. After obtaining his doctorate, he was inspired to design a small stellarator in Latin America. He established the first plasma laboratory at his university and became head of design, construction and implementation of the SCR-1. In the beginning, his only help came from two undergraduate students. Since then, the laboratory has grown to include two other physicists, six engineers, 25 undergraduate and two master's degree students.

"With this first stellarator we can show the rest of the community that it's possible for a university or a small research center to do a small experiment related to stellarators," he said. "You can do experiments without investing much money and you can prove if this configuration is working or not. You can also research engineering topics."

An advocate for fusion energy

Vargas-Blanco has also been an advocate for fusion energy. He met with Clotilde Fonseca, then Costa Rica's minister of science and technology, and convinced her to declare Costa Rica's support for fusion energy in 2011. He convinced his university to do the same. He helped organize the Latin American Workshop on Plasma Physics and two other conferences in 2014 and held a summer school on plasma physics for 80 students that year.

The collaboration with PPPL researchers allows Vargas-Blanco to do research related to both stellarators and spherical tokamaks, he said. "I can talk here with people who know about spherical tokamaks and who know about stellarators, and for me it's very practical to try to talk about both because both are very useful for us," he said.

Gates, PPPL's stellarator physics leader, met Vargas-Blanco at a conference at the Max Planck Institute in Greifswald, Germany, in 2015 and a collaboration was formed. Gates said Vargas-Blanco arrived with a spreadsheet of his research goals at PPPL and he's been making his way through the list. "He's taken responsibility for the whole thing," he said. "He's very focused."

The physicist arrived at PPPL in May and will remain until the end of July. His wife, Yoslaidy, and daughter Ivánna, joined him in Princeton earlier this month. He said he enjoys the Princeton area, which he describes as "very beautiful"

continued on page 5

FSU safety lessons

continued from page 1

Betsy Dunn, director of Environment, Safety, and Quality Assurance at Argonne National Laboratory, led the investigation of the accident at the MagLab on Oct. 20, 2015. She urged PPPL employees to apply lessons from the accident to their own work situations. "Don't ask, 'Would we have prevented it here?'" she said. "Ask, 'How could it happen here?' It could happen here, it could happen at Argonne, it could happen at any of our labs."

A jumping off point

The discussion was meant as not just a wake-up call but also as a jumping-off point for discussions throughout the Laboratory over the next few weeks on how PPPL can bolster its safety culture. Each PPPL employee was asked to write down safety ideas and bring them to small group meetings over the next few weeks. The resulting suggestions will be compiled and discussed at the July 18 Environment, Safety & Health Executive Board meeting. "There are a lot of non-technical and human factor issues that are applicable to everyone here," said Jerry Levine, head of Environment, Safety, & Health.

Dunn told the packed audience in the MBG Auditorium that investigating a fatal accident is "life changing." "You do not forget what you see when you investigate someone's death," she said. "It's awful and hopefully I won't get too choked up when I talk to you about it."

Jerry Levine, head of ES&H, introduces Betsy Dunn.

Glenn Maurice Nix, 52, the accident victim, was a technician at the laboratory for two-and-a-half weeks. (Photo courtesy of Betsy Dunn)

While there were several factors that led to the accident, one major lesson is that employees must not become complacent and must put their own safety first, Dunn said. Even senior workers who had been at the MagLab since it was founded in 2004 missed signs that something was wrong. "Everybody's got to have this questioning attitude," she said. "There's only one person looking out for you and it's you. If something doesn't feel right, you stop work. If you don't get satisfaction talking to one person, take it up the chain."

The accident took place in the cooling water system of one cell of an experiment called the "Series Connected Hybrid Project," a group of 16 cells of powerful magnets at the MagLab. The laboratory, which receives 70 percent of its funding from the National Science Foundation and 30 percent from the state of Florida, is the largest high magnetic field lab in the world, with two other sites at the University of Florida in Gainesville and Los Alamos National Laboratory in New Mexico.

The laboratory had a previous safety incident in 2012 when a worker suffered third-degree burns in an arc flash. Since then, the MagLab "had made some positive strides towards improving their electrical safety program," Dunn said.

The technician who was killed was Glenn Maurice Nix, 52, a father of five with three grandchildren. He had only been working at the MagLab for two-and-a-half weeks when the accident occurred. He and another technician, who had been at the lab for three months, were called on to remove a flange, or steel cap, from a pipe connected to the magnet cooling water system.

Nix was trying to loosen a nut on the flange and crossed in front of the pipe when there was an explosion caused by a buildup of highly pressurized air and water behind the flange. The steel cap hit Nix in the chest, crushing his ribs, and causing him to hit his head on a nearby metal support structure. He was pronounced dead at the scene. The second technician sustained minor injuries.

Betsy Dunn, director of Environment, Safety, and Quality Assurance at Argonne National Laboratory, who led the investigation of the accident at the National Magnetic Field Laboratory, speaks to PPPL employees at the all-hands meeting.

continued on next page

FSU safety lessons

continued from page 3

Investigators found that a compressed air valve was closed that should have been open to inject compressed air in order to seal a butterfly valve and prevent pressurized water from entering into the system. This closure prevented the butterfly valve from working properly, allowing pressurized water to leak into the pipe behind the valve and compressing the air so that it too was highly pressurized.

The stored energy from the water and air released in the explosion meant that the victim was hit with the force of nearly a pound of TNT explosives, Dunn said. "When I say he was killed on impact, that is why," she said. "He had an explosive in front of him."

Multiple causes

Dunn said the root causes leading to such an incident are like the root of a plant with numerous branches. "In an accident like this, there's not just one thing that goes wrong, there's a whole series of things that go wrong," she said. "If they line up just right, it's like Swiss cheese, so that's what we look for."

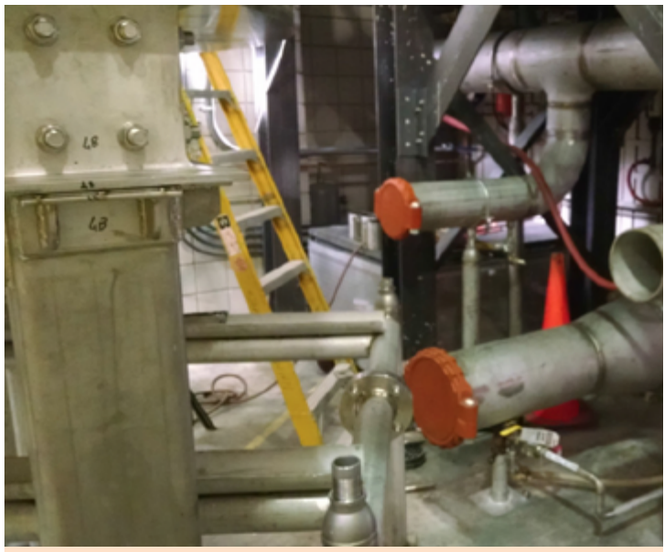
The first cause was that no one had physically verified that there was zero energy in the system before the work was performed, Dunn said. The work on the system had begun several weeks prior, and was interrupted by the need for electrical technicians to perform other unrelated activities.

When work was ready to resume to connect water piping, the system should have been thoroughly checked and the absence of any energy sources verified before the technicians began, Dunn said. If qualified employees had opened one of several drain and vent valves, they would have seen water and would have known that there was pressure in the system. She added that there also were no instruments to show the pressure in the system. A pressure gauge was installed a week after the accident.

Rich Hawryluk, center, head of ITER and Tokamaks, asks a question during the question and answer period after the presentation. To his left is Al von Halle, the head of NSTX-U engineering and operations; at right, Tim Stevenson, head of Project Management; in front physicist Ilya Dodin.

No project manager was in charge of the system, so no one had an overview of the work taking place, Dunn said. Both the foreman and the second mechanical technician involved in the accident told investigators they had no idea electricians had been doing work, she said.

The laboratory had established a lock out-tag out procedure two weeks earlier. But investigators found a flaw in that procedure, which is intended to prevent a potentially dangerous high-energy machine or other equipment from being used until it has been verified as safe. The workers involved in such a procedure must not only be familiar with the project but also trained in lock out-tag out and other safety



Workers were trying to remove the flange, or steel cap, on the pipe at right when the accident occurred. (Photo courtesy of Betsy Dunn)

procedures, which neither technician was. And their foreman had just gotten back from a medical leave. "If I'm putting a wrench on that system, I need to be an authorized worker and I need to be trained in that system," Dunn said.

The system also did not have a means to effectively separate the energy in the equipment from a worker, Dunn said. This oversight seemed to reflect the failure of experienced workers to reexamine existing procedures. "You really do need to go back and look at your systems," Dunn said. "When I asked, 'Why did you design this system this way?' the answer was, 'We've done it this way for 25 years and we've never had a problem.'"

The cooling water system should have been well-labeled with signs indicating if valves were open or closed and detailed diagrams posted nearby, Dunn said. Investigators spent five hours trying to figure out how the system worked because no detailed schematic existed, she said.

The MagLab did not have adequate work planning and control processes that would ensure workers were better trained about the overall cooling water system and that someone reviewed work plans, Dunn said. This meant that the only people who had to sign off on the work were the workers themselves. With better procedures in place, at least one experienced worker would have been on site.

Valuable lessons

Dunn said the incident provides valuable lessons for PPPL and other laboratories. PPPL employees should ask themselves the kind of hard questions investigators had to ask in the wake of the accident, she said. "Do you understand the system you are being asked to work on?" she asked. "You have every right to say, 'I don't know the system well enough,' or ask for more training, ask someone to walk through with you to visually verify things."

"My own personal closing thought is this really does apply to everybody," Dunn said. "There's something in here for even the office workers in terms of looking at your own systems and how you do business. Who's in charge? Does everyone have what it takes to do the job correctly?"

Richard Hawryluk, head of ITER and Tokamaks, said the challenge is to have strong enough systems to avoid such failures. "My experience on both sides of investigations into incidents that have occurred over the years has been that they are always due to multiple things breaking down," he said during the question and answer period. "The tricky part we have to deal with is not that this happens but how do you deal with it ahead of time? How do you make sure that each of these variables is solid and reliable? Because they will line up like Swiss cheese."

Iván Vargas-Blanco

continued from page 2

and "very green." His home country is tropical and his laboratory is within sight of the Irazú Volcano, where on a clear day you can see the Atlantic and Pacific oceans on each side of the country.

Meanwhile, one colleague from the Plasma Laboratory for Fusion Energy and Applications is doing research at the Max Planck Institute for Plasma Physics in Greifswald and another is in Garching, both in Germany. Vargas-Blanco said he hopes that other colleagues will follow his example and come to PPPL. "This is part of our goal, to try to send people to important research centers and to train them in different topics that are important for us," he said.

Like many people in his field, Vargas-Blanco said he continues to believe in the long-term goals of fusion energy, especially for developing countries like his own. "I think it's very important for science to do research in this field because every day we can see that we need the energy," he said. "I think it's very good for the future generations. Of course, it's not simple. It's a little complicated. We need to spend a long time to obtain this but I think it's very important."

Costa Rica stellarator

continued from page 1

Vargas-Blanco is visiting PPPL for three months through July. While at the Lab he is using the VMEC and STELLOPT computer codes to come up with SCR-1 plasma shapes that achieve the best properties, such as stability.

PPPL is enthusiastic about the Costa Rican stellarator, the newest addition to the worldwide family of fusion facilities. "This new machine helps signify the long-term importance of fusion," said Zarnstorff. "It's encouraging that Costa Rica is taking these steps. We're thrilled."

According to Vargas, Costa Rica's new fusion program will help demonstrate that a small, inexpensive stellarator like the SCR-1, which was built for $500,000, has advantages that its larger cousins lack. The device measures one meter in diameter, compared with 16 meters for the new Wendelstein 7-X stellarator in Germany. "One of the main reasons you might want to have a small stellarator is that you can explore different kinds of magnetic configurations before building a big machine," Vargas-Blanco said.

The stellarator's small size enabled TEC to fabricate the device's magnetic coils using 3-D printing. Specifically, TEC used the printing to make molds and then poured molten aluminum into the molds to form the coils. This innovative technique is especially helpful when building stellarators because the magnetic coils have convoluted shapes that are challenging to construct using more traditional methods. "By using 3-D printing you can explore very complicated magnetic configurations," said Blanco, "even configurations no one has ever constructed before."

Costa Rican physicists will use SCR-1 to gain experience with fusion technology and diagnostics and insight into plasma physics. Vargas-Blanco hopes the device will lead to almost a decade of fruitful training and research. "Everyone in Costa Rica is excited," he said.

TEC's fusion program will not stop with this first step. TEC scientists are already in the process of designing SCR-2 in collaboration with PPPL and the Max Planck Institute for Plasma Physics in Greifswald, Germany. This stellarator will include superconducting magnetic coils and will be optimized. In the same laboratory in Costa Rica, the spherical tokamak MEDUSA-CR that was donated by the University of Wisconsin-Madison is being recommissioned.

PPPL'ers can watch the live stream of the Wednesday event from 1:30 to 2:30 p.m. in Room 318 of the Lyman Spitzer Building. It will also be broadcast live via You Tube on the TEC website www.tec.ac.cr.

A view of the Costa Rica Stellarator 1 at the Costa Rica Institute of Technology.

DOE promotes best practices, seeks more ideas

The Department of Energy has published its first compilation of Strategic Best Practices from across the department and the National Laboratory System.

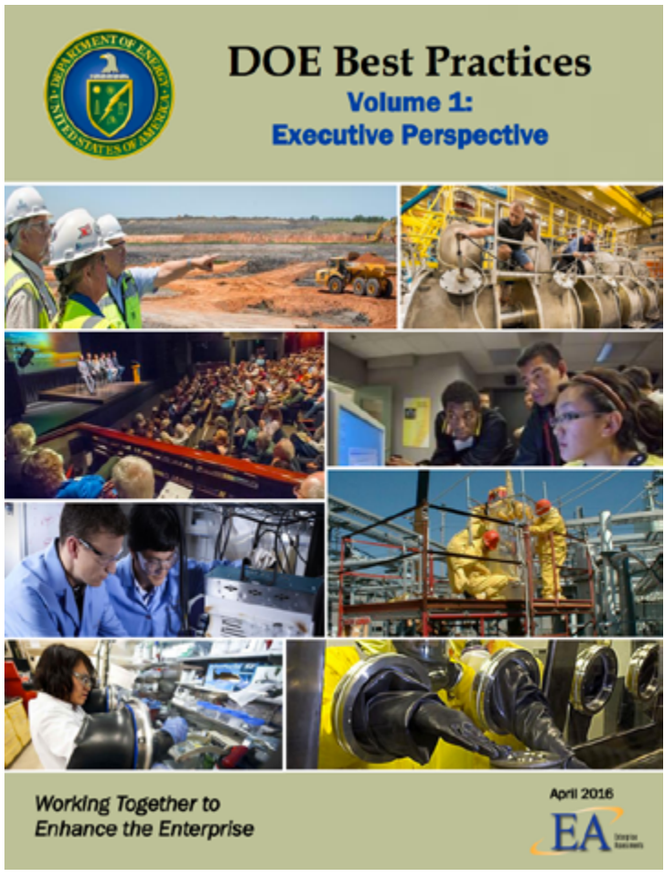
The report by DOE's Office of Enterprise Assessments (OEA), available on DOE's PowerPedia site, highlights 19 examples of work that's being done well, with the expectation that the practices will be adapted for use throughout DOE and the labs.

"In the past, focusing on failures and vulnerabilities within DOE was common," the report states. "Secretary Moniz's recent direction for Enterprise Assessments to capture strategic-level best practices marks a fresh alternative to examine what is being done well, by whom, across the enterprise."

Topics range from attracting talent to reducing infrastructure risk to modernizing business systems. The examples resulted from extensive research by OEA staff. An "Executive Perspective" document summarizes each practice on a single page that outlines benefits, requirements, implementation actions, and contact information for lab staff members who can explain their best practice in detail.

"PPPL is a learning organization. By looking at best practices and lessons learned we can benefit from what other DOE organizations have developed and deployed," said John DeLooper, head of Best Practices and Outreach at PPPL.

Work on the next set of best practices is under way, and lab staff members are encouraged to recommend examples that would be of interest across the lab system.



"This report represents the beginning," Secretary Moniz said in letters thanking participants. "I would like to institutionalize proven Strategic Best Practices and the process to collect and promote them, and have your good work be a catalyst for ongoing improvement within DOE."

Manager Toolkit provides wide range of online resources

New and experienced managers at PPPL are encouraged to use the new Manager Toolkit on PPPL's Human resources page, hr.pppl.gov. The site has links to external eLearning videos and articles, as well as internal policies, procedures and templates.

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.

PPPL hosts U.S.-China magnetic fusion workshop

Some 75 leading scientists from the United States and the People's Republic of China (PRC) will gather at PPPL this week for the eighth biennial workshop on magnetic fusion energy. Topics at the June 28-30 workshop will range from experiments on current facilities to power plant design to preparations for ITER, the international tokamak under construction in France.

"The main purpose of the meeting will be to develop collaborations between our two countries," said Rich Hawryluk, head of the ITER and Tokamaks Department, who is the local organizer of the event with Administrative Assistant Marilyn Hondorp. Included during the three-day event will be a poster session and oral presentations intended to contribute to plans for collaborations over the next two years.

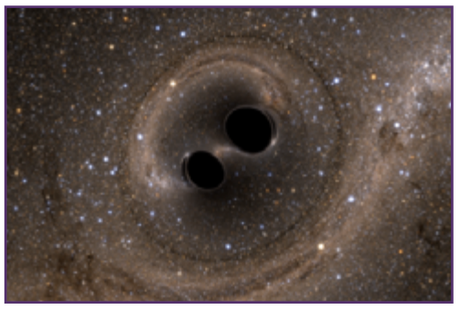
The United States has worked with China on magnetic fusion research in a number of ways. In one significant step, the University of Texas operated a fusion facility that it dismantled and shipped to China, which began running experiments on the machine in 2007. Recent collaborations include U.S. researchers facilitating experiments on China's Experimental Advanced Superconducting Tokamak (EAST), and working with China on magnetic fusion theory.

Workshop participants will come from the University of Science and Technology of China and the country's major fusion research facilities. U.S. participants will include physicists from PPPL, General Atomics, Lawrence Livermore National Laboratory, MIT, and other universities.

The previous workshop was held in Nanjing, China, in November 2014.

COLLOQUIUM

The Observation of Gravitational Waves from a Binary Black Hole Merger



Dr. Duncan Brown
Syracuse University

Wednesday, June 29
4:15 p.m., M.B.G Auditorium, Lyman Spitzer Building

Abandoned Bike Roundup at PPPL

Regular biking commuters to PPPL are having trouble finding space on bike racks because of the numerous bicycles that have apparently been abandoned. These are bicycles that are dirty, rusty, or have flat tires and have been left in the bike racks for some time.

In order to make room for bikers, the abandoned bikes will be tagged and owners will have until July 1 to remove the bicycles. The tagged bicycles left after July 1 will be removed and donated to a local charity. If you have any questions or need assistance putting your bike in working order, please contact Rob Sheneman, organizer of PPPL's Bike Challenge team at ext. 3392.

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 27	Tuesday June 28	Wednesday June 29	Thursday June 30	Friday July 1
COMMAND PERFORMANCE Chef's Feature	**BBQ Pulled Chicken** with Mashed Potatoes & Vegetable	**Ravioli** with Spinach, Sundried Tomatoes, Roasted Peppers, Olives and Artichokes	**Maple-Glazed Ham** served with Au Gratin Potatoes & Roasted Squash & Zucchini	**Bratwurst & Sauerkraut** with Braised Cabbage & German Potato Salad	**Outdoor BBQ** with Texas Brisket, Burgers, Hot Dogs, Peach Cobbler, Corn, Baked Beans and Beverage
Early Riser	**Chocolate Chip Pancakes** with Bacon	**Italian Meat & Cheese Omelet** topped with Wilted Spinach with Home Fries	**Potato, Roasted Pepper & Sundried Tomato Casserole** with 2 Eggs any style	**Cinnamon Raisin Pancakes** with Homemade Apple Compote	**Brunch Panini** with Prosciutto, Provolone, & Strawberry Preserve
Country Kettle	**Turkey Soup** with Dumplings	**Quinoa Corn Chowder**	**Tortilla Soup**	**Creamy Spinach and Artichoke**	**Turkey Chili**
Grille Special	**Broccoli Rabe & Beef Flatbread**	**Grilled Ham & 3 Cheeses** on Texas Toast	**Cheese Calzone** with Marinara Sauce	**Turkey Burger** with Turkey Bacon, Cheddar & Provolone Cheese on a Kaiser Roll	**BBQ Tempeh Wrap** with Cheddar Cheese, Peppers & Onions
Deli Special	**Pepper & Mushroom Quesadilla** with Cilantro & Cheddar	**Asiago Roast Beef Toasted Ciabatta** with Grilled Onion, Tomato & Horseradish	**Chili Cheese Dog** served with Fries	**Roasted Salmon** with Potatoes & Mushrooms over Spring Mix	**Curry Chicken Salad** with Grapes on a Kaiser Roll
Panini	**Ham,** Pickle, Jack Cheese, Brown Mustard & Tomato on a Pretzel Roll	**Fried Fish** with Cheddar, Tomato & Tartar Sauce Torpedo	**Breaded Chicken Cutlet** with Ham, Swiss Cheese, Lettuce & Honey Mustard Ciabatta	**Curried Lentil & Brown Rice Wrap**	**Texas BBQ Beef** topped with Southwest Slaw on a Kaiser Roll

	Monday July 4	Tuesday July 5	Wednesday July 6	Thursday July 7	Friday July 8
COMMAND PERFORMANCE Chef's Feature	**Independence Day** ★ ★ ★	**Baked Eggplant Parmesan** served with Pasta & Garlic Bread	**Fried Chicken** with Cornbread Stuffing & Collard Greens	**Mac & Cheese Bar** served with a Side Salad	**Seafood Pasta Bar**
Early Riser		**Banana Walnut French Toast** with Caramel Sauce	**Mango & Blueberry Pancakes** served with choice of Breakfast Meat	**Biscuits & Gravy** with Choice of Breakfast Sausage	**2 Eggs, 2 Pancakes,** Choice of Breakfast Meat & Potatoes
Country Kettle		**Tomato Bisque**	**Beef Barley**	**Vegetable Noodle**	**Matzoh Ball Soup**
Grille Special		**Hot Pastrami & Cheddar Cheese** on French Bread	**Fish Taco** with Cabbage, & Pico de Gallo served with Corn Relish & Chipotle-Lime Sour Cream	**Turkey, Bacon, Cheddar,** Diced Tomato, Red Onion and BBQ Chipotle Mayo Flatbread	**Roast Vegetable Stromboli**
Deli Special		**Chicken, Avocado, Pepperjack Cheese & Tomato** on Ciabatta Bread	**Turkey Pastrami** on Rye with Coleslaw, Swiss Cheese and Russian Dressing	**Cheesey Seafood Casserole Melt** on Rye	**Chicken, Mozzarella,** Red Onion, Basil, Arugula and Balsamic Tomatoes on French Bread
Panini		**Fish Cake Sub** with Pepperjack Cheese & Chipotle Cream	**Turkey Meatball Parmesan Torpedo**	**Portobello Mushroom & Fontina Cheese** with Roasted Peppers on Ciabatta	**Foot-long Chili Dog**

MENU SUBJECT TO CHANGE WITHOUT NOTICE

VEGETARIAN OPTION

WEEKLY
Editor: **Jeanne Jackson DeVoe** ◆ Layout and graphic design: **Kyle Palmer** ◆ Photography: **Elle Starkman**
Science Editor: **John Greenwald** ◆ Webmaster: **Chris Cane** ◆ Communications Director: **Larry Bernard**

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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/.

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