

## THIS WEEK

WEDNESDAY, JAN. 11

### PPPL Colloquium

4:15 p.m. ♦ MBG Auditorium  
[Motivations for Spherical Torus  
research and initial results from  
NSTX Upgrade](#)  
Jon Menard, PPPL

JAN. 13-15

**Conference for Undergraduate  
Women in Physics (CUWiP)**  
Princeton University

FRIDAY, JAN. 13

**CUWiP tour of PPPL**  
1:30 p.m.

SATURDAY, JAN. 14

**Science on Saturday**  
9:30 a.m. ♦ MBG Auditorium  
[Plasma Control for Energy](#)  
Egemen Kolemen, PPPL  
& Princeton University

JAN. 15-16

**CUWiP+ Plasma Physics Workshop**  
PPPL

## UPCOMING

MONDAY, JAN. 16

**Martin Luther King Jr. Day**  
PPPL & Princeton University closed

WEDNESDAY, JAN. 18

**PPPL Colloquium**  
4:15 p.m. ♦ MBG Auditorium  
[Chaotic Dynamics in the  
Physical Sciences](#)  
Edward Ott, University of Maryland

FRIDAY, JAN. 20

**Public Tour**  
10 a.m.

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# Physicist Stefan Gerhardt receives 2016 Excellence in Fusion Engineering Award

By Raphael Rosen

**S**tefan Gerhardt, principal research physicist and head of experimental operations on the National Spherical Torus Experiment-Upgrade (NSTX-U) at PPPL, has won the Fusion Power Associates 2016 Excellence in Fusion Engineering Award.

The honor, given by directors of the research and educational foundation, recognizes “persons in the relatively early part of their careers who have shown both technical accomplishment and potential to become exceptionally influential lead-



Stephen O. Dean, right, president of Fusion Power Associates, presents the 2016 Excellence in Fusion Engineering Award to PPPL physicist Stefan Gerhardt at the Fusion Power Associates’ 37th annual meeting and symposium Dec. 13 in Washington, D.C. (Photo by Dale Meade)

ers in the fusion field.” The award was presented on Dec. 13 at Fusion Power Associates’ 37th annual meeting and symposium in Washington, D.C. Fusion Power has presented the award each year since 1987 in memory of David J. Rose, a professor of nuclear engineering at MIT.

In its notification letter, the group’s board of directors cited Gerhardt’s “many scientific contributions,” including his “recent work on predicting plasma disruptions, which will provide major benefit to ITER and other major fusion experiments, and the leadership you provided and are providing.” ITER is an international tokamak under construction in France to demonstrate the feasibility of fusion power.

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# Scientists develop a path toward improved high-energy accelerators

By John Greenwald

**P**hysicists at PPPL, in collaboration with researchers in South Korea and Germany, have developed a theoretical framework for improving the stability and intensity of particle accelerator beams. Scientists use the high-energy beams, which must be stable and intense to work effectively, to unlock the ultimate structure of matter. Physicians use medical accelerators to produce beams that can zap cancer cells.

“When physicists design the next-generation of accelerators, they could use this theory to create the most optimized focused beams,” said PPPL physicist Hong Qin. Qin, executive dean of the School of Nuclear Science and Technology at the University of Science and Technology of China, is a co-author of the research described in the November issue of *Physical Review Letters*.

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# PPPL's Ronald E. Hatcher Science on Saturday Lecture Series kicks off Jan. 14 with a banquet of cutting-edge science talks

By Jeanne Jackson DeVoe

PPPL will once again offer a wide variety of cutting-edge science talks as it kicks off its popular Ronald E. Hatcher Science on Saturday Lecture Series for high school students and science lovers of all ages on Saturday, Jan. 14, at 9:30 a.m. at the Laboratory.



Egemen Kolemen will be the first speaker in the Ronald E. Hatcher Science on Saturday lecture series. (Photo by Frank Wojciechowski)

This is year 33 of the free nine-week lecture series, which features cutting-edge science talks by top experts in their fields that are aimed at a general audience. The DOE's Office of Science funds the program. This year's talks by scientists from Princeton University and other institutions include discussions of the physics of cancer, emerging diseases, and the challenge of responding to climate change.

The program was renamed "The Ronald E. Hatcher Science on Saturday Lecture Series" two years ago in honor of the late PPPL engineer who spent 20 years organizing the series and serving as the unofficial master of ceremonies.

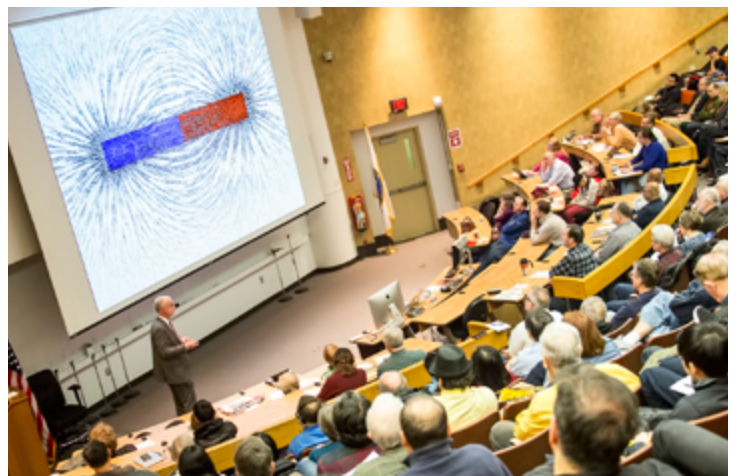
"Putting together the list of speakers is always a delight and I learn something new at every lecture," said Andrew Zwicker, head of the Office of Communications and Public Outreach, who hosts the event. "There is nothing more rewarding than seeing the auditorium full of people of all ages who are curious about the world around them and are fascinated by how scientists are helping to make our world a better place."

The series begins with a talk by Princeton University and PPPL physicist Egemen Kolemen entitled "Plasma Control

for Energy." A complete schedule is available at <https://pppl.princeton.edu/education/science-education/programs/ronald-e-hatcher-science-saturday-lecture-series>.

The lectures begin at 9:30 a.m. and the doors open at 8:15 a.m. with light refreshments for early birds. Plan to come early to the lectures because seats fill up quickly. (There is no lecture on Feb. 25 due to the U.S. DOE's New Jersey High School Science Bowl®). Adult visitors must show a photo ID such as a license or passport.

You can also stream the lectures live from home at [https://mediacentral.princeton.edu/id/1\\_wdp1m3et](https://mediacentral.princeton.edu/id/1_wdp1m3et) and you can view archives of the lectures at <http://www.pppl.gov/sos-listing>. If Science on Saturday is canceled due to inclement weather or other emergency, an announcement will be posted on the PPPL website at [www.pppl.gov](http://www.pppl.gov) and a message will be left on the Science on Saturday Hotline, (609) 243-2121. 📺



Ed Synakowski, associate director of Science for Fusion Energy Sciences at the U.S. Department of Energy, discusses the path to the development of fusion energy at a lecture in March of 2016. (Photo by Elle Starkman)

## Ronald E. Hatcher Science on Saturday LECTURE SERIES

Jan. 14

**Plasma Control for Energy**  
Egemen Kolemen, Princeton

Jan. 21

**When Plasmas Meet Surfaces: An Exploration of Physics and Technology at the Plasma-Materials Interface**  
Angie Capece, TCNJ

Jan. 28

**The Physics of Cancer**  
Robert Austin, Princeton

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



# PPPL's enjoy holiday feast with a touch of magic

PPPLers enjoyed a feast of roast pork and turkey, mashed potatoes, and numerous other dishes while enjoying the tricks of magician and comedian Arsene Dupin. After sampling desserts provided by PPPLers, Dupin performed a humorous magic show for PPPL staff in which several members of the audience, including Al von Halle, Kathleen Lukazik, and photographer Elle Starkman, participated.

(Photos by Elle Starkman)



Dupin enjoys a moment in the audience next to Kathleen Lukazik.



Terry Brog, interim director of PPPL, right, with magician Arsene Dupin.



Smiling their way through the buffet line, left to right, Greg Schpakow, Brett Hudnett, and Kenneth Feeley.



Dave McComas, Princeton University vice president for PPPL, with administrators, left to right, Farra Rosko, Janice Huang, and Carol Ann Austin.



Al von Halle, left, assists Dupin with a trick.



Bill White sports a festive holiday suit while Brian Tomasko, right, shows off a jaunty hat.



Dressed in holiday garb, left to right: Alana Coleman, Carol Ann Austin, Mary Payne, Angela Powell, Pamela Serai, Tawana Lewis, Angela Breland-Jackson, Arlene White, Andrea Moten, and Margaret Kevin-King.

## Stefan Gerhardt wins award

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Jon Menard, program director of the NSTX-U, applauded Gerhardt's receipt of the Fusion Power award. "In the span of only a few years, Stefan's tenacity, legendary work ethic, attention to detail, and technical prowess have all been focused on whatever problem needs to be solved," Menard said.

Gerhardt first became interested in plasma physics and fusion as an undergraduate at the University of Wisconsin-Madison. While looking for a campus job, he discovered that the plasma physics group had openings. "I worked on the capacitor banks and did various maintenance tasks on the Madison Symmetric Torus, a plasma research machine," he recalled. "By the time I received an undergraduate degree, I had worked for three years in a fusion laboratory. I just kept on going from there."

In 2004, Gerhardt joined PPPL as a post-doctoral researcher and began working on the Magnetic Reconnection Experiment (MRX), a device that lets physicists study the breaking apart and snapping together of magnetic field lines in plasma. He soon was promoted to staff physicist, and after a vacancy

opened up he became the head of magnetic diagnostics for PPPL's National Spherical Torus Experiment (NSTX).

For Gerhardt, the quest to create a viable fusion power source is both a devilishly difficult engineering problem and a pressing social obligation. "There's no doubt that the energy demands of the world are ever-growing, and the environmental impact of those energy demands could be debilitating," Gerhardt said.

"And so, how do you get out of that? Tell everyone to live as if they were in the 17th century? Probably not realistic. In addition to being technically interesting, fusion is a very relevant topic. I personally like that." 



Stefan Gerhardt  
(Photo by Elle Starkman)

## PPPL & Princeton University closed for Martin Luther King Jr. Day Jan. 16

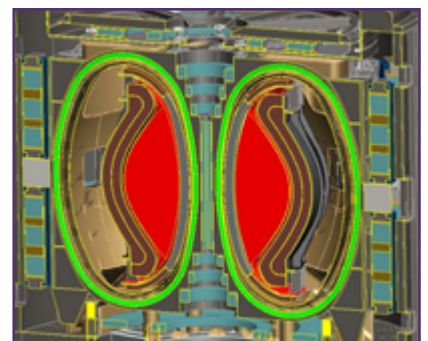
PPPL and Princeton University will be closed on Monday, Jan. 16, in honor of Martin Luther King Jr. Day.

The University will hold its free public community breakfast honoring the holiday on Jan. 16 from 8:30 a.m. to 10 a.m. in the Carl Fields Center's Multipurpose Room, 55 Prospect Ave.

# COLLOQUIUM

Motivations for Spherical Torus research and initial results from NSTX Upgrade

**Jon Menard**  
PPPL



**Wednesday, Jan. 11**

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



# High-energy accelerators

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## Zippering through tunnels or tubes

Accelerator beams consist of billions of charged particles that zip through tunnels or tubes before colliding with their targets. In scientific experiments, these beams strike their targets with an enormous energy density and generate subatomic particles that have not been seen since the early universe. The long-sought Higgs Boson, the particle that carries the field that gives mass to some fundamental particles, was discovered in this way in the Large Hadron Collider in Europe, the world's largest and most powerful accelerator.

In order for a beam to maintain its intensity, the particles in the beam must remain close together as they zip through the beamline.

However, the beam loses intensity as the mutual repulsion of particles and imperfections of the accelerator degrade the beam. To minimize such degradation and losses, the walls of large accelerators are lined with high precision magnets to control their motion.

The new research advances PPPL's theoretical work over the past seven years to improve the stability of beam particles. The theory strongly couples the vertical and horizontal



Hong Qin  
(Photo by Elle Starkman)

motions of the particles — in contrast to standard theory that treats the different motions as independent of each other. Results of the theory “provide important new theoretical tools for the detailed design and analysis of high-intensity beam manipulations,” according to the paper.

Lead author of the work is Moses Chung, a doctoral graduate of the Princeton Program in Plasma Physics who is now with the Ulsan National Institute of Science and Technology in South Korea. Co-authors include the late Ronald Davidson, a former director of PPPL and professor of astrophysical sciences at Princeton University, and Lars Groening and Chen Xiao of the Helmholtz Centre for Heavy Ion Research in Germany. Support for this work comes from the National Research Foundation of Korea and the DOE Office of Science.

## Altering a long-standing model

The paper addresses a 1959 work by two Russian physicists that formed the basis for analysis of the properties of high-intensity beams for the past several decades. This work considers the particle motions to be uncoupled. Chung and his co-authors modify the Russian model — called the Kapchinskij-Vladimirskij distribution — to include all coupling forces and other elements that can make the beams more stable.

The resulting theoretical tool, which generalized the Russian model, agreed well with simulation results for the Emittance Transfer Experiment at the Helmholtz Centre in Germany, which illustrated a new beam manipulation technology for future accelerators. More intense beams could enable the discovery of new subatomic particles, said Qin. 📧

## Application opens for presenters at 2017 Princeton Research Day

Applications are being accepted through Feb. 20 for non-faculty researchers at Princeton University, such as undergraduates, graduate students and postdoctoral researchers, to present at the second annual 2017 Princeton Research Day on May 11. The application is available at <https://researchday.princeton.edu>.

[The link to the Research Day website is available here.](#)

[The link to the application is available here.](#)

## Thank you for your food contributions

PPPL'ers contributed several boxes of food to Princeton University's food drive, which collected 2,965 pounds of food for the Mercer Street Friends Food Bank. Thank you for your contributions!

# Contribute to Princeton University's Business Clothing Drive

Please contribute to Princeton University's annual clothing drive to collect business attire for men and women, benefitting Dress for Success, HomeFront's Suitably Dressed, UIH's Operation Fatherhood, and Isles.

The University is also collecting unwanted stuffed toys for donations to Glad Dogs Nation, which creates safe dog toys from old, unwanted stuffed animals. To learn more about Glad Dogs Nation visit [www.gladdogsnation.com](http://www.gladdogsnation.com)

Items can be brought to 350 Alexander St. between 8 and 9 a.m. and 12:30 and 1:30 p.m., weekdays, Jan. 25 through Feb. 1.

Volunteers are needed during collection hours. For more information, or to volunteer to assist with the clothing drive, contact Erin Metro in Community and Regional Affairs at [emetro@princeton.edu](mailto:emetro@princeton.edu) or 609-258-5144.

**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 January 9	Tuesday January 10	Wednesday January 11	Thursday January 12	Friday January 13
<b>COMMAND PERFORMANCE Chef's Feature</b>	<b>Roast Pork Loin</b> with Roasted Potatoes	<b>Fried Chicken</b> with Mashed potatoes and Fried Green Tomatoes	<b>Pepper Steak</b> with Rice	<b>Assorted Flatbread Pizzas</b> with Side Salad	<b>Pesto-Crusted Tilapia</b> with Wild Rice
Early Riser	<b>Potato Skins</b> with Egg, Bacon & Swiss Cheese	<b>Steak, Egg &amp; Cheese Quesadilla</b>	<b>Corned Beef Hash</b> with 2 Eggs	<b>French Toast Sticks</b>	<b>2 Eggs</b> , Choice of Breakfast Meat & Tater Tots
Country Kettle	<b>Egg Drop</b>	<b>Turkey Noodle</b>	<b>Tuscan Bean</b>	<b>Split Pea</b>	<b>Manhattan Clam Chowder</b>
Deli Special	<b>Jerk Chicken</b> with Pepper Jack and Roasted Peppers on Brioche roll	<b>Italian Chopped Antipasto Wrap</b>	<b>Shrimp Salad Wrap</b>	<b>Asparagus, Sundried Tomatoes, Roasted Peppers &amp; Mozzarella Cheese Wrap</b>	<b>Chicken Parmesan Sub</b>
Grill Special	<b>Turkey Reuben</b> on Rye	<b>Hawaiian Teriyaki Burger</b>	<b>Falafel Pita</b>	<b>BBQ Chicken Grilled Cheese</b>	<b>Crab, Asparagus &amp; Roasted Pepper Quesadilla</b>
Panini	<b>3 Cheese Panini</b> with Cheddar, Swiss & Blue Cheese with Bacon & Tomatoes on Sourdough	<b>Sausage Torpedo</b> with Peppers & Onions	<b>Teriyaki Chicken</b> with Asian Slaw, & Swiss Cheese on a Kaiser Roll	<b>Open-Faced BBQ Turkey Sandwich</b>	<b>Grilled Peanut Butter and Banana</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](http://pppl.org) 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/>.

The next issue of the PPPL Weekly will be on Tuesday, Jan. 17, due to the Martin Luther King Jr. Day holiday.