PPPL PRINCETON PLASMA PHYSICS LABORATORY
A Collaborative National Center for Fusion & Plasma Research
U.S. DEPARTMENT OF ENERGY
WEEKLY
October 3, 2016

Calendar of Events

THIS WEEK

MONDAY, OCT. 3

PPPL Colloquium
2 p.m. ◆ MBG Auditorium
The Gifts of the Ocean and its Future
Ken Furuya, University of Tokyo

WEDNESDAY, OCT. 5

PPPL Colloquium
4:15 p.m. ◆ MBG Auditorium
Better Cities Through Imaging
Gregory Dobler, New York University

FRIDAY, OCT. 7

American Red Cross Blood Drive
8 a.m.–1 p.m. ◆ American Red Cross Bloodmobile, Lower End Parking Lot

UPCOMING

TUESDAY, OCT. 11

Tour Guide Meeting and Training
9:30–11:30 a.m. ◆ MBG Auditorium
See page 6 for details.

WEDNESDAY, OCT. 12

PPPL Colloquium
4:15 p.m. ◆ MBG Auditorium
Estimating the Age of Life Using Moore's Law
Alexei Sharov, National Institutes of Health

THURSDAY, OCT. 13

Laboratory Management Review meeting (LMR)
8:30 a.m.–12 p.m.

INSIDE

Terry Brog, PPPL's new interim director, outlines challenges ahead to staff

By Jeanne Jackson DeVoe

Terry Brog, the newly-named interim director of PPPL, urged the Laboratory staff to pull together during the next year to 18 months to ensure that the National Spherical Torus Experiment-Upgrade runs smoothly when it reopens and that the Laboratory operates at the highest possible level throughout the period.

Brog replaced Stewart Prager, who announced his resignation on Sept. 26 during an all-hands meeting following the shutdown of NSTX-U caused by problems with a magnetic coil (See below). Chief Information Officer Stacia Zelick became interim deputy director for operations and Marc Cohen, head of information user support and operations, became the interim chief information officer.

Terry Brog, interim director of PPPL *(Photo by Elle Starkman)*

"The next time we start up NSTX-U it has to run for as long as we want it to," Brog said. "All eyes are on us." He said the fact that the experiment had to close to fix problems has caused concerns at the U.S. Department of Energy (DOE), which funds PPPL. While the DOE fully supports fixing the machine, "They've given us time and money to fix the problem but the next time we start up we're going to have to be ready," Brog said.

University expresses support

Christopher L. Eisgruber, the president of Princeton University, which manages the Laboratory, told staff members at the all-hands meeting that the University fully supports PPPL. "The University is firmly committed to standing together with you as

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Stewart Prager praised as he steps down as PPPL director

By Jeanne Jackson DeVoe

Staff applauded Stewart Prager and Lab and University leaders praised his accomplishments after Prager last week announced his retirement as director of PPPL, a position he held for eight years. Prager said he was stepping down now to allow new management to carry forward the reassembly of the National Spherical Torus Experiment-Upgrade (NSTX-U), which is shut down for about a year because of a failed magnetic coil.

Stewart Prager *(Photo by Elle Starkman)*

Prager received three standing ovations during the Sept. 26 all-hands meeting in the MBG Auditorium at which he made the announcement. He will take a one-year sabbatical as he returns to research activities in plasma physics and fusion energy, and will remain a Princeton University professor.

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How to keep the superhot plasma inside tokamaks from chirping

By Raphael Rosen

"Chirp, chirp, chirp." The familiar sound of birds is also what researchers call a wave in plasma that breaks from a single note into rapidly changing notes. This behavior can cause heat in the form of high energy particles — or fast ions — to leak from the core of plasma inside tokamaks — doughnut-shaped facilities that house fusion reactions.

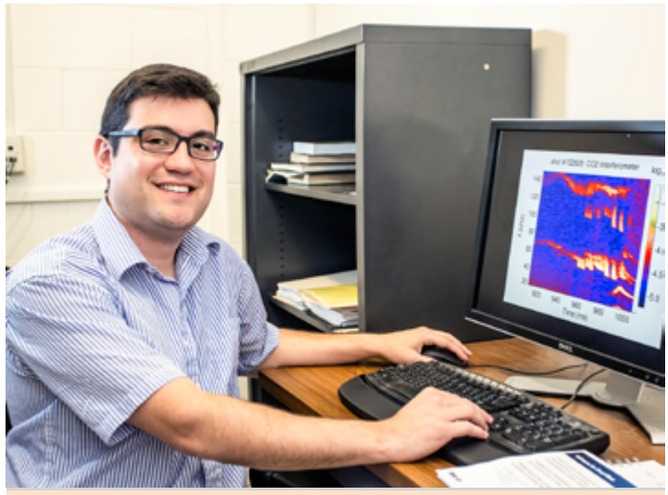
Physicists want to prevent these waves from chirping because they may cause too many fast ions to escape, cooling the plasma. As the plasma cools, the atomic nuclei in the tokamak are less likely to come together and release energy and the fusion reactions will sputter to a halt.

"Chirping modes can be very harmful because they can steal energy from the fast ions in an extended region of the plasma," said Vinícius Duarte, a graduate student from the University of São Paulo. Duarte is at PPPL conducting research for his dissertation. Support for this work comes from the DOE Office of Science.

Chirping modes often have frequencies far above what the human ear can hear. The name — "chirping" — stems from the change in the waves' frequency over time. Typically, the modes start with a high frequency and drop down in frequency very rapidly. The chirping of modes has been studied for decades as physicists seek to understand and eliminate them.

In a recent theoretical study, Duarte discovered some conditions within plasma that can make the chirping of modes more likely. A paper he is preparing on this topic explains the phenomenon and may help to optimize the design of fusion energy plants in the future. Collaborating on the research were physicists at PPPL, General Atomics, the University of California-Irvine, and the University of Texas at Austin. Physicist Nikolai Gorelenkov, Duarte's PPPL advisor, introduced him to the software code that enabled this work, Prof. Herbert Berk of the University of Texas co-advised on the project and researchers from the DIII-D National Fusion Facility that General Atomics operates for the DOE provided the data for comparison with the theory.

The researchers began by noting that the chirping of modes seems to occur in some tokamaks more often than in others. They are rare in the DIII-D tokamak, for example, but were common in the National Spherical Torus Experiment (NSTX), PPPL's former flagship fusion device, which has recently been upgraded.



Vinícius Duarte, a graduate student from the University of São Paulo, is conducting research at PPPL on chirping modes. *(Photo by Elle Starkman)*

By running simulations on PPPL computers, Duarte and the team found that plasma turbulence — or random fluctuation — was a factor that helped explain the chirping of modes. Chirping can occur when there is a strong concentration of fast ions bunched together, while other particles are widely spaced.

The surprise is that substantial turbulence can break up concentrations of fast ions, and therefore help to extinguish the chirping of modes.

The simulations matched the data from experiments. In NSTX, the turbulence has little effect on fast ions and chirping modes are common, whereas DIII-D has relatively high interaction between turbulence and fast ions and chirping modes are rare. In DIII-D, chirping starts only when the interaction between the turbulence and fast-ions markedly decreases.

These findings could lead to fusion facilities that leak less heat than current machines and could improve the efficiency of ITER, the international tokamak under construction in France to demonstrate the feasibility of fusion power. "In ITER, where fast ions from fusion reactions are expected to sustain a burning plasma, the good confinement of these particles is a crucial issue," said Duarte.

American Red Cross Blood Drive

Friday, October 7

8 a.m.–1 p.m.

American Red Cross Bloodmobile
Lower Parking Lot

The need for blood is constant and your donation is important for maintaining a healthy and reliable blood supply. One pint of donated blood can save up to three lives.

Please give blood. All blood types are needed.

To schedule a donation appointment, please contact the OMO at extension 3200.

Thank you.
American Red Cross
Occupational Medical Office Staff

McComas recognizes "exceptional" team of engineers and technicians

David McComas, the Princeton University vice president for PPPL, bestowed challenge coins on a team of engineers and technicians who verified and tested high-current bolted joints on the National Spherical Torus Experiment-Upgrade (NSTX)-U) in August before disassembling the joints as part of the current outage.

McComas gave out the specially-designed coins to recognize the outstanding achievement of the seven-member team during the morning meeting on Sept. 23.

Members of the team were charged with performing verification testing during the removal of the silver-plated copper conducting bolted joints that connect NSTX-U's 36 magnetic toroidal field coils. Senior electrical engineer Hans Schneider recommended that McComas recognize the team for their work on the project. In a nomination letter to McComas, Schneider said the team performed this work with "outstanding attention to detail, thoroughness, and safety."

The challenge coin is the second for Lead Machine Technician Scott Gifford. McComas previously recognized him, along with Joe Winston, a senior technical associate, with challenge coins in June. The two were recommended by Jonathan Menard, program director for the NSTX-U, for recognizing in May that high current leads connecting a poloidal field coil on NSTX-U were moving. "This was not supposed to occur, " Menard said, "and thanks to their keen observations and knowledge of the machine, we stopped operations before any major damage was done to the leads or the coil."

"The coins are for exceptional service," McComas said. "This is my way of recognizing people at the Laboratory for outstanding performance."

The coins have the PPPL logo and the Princeton University logo on each side. McComas said he came up with the idea of the challenge coins after being handed one himself by a NASA official. He has since learned that officers in the military often distribute coins as a way to recognize members of the armed services who go above and beyond the call of duty.

The term "challenge coin" stems from being able to prove one's membership in a military organization when challenged. It since has become a significant way to recognize achievement.

Senior Electrical Engineer Hans Schneider, far left, with members of the team he nominated for a challenge coin given by David McComas, Princeton University vice president for PPPL, second from left, and Scott Weidner, Princeton University assistant vice president for engineering at PPPL, center. Team members from left are: Scott Gifford, lead machine technician; Chad Ennis, Akeem Robinson, Dan Stevens, and Jay Basler, machine technicians; Kevin Lamb, a senior electrical technician; and Chris Freeman, an electrical engineer. *(Photo by Jeanne Jackson DeVoe)*

Boy Scouts STEM Fair, October 22

Volunteers needed

Subject experts in physics and engineering are especially needed to plan workshops.

Please contact Rob Sheneman, rshenema@pppl.gov, ext. 3392, to volunteer.

Path forward

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a fusion Laboratory," he said. "I believe, and the University believes, that what goes on here and the first-rate science that this Lab produces is extremely important for the country and the world."

Stacia Zelick, interim deputy director for operations *(Photo by Elle Starkman)*

David McComas, the Princeton University vice-president for PPPL, echoed that sentiment and the fact that the DOE is firmly behind PPPL. "There's an incredible commitment there for us to be the best Lab in the DOE complex," he said. "That should be the goal for all of us and we have to work hard to get there from here."

Princeton University will lead the search for a new director, a tenured position with the University. McComas, who chairs the search committee, said such searches typically take from nine to twelve months.

Brog and McComas agreed that the Laboratory needs to dramatically improve its performance in the next six months to avoid having the DOE contract for running PPPL put out to bid. Not only does the Laboratory want to continue its 65-year relationship with the University, the re-compete process itself is costly and time-consuming, Brog said. "We need to do everything we can between now and March to convince DOE to not recompete this Laboratory," he told staff.

A new engineering head

In addition to the changes in the director's office, Brog announced that Valeria Riccardo, the chief engineer at the United Kingdom's Atomic Energy Authority, will start as the head of engineering beginning in January. The Authority operates the JET and MAST tokamaks. Brog said Riccardo would be visiting PPPL in October and he is updating her on current developments.

Brog outlined short-term actions. Among them: The Engineering Department will be restructured and Facilities and Site Services, currently a division of engineering, will become its own department with its own department head reporting to the deputy director for operations. Other changes may be forthcoming, he said.

Also, engineer Charles Neumeyer will oversee the NSTX-U project. Neumeyer has managed the U.S contribution to the steady state electrical network that will light and power the buildings of the international fusion experiment ITER. Les Hill, the project manager of PPPL's multimillion-dollar Infrastructure and Operational Improvements project,, will also be tasked with Laboratory project management oversight. "We have to really dig into NSTX-U. We have to find out everything that we know has gone wrong and we need to think of the other things that could go wrong," Brog said.

In response to a question, Brog said he expected some additional changes to the engineering department. The Laboratory will likely bring in an outside consultant to ensure that improvements are made in the process of building new coils from design to fabrication, as well as looking at other components.

Some researchers said that while they applaud tightening up procedures around designing and building magnetic coils, they question how the Laboratory can balance the need to manage risk with the need to take some risks in experiments. "The danger here is that a very conservative approach to the control of failures is going to impact just how adventurous we get in our research," said Richard Majeski, principal investigator on the Lithium Tokamak Experiment (LTX). "This is important for me and LTX because we're trying to take very novel approaches to our tokamak."

Brog said the Laboratory must improve its performance in several areas. To overcome the current setbacks and win back the faith of the DOE, all PPPL staff members must dedicate themselves to doing the best possible job 40 hours a week to achieve PPPL's mission, and they must work together as a team, he said.

"I want everyone to have a keen sense of urgency of what we need to accomplish in the next 18 months," Brog told staff at the operations staff meeting. "I think we have all the resources we need right now to be successful. We probably need to change direction a little bit, change our focus a little bit, but I do believe it."

Several areas to improve

The DOE has identified several specific areas throughout the Laboratory that the staff must work together to improve, Brog said. One goal is to improve the quality of the Laboratory's engineering across the board. "There has been less than great performance when it comes to the entire spectrum of engineering," he said. "And we need to fix that. It starts with design, validation, verification, fabrication. We need to make sure that everything we tie to that machine out there is exactly the way we want it."

An additional challenge is addressing the budget for indirect costs for Laboratory operations, which has been growing over the last five years, Brog said. Researchers noted that the current charge rate makes it difficult for them to get funding. Michael Zarnstorff, PPPL's deputy director for research, said physicists and engineers also need to generate new ideas in order to get additional funding. "Proposing new ideas is the lifeblood of the Laboratory," he said.

To reduce costs, the proposed budget for most departments will be reduced by 3 to 5 percent in the coming fiscal year, which began Oct. 1, Brog said. "We need to increase the efficiency of producing the research," he said in his meeting with research staff. "One of the ways we can do this is to reduce indirect costs."

In terms of performance management, PPPL needs to do a better job aligning its goals with the goals of the DOE, Brog said. And that alignment needs to take place throughout the PPPL organization, from individual staff members through divisions and departments. "It's almost impossible for all of you to perform the way we want you to perform and hit the goals of the DOE if those goals are not aligned," Brog said.

Marc Cohen, interim chief information officer *(Photo by Elle Starkman)*

PPPL also must do a better job at workforce planning so that new staff members are trained to replace retiring staff. "We have to identify what we currently have, what we need now, what we need five-to-ten years down the road," Brog said, "and we need to put together a plan to make sure we address all those issues we know we have."

Brog sent out emails to staff asking for their input. "I need your help," he told staff members. "We've talked about several things that need improvement and you folks probably have some very good ideas about how we can address several of these issues."

Stewart Prager

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Prager noted that he has headed PPPL for longer than most recent national laboratory directors have held office, and had been already contemplating stepping down. The recent situation with NSTX-U defined an opportune moment for that transition, he said. The change also creates a path for increasing the confidence of the U.S. Department of Energy, which funds the Laboratory, in PPPL's engineering practices. "It makes sense for a new director to preside over the rebuilding and enhancement of our engineering practices, and to see it through to completion" he said. "All that increase in confidence will then flow to a new director."

An international search for a new director has begun. Terry Brog, PPPL's deputy director for operations and chief operating officer, is interim director of the Laboratory; Stacia Zelick, PPPL's chief information officer and head of information technology, is interim deputy director for operations and COO (See story page 1).

Prager said he has mixed feelings about leaving the position. He joked that he feels "immense liberation and joy" about no longer facing the 24-7 demands of the directorship. But at the same time, he said, "It's been tremendously gratifying to be involved managerially with all the exciting activities at PPPL."

Princeton University President Christopher L. Eisgruber praised Prager at the all-hands meeting for his "extraordinary leadership over the past years. He's been an extraordinary leader and he has brought the vision that we needed for the plasma community," Eisgruber said. "He continues to be respected as an extraordinary scientist and a leader and we're very fortunate that he's staying here and will contribute to this Laboratory."

Prager is the sixth director of PPPL. He is an eminent plasma physicist who built an international reputation at the University of Wisconsin over more than three decades before joining the Laboratory in 2009. Deputy Director for Research Michael Zarnstorff, who is remaining in his position, thanked Prager "for his leadership and his enthusiasm and his kindness. I've really enjoyed being part of his team," Zarnstorff said. "It's been a real honor and an opportunity and for me, it's been a real pleasure."

During Prager's eight years as director, PPPL launched many projects. Among them, the Laboratory constructed the $94 million NSTX-U; designed and fabricated major components for ITER, the international fusion project in France; expanded work on major fusion facilities domestically and internationally; and launched a campus plan to modernize PPPL's facilities. Prager also nurtured innovation and diversity with the initiation of FLARE, a magnetic reconnection experiment; an upgrade of the Lithium Tokamak Experiment (LTX); a new nanotechnology laboratory, and more. He also was a leader of the effort to establish the Max Planck-Princeton Center for Plasma Physics.

"I've been incredibly impressed with the intelligence and capability, the dedication, the programs you've started," David McComas, Princeton University vice president for PPPL, told Prager at the meeting. He commended Prager for stepping down "in a way that lets the Lab move forward."

Acting PPPL Director Brog also thanked Prager. "I want to thank Stewart again for his leadership of the Laboratory," he said. "There have been a lot of outstanding achievements over the past eight years."

Prager said he has enjoyed working with PPPL employees from every department. PPPL is unusual in that staff members often feel they are part of a "family," he said. "The people at PPPL have a dedication to mission, a spirit of volunteerism, a spirit of openness to any idea," Prager said. "The reason I loved the job is working with the staff. Interacting with the staff on the broad array of initiatives at PPPL has been the dominant source of pleasure in the job."

Wanted: Undergraduate women interested in physics for January conference

What: Apply now for the 2017 Conference for Undergraduate Women in Physics.

When: Oct. 14 deadline for the Jan. 13–15 conference.

Where: Princeton University

Cost: The conference, lodging and meals are covered. Students pay $45 registration fee and transportation.

Applications and more information: cuwip.princeton.edu
or contact Shannon Swilley Greco, sgreco@pppl.gov, ext. 2208

COLLOQUIUM

The Gifts of the Ocean and its Future

Ken Furuya
University of Tokyo

Monday, Oct. 3
2 p.m., M.B.G Auditorium, Lyman Spitzer Building

Better Cities Through Imaging

Gregory Dobler
New York University

Wednesday, Oct. 5
4:15 p.m., M.B.G Auditorium, Lyman Spitzer Building

Tour Guide Meeting & Training Oct. 11 at 9:30 a.m.

New and experienced tour guides are invited to a tour guide meeting & training on Tuesday, Oct. 11 from 9:30 a.m. to 11:30 a.m. in the MBG Auditorium. Bring your friends! We'll have refreshments, tee shirts for new tour guides, and we'll go over what's new in the tour program. Then we'll have a tour training session on tour demos, highlights of our tours and a tour for new tour guides.

To sign up to be a tour guide or for more information contact Jeanne Jackson DeVoe, jjackson@pppl.gov, ext. 2757.

Bluefishing Trip Aboard the Suzie Girl
Rescheduled!

Date: Saturday, **October 9**, 2016

Departure: 7:30 a.m. SHARP!!!

Location: Belmar Marina Hwy. 35, Belmar, NJ 07719

Cost: $80 Per person ALL INCLUSIVE

Cost includes everything: rods, bait, fish cleaning, food, beverages. All you need to do is show up!

Contact Andy Carpe ext. 2118 acarpe@pppl.gov
Bob Tucker Jr. ext. 3190 rltucker@pppl.gov

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 October 3	Tuesday October 4	Wednesday October 5	Thursday October 6	Friday October 7
COMMAND PERFORMANCE Chef's Feature	**Beef Chili Boule** with Assorted Toppings	**Baked Manicotti** with Garlic Bread	**Maple-Glazed Ham** served with Au Gratin Potatoes & Roasted Squash & Zucchini	**Traditional Sauerbraten**	**Teriyaki-Grilled Salmon** with Roasted Edamame and Rice
Early Riser	**Bacon, Egg and Cheese Croissant**	**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 Preserves
Country Kettle	**Manhattan Clam Chowder**	**Potato Corn Chowder**	**Chicken Noodle**	**Tomato Soup**	**Turkey Chili**
Grille Special	**Grilled Ham and 3 Cheeses** on Challah Bread	**Fried Salami and Cheddar** on a Kaiser	**Cheese Calzone** with Marinara Sauce	**Knockwurst & Sauerkraut** with Braised Cabbage & German Potato Salad	**BBQ Tempeh Wrap** with Cheddar Cheese, Peppers & Onions
Deli Special	**Turkey Bruschetta** on Ciabatta	**Asiago Roast Beef Toasted Ciabatta** with Grilled Onion, Tomato & Horseradish	**BBQ Pulled Chicken** on a Kaiser Roll	**Turkey Pastrami Sloppy Joe**	**Autumn Chicken Salad** on Multigrain Bread
Panini	**Pastrami and Swiss Flatbread**	**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

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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