

Calendar of Events

SATURDAY, MAR. 12

Ronald E. Hatcher Science on Saturday Lecture Series
9:30 a.m. ♦ MBG Auditorium
[Taking the Universe's Baby Picture](#)
Professor David Spergel, Princeton University

UPCOMING

MONDAY, MAR. 14

Pi Day Celebration
1:00-2:30 p.m. ♦ LSB Lobby
Come enjoy a nice slice of pie à la mode and network with your colleagues!

WEDNESDAY, MAR. 16

American Red Cross Blood Drive
8 a.m.-1 p.m. ♦ American Red Cross Bloodmobile, Lower End Parking Lot
For an appointment or information, please contact Tricia Berran, 243-3200, or sign up online at redcrossblood.org. Enter Sponsor Code: PPPLPrinceton

PPPL Colloquium
4:15 p.m. ♦ MBG Auditorium
[Fusion Rockets for Planetary Defense](#)
Dr. Glen Wurden, Los Alamos National Laboratory

SATURDAY, MAR. 19

Ronald E. Hatcher Science on Saturday Lecture Series
9:30 a.m. ♦ MBG Auditorium
[Using Physics and Chemistry to Understand the Genome](#)
Professor Mary Jo Ondrechen, Northeastern University

INSIDE

Shannon Greco Award 4

Pi Day Celebration 4

Science on Saturday Calendar 5

Young Women's Conference 5

Red Cross Blood Drive 6

Performance Management Toolkit 6

Science and Engineering Fair 7

Menu 7

Ron Strykowski, project manager extraordinaire who oversaw the \$94 million NSTX Upgrade, retires

By Jeanne Jackson DeVoe

Ron Strykowski, the project manager who oversaw the massive details required to complete the \$94 million National Spherical Torus Experiment Upgrade (NSTX-U) and other large projects at PPPL, retired on Feb. 25 after more than three decades at the Laboratory.

His role on the NSTX-U project, Strykowski once said, is that of “a conductor who doesn’t know how to play instruments. You don’t tell anyone how to play the violin. You ask, ‘What do you need to play the violin better?’”

Just prior to his retirement, Strykowski pointed to a thick binder that represented the closeout report for the six-year NSTX-U project. “This is the thing I’m most proud of,” he said. “The only thing I’m leaving this office with is this book. This means a lot. It was a growing and learning experience for everybody.”



Ron Strykowski

[continued on page 2](#)

PPPL researchers advance understanding of plasma turbulence that drains heat from fusion reactors

By Raphael Rosen

The life of a subatomic particle can be hectic. The charged nuclei and electrons that zip around the vacuum vessels of doughnut-shaped fusion machines known as tokamaks are always in motion. But while that motion helps produce the fusion reactions that could power a new class of electricity generator, the turbulence it generates can also limit those reactions.

Now, physicists at PPPL appear to have gained important new insights into what affects this turbulence, which can impact the leakage of heat from the fusion plasma within tokamaks. Understanding how fusion plasmas lose heat is crucial because the more a plasma is able to retain its heat the more efficient a fusion reactor can be. Such understanding could improve the performance of ITER, the multinational tokamak being built in France, by leading to a reduction in heat leakage.

Results of this research have been published in a series of papers, with the most recent one in *Physics of Plasmas* in December 2015. Initial observations were reported in *Physical Review Letters* in 2011 and in *Physics of Plasmas* in 2012. The research was supported by the DOE’s Office of Science.

[continued on page 3](#)

Ron Strykowski retires

continued from page 1

PPPL Director Stewart Prager said Strykowski would be sorely missed. “Ron brought a unique set of skills and talent to the Lab,” he said. “His successful management of the complex NSTX-U construction project was a tour-de-force, from which the Lab will be benefitting for many years to come. That’s quite a legacy. And working with Ron was an absolute pleasure; he was both tough and enormously generous at the same time.”

“Ron has a heart of gold,” said Tim Stevenson, head of the Office of Project Management. “He did a great job holding the project together. He was a great leader and representative for the project, dealing with the management and the DOE side.”

The NSTX-U was the most challenging project he worked on at PPPL, Strykowski said.

“We were designing upgrades to an existing machine, and anytime you do remodeling work it’s a lot more difficult and more costly than building anew,” he said. “So it required a tremendous amount of analysis time, designer time, engineering time, to try to meet the physicists’ requirements.”

New techniques to construct NSTX-U

The NSTX-U team had to come up with new technological techniques to deal with some of the challenges of the upgrade, Strykowski said. One new process used on the inner TF coils center stack called “stir welding” allowed technicians to meld two different types of metal together without affecting their original mechanical properties. Another technique allowed technicians to make very precise cuts into solid copper material using electric discharge machining. A third technique to assemble quadrants of fiberglass-wrapped copper conducts in the NSTX-U center stack used a process called vacuum pressure impregnation (VPI) in which liquid epoxy was injected into a mold with the quadrants and heated to 330 degrees F to seal and insulate the conductors.

Strykowski also played a big part in establishing formal planning and control procedures. One reason he was hired 33 years ago was to design and implement such procedures. There was resistance at first, he said, but now the planning process is part of the PPPL culture. “It’s mandated, but most people realize that it’s in their best interest to go through the discipline of planning a job,” he said.

Planning a project forces everyone to articulate the scope of the project, set down their plans, define the final outcome, come up with a schedule, and make sure there are enough resources to get the work done, Strykowski said. Sometimes that means anticipating problems that never occur. For example, Strykowski bought copper as a Plan B in case the VPI didn’t work. Other problems, like the March 2014 death of principal engineer Ronald Hatcher, who was in charge of developing new power systems for the NSTX-U, could not be anticipated. “We’ll never replace him but we had to make up for that loss going forward, so it was challenging,” Strykowski said.

Strykowski grew up in Philadelphia and graduated from Pennsylvania State University in State College, Pennsylvania, in 1973 with a degree in civil engineering. He worked for two different Cherry Hill engineering companies for nine years before coming to PPPL in 1982. “I’ve been happy as a peach ever since,” Strykowski said.

Strykowski’s first project was preparing the Tokamak Fusion Test Reactor (TFTR) for deuterium operations. Years later, in 1997, he worked on decommissioning TFTR, a \$43 million project. “That was really exciting,” Strykowski said. There were numerous technical challenges, including



Strykowski, second from right, leads a tour for a 2013 Lehman Review.

decontaminating the machine and finding a way to take the machine apart. PPPL engineers developed a diamond wire cutting technique to cut the vessel into pieces.

Strykowski was the project control manager on the National Compact Stellarator Experiment (NCSX), working alongside physicist Hutch Neilson, now the head of Advanced Projects, who was the project manager. “That was an even greater challenge because we had to design components to tolerances that people never thought possible,” Strykowski said. Although the project wasn’t finished due to budget overruns, Strykowski said it “was a major technological success.”

“A uniquely talented individual”

“Ron is a uniquely talented individual,” Neilson said. “He’s known in the Lab as a project manager and financial wizard, but really he’s an engineer and that’s been the key to Ron’s success.”

Neilson recalled watching Strykowski run monthly status meetings on the NCSX project (now called QUASAR). “He could make senior engineers squirm in their seats with questions like, ‘It was your estimate that this project was going to take six months but it took a year, I’m just curious as to why?’” Neilson joked that when Strykowski “administered torture it was done with the utmost respect and humor. The ultimate question was going to be, ‘O.K., what can I do to help?’”

After the NSTX-U project was completed, Strykowski oversaw the start of the \$26 million Infrastructure Operations Inventory (IOI) project to rehabilitate many of the buildings at PPPL. A new project manager will have to oversee the project, which is scheduled to begin construction this spring.

While he is looking forward to not commuting at least an hour each day from Mount Laurel, New Jersey, Strykowski said he does have some regrets leaving PPPL. “It’s not the work I’ll miss. It’s the people,” he said. “Talking to people in the hallways and at the end of meetings – just rubbing elbows with folks. I’ll miss that.”

But Strykowski said he wanted to retire while he was still able to enjoy his retirement. “I’m retiring to something, not from something,” he said.

He has plenty to work on. But, “the first project is going to be me,” he joked. He has joined a gym and his wife Kathleen has given him plenty of home remodeling projects, including constructing a Japanese gazebo in their yard.

Strykowski also plans to return to some of his hobbies. A licensed pilot who sometimes flew a rental plane to work in the 1980s, Strykowski said he wants to return to flying and do some scuba diving. He said he is looking forward to spending some time with Kathleen and their two daughters, Michele, 25, and Nicole, 24, who are both nurses, at the family’s summer home in Sea Isle City. “I’m going to cook more, and then at the end of the day watch the sunset with a martini,” he said. ☺

Plasma turbulence

continued from page 1

The findings build on the fact that the center of the plasma gets much hotter than the edge during the operation of a tokamak. Turbulence then tends to drive the ions and electrons in the hot central plasma towards the edge, just as the hotter water at the bottom of a tea kettle tends to mix with the cooler water at the top, keeping the water, or plasma, from getting as hot as it otherwise could. But when scientists create what's known as a "high density gradient," by making the density of the plasma change rapidly from high at the center to low at the edges, the plasma can get hotter before that heat starts to leak.

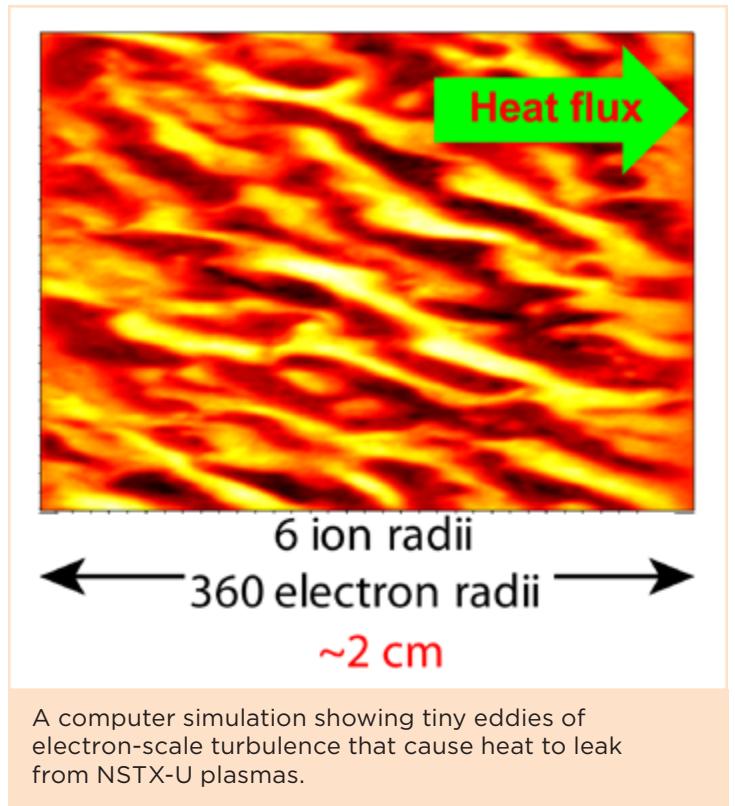
At PPPL, a team of researchers including physicists Yang Ren and Walter Guttenfelder has now shown that a steep density gradient can also reduce the strength of the electron turbulence. To continue the tea kettle analogy, a steep density gradient can weaken the intensity of the boiling. And weaker boiling, or turbulence, means that less heat escapes from the plasma.

The physicists did their research on PPPL's National Spherical Torus Experiment (NSTX), a spherical tokamak that is shaped like a cored apple, prior to its recent upgrade. "NSTX is one of the few tokamaks in the world that can obtain a direct measurement of electron-scale turbulence," said Juan Ruiz Ruiz, a graduate student at MIT and first author of the most recent paper.

Using PPPL computers, the team analyzed the data produced during 2010 NSTX experiments when scientists used a diagnostic called a high-k scattering device that beams microwaves into the plasma and measures how they scatter. The data confirmed that the turbulence was low when the density gradient was steep.

To analyze how the density gradient affected the strength of the electron turbulence, the team fed information about the plasma's temperature and density into a program run on computers at the National Energy Research Scientific Computing Center, a DOE Office of Science User Facility at Lawrence Berkeley National Laboratory in Berkeley, California. The results showed that the steep gradient reduced the strength of the electron turbulence much more than earlier theories had predicted.

The paper's discussion of electron turbulence complements MIT research that was recently reported in the journal "Nuclear Fusion." Simulations of experiments on MIT's Alcator C-Mod, a conventional tokamak that is shaped like a doughnut, found that electron-scale turbulence



can contribute significantly to the much larger ion-scale turbulence that is thought to dominate heat loss in conventional tokamaks.

This contribution was demonstrated in multiscale simulations, led by MIT research scientist Nathan Howard, that contradicted a common assumption that the impact of electrons was virtually negligible in conventional tokamaks. The separate Ruiz research provided further evidence of the importance of electrons to the turbulent transport of plasma. The spherical tokamak this research was based on enables the impact of electrons to be more readily seen, since the much larger ion-scale turbulence in such tokamaks is usually suppressed.

"Understanding the stabilizing mechanisms of the turbulence is definitely an important task in order to gain a predictive capability in the design of future fusion reactors," said Ruiz. "Further investigation is required to understand heat losses in tokamaks, and the upgraded version of the NSTX, the NSTX-U, will certainly be used to investigate this issue in detail."

Members of the team that contributed to Ruiz's research included scientists from MIT, University of California-Davis, University of Wisconsin-Madison, the National Fusion Research Institute in South Korea, and Nova Photonics, Inc. in New Jersey. [D](#)



PPPL scientists Walter Guttenfelder and Yang Ren.

Shannon Greco is recognized as a “Woman of Excellence”

Shannon Greco, a Science Education program leader, was recognized by the YWCA Princeton as one of the “women of excellence” of 2016 at the Y’s Annual Tribute to Women Awards Dinner on March 3 at the Hyatt Regency in Princeton for her work with young women and disadvantaged youth.

The award is given to women who “embody the YMCA’s mission of eliminating racism and empowering women.” Among numerous other activities, Greco helped start two all-girl robotics teams for the Y. 📷



Head of Science Education Andrew Zwicker, left, who is also a New Jersey assemblyman, presented Greco with a joint resolution by the New Jersey Assembly and Senate recognizing her achievement. (Photo by Atiba Brereton).

π Day Celebration

Celebrate Pi Day and Einstein’s Birthday!



Monday, 3.14, from 1:00 to 2:30 p.m.

Enjoy pi(e) and ice cream in the Lobby!

Come enjoy a nice slice of pie à la mode
and network with your colleagues!

Ronald E. Hatcher

Science on Saturday LECTURE SERIES

Mar. 12

Taking the Universe's Baby Picture

David Spergel, Princeton University

Mar. 19

Using Physics and Chemistry to Understand the Genome

Mary Jo Ondrechen, Northeastern University

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

Volunteer for PPPL's Young Women's Conference March 18!



PPPL's 15th Annual Young Women's Conference in Science, Technology, Engineering, and Mathematics on March 18 from 9 a.m. to 2 p.m. at Princeton University's Frick Chemistry Laboratory will have more young women than ever—with 568 registered attendees. Dozens of volunteers are needed to help out with registration or lunch, lead groups, help out with exhibits, and numerous other tasks. Please go to <http://goo.gl/forms/OQBsvkL6jn> to fill out a registration form and pick your preferred job or jobs. There will be a shuttle early in the morning on March 18 to pick up volunteers and to transport volunteers back to PPPL. Lunch will be provided.

Please contact organizer Deedee Ortiz, dortiz@pppl.gov, ext. 2785 with any questions. Thank you!

American Red Cross Blood Drive

Wednesday, March 16

8 a.m.-1 p.m.

**American Red Cross Bloodmobile,
Lower End Parking Lot**

Appointments are preferred.

For an appointment or information, please call:

**Tricia Berran
609-243-3200**

Or sign up at redcrossblood.org

Enter Sponsor Code: PPPLPrinceton

Performance Management Toolkit for Supervisors

A new [Performance Management Toolkit](#) for supervisors is available on the [PPPL Human Resources page](#). The toolkit contains links to procedures, job aids, communication templates, and documentation tools for the following performance management actions:

- Coaching for Improvement
- Performance Improvement Plans (PIPs)
- Progressive Discipline

Please take some time to review the new toolkit and become familiar with its contents. Please direct any questions you have to Director of Human Resources Paulette Gangemi.

Thank you.

Paulette Gangemi, Director of Human Resources

Pgangemi@pppl.gov

Ext. 2224

Volunteers wanted for Mercer Science and Engineering Fair

Organizers of the Mercer Science and Engineering Fair are looking for scientists and engineers to volunteer as judges of fourth to twelfth-grade science projects during the fair next month at Rider University.

Students from Mercer County schools show off their original science projects at the fair from March 13 to March 17. Judging for the elementary division (grades 4 to 5) and the junior division (grades 6 to 8) takes place Sunday, March 13. Judging for the senior division takes place March 13 and March 14. Additional information about the fair is available at <http://mercersec.org/about/msef>.

To volunteer, create an account online and check off judge to volunteer at <https://mercersec.org/help/BecomeAJudge>.

BROCK

MARK GAZO
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 7	Tuesday March 8	Wednesday March 9	Thursday March 10	Friday March 11
COMMAND PERFORMANCE Chef's Feature	Ota-Ya Sushi	Vegetable Tikka Masala over Rice with Naan	Beef Stew served with Buttermilk Biscuit	Chicken Cordon Bleu served with Risotto	COMMAND PERFORMANCE Seafood Pasta with Shrimp, Scallops, Clams & Mussels
Early Riser	Raisin Bread French Toast	Bagel with Lox & Cream Cheese	Cheesesteak Omelet with Homefries	Cranberry Walnut Pancakes	Sausage, Gravy & Grits served with 2 Eggs Any Style
Country Kettle	Vegetable Barley	Beef Noodle	Lentil	New England Clam Chowder	White Bean Escarole
Grille Special	BURGERLICIOUS Use it or Blues it Buffalo Turkey Burger Grilled Turkey burger with melted blue cheese crumbles, sliced celery, shredded lettuce, tomato, red onion and fiery buffalo sauce on a grilled brioche roll (Available All Week)	Bratwurst & Sauerkraut on a Torpedo with German Potato Salad	Tuna Melt on Rye with Swiss Cheese & Tomato	Chicken Breast on French Bread with Broccoli Rabe & Aged Provolone Cheese	Grilled Cheddar, Apple & Spinach on Multigrain Bread served with Cranberry Sauce
Deli Special	Grilled Portobello Mushroom with Red Onion, Red Pepper & Provolone on Wheat Roll	Open-Faced Sloppy Joe	Peppered Ham & Muenster Cheese on Pumpernickel Bread	Tuna Salad Club Sandwich with Hard-Cooked Egg	Grilled Jerk Chicken with Grilled Pineapple, Peppers & Onion on a Kaiser Roll
Panini	Turkey, Ham, Salami, Pepperoni, Provolone, Cheddar & Banana Peppers on Sourdough	Tuna Salad Quesadilla with Cheddar & Avocado served with Corn Relish	Pulled BBQ Chicken Wrap with Pepper Jack Cheese, Avocado & Tomato	Falafel on a Pita with Tzatziki Sauce	Cheeseburger Muffin served with Macaroni Salad

MENU SUBJECT TO CHANGE WITHOUT NOTICE

VEGETARIAN OPTION

WEEKLY

Editor: **Jeanne Jackson DeVoe** ♦ Layout and graphic design: **Kyle Palmer**

Photography: **Elle Starkman** ♦ Science Editor: **John Greenwald** ♦ Webmaster: **Chris Cane**

The PPPL WEEKLY is published by the [PPPL Office of Communications](#) on Mondays throughout the year 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 ♦ PPPL WEEKLY is archived on the web at: <http://w3.pppl.gov/communications/weekly/>.