

## THIS WEEK

WEDNESDAY, OCT. 4

**Weekly Lunchtime Leadership Chat**  
12 p.m. ♦ Cafeteria  
**Kristen Fischer,**  
Chief Financial Officer

**PPPL Colloquium**  
4:15 p.m. ♦ MBG Auditorium  
**High-Yield Neutron Generators  
for Industrial Applications**  
Ross Radel, Phoenix Nuclear

FRIDAY, OCT. 6

**American Red Cross  
Fall Blood Drive**  
8 a.m.-1 p.m. ♦ Blood mobile  
by the Warehouse near Mod VI  
[See page 2 for details.](#)

## UPCOMING

WEDNESDAY, OCT. 11

**PPPL Colloquium**  
4:15 p.m. ♦ MBG Auditorium  
**Overview of the Basic Plasma  
Science Facility**  
Troy Carter, University of California -  
Los Angeles

WEDNESDAY, OCT. 18

**PPPL Colloquium**  
4:15 p.m. ♦ MBG Auditorium  
**Properties and Degradation  
of Polyimide in Extreme  
Hygrothermal Environments**  
Professor Alan Zehnder,

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# Final shipment of electrical components in PPPL's contribution to ITER

By Jeanne Jackson DeVoe

The final truck of six carrying 63 crates of uninterruptible power supply equipment was expected to arrive at the international ITER fusion experiment today. The shipment marks a successful conclusion to PPPL's massive project to provide steady state electrical network (SSEN) equipment to power much of the 445-acre facility in the south of France.

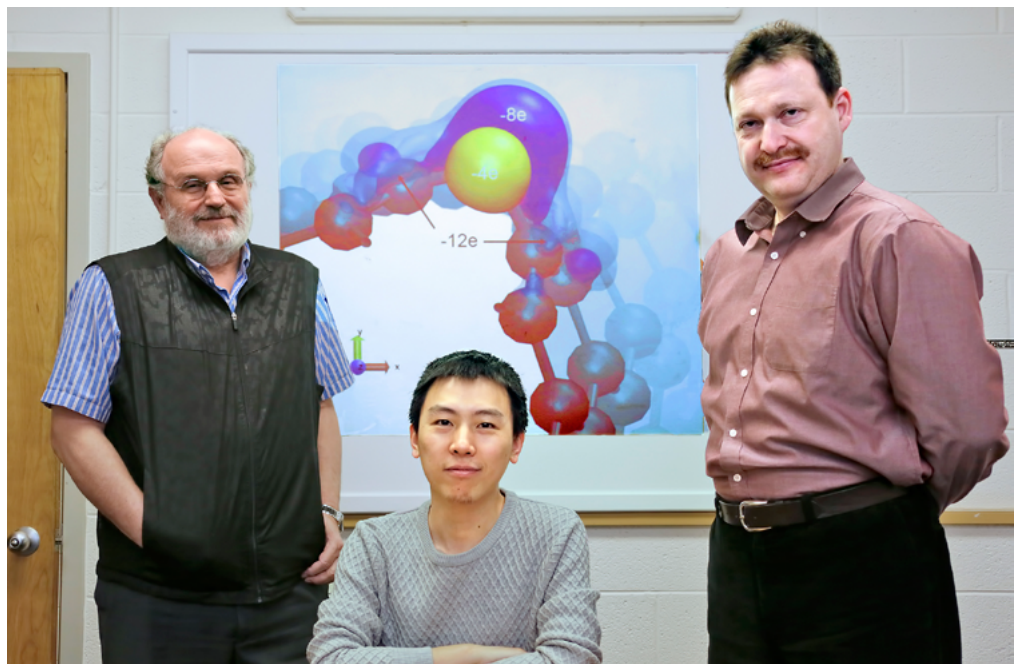
The six-truck shipment, with the first five trucks arriving on Sept. 28, was the 35th and final delivery of equipment from companies all over the world, including from the United States, over the past three years. The shipment completed the U.S. contribution of three-quarters of the SSEN system to ITER, the international experiment under construction in the south of France to demonstrate the feasibility of fusion power.

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# Simulation demonstrates how exposure to plasma makes carbon nanotubes grow

By Raphael Rosen

Research performed at PPPL with collaborators from Princeton University and the Institute for Advanced Computational Science at the State University of New York at Stony Brook has shown how plasma causes exceptionally strong, microscopic structures known as carbon nanotubes to grow. Such tubes, measured in billionths of a meter, are found in everything from electrodes to dental implants and have many advantageous properties. In principle, they have a tensile strength, or resistance to breaking when stretched, 100 times greater than that of a same-sized length of steel wire.



From left: Predrag Krstic, research professor at the Institute of Advanced Computational Science at the State University of New York at Stony Brook; graduate student Longtao Han, Institute of Advanced Computational Science, Stony Brook; PPPL physicist Igor Kaganovich. (Photo by Elle Starkman)

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# PPPL physicist Francesca Poli named ITER Scientist Fellow

By John Greenwald

PPPL physicist Francesca Poli has been appointed an ITER Scientist Fellow. She will join a network of researchers who have achieved international recognition and will work closely with ITER, an international tokamak under construction in France, to develop the scientific program to be carried out during the fusion device's lifetime.

Poli will facilitate installation of TRANSP, the PPPL-developed computer code that is used throughout the world to analyze and predict fusion experiments. Included in her role will be the design of scenarios for the ITER research plan and the training of young researchers on operation of the code.

"I'm pretty excited," Poli said of the appointment, which was approved by ITER Director-General Bernard Bigot. "This will allow us to promote TRANSP for ITER and will be good for the Laboratory," she said. "It will enable us to improve TRANSP by developing new capabilities."



Francesca Poli  
(Photo by Elle Starkman)

For ITER, Poli previously coupled a reduced model of neo-classical tearing modes, a type of plasma instability, to the large and complex TRANSP code. She continues to work with the International Tokamak Physics Activity Integrated Operation Scenarios (ITPA-IOS) topical group on the modeling of ITER with TRANSP.

Poli will remain at PPPL during the three-year renewable fellowship, which includes the opportunity for frequent travel to ITER. Among benefits of the fellowship will be a graduate student to assist in research and support for travel expenses for extended visits to work with ITER scientists on-site in Cadarache, France.

Poli, a PPPL physicist since 2010, is an expert in simulating the evolution of tokamak plasma discharges. She applies her expertise to interpreting existing experiments, predicting and designing new experiments, and predicting plasma performance in ITER. 📧

# COLLOQUIUM

## High-Yield Neutron Generators for Industrial Applications

**Ross Radel**, Phoenix Nuclear

**Wednesday, Oct. 4**

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

## The American Red Cross Fall Blood Drive

**Friday, Oct. 6**  
**8 a.m.–1 p.m.**

Appointments are preferred and can be made either by calling the OMO at ext. 3200 or online: [redcrossblood.org](http://redcrossblood.org), enter sponsor code: PPPLPrinceton.

The blood mobile will be parked along side of the Warehouse near Mod VI. Please report to the Mod VI Conference room prior to going into the blood mobile.

Please consider donating. You can make a difference—your blood donation matters!



# ITER electrical components

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A truck leaves from Gutor UPS and Power Conversion in Wettingen, Switzerland, on Sept. 27 en route to the ITER storage facility in Saint-Louis-Du-Rhône, France. (Photo courtesy of Gutor UPS and Power Conversion)

The final SSEN components arrived 10 days ahead of PPPL's deadline for the project. The first SSEN delivery in 2014 was the very first component to be delivered to the ITER site. The SSEN project is now the first U.S. package to be completed in its entirety, said Hutch Neilson, head of the PPPL ITER Fabrication Department.

"I think it's a great accomplishment to finish this," Neilson said.

"The successful completion of the SSEN program is a very important accomplishment both for the US ITER project and for PPPL as a partner in the US ITER project."



Hutch Neilson  
(Photo by Elle Starkman)

In addition to the electrical components, PPPL is also responsible for seven diagnostic instruments and integrating the instruments inside ITER port plugs. While PPPL is continuing work on an antenna for one diagnostic, most of the diagnostic and port integration work has been put on hold amid uncertainty over U.S. funding for ITER.

The six trucks carrying 107 metric tons of power equipment made their way from Wettingen, Switzerland, northwest of Zurich, to an ITER storage facility in Port-Saint-Louis-Du-Rhône, France. The equipment will be used to provide emergency power to critical ITER systems in the event of a power outage.

A device known as a tokamak, ITER will be the largest and most powerful fusion device in the world. Designed to produce 500 MW of fusion power for 50 MW of input power, it will be the first fusion device to create net energy, i.e., get more energy out than is put in. Fusion is the process by which stars like the sun create energy — the fusing of light elements.

The SSEN project was a complex enterprise. PPPL researched potential suppliers, solicited and accepted bids, and oversaw the production and testing of electrical components in 16 separate packages worth a total of about \$30 million. The effort involved PPPL engineers, as well as Procurement and Quality Assurance staff who worked to make sure the components met ITER specifications and would do exactly what they are supposed to do. "It's really important that we deliver to ITER equipment that exactly meets the requirements they specify, and that it be quality equipment that doesn't give them trouble down the road," Neilson said. "So every member of the team makes sure that gets done."



John Dellas  
(Photo by Elle Starkman)

Many of the components were for the high-voltage switchyard. A massive transformer procured by PPPL was connected to the French electrical grid in March. It was one of four of the 87-ton transformers built in South Korea by Hyundai Heavy Industries, a branch of the company known for producing cars.

The SSEN components came from as close to home as Mount Pleasant, Pennsylvania, to as far away as Turkey, with other components coming from Mexico, Italy, Spain, France, Germany, South Korea, and the Netherlands.

John Dellas, the head of electrical systems and the team leader for the project, has been working on the ITER SSEN project for the several years. He traveled to Schweinfurt, Germany, to oversee testing of the control and protection systems for the high-voltage switchyard.

Dellas took over the project from Charles Neumeyer after Neumeyer became engineering director for the NSTX-U Recovery Project last year. Dellas said Neumeyer deserves most of the credit for the program. "Charlie took the team down to the 10-yard line and I put everything in the end zone," Dellas said. "I was working with Charlie but Charlie was the quarterback."

Neumeyer said he was happy to see the project completed. "It's very gratifying to see roughly 10 years of work come to a satisfying conclusion under budget and on schedule," he said.

Other current PPPL staff working on the project include Don Howe, Chi Man Cheung, and Arlene White, of Procurement; Adolfo Amaya, Barry Jedic, and Frank Malinowski of Quality Assurance; Emil Nassar, from Project Controls; and Kathleen Lukazik, procurement systems support administrator. The team previously included Larry Sutton and Skip Schoen, both of whom have retired. 📍



A map of the countries from which PPPL procured SSEN supplies. (Map courtesy of Charles Neumeyer).

# Carbon nanotubes

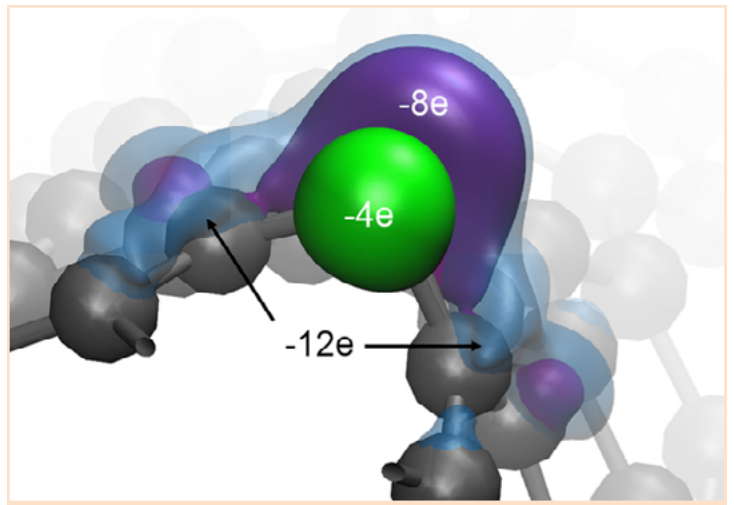
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The tubes are also used in transistors and might someday replace the copper in computer chips. But before manufacturers can produce such nanotubes reliably, scientists must understand in more detail how they form.

The new findings, reported in the journal *Carbon* in February, contributes to an ongoing project at PPPL's Laboratory for Plasma Nanosynthesis that focuses on the growth of nanoparticles in plasmas. Inaugurated in 2012, the laboratory combines PPPL expertise in plasma science with the materials science capabilities of Princeton University and other institutions and is part of the PPPL Plasma Science and Technology Department headed by physicist Philip Efthimion. Lead principal investigator is physicist Yevgeny Raitses; co-principal investigators are physicists Igor Kaganovich, deputy director of the Theory Department at PPPL, and Brentley Stratton, head of the diagnostics division at PPPL.

Scientists performed computer simulations at Stony Brook showing that the plasma, a soup of atoms and electrically charged particles, can give carbon nanotubes a negative electrical charge. The simulations indicated that a negatively charged nanotube would bind carbon atoms from the surrounding environment longer and more strongly to the surface of the tube. And the longer an atom spends attached to the nanotube, the more likely it is to move down to a cluster of atoms, known as a metal catalyst, causing the tube to grow.


"In our research we found a significant increase in the time the carbon atoms spent on the tubes," said Predrag Krstic, research professor at the Institute for Advanced Computational Science and a paper coauthor. "As a consequence, there is a significant increase in the migration rate of the carbon atoms towards the metal catalyst."



A diagram showing regions of different electron density, indicating a strong covalent bond between a carbon atom and two neighboring carbon atoms. (Image courtesy of Longtao Han, Predrag Krstic, Igor Kaganovich, Roberto Car)

Increased availability of high-speed computers has recently made such research possible. "What has changed is that these days computers are so fast that we can accurately model phenomena like what happens to nanotubes when immersed in plasma," said Kaganovich, also a coauthor.

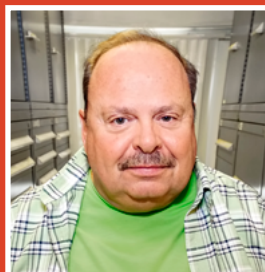
Going forward, researchers plan to develop a more detailed model of how both boron-nitride and carbon nanotubes grow in a real plasma environment. Advanced computational power makes the development of these new models possible.

Other collaborators on this work included physicists Roberto Car of Princeton University and Longtao Han at Stony Brook. Funding was provided by the DOE's Office of Science. The researchers made use of the Oak Ridge Leadership Computing Facility, a DOE Office of Science User Facility at Oak Ridge National Laboratory. 

## PPPL bids a fond farewell to retiring employees:



**JOHN BOSCOE,**  
Senior quality control  
inspector, IT  
19 YEARS



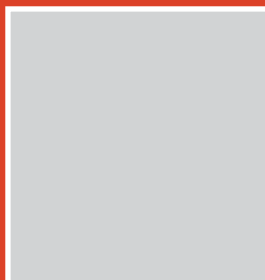
**JAMES CONOVER**  
Senior stores  
administrator, ES&H  
42 YEARS



**BILL DAVIS**  
Head of Instrument Controls  
& Data Acquisition  
37 YEARS



**VINCE MASTROCOLA**  
Senior engineer,  
Engineering  
43 YEARS




**MARIA PUEYO**  
Waste management  
engineer, ES&H  
22 YEARS



**AL VON HALLE**  
Engineer, Engineering  
37 YEARS

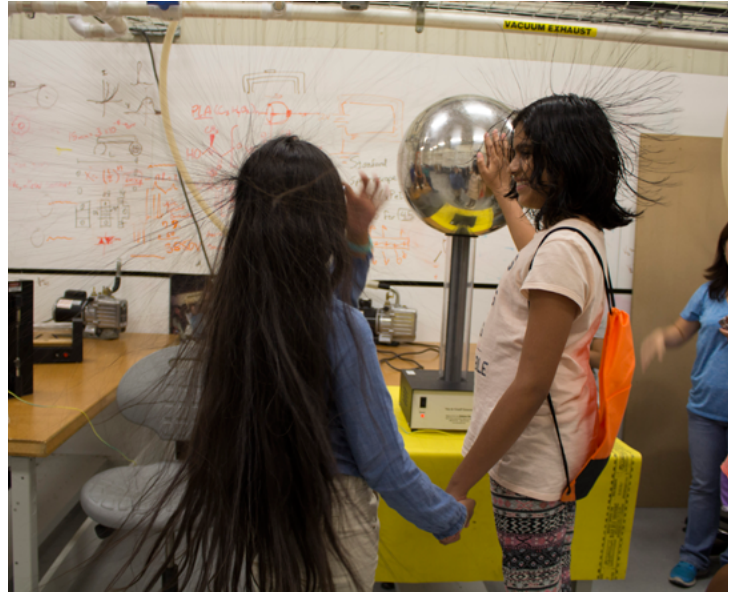


## Plainsboro Girl Scout Troop Visits the Laboratory

A dozen girls from Girl Scout Troop #71584 in Plainsboro visited PPPL on Sept. 21 with Jessica Guttenfelder and Erik Gilson serving as tour guides. 



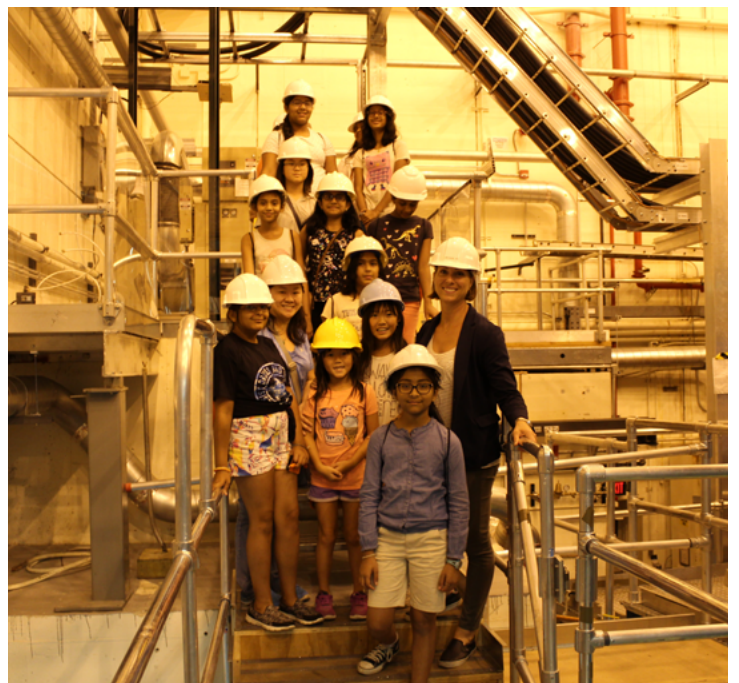
Jessica Guttenfelder talks to the Scouts in the NSTX-U test cell. (Photo by Erik Gilson)



Two Scouts have fun with the Van de Graaff generator. (Photo by Erik Gilson)



Guttenfelder talks to the Scouts in the tunnel leading to D Site. (Photo by Erik Gilson)




Guttenfelder, at right, with the Girl Scouts, in the NSTX-U test cell. (Photo by Erik Gilson)

## PPPL to join the “Agent in the Lab” Program

In October, 2016, Patrick Gildea from DOE’s Brookhaven Field Office (BFO) based out of the Brookhaven National Laboratory was assigned as the primary Counterintelligence representative for PPPL and the University of Rochester’s Laboratory for Laser Energetics. Recently, Richard Schmid from the FBI was added to assist in those efforts as part of PPPL’s new “Agent in the Lab” program.

The Agent in the Lab (AIL) program was established in the early 2000s as an initiative between the DOE and FBI designed to strengthen counterintelligence efforts to protect the safety and security of DOE National Laboratories. Under the program, FBI agents coordinate with DOE counterintelligence personnel to address counterintelligence concerns with Laboratory staff. AILs, such as Special Agent Schmid, have been placed at labs on a rolling basis, and PPPL is one of the last labs to receive an AIL.

As always, the focus is dealing with PPPL’ers who are traveling to foreign countries to ensure that travelers are aware that they may know enough about certain technologies to make them a target of foreign governments even if that information isn’t classified. This is particularly relevant as all PPPL’ers may be perceived as representatives of DOE and the U.S. Government.

Questions should be addressed to Fran White ([fwhite@pppl.gov](mailto:fwhite@pppl.gov)). 



## Dave McComas, Princeton University vice president for PPPL, hosts Council Café Lunch



Dave McComas, Princeton University vice president for PPPL, middle left, talks to staff members during a Council Café Lunch on Sept. 28. To McComas's right, clockwise, are: Erik Gilson, Atiba Brereton, Prentice Bisbal, Jim Hirsch; Kevin Lamb, Pete Titus, and Ahmed Diallo. *(Photo by Elle Starkman)*

## Chinese government officials tour PPPL



Chinese provincial government officials from Shanxi province visited PPPL on Sept. 26. Led by tour guides Ray Camp and Danny Cai, who served as a translator, the group visited the NSTX-U Control Room and test cell and other sites. The group comes from the province that most of China's coal and wanted to learn about fusion energy. *(Photo by Elle Starkman)*



# Council Café Lunch

This Week:  
**Kristen Fischer,**  
 Chief Financial Officer



**Wednesday, Oct. 4**  
 12 p.m., PPPL Café

**BROCK**  
**NICK PETTI**  
 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 Oct. 4	Tuesday Oct. 5	Wednesday Oct. 6	Thursday Oct. 7	Friday Oct. 8
<b>COMMAND PERFORMANCE Chef's Feature</b>	<b>Chicken Parmigiana</b> over Pasta	<b>Baked Potato Bar</b>	<b>Sushi</b>	<b>"Super Salad"</b>	<b>Tortellini Primavera</b> with Garlic Bread
Early Riser	<b>Bacon, Egg &amp; Cheese Croissant</b>	<b>Sausage, Egg, and Cheese Biscuit</b>	<b>Mango &amp; Blueberry Pancakes</b> served with Choice of Breakfast Meat	<b>Ham, Egg and Cheese Sandwich</b>	<b>2 Eggs, 1 Pancakes,</b> Choice of Breakfast Meat & Potatoes
Country Kettle	<b>Vegetable Noodle</b>	<b>Cream of Mushroom</b>	<b>Beef Barley</b>	<b>Tuscan Chicken and Pasta</b>	<b>Seafood Chowder</b>
Deli Special	<b>California Wrap</b>	<b>Hummus Turkey Wrap</b>	<b>Buffalo Chicken Salad Wrap</b>	<b>Grilled Ham and Cheese</b> on Texas Toast	<b>Chicken, Mozzarella,</b> Red Onion, Basil, Arugula and Balsamic Tomatoes on French Bread
Grill Special	<b>Patty Melt</b>	<b>Shrimp Tacos</b>	<b>TBD</b>	<b>Portobello Mushroom Cheese "Steak"</b>	<b>Monte Cristo</b>
Panini	<b>Jersey Tomato Hoagie</b> with Fresh Mozzarella, Spinach and Pesto	<b>Bratwurst Sandwich</b>	<b>TBD</b>	<b>Sausage and Peppers</b>	<b>Foot-long Hot Dog</b>

MENU SUBJECT TO CHANGE WITHOUT NOTICE

HEART HEALTHY

VEGETARIAN OPTION

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

The PPPL WEEKLY is published by the [PPPL Office of Communications](#) on Mondays throughout most of the year and biweekly during the summer, 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](mailto:commteam@pppl.gov) ♦ PPPL WEEKLY is archived on the web at: <http://w3.pppl.gov/communications/weekly/>.