

THIS WEEK

WEDNESDAY, FEB. 28

Council Café Lunch
12 p.m. ♦ Cafeteria
Marc Cohen
Interim head of IT

Colloquium
4:15 p.m. ♦ MBG Auditorium
**Gravitational Waves: Discoveries
and Future Detectors**
Matthew Evans, MIT Physics

SATURDAY, MAR. 3

Science on Saturday
9:30 a.m. ♦ MBG Auditorium
**Looking Ahead a Split Second:
How the Brain Learns Predictions
in an Unpredictable World**
Sam Wang, Princeton University

UPCOMING

WEDNESDAY, MAR. 7

Council Café Lunch
12 p.m. ♦ Cafeteria
Phil Efthimion
Head of the Plasma Science
& Technology Department

FRIDAY, MAR. 9

Employee Tour
10-11:30 a.m. ♦ LSB Lobby
[See page 6 for details.](#)

SATURDAY, MAR. 10

Science on Saturday
9:30 a.m. ♦ MBG Auditorium
**Control in the Sciences of Vast
Length and Timescales**
Herschel A. Rabitz, Princeton
University, and Andrea Woody,
University of Washington

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N.J. First Lady learns about science education at PPPL

By Jeanne Jackson DeVoe

New Jersey First Lady Tammy Murphy came to PPPL last week to learn about Science Education programs and discuss ways of promoting science, technology, engineering and mathematics (STEM) programs and innovation statewide.

Murphy toured PPPL's Science Education Laboratory and met with Andrew Zwicker, head of Communications & Public Outreach, and the Science Education staff, as well as Rich Hawryluk, PPPL interim director, and Dave McComas, the Princeton University vice president for PPPL. She also met with students in the Science Education Lab who were working under the DOE's Science Undergraduate Laboratory Internship and the Community College Internship programs.



New Jersey First Lady Tammy Murphy, right, in the Science Education Laboratory with, from left: college intern Vinicius Wagner; Arturo Dominguez, senior program leader in Science Education; college intern Geena Elghossain, facing Dominguez; Andrew Zwicker, head of Communications and Public Outreach and Science Education, and Rich Hawryluk, PPPL's interim director. (Photo by Elle Starkman)

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Physicists learn how to better control instabilities in ITER

By Raphael Rosen

A key goal for ITER, the international fusion device under construction in France, will be to produce 10 times more power than goes into it to heat the hot, charged plasma that sustains fusion reactions. Among the steps needed to reach that goal will be controlling instabilities called “neoclassical tearing modes” that can cause magnetic islands to grow in the plasma and shut down those reactions.

Fusion, the reaction that powers the sun and most stars, is the fusing of light elements that generates massive amounts of energy. Scientists seek to replicate fusion on Earth, creating a “star in a jar,” for a virtually inexhaustible supply of power to produce electricity.

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Tammy Murphy visit

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Dave McComas, Princeton University vice president for PPPL, center, and Hawryluk chat with Murphy in the Director's Conference Room (Photo by Elle Starkman)

"It's really clear to us that STEM is where we want to go," Murphy told the group. "[Gov.] Phil [Murphy] has made no bones about that. We are looking for ideas about how we can get more students in STEM."

Murphy had been first lady of New Jersey for just five weeks when she visited PPPL. She has made improving education and environmental concerns two of her top issues. A Virginia native, Murphy graduated from the University of Virginia with a degree in communications. She met her husband, Phil, when they both were working for the Wall Street investment firm Goldman Sachs. She is a founding member and secretary of the Climate Reality Project, the group founded by former Vice President Al Gore. Murphy played an active role in her husband's political life when he was ambassador to Germany from 2009 to 2013 and in the recent campaign. She now has an office down the hall from him in Trenton. The couple has four children and they commute every day from their home in Middletown, New Jersey, in Monmouth County.

McComas said education is a key part of PPPL's mission. "Of course we're focused on fundamental plasma physics and getting fusion energy for the world," he told Murphy. "But as part of Princeton University we are always interested in the educational aspects of our mission too."



Murphy shares a laugh with Dominguez as she views the Remote Glow Discharge Experiment in the Science Education Laboratory. (Photo by Elle Starkman)



Zwicker speaks with Murphy in the Director's Conference Room. (Photo by Elle Starkman)

Stopping at the Science Education Lab

The first lady began her brief visit in the Science Education Laboratory where she met several PPPL interns. She chatted with Geena Elghossain, a college intern from the College of New Jersey who is working on the Magnetorotational Instability Experiment. She also met Vinicius Wagner, an intern from Palm Beach State College in Florida who is from Brazil. Wagner is working on the [Remote Glow Discharge Experiment \(RGDX\)](#) with Arturo Dominguez, a senior program leader in Science Education. "It's absolutely an incredible opportunity," Wagner told the first lady. "There couldn't be a better place to work."

Dominguez demonstrated the RGDX and Zwicker explained that it is a remote plasma experiment that anyone can operate anywhere in the world with access to the Internet. He noted that users have hailed from all 50 states, 90 countries, and all seven continents (thanks to a former PPPL'er in Antarctica).

Numerous PPPL Science Education programs

Zwicker discussed PPPL's numerous programs to draw students into STEM fields. These include more than 50 high school and college interns, the Science on Saturday program, which recently drew 400 people to hear about autonomous vehicles, the Young Women's Conference on March 22, classroom visits, and a variety of outreach efforts focused on underrepresented students in physics.

Hawryluk said STEM programs could help make the physics field and particularly the plasma physics field more diverse. "One of the issues we face is we don't have as diverse a staff as we would like," he said. "If you don't have the people enter into the pipeline, you're never going to have highly trained people at the other end."

Shannon Swilley Greco, a program leader in Science Education, noted that the programs aimed at involving young women in STEM have helped inspire young female scientists. These include the Young Women's Conference and the APS Conference for Undergraduate Women in Physics, one of which Princeton University and PPPL hosted last year, at the University. "We get feedback from some of the women saying it was one of the greatest things they've attended," Greco said.

Discussing the Young Women's Conference

Murphy asked if the Young Women's Conference could be expanded or viewed remotely by more people. Deedee Ortiz, the Science Education program manager who organizes the conference, noted that the event has already gotten so big that it had to move from PPPL to Princeton University. About 750 young women will attend this year. Greco added that doing hands-on experiments at the conference and meeting working

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Tammy Murphy visit

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female scientists as well as other young women interested in STEM is an important benefit of attending. Ten young women from each school are invited and these young women interested in STEM may not feel supported at their schools, Greco said. But they feel inspired when they join hundreds of other young women who are also interested in STEM.

Murphy said she would like to see New Jersey become a center for science and technology, and to do that science education needs to reach everyone in the state. "If you're succeeding that means our economy will be succeeding and all 9 million people in New Jersey will benefit from that," she said.

McComas said it is difficult to know how to support state-wide efforts without knowing who is working on such efforts. A state clearinghouse on science and technology would solve that problem, he said.

"It was a pleasure to talk to the first lady of New Jersey, who is focusing on STEM education, and to tell her about the work we've been doing here at PPPL for so long," Zwicker said after the visit. "I'm looking forward to talking to her more about our education and outreach efforts and learning more about her efforts to bring STEM education to all New Jersey students, regardless of their education and economic status." 📷



Taking part in the visit with Murphy were, from left: Dominguez; Deedee Ortiz, Science Education program manager; Zwicker; Shannon Greco, program leader in Science Education; McComas; and Hawryluk. (Photo by Elle Starkman)

Ronald E. Hatcher

Science on Saturday LECTURE SERIES

Mar. 3

Looking Ahead a Split Second: How the Brain Learns Predictions in an Unpredictable World
Sam Wang, Princeton University

Mar. 10

Control in the Sciences of Vast Length and Timescales
Herschel A. Rabitz, Princeton University
Andrea Woody, University of Washington

Mar. 17

On the Path to Clean Fusion Energy
Michl Binderbauer, TAE Technologies

Saturdays at 9:30 a.m., MBG Auditorium

Neoclassical tearing modes

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Outlining a direction for the control of tearing modes has been PPPL physicist Francesca Poli. She and coauthors recently published findings in the journal *Nuclear Fusion* that describe an approach that for the first time simultaneously simulates the plasma, the magnetic islands, and the feedback control from waves that provide so-called electron cyclotron heating and current drive.

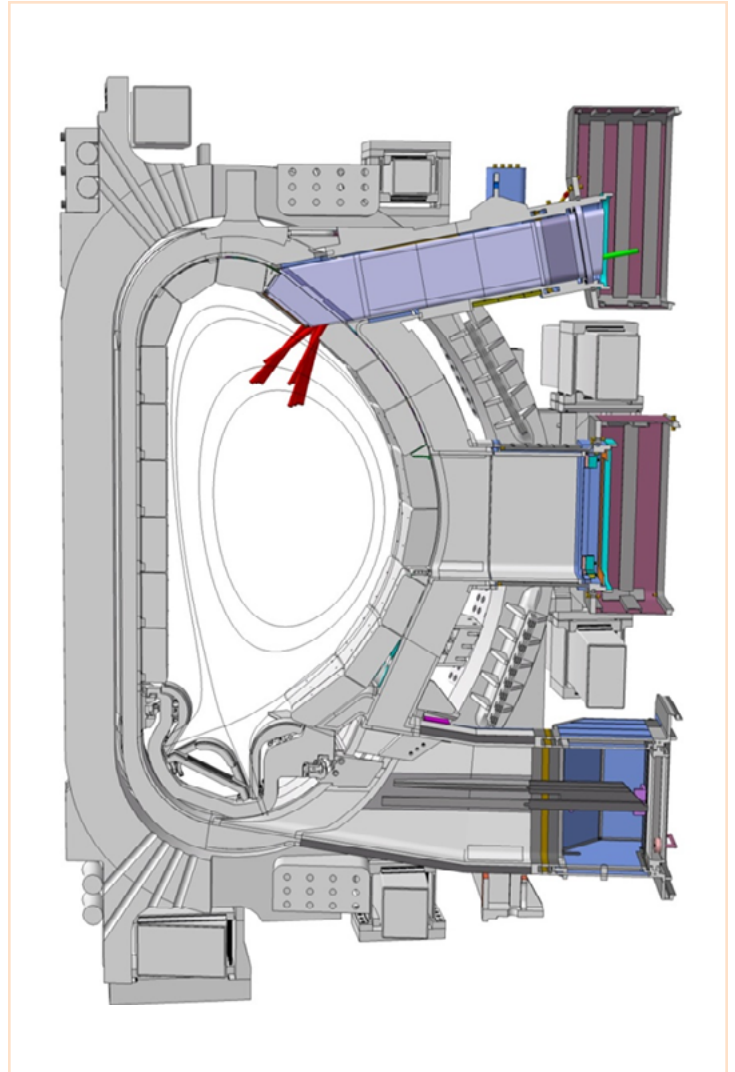
These waves, which accelerate the electrons gyrating along magnetic field lines in the plasma in fusion devices called “tokamaks,” can deposit energy into the islands and should have the ability to suppress or stabilize tearing modes in the ITER device. “Basically, you are trying




Francesca Poli
(Photo by Elle Starkman)

to shoot the beam of electron-cyclotron waves inside the island to replace current that has been depleted from the island,” Poli said. “If you shoot inside the island, that’s okay. If you shoot outside the island, that’s not okay. The current from the electron-cyclotron waves has to be aligned, within some uncertainty, with the island. The simulations we performed can determine the maximum misalignment that can be tolerated and under which conditions experiments should be run.”

Poli conducted the research on PPPL computers running TRANSP, the PPPL-developed code that physicists around the world employ to analyze and predict fusion experiments. Results showed that simulations are generally most helpful when they model the plasma in an integrated manner. For example, rather than depict a magnetic island in isolation, simulations should take into account what happens to the surrounding plasma both when the island grows and after the application of radio waves to produce the electron-cyclotron heating. Only by using a more integrated model can scientists determine under which conditions the island stabilization will be successful.



ITER plasma cross-section and structures (Image courtesy of Mark Henderson, ITER Organization)

Coauthors of the paper presenting the findings were Eric Frederickson and Nicola Bertelli of PPPL; Mark Henderson and Sun Hee Kim of the ITER Organization; Emanuele Poli of the Max Planck Institute for Plasma Physics, Germany; and Daniela Farina and Lorenzo Figini of the Institute of Plasma Physics, Italy. Support for this work comes from the DOE Office of Science and the ITER Organization. 

Submit your questions for Plasma 101 Lunch & Learn

Please submit your questions about fusion energy, plasma, or any of the research we do here in the box in the LSB lobby.

Sample questions:

What is plasma?

How is what we do different from “nuclear power?”

Why don’t we have fusion energy on the grid yet?

A taste of Italy on first stop of “World of Thanks Tour”

PPPL staff took a break from their work for some Italian treats on Thursday, Feb. 22, on the first stop of “A World of Thanks Tour.” The event was sponsored by the Princeton University Vice President for PPPL’s office and was the first in a series. “Princeton University is really thankful to all of the PPPL staff for their hard work and great contributions to the critical work of the Laboratory,” said David McComas, the Princeton University vice president for PPPL. “We just wanted to have a little celebration to take a moment off and give thanks.”

McComas, along with Scott Weidner, Princeton University assistant vice president for engineering for PPPL, and Chelle Reno, Princeton University assistant vice president for operations, served Italian pastries such as biscotti, seven-layer cookies and sfogliatella, a shell-shaped pastry sometimes called “lobster tail.”

Staff members seemed to enjoy the party. “We really do need morale boosters, even if they’re little ones like this,” said John Wertenbaker of the IT Department.

PPPL staff with ideas of what country and favorite desserts to feature in the future should contact Farra Rosko, frosko@princeton.edu with their suggestions. 🍪

(Photos by Elle Starkman)



Chelle Reno, Princeton University assistant vice president for operations for PPPL, serves Weiguo Que



Enjoying the celebration were, from left: Kevin Lamb, Matt Reinke, Michael Mardenfeld, Mark Karlik, Dan Stevens, Atiba Breton, Scott Gifford, Philip Fautleroy, and John DeSandro.



Kyle Palmer, left, Nicole Adams, and Harry Tsamutalis, at the party.



Devon Battaglia is at the front of the line for pastries being served by Scott Weidner, Princeton University assistant vice president for PPPL.



Ambica Nandanavanam, Chitra Venkatraman, and Norm Nilsen, are all smiles at the event.



Serving at the “World of Thanks Tour” event were, from left: Scott Weidner, Princeton University assistant vice president for engineering for PPPL; Chelle Reno, Princeton University assistant vice president for operations for PPPL; Farra Rosko, executive assistant to the vice president; and Dave McComas, Princeton University vice president for PPPL.



Dave McComas, Princeton University vice president for PPPL, serves a biscotti to Tori Sikkema as Tom Egebo and others wait in line.

Going, going, gone: The Mod 6 building is demolished

A gigantic excavator made quick work to demolish the Mod 6 building last week. With staff from Site Protection; Quality Assurance; and the Environmental, Safety & Health divisions all moved, the 24-year-old building was ready to be demolished. The building was acquired in 1993 as a temporary space. The demolition was part of the Infrastructure Operational Improvements (IOI) project. Metal and other materials from the building will be recycled. 🗑️



The excavator removes building materials.
(Photo by Elle Starkman)



An excavator tears into the Mod 6 building.
(Photo by Elle Starkman)

Tour the Laboratory on an employee tour!

- Who:** PPPL Staff
- What:** See the NSTX-U Control Room, test cell, and other areas of the Laboratory on an employee tour
- When:** March 9, 10–11:30 a.m.,
and the second Friday of each month at 10 a.m.
- Where:** Meet in the LSB Lobby
- Why:** Learn more about our research and mission
- How:** [Sign up here](#) or contact tours@pppl.gov

Video team follows graduate student Brian Kraus at PPPL

A Princeton University video team came to PPPL on Friday, Feb. 16, to videotape Brian Kraus, a graduate student in plasma physics at PPPL, while he worked in the Laboratory and gave a public tour. Videographer Danielle Alio and science writer Liz Fuller-Wright, of Princeton University Communications, are doing a video on Kraus and Stevie Bergman, a graduate student in physics, and their weekly radio show "These Vibes Are Too Cosmic" (TVR2C). The show airs live on Tuesdays from 6 to 8 p.m. on Princeton's radio station (WPRB FM 103.3) or online at wprb.com. It focuses on music and science and often features interviews with researchers at Princeton or visiting Princeton. For example, a recent show featured an interview with graduate researcher Isabela Morales, of Princeton's Department of History, who is researching Princeton's connections to slavery. The show's website is <https://tvr2c.com>.



Tour guide Brian Kraus speaks to visitors in the LSB Lobby during a public tour on Feb. 16. (Photo by Elle Starkman)



Danielle Alio videotapes Kraus speaking to visitors. (Photo by Elle Starkman)

COLLOQUIUM

Gravitational Waves: Discoveries and Future Detectors

Professor Matthew Evans
MIT Physics

Wednesday, Feb. 28
4:15 p.m., M.B.G. Auditorium, Lyman Spitzer Building

American Red Cross Blood Drive

Wednesday, March 14

8 a.m.-1 p.m.

Appointments are preferred. Please call the OMO at ext. 3200 or go to redcrossblood.org and enter sponsor code PPPLPrinceton.

You can make a difference! Your blood donation matters!

Thank you!

—American Red Cross, Occupational Medicine Office and Human Resources

Volunteer for the Young Women's Conference March 22

There will be 750 girls from all over New Jersey at this year's Young Women's Conference March 22 at Princeton University. Volunteers are needed to help out with PPPL and Liberty Science Center tables, registration, and other tasks.

Please contact Deedee Ortiz, dortiz@ppp.gov, ext. 2785 and stay tuned for registration information.

Council Café Lunch

This Week:
Marc Cohen,
Interim head of IT



Wednesday, Feb. 28
12 p.m., PPPL Café

March 7: Phil Efthimion

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 Feb. 26	Tuesday Feb. 27	Wednesday Feb. 28	Thursday Mar. 1	Friday Mar. 2
Early Riser	Bacon, Egg & Cheese Croissant	Sausage, Egg and Cheese Biscuit	Chocolate Chip Pancakes served with Choice of Breakfast Meat	Ham, Egg and Cheese Sandwich	2 Eggs, 1 Pancakes, Choice of Breakfast Meat & Potatoes
Country Kettle	Soup of the Day	Soup of the Day	Soup of the Day	Soup of the Day	Soup of the Day
Deli Specialty	Capicola with Provolone and Hot Pepper Relish	Wasabi Turkey Wrap	Maple-Roasted Vegetable Wrap	Deviled Egg Salad Croissant	Chicken, Mozzarella, Red Onion, Basil, Spinach and Balsamic Tomatoes on French Bread
Grill Specialty	Patty Melt	Shrimp Tacos	Chicken and Sausage Jambalaya	Portobello Mushroom Cheese "Steak"	Apple Cheddar Melt
COMMAND PERFORMANCE Chef's Feature	Chicken Saltimbocca over Garlic Rice	Baked Potato Bar	Roast Beef Au Jus with Mashed Potatoes and Corn	"Super Salad"	Fish and Chips
Grilled Panini	Tomato, Fresh Mozzarella, Spinach and Pesto Hoagie	Roast Beef with Boursin Cheese and Caramelized Onion	Bologna Pretzel Melt	Sausage and Peppers	Cuban Sandwich

MENU SUBJECT TO CHANGE WITHOUT NOTICE

HEART HEALTHY

VEGETARIAN OPTION

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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/>.