

THIS WEEK

JUNE 12-16

SULI one-week course
MBG Auditorium
[A schedule is available here.](#)

MONDAY, JUNE 12

Joint Princeton Center for Heliophysics/Astroplasmas Seminar
11 a.m. ♦ Theory Seminar Room (T169)
Nonthermal Particle Acceleration in Magnetic Reconnection and Turbulence in Collisionless Relativistic Plasmas
Dmitri Uzdensky, Institute for Advanced Study and University of Colorado - Boulder

WEDNESDAY, JUNE 14

Code Performance Tuning mini-course
10:30 a.m.-2:30 p.m. ♦ Display Wall Room, A104
[See page 9 for more information.](#)

FRIDAY, JUNE 16

Public Tour
10 a.m. ♦ Display Wall, Room A104

UPCOMING

MONDAY, JUNE 19

Information Session on Performance Management System
1-2 p.m. ♦ MBG Auditorium

TUESDAY, JUNE 20

Information Session on Performance Management System
2-3:30 p.m. ♦ MBG Auditorium

THURSDAY, JUNE 29

Information Session on Performance Management System
11 a.m.-12 p.m. ♦ MBG Auditorium

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Physicists discover lithium oxide on tokamak walls improves plasma performance

By Raphael Rosen

Lithium compounds improve plasma performance in fusion devices just as well as pure lithium does, a team of PPPL physicists has found.

The research was conducted by former Princeton University physics graduate student Matt Lucia under the guidance of Robert Kaita, principal research physicist at PPPL and one of Lucia's thesis advisors, and the team of scientists working on a machine known as the Lithium Tokamak Experiment (LTX). As part of his dissertation, Lucia investigated how lithium deposited on walls of doughnut-shaped fusion machines known as tokamaks affected the performance of LTX. Like the plasma within a tokamak, the plasma within LTX is shaped like a doughnut. The plasma, a soup of charged particles, is surrounded by a copper shell with an inner wall made of stainless steel.

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Master organizer John DeLooper retires

By Jeanne Jackson Devoe

Before John DeLooper began his retirement on June 5, he compiled a list of his duties at PPPL just to make sure that nothing fell through the cracks. It was 12 pages long.

The list was typical of DeLooper, who built a reputation in his 29 years at the Laboratory as a master organizer. He brought together numerous events that included PPPL's open houses and visits by U.S. Department of Energy (DOE) Secretaries of Energy and Congressional representatives.

DeLooper has had numerous job titles. He served as interim deputy director for operations and chief operating officer for eight months from November 2015 to June 2016 after Adam Cohen took a position as Deputy Under Secretary for Science and Energy with the DOE. His most recent position was special advisor to the director.



John DeLooper

Worked under four directors

"I've worked for four separate directors and every one of them gave me opportunities I wouldn't have imagined," DeLooper said. "But the reason I was successful was when I asked for help, people stepped up and helped, and I'll be forever grateful for them."

Jerry Levine, head of Environment Safety & Health (ES&H), who has been at PPPL for 41 years, has known DeLooper since he started at the Lab. "John was one of the hardest workers I've ever seen," he said. "He had a lot of insight into people and how the Lab worked and I thought he was very effective in accomplishing things."

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PPPL & PS&T recognized for their safety records

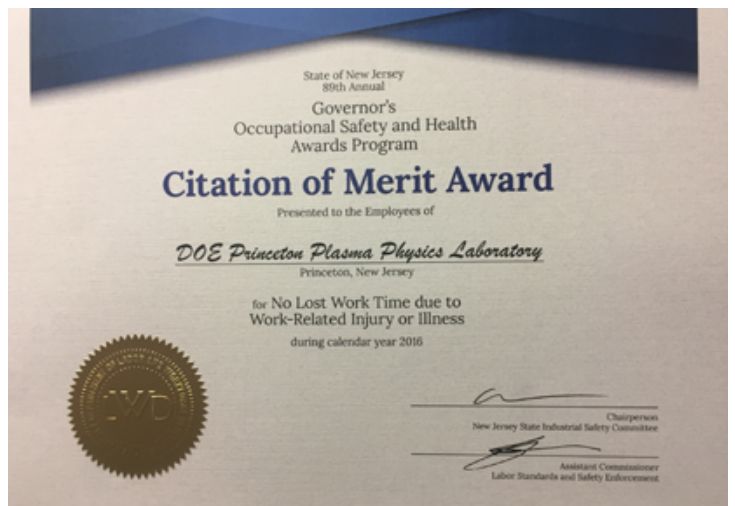
PPPL and PPPL's Plasma Science & Technology (PS&T) Department each received awards for their safety records at the 89th Annual Governor's Occupational Safety and Health Awards Program, sponsored by the State of New Jersey Department of Labor and Workforce Development.

The PS&T Department received the Commissioner's Continued Excellence Award for working 10 years (the equivalent of 451,188 consecutive hours) without any lost time due to a work injury or work-related illness.

PPPL received the Citation of Merit for having no employees out of work for work-related injuries or illnesses in calendar year 2016.

"These awards are a testament to the Lab's strong safety culture and the hard work of our staff," said Jerry Levine, head of Environment, Safety & Health. "Everyone who works here should be justifiably proud to have earned this recognition."

Terry Brog, PPPL's interim director, also offered his congratulations. "Safety is the highest priority here at PPPL and I am happy to see PPPL be recognized for its safety vigilance," said Brog. "I would especially like to congratulate the Plasma Science & Technology Department for their exemplary safety record, which sets an example for everyone here at PPPL." 



Information sessions on changes to PPPL's Performance Management system

PPPL will hold three information sessions to discuss changes to PPPL's Performance Management system on the following dates in the MBG Auditorium:

Monday, June 19, 1-2 p.m.

Tuesday, June 20, 2:30-3:30 p.m.

Thursday, June 29, 11 a.m.-12 p.m.

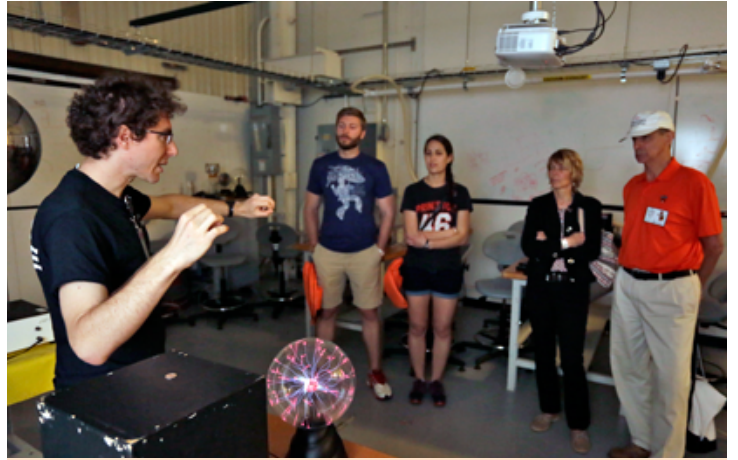
PPPL's reunion tours are a hit with Princeton University alumni

More than 50 Princeton University alumni and their families got a behind-the-scenes look at the Laboratory on two tours Friday June 2 for Princeton Reunions Weekend. The tours received rave reviews. One visitor said in a survey, "Excellent, I learned so many new things!" "Extremely enjoyable," said another visitor. "I wish I had studied physics instead of law!"

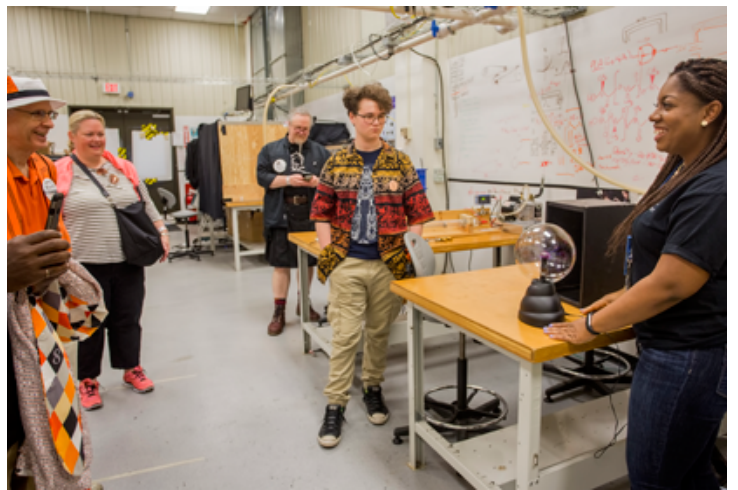
Tour guides were Brian Kraus, Arturo Dominguez, Nicole Allen, Erik Gilson, Charles Swanson, Carmela Ciummo and Jacob Schwartz. 📷



Carmela Ciummo, second from left, talks to visitors in the National Spherical Torus Experiment-Upgrade (NSTX-U) test cell. (Photo by Elle Starkman)



Tour guide Jacob Schwartz gives plasma demonstrations in the Science Education Laboratory. (Photo by Elle Starkman)



Nicole Allen, right, has a laugh with visitors in the Science Education Lab. (Photo by Elle Starkman)



Erik Gilson talks to visitors in the NSTX-U Control Room. (Photo by Elle Starkman)

Major progress in C Site-MG renovations as IOI project continues

By Jeanne Jackson DeVoe

The two main projects of the Infrastructure Operational Improvements (IOI) project — offices in the Lyman Spitzer Building (LSB) Annex and the renovation of the C Site-Motor Generator (MG) Building, are beginning to take shape.

“You can see the nature of the work is changing dramatically,” said Les Hill, head of the IOI project. “It’s moving along nicely.”

Most of the concrete floor has been installed in the C Site-MG Building. Workers poured cement for the final quadrant of the floor in the southeast section of the building. The concrete in that area is thicker than in the rest of the building and the floor is supported by steel-reinforced concrete pillars. It will hold large machinery for technical shops, which will be relocated from the Research Storage and Assembly (RESA) building once renovations are finished. A small section of the floor was left open in case heavy machinery needs to be lowered into the basement.

The completion of most of the concrete floor is “a major milestone,” Hill said. It will allow contractors to bring in heavy equipment to begin work on the rest of the building. Contractors will install insulation in the walls and will install heating, ventilation, and air conditioning (HVAC) systems and high-efficiency lighting in the ceilings.

Workers have also begun demolishing the roof. By last week, they had removed seven of the 14 huge fans underneath the roof. The work has been delayed somewhat by the rainy weather over the past few weeks but Hill said he is confident the demolition will be finished by July. Most of the work on the building will be completed by December, he said.

Meanwhile, offices are taking shape in the LSB Annex. Most of the sheet rock is in place and spackled on the top two



Progress on the walls of the 2nd floor of the LSB Annex. (Photo by Elle Starkman)



Contractors will install new HVAC systems in the ceiling of the Control Room Annex. (Photo by Elle Starkman)



Sheet rock and spackling for office walls on the first floor of the LSB Annex is progressing. (Photo by Elle Starkman)

floors of the building and needs to be spackled on the first floor. The HVAC systems are completed in the ceiling and wiring for the computer network system is being put in place. Ceiling tiles should be installed in the next two weeks.

Kate Morrison, in PPPL’s Facilities Department, is working with Princeton University on selecting and purchasing furniture for Annex offices.

Workers have connected the HVAC systems to those in the main LSB building through hall ceilings. A temporary wall that separated the business office in the main building from the Annex has been removed.

The National Spherical Torus Experiment Control Room Annex has been walled off from the Control Room and workers are installing a new HVAC system and fire protection system in the ceiling.

Hill said he expects the LSB Annex work to be completed by September. 📍



A worker puts the finishing touches on the final quadrant of the cement floor in the C Site-MG Building. (Photo by Elle Starkman)

John DeLooper retires

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DeLooper has a background in both engineering and finance, with a bachelor's degree in mechanical engineering and an MBA from Fairleigh Dickinson University. Before coming to the Laboratory, he worked for Burns and Roe Enterprises, an Oradell engineering and construction firm, and was manager of corporate quality assurance.

He joined PPPL's Quality Assurance Department in 1988 and eventually headed the department. One of his largest projects was leading the team that compiled the University's bid to manage the Laboratory after the DOE rebid PPPL's contract in 2008. He received the assignment on Memorial Day and spent most of the summer working on the project. The proposal was successful. He led another massive effort earlier in his career at the Lab when he led a self-assessment of PPPL in 1990 to prepare for a team of investigators called the "Tiger Team" who came to PPPL for a four-week assessment required by the DOE.

DeLooper was at the logistical forefront of another massive effort when the fusion community organized a meeting of experts from around the world in Snowmass, Colorado, in 1999 and 2002, to discuss pathways to fusion energy. DeLooper organized hotel and meeting space, prepared meeting schedules and social events, and set up a 24-hour computer center. It was the first time the fusion community came together. The first meeting focused on the U.S. program, while the second identified directions for a burning plasma. Attendees at the 2002 meeting urged the United States to rejoin ITER, the international fusion project under construction in France, which the U.S. had withdrawn from for budget reasons in 1998. The U.S. rejoined ITER in 2003.



DeLooper shows children a bubble in the Science Education Laboratory in 2006. (Photo by Elle Starkman)



A youngster lights up a fluorescent bulb with a plasma ball as DeLooper gives talks to a group of Princeton University parents and freshmen during Freshman Parents Day in 2015. (Photo by Jeanne Jackson DeVoe)



John DeLooper, right, enjoys a laugh showing a youngster trying out the Van de Graaff generator at PPPL's Communiiversity booth in 2013. (Photo by Jeanne Jackson DeVoe)

"The two Snowmass meetings were major events and very successful," said Rich Hawryluk, head of the NSTX-U Recovery Project, who co-chaired the first meeting. "If it wasn't for John's tremendous efforts in organizing those meetings, they could never have been as productive as they were. He just did an amazing job facilitating it." DeLooper organized many such major events, Hawryluk added. "His ability to work with people harmoniously and effectively was just outstanding."

DeLooper's achievement in facilitating the meeting was recognized when he received the DOE's Distinguished Associate Award in 2003. The award was presented by Anne Davies, then head of the U.S. Fusion Energy Sciences Program, and signed by then Secretary of Energy Spencer Abraham.

Jim Graham, head of Quality Assurance and Control, worked for DeLooper for two different periods and with him on several efforts. "When I first started at the Lab, John got me involved with the self-assessment and Tiger Team efforts. At that point it was apparent that he had a ton of energy, was very interested in getting things done right, and was great at coordinating diverse groups from a project management standpoint," Graham said.

Organized large VIP events

DeLooper has since organized many large VIP events, including hosting every Secretary of Energy during his tenure at the Laboratory from James Watkins in the early 1990s to Ernest Moniz in May of last year. He has also pulled together Open House events at PPPL for the surrounding communities, including the most recent one in 2013, which drew 3,000 people.

He was famously calm while managing dozens of groups and individuals for such events, which he kept track of on spreadsheets. "I just sort of laid out a plan and carried it out," DeLooper said. "I can lay out a road map on how to get from Point A to B for all the pieces to come together, but then I have to ask help for people to carry them out."

"John is a man of many talents, one of which is getting people organized to achieve a goal," said physicist Rob Goldston, professor of astrophysical sciences at Princeton, and a former director of PPPL. Goldston recalls asking DeLooper to organize an event in 1997 to rename PPPL's office building the Lyman Spitzer Building in honor of the famous pioneering physicist who founded the Laboratory and who had recently passed away. DeLooper brought together Spitzer's widow, Doreen, as well as former directors Melvin Gottlieb, Harold Furth, and Ron Davidson, and Martha Krebs, then head of the DOE Office of Science. "Martha Krebs made it clear that

John DeLooper retires

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DeLooper, left, on a tour of NSTX-U in 2016, with U.S. Rep. Rodney Frelinghuysen, Princeton University President Christopher L. Eisgruber, and Jon Menard, head of NSTX-U Research, right. (Photo by Elle Starkman)

she was so impressed with John that she wanted to hire him away from us,” Goldston said. “This terrified me because I relied on John for so much.”

A trained volunteer who was active with his local first aid company for many years, DeLooper headed a department that included emergency services, health physics and quality assurance in the 1990s. He was instrumental in developing emergency response plans and procedures. He and Erik Perry have served as directors in emergency response exercises for several years.

Contributions to Science Education

The head of the Science Education and Outreach Department for many years, DeLooper was a fixture at Science on Saturday lectures, the DOE’s N.J. Regional Science Bowl, science fairs at American Physical Society conferences, and many other events.

Andrew Zwicker, head of Communications and Public Outreach, noted that DeLooper also used his engineering skills to build most of the plasma demonstrations that Science Education still uses. “It was my pleasure to work for John for



DeLooper, third from left, with Michael Zarnstorff, deputy director for research; Larry Bernard, communications director, and Rich Hawryluk, head of the NSTX-U Recovery Project, serving pretzels on Pretzel Day in 2016. (Photo by Elle Starkman)



DeLooper shows visitors the NSTX-U Control Room on a 2016 tour. (Photo by Elle Starkman)



DeLooper shows visitors the QUASAR vacuum vessels during a 2016 tour. (Photo by Elle Starkman)

almost my entire career here at PPPL,” Zwicker said. “John was my boss, advisor, friend, and every day a reminder of how to do the highest quality job here with pride and dignity.”

DeLooper said he’s grateful to his wife, Carol, for her support during years of long hours at PPPL. “She was the bedrock when I was busy working here,” he said. The couple is looking forward to lots of traveling and will continue to explore national parks around the country.

There will be plenty of tasks to do in retirement as DeLooper is fixing up his house in Hopewell to sell so that he and his wife can move to Virginia. Retirement will also give the couple more time to spend with their children and grandchildren: David, who works in marketing for the Red Bull Co. in Atlanta; John, a librarian at Hudson Community College, living in Brooklyn, who has a 7-month-old son Joaquin; and Rachel, a teacher in Ashburn, Virginia, who has two children, Liam, almost 4, Alena, 2, and another boy on the way in October.

PPPL’s mission to develop fusion energy as an energy source for the world was one of the things that drew DeLooper to the Laboratory to begin with. And after working for decades to achieve that mission, DeLooper said he remains hopeful. “I wanted to have a better way of producing energy for my children,” he said, “and in my retirement letter, I basically encouraged the Laboratory to get fusion done for my grandchildren.” 📧

Lithium oxide

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Lucia used a new device known as the Materials Analysis and Particle Probe (MAPP), invented at the University of Illinois at Urbana-Champaign and installed on LTX. The MAPP system lets scientists withdraw samples into a chamber connected to LTX and study them without compromising LTX's vacuum environment. MAPP lets scientists analyze how tokamak plasmas affect a material immediately after the experiment ends. In the past, scientists could only study samples after the machine had been shut down for maintenance; at that point, the vacuum had been broken and the samples had been exposed to many experiments, as well as to air.

Lucia used the evaporation technique to coat a piece of metal with lithium, and then used MAPP to expose the metal to plasma within LTX. As he expected, Lucia observed lithium oxide, which forms when lithium reacts with residual oxygen in LTX's vacuum chamber. He was surprised, however, to find that the compound was just as capable of absorbing deuterium as pure lithium was.

"Matt discovered that even after the lithium coating was allowed to sit on the plasma-facing components within LTX and oxidize, it still was able to bind hydrogen," said Kaita.

"For a while, we were thinking you had to have high-purity lithium because we thought that if the lithium already has a dance partner — oxygen — it's not going to dance with hydrogen," said Mike Jaworski, research physicist at PPPL and co-author of the paper. "We thought that once it was oxidized, lithium would be chemically inert. But in fact we found that lithium will take all the dance partners it can get."

Lucia's results are the first direct evidence that lithium oxide forms on tokamak walls and that it retains hydrogen isotopes as well as pure lithium does. They support the observation that lithium oxide can form on both graphite, like the tiles in NSTX, and on metal, and improve plasma performance.


The results support past findings involving PPPL's National Spherical Torus Experiment (NSTX), a tokamak. In 2010,

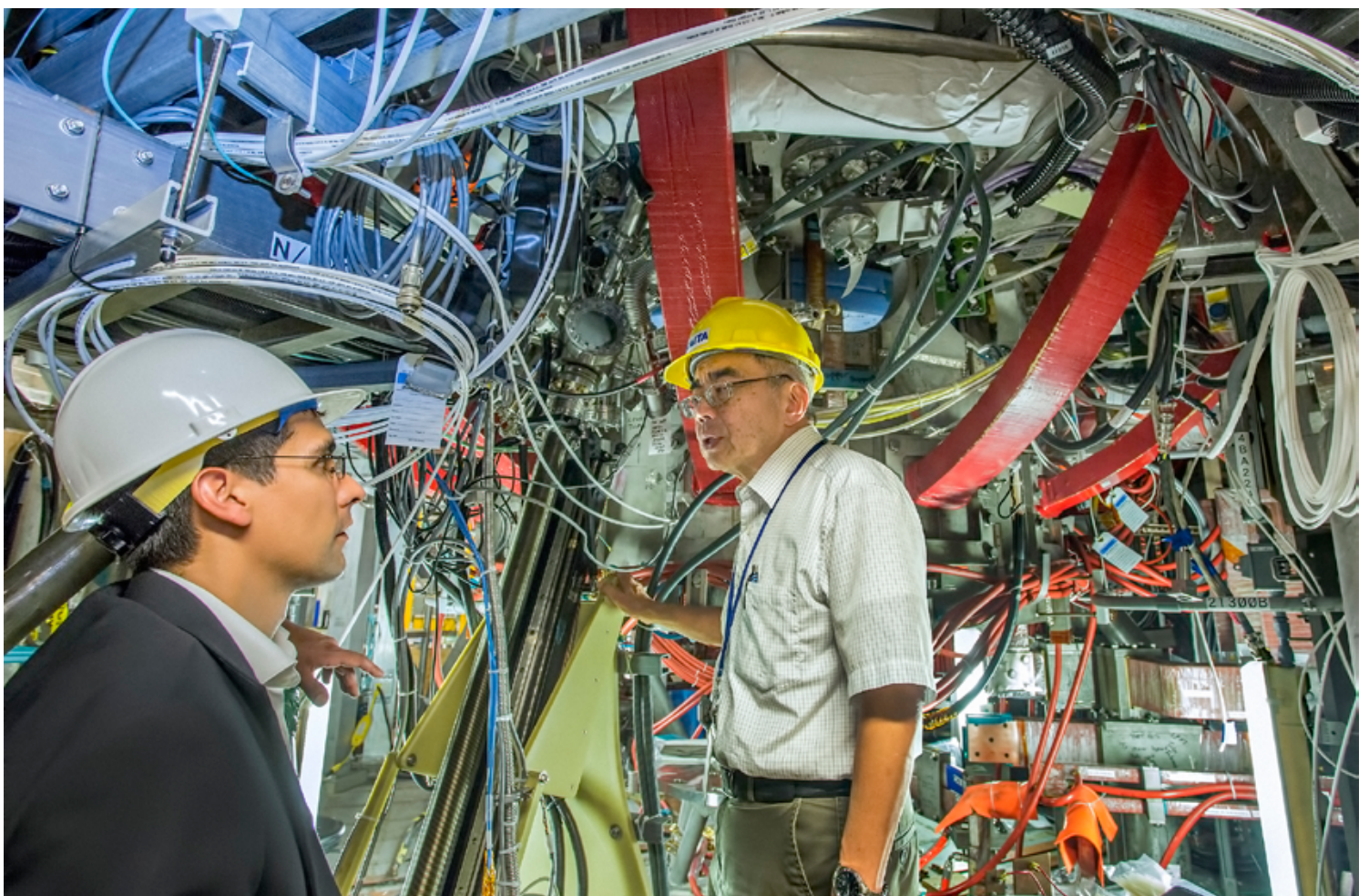
scientists placed a large metal ring coated with lithium on the floor of NSTX's vacuum vessel. This device, known as the Liquid Lithium Divertor (LLD), was the first attempt to create a large lithium-coated metal surface inside NSTX. Later, after the NSTX divertor had been exposed to residual oxygen in the vacuum vessel, scientists studied the divertor's surface. The researchers heated the divertor and detected deuterium. The finding hinted that the deuterium had been trapped by the lithium oxide in the LLD, but the evidence was not definitive.

These new findings indicate that lithium within tokamaks may not have to be as pure as once thought. They also show that if the carbon tiles in NSTX, now the National Spherical Torus Experiment-Upgrade (NSTX-U), are replaced with metal tiles and coated with lithium, the plasma performance should not decline. "The key thing is that we can keep on using lithium evaporation if we go to metal walls in NSTX-U," Kaita said.

The team has to do more research to determine whether these findings will apply to future plasma machines, which might have flowing liquid metal walls that could contain both lithium and lithium oxide. "If we want to extrapolate our results to a fusion reactor, we have to ask whether the experiments are indicative of the performance we could expect in the future," said Jaworski. The next step in this research would entail measuring precisely the hydrogen retention rate of both pure and oxidized lithium, and comparing them rigorously.

The findings appeared in the April 2017 issue of *Fusion Engineering and Design*. The research was funded by the DOE Office of Science (Fusion Energy Sciences).

The team included scientists from PPPL, the University of Illinois at Urbana-Champaign, The College of New Jersey, Princeton University, and Lawrence Livermore National Laboratory. 



PPPL physicists Robert Kaita, right, and Michael Jaworski in front of NSTX-U. (Photo by Elle Starkman)

Princeton High School Robotics Team tours PPPL



Physicist Dave Gates gives a tour to members of the Princeton High School Robotics team on June 8.

Reminder: Central campus parking option available for PPPL staff

Do you have business or meetings on Princeton University's central campus? PPPL staff now have use of a limited number of "Official Business Cards" (OBC) that allow two-hour parking in many campus locations. The locations are:

- Numbered Lots (except restricted lots 8, 9, & 18)
- Front of Dillon Gym
- Brown Hall OBC spaces
- Rear of Edwards Hall
- Visitor spaces behind Baker Rink, Lot 12 (close to MacMillan)

The parking cards can be checked out from Carol Ann Austin in the Director's Office. So don't leave for campus without it!

Code Performance Tuning & Optimization Mini-course at PPPL

Ian Cosden, manager of the Research Computing Department at Princeton University, will give a mini-course entitled, “Code Performance Tuning and Optimization: A practical tutorial on how to make your code run faster.”

Wednesday, June 14, 10:30 a.m.–2:30 p.m.
in the Display Wall Room, A104

The course will discuss approaches to tuning compiled-language, such as C/C++ and Fortran, as well as strategies, tips and tricks for tuning your code. The course will also give an overview of compiling options. Finally, the course will present a detailed, step-by-step case study of an example code, to illustrate how to apply some common tuning techniques.

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 June 12	Tuesday June 13	Wednesday June 14	Thursday June 15	Friday June 16
COMMAND PERFORMANCE Chef's Feature	Beef and Bean Burrito with Yellow Rice	Buffalo Chicken Mac and Cheese	Grilled Fish Cake Sandwich	Sloppy Joe with Tater Tots	Shrimp Basket
Early Riser	Blueberry Pancakes	Cheesy Polenta Cakes with 2 Eggs	Tater Tot Breakfast Bake	Ham, Egg & Cheese French Toast	Bacon, Spinach & Mozzarella Quesadilla with Cilantro Cream
Country Kettle	Cream of Broccoli	Spinach and White Bean	Chicken Pot Pie	Cream of Mushroom	Beef and Rice
Deli Special	Pepper Ham and Provolone on Semolina Hero	Made to Order Pita Pizza Bar with Tossed Salad	Lemon Rosemary Turkey Sandwich	American Hoagie with Ham, Bologna, and American Cheese	Italian Tuna Salad Wrap
Grill Special	Cheddar Bacon-Wrapped Hot Dog	Chorizo Quesadilla	CELEBRITY GUEST CHEF "Guy Fieri" Chicos Puerto Rican Pork Roast, Pepperjack and Horseradish Double-baked Potatoes, and Side	Grilled Margherita Sandwich	Pepperoni Roll
Panini	Corned Beef Reuben	Chicken Breast, Mozzarella Cheese, Spinach and Tomato Pesto on Ciabatta Bread	Pierogies with Fried Onions	Meatball Parmigiana Sandwich	NY Street Dog— 2 Sabrett Hot Dogs with Sauerkraut, Red Onions & Mustard Served with Fries

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