

## THIS WEEK

### WEDNESDAY, MARCH 28

#### Council Café Lunch

12 p.m. ♦ Cafeteria

#### Scott Weidner

Princeton University assistant vice president for engineering

#### Colloquium

4:15 p.m. ♦ MBG Auditorium

#### Combating Instabilities in Nanocrystalline Tungsten through Grain Boundary Doping

Jason Trelewicz, Stony Brook University

## UPCOMING

### WEDNESDAY, APRIL 4

#### Council Café Lunch

12 p.m. ♦ Cafeteria

#### Valeria Riccardo

Head of Engineering

#### Colloquium

4:15 p.m. ♦ MBG Auditorium

#### Paths to low-carbon energy

Robert Socolow, Princeton University

### FRIDAY, APRIL 6

#### Public Tour

10 a.m.

Contact [tours@pppl.gov](mailto:tours@pppl.gov)

### WEDNESDAY, APRIL 11

#### Council Café Lunch

12 p.m. ♦ Cafeteria

#### David Carle

Head of Facilities and Site Services

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# Winding of NSTX-U prototype coil begins

By Jeanne Jackson DeVoe

**P** PPL staff began winding a prototype coil that will test a new design for a crucial component of PPPL's flagship experiment, the National Spherical Torus Experiment-Upgrade (NSTX-U).

The coil winding began on a PPPL-designed machine in a new clean room located in the C Site high bay. The prototype will test redesigned magnets for the NSTX-U called "poloidal field coils" (PFs) prior to the construction of the final coils, which the NSTX-U Recovery Team has dubbed "production coils."

"The PPPL magnet team is very excited to be winding our prototype PF1A coil," said Jonathan Menard, head of the NSTX-U Recovery Project. "Building very high quality coils is essential for the NSTX-U Recovery to succeed, and the team is paying close attention to cleanliness of the winding area and any non-conformances observed during fabrication. Further, building prototypes at both PPPL and external vendors is providing critical experience on how best to build future production coils."



Copper is fed into a coil winding machine where it will later be wound onto a mandrel. (Photo by Jeanne Jackson DeVoe)

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# Drifting and bouncing particles help maintain stability in fusion plasmas

By Raphael Rosen

**A** key challenge in fusion research is maintaining the stability of the hot, charged plasma that fuels fusion reactions inside doughnut-shaped facilities called "tokamaks." PPPL physicists have recently found that drifting particles in the plasma, which consists of free electrons and atomic nuclei, can forestall instabilities that reduce the pressure crucial to high-performance fusion reactions inside these facilities.

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# PPPL recognizes employees at Service Recognition Luncheon

PPPL recognized the work anniversaries of its employees at the Service Recognition Luncheon on Tuesday, March 20.

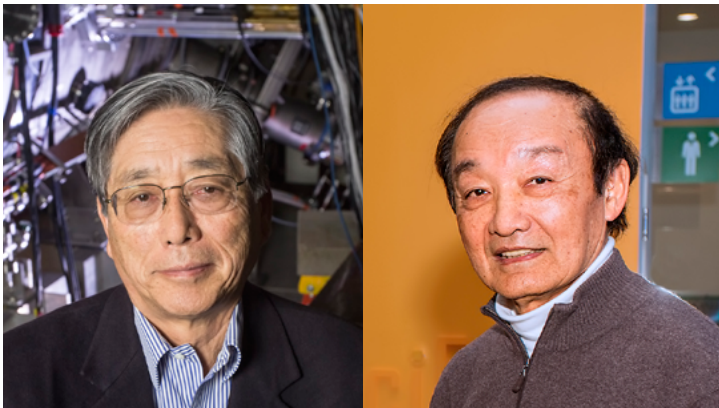
“Let me begin first of all by acknowledging your contributions and your accomplishments from the research staff who made the experiment to all the other groups, whether it’s facilities or ESU (Emergency Services Unit),” said Rich Hawryluk, PPPL’s interim director. “I’d like to thank you once again for all you’ve accomplished.”

“It’s the people who make this institution,” said Dave McComas, Princeton University vice president for PPPL. “Let me thank each of you very much for your dedication and service.”

(Photos by Elle Starkman)



**Recognized for 50 years of service** were James P. Taylor, left, an experimental advanced technician, and Joel Hosea, a senior managing research physicist who recently retired.



**45 years:** Masaaki Yamada, principal research physicist, and Bill Tang, chief scientist.

**Other employees recognized by Rich Hawryluk, PPPL’s interim director, left, and Dave McComas, the Princeton University vice president for PPPL were:**



**40 years:** Gary Taylor, principal research physicist (retired); David Mikkelsen, principal research physicist (retired); Phil Efthimion, senior managing research physicist. Not shown: Michael DiMattia, senior technician; Arlene White, supervising procurement specialist; Ernest Valeo, principal research physicist (retired); and Alexander Nagy, head of Engineering Collaborations.



**35 years:** Connie Cummings, quality assurance technical specialist, and John Wertenbaker, lead technician, Instruments and Control. Not shown: Gary Gibilisco, electronics advanced technician (retired); Joseph Bartzak III, lead technician; Allan Reiman, principal research physicist.



**30 years:** Charles Neumeyer, NSTX-U Recovery Project engineer, left, and Jerry Levine, head of Environment, Safety and Health. Not shown: Charles Kessel, principal engineer; Patricia Potts, senior warehouse/receiving clerk; Subrahmanya Ramakrishnan, principal engineer (retired).

**25 years:** Richard Majeski, principal research physicist, and Guo-Yong Fu, principal research physicist (retired)



**20 years:** Elle Starkman, multimedia specialist; Andrew Zwicker, head of Communications & Public Outreach; Susan Thiel, support assistant. Not shown: Stephen Langish, project director, Infrastructure and Operational Improvements; David Gates, managing principal research physicist; Elena Belova, principal research physicist. (Photo by Jeanne Jackson DeVoe)



**15 years:** Margaret Carideo, project planning and control officer. Not shown: Mark Swanek, project engineering/chemist; and Jim Chen, senior engineer, Technical.

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# NSTX-U Recovery Project Advisory Committee holds first meeting

A newly-formed NSTX-U Recovery Project Advisory Committee comprised of national and international experts, held its first meeting March 22 to 23. Most members, with the exception of chairman Robert Iotti, the former chair of the ITER Council, attended remotely due to weather and travel constraints.

“I am pleased that such an accomplished group has agreed to be part of the NSTX-U Recovery Project Advisory Committee,” said Rich Hawryluk, PPPL’s interim director. “They are looking at the Recovery Project and giving us an independent and critical evaluation to make sure that we are going in the right direction.”

Among other topics, the group was charged with reviewing major technical challenges and determining whether PPPL is addressing the recommendations in the U.S. Department of Energy (DOE) reviews of the project held Feb. 6 to 8.

The Advisory Committee will convene again sometime before the end of the fiscal year to ensure that PPPL is prepared for the baseline review that will look include a detailed review of the Recovery Project plans, as well as the cost and schedule of the project. They will be joined by additional experts in scheduling and cost analysis as part of a “director’s review,” prior to the baseline review. Other committee members are: Michel Huguet, former head of ITER magnets; Tom Todd, former chair of technology at the Culham Centre for Fusion Energy in England; Martin Cox, of the Culham Centre for Fusion Energy; Angus Bampton, of the Pacific Northwest National Laboratory; Roy Lebel, of Brookhaven National Laboratory; and John Post, of Lawrence Livermore National Laboratory. In addition, Ron Parker, emeritus professor at MIT’s Plasma Science and Fusion Center; John Smith, of General Atomics; and Rem Haange, former ITER technical director are members of the committee but were not able to attend. ☞

## Coil winding

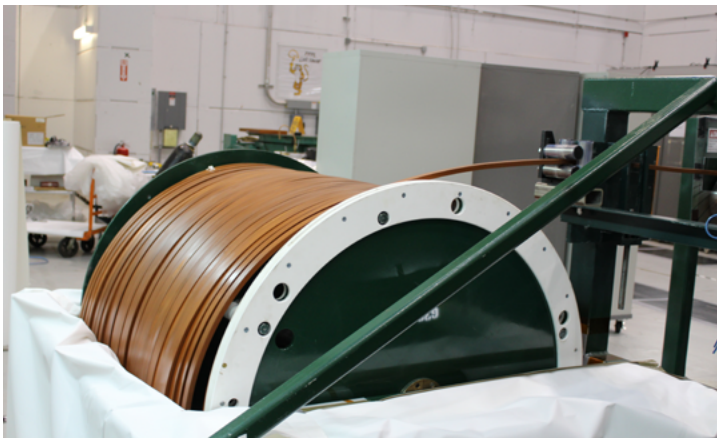
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The prototype coil that is completed will be tested and then be sectioned into pieces and analyzed to ensure that each stage of the process was successful.

PPPL designed and built a coil winding machine that unwinds the copper from a spool and stretches out and feeds it into a device that adds layers of Kapton (a type of durable insulating tape that can withstand high voltage) and fiberglass. The combined layer of coil is then automatically wound onto a steel mandrel, which acts like the spool. The winding will continue through at least this week.



The mandrel onto which the coil will be wound.  
(Photo by Jeanne Jackson DeVoe)



A large spool of copper at the foot of the machine.  
(Photo by Jeanne Jackson DeVoe)



The clean room in the coil winding facility.  
(Photo by Jeanne Jackson DeVoe)

The final design review for the production coils is scheduled on Friday, March 30. The production coils will have a similar design to the prototype coils. The DOE has set a deadline of July 15 for PPPL to have at least one prototype coil built and tested, said Russ Feder, the NSTX-U Recovery Project manager.

### A new coil design

Although both the prototype and production coils are wound on a mandrel, the mandrel is designed so that it can be removed, creating a mandrel-less coil that will enhance acceptance prior to insulation and make it easier for turn-to-turn electrical testing on NSTX-U without removing the coil from the machine. The next step in the process will be to place the prototype coil in a vacuum-sealed mold and inject it with an epoxy that will be baked up to approximately 170 degrees Centigrade to solidify the epoxy and combined fiberglass-Kapton tape that will insulate the coils.

Three other facilities, Everson-Tesla Inc. in Pennsylvania, Tesla Engineering in England, and Sigmaphi in France, are each building prototype coils. The results of the final tests will help determine which facilities produce the three sets of production coils.

“All the techs are happy to finally be producing the coils,” said Steve Raftopoulos, the responsible engineer for magnets on the Recovery Team, “and the design team is also extremely gratified that we’re at this point and looking forward to the next step.” ☞

# COLLOQUIUM

## Combating Instabilities in Nanocrystalline Tungsten through Grain Boundary Doping

**Jason Trelewicz**

Stony Brook University

**Wednesday, March 28**

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

## Young Women's Conference Postponed Until Later This Spring

PPPL's Young Women's Conference, scheduled for March 22 at Princeton University, was canceled due to the March 21 snowstorm. The event was set to be the largest in the event's history with more than 750 young women attending and New Jersey First Lady Tammy Murphy scheduled to make an appearance. The event will be rescheduled later this spring, possibly toward the end of May. Stay tuned for details about volunteering.

## Service Recognition Luncheon

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**10 years:** Gregory Tchilinguirian, plant instrument and control group leader; Robert Walker, emergency services officer; Edmund Jenkins, facility systems engineer; Kevin Czarnecki, IT security analyst; Nelson Neal, custodian; Michael Gonzalez, senior human resources generalist; Christopher Stires, health physics technician. Not shown: Lance B. Smith, fully qualified technician; Mark Smith, lead engineer; Debra Anderson, custodian; Jeffrey Chaplin, emergency services officer; Eun-Hwa Kim, research physicist.



**5 years:** Rajesh Maingi, deputy head of ITER and Tokamaks; John Greenwald, science editor; Jeanne Jackson DeVoe, communications specialist; Morgan Styer, project engineer. Not shown: Emil Nabil Nassar, project planning and control officer; Helen Wojtenko, staff accountant, Enrique Merino, research specialist; John Dellas, senior engineer. 📷

# Drifting particles

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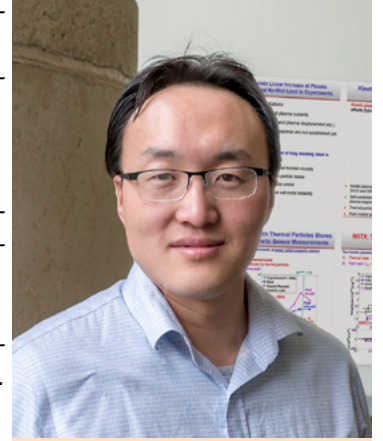
Fusion, the power that drives the sun and other stars, is the fusing of light elements in the form of plasma that produces massive amounts of energy. PPPL scientists seek to study and replicate fusion by heating the plasma to superhot temperatures inside a tokamak and confining it under pressure in spiraling, magnetic fields. Physicists use the term “beta” to characterize how the pressure of the heat produced by a tokamak compares with the pressure of the magnetic field used to contain the plasma.

Research led by Zhirui Wang used data from the National Spherical Torus Experiment (NSTX), a spherical tokamak at PPPL shaped like a cored apple that produces high-beta plasmas. Findings of the study explain how particles that drift and bounce within the fields can stabilize high-pressure and high-performing plasmas.

Such particles become trapped and bounce back and forth within a limited portion of the magnetic fields instead of traversing their entire circumference around the machine. The portions themselves can drift around the machine. The bouncing and drifting can dissipate energy that might otherwise destabilize the plasma and interfere with fusion reactions, the physicists found.

Researchers first noticed discrepancies between the NSTX data and simulation predictions. Modifying the code to take the trapped particles into account improved the agreement by producing simulations suggesting that the plasma would remain stable longer under high pressure, as the NSTX experiments showed. “We found that tokamaks can go to a higher beta because the plasma will be stabilized by these kinetic effects,” said Wang, lead author of a paper describing the results in the journal *Nuclear Fusion*.

Improved kinetic simulations could also lead to better predictions and control of plasma instabilities known as edge-localized modes (ELMs), which appear at the edge of high-confinement plasmas. By unleashing large amounts of energy to the wall, can significantly damage plasma-facing components in a fusion reactor. Better predictions would allow scientists to foresee when an ELM is about to occur and adjust magnetic controls so the instability is either mitigated or completely suppressed before it erodes the materials surrounding the fusion plasma.

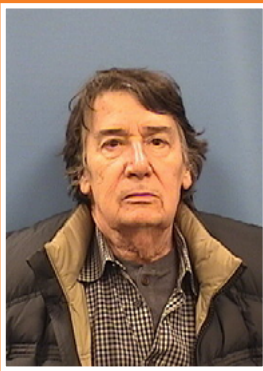


Zhirui Wang  
(Photo by Elle Starkman)

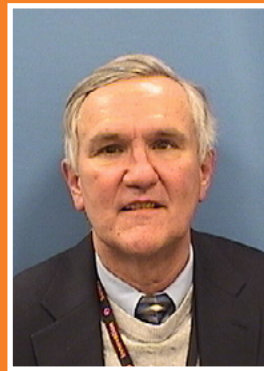
Overall findings of this research could lead to improved achievement of high-performance fusion plasmas in present day tokamaks and in ITER, the international experiment under construction in France to demonstrate the feasibility of fusion power.

Participants in this research and coauthors of the paper included PPPL physicists Jong-Kyu Park, Jonathan Menard, Stanley Kaye, and Stefan Gerhardt, as well as General Atomics physicist Yueqiang Liu. Support for this research was provided by the DOE Office of Science. [📄](#)

## PPPL Welcomes New Employees!



**TOM JERNIGAN,**  
Project manager  
IOI



**NORM NILSEN**  
Project manager/ICAP  
OFFICE OF THE DIRECTOR



**OSCAR PONCIANO**  
Emergency services officer  
SITE PROTECTION



**KATHLEEN ROQUE**  
Supervising procurement  
specialist  
BUSINESS OPERATIONS

# Science on Saturday lecture series concludes with a PPPL tour

The Edward E. Hatcher Science on Saturday lecture series concluded on March 17 with a lecture by Michl Binderbauer of Tri Alpha Energy and a tour of the Laboratory for more than 100 people.

The audience gave a round of applause to Deedee Ortiz, the Science Education program manager who organizes the event, and Andrew Zwicker, head of Science Education and Communications and Outreach, who hosts the event.

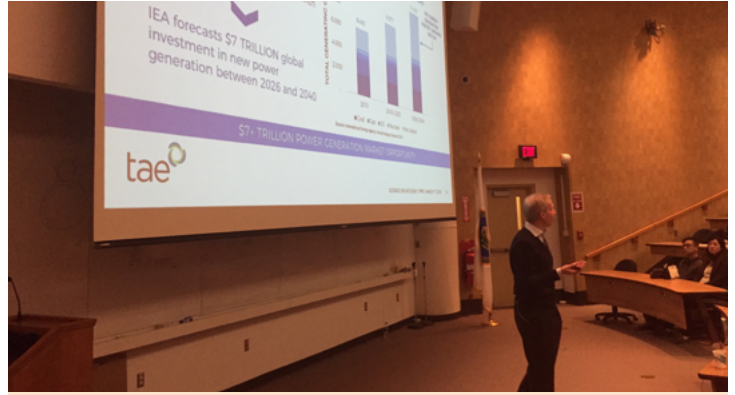
The visitors said they really enjoyed the tour. "I really liked looking at the tokamak," said Aromal Suresh, a student at Somerset Vo Tech School.

"The whole place is interesting," said Alan Shi, an 11-year-old sixth-grader from Perth Amboy. "I liked seeing the reactor. It's cool because it shows how much humans have learned in thousands of years."

"It was wonderful," said Somesh Rao, of West Windsor. "The tour guide makes it simple enough to understand. I don't know the physics but it's very fascinating. All of the talks do that for me too, so I'm excited that it was on Saturday."

"A lot of what Arturo (Dominguez) said resonated with me because I feel like if PPPL is successful there's hope for mankind and I'm going into my days hoping it succeeds," said Steve Spielvogel, of Princeton. "He made it interesting and fun and he really taught us a lot."

The tour guides who volunteered to come in on a Saturday to give the tour were: Arturo Dominguez, Brian Kraus, Kevin Lamb, Jacob Schwartz, Atiba Brereton, and Hans Schneider.



Michl Binderbauer, chief technology officer at TriAlpha Energy, discusses TriAlpha's fusion program at the final Science on Saturday program on March 17. (Photo by Jeanne Jackson DeVoe)



Aromal Suresh, left, of Bridgewater Township, and Karnav Dalal, of Franklin Township, in the National Spherical Torus Experiment-Upgrade test cell. (Photo by Jeanne Jackson DeVoe)



Steven Spielvogel and Jasmine Hibbitt, both of Princeton, try out the Van de Graaff generator in the Science Education Laboratory. (Photo by Jeanne Jackson DeVoe)



Tour guide Atiba Brereton with visitors in the lobby. (Photo by Jeanne Jackson DeVoe)



PPPL technicians helping out with the tours on Saturday were, from left: Robert Tucker Jr., Dan Stevens, and Saj Gilani. (Photo by Jeanne Jackson DeVoe)



Arturo Dominguez talks to visitors in the National Spherical Torus Experiment-Upgrade (NSTX-U) test cell. (Photo by Jeanne Jackson DeVoe)

# Nominate sustainable PPPL'ers for Green Machine Awards!

Please submit award nominations for PPPL employees or employee teams that have contributed to PPPL's environmental performance. Nominations are due by Wednesday April 11, by completing the online nomination form or emailing Leanna Sullivan ([lsullivan@pppl.gov](mailto:lsullivan@pppl.gov)).

## Nominate yourself or your colleagues for:

- Reducing greenhouse gas emissions
- Saving energy
- Saving water
- Reusing equipment or material
- Recycling materials or equipment
- Reducing the use of toxic or hazardous materials
- Reducing or eliminating pollution
- Other actions that help protect public health or the environment
- Sustainable acquisition (purchasing recycled content, energy efficient biobased, and other "green" products)
- Estimated cost savings or environmental benefit

## Nominations should include:

- Nominee's name(s)
- PPPL work group
- Description of the actions taken

## Self-nominations will be accepted.

Note: While the PPPL Green Machine Awards recognize environmentally sustainable practices at work, we would also like to hear about what you're doing at home. If you've made an effort to "green your home" and would like to share your experience during Earth Day, please complete the applicable section of the online nomination form.

Please contact Leanna Meyer ([lmeyer@pppl.gov](mailto:lmeyer@pppl.gov)) or Margaret King ([mking@pppl.gov](mailto:mking@pppl.gov)) if you have questions. Information about PPPL's Earth Day activities is available at <https://sites.google.com/a/pppl.gov/environmental-services/sustainability/earth-week>

## Are workers' and supervisors' expectations aligned?

STOP program data indicates workers' perceptions (worker's interpretation of expectations) are not always aligned with supervisors' expectations. Talk to clarify before beginning work.



**Safety first:  
Use the STOP program!**

# Council Café Lunch

**This Week:**  
**Scott Weidner, Princeton University assistant vice president for engineering**



**Wednesday, March 28**  
**12 p.m., PPPL Café**

*April 4: Valeria Riccardo*

**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 March 26	Tuesday March 27	Wednesday March 28	Thursday March 29	Friday March 30
Early Riser	Bacon, Egg and Cheese English Muffin	Mexican Breakfast Burrito	Scrapple and Eggs	Cinnamon-Raisin Pancakes with Homemade Apple Compote	French Toast Sticks
Country Kettle	Soup of the Day	Vegetable	Chicken Noodle	Tomato Soup	Chili Bean
Deli Specialty	Autumn Chicken Salad Wrap	Smoked Salmon and Herb Cream Cheese Bagel	Cajun Egg Salad Wrap	Italian Hoagie	Cobb Salad Wrap
Grill Specialty	Mushroom Quesadilla	Burgerlicious Old Macdonald Burger	Bacon, Arugula and Fried Green Tomatoes	Flatbread Pizza and Tossed Salad	Grilled Ham Mac and Cheese
<b>COMMAND PERFORMANCE</b> <b>Chef's Feature</b>	Chicken Cordon Bleu with Wild Rice Pilaf	Pasta Bake with Meat Sauce and Garlic Bread	Carved Turkey with Stuffing and Gravy		Fried Fish with Potato Salad and Spinach
Grilled Panini	Ham and Swiss Melt	Corned Beef Reuben	Kielbasa with Sauerkraut	BBQ Pork Sandwich	Vegetable Lasagna

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**

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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](mailto:commteam@pppl.gov) ♦ PPPL WEEKLY is archived on the web at: <http://w3.pppl.gov/communications/weekly/>.