

Calendar of Events

MONDAY, OCT. 5

State of the Lab Address
1:30 p.m. ♦ MBG Auditorium
Refreshments to follow in
the lobby

FRIDAY, OCT. 9

**Princeton University Freshman
Families Tour**
2 p.m.

SATURDAY, OCT. 10

**Princeton University Freshman
Families Tour**
2 p.m. and 3 p.m.

UPCOMING

WEDNESDAY, OCT. 14

PPPL Colloquium
4:15 p.m. ♦ MBG Auditorium
[Atomic Tracings—The History
of Radio Isotopes in Science
and Medicine](#)
Angela N.H. Craeger, Princeton
University

TUESDAY, OCT. 20

Lab Management Review
8:30 a.m.

WEDNESDAY, OCT. 21

PPPL Colloquium
4:15 p.m. ♦ MBG Auditorium
[Reconnection at the Dayside
Magnetopause from MMS](#)
Dr. James Burch, Southwest
Research Institute

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Construction completed, PPPL is set to resume world-class fusion research later this fall

By John Greenwald

At PPPL, world-leading fusion research resumes later this fall. After more than six years of planning and construction — including three years of building and 574,000 hours of labor — the National Spherical Torus Experiment-Upgrade (NSTX-U) is ready to play a critical role in the quest to develop fusion energy as a clean, safe and virtually limitless fuel for generating electricity.

The \$94 million overhaul has made the machine the most powerful spherical tokamak in the world. The upgrade has doubled its heating power and magnetic field strength, lengthened its operation from one second to five seconds and increased its plasma performance by a factor of 10. The improvements create a flexible research platform that will enable some of fusion’s most outstanding puzzles to be directly addressed for the first time, thus supporting continued U.S. leadership in the quest for fusion systems that can form the basis of commercial fusion power. .

“This achievement signifies the completion of an extremely successful challenge, which opens the door to a decade or more of exciting research,” said PPPL Director Stewart Prager. “The world will now be watching to see if this experiment can serve to further improve our vision for future reactors.”

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Spotlight on PPPL inventors and a farewell to Lew Meixler at recognition dinner

By Jeanne Jackson DeVoe

More than 60 people helped celebrate PPPL’s 44 inventors of 2014 at the Laboratory’s 2015 Patent Recognition Dinner at Princeton University’s Prospect House on Sept. 30.

“This is an incredibly important program for the Laboratory,” said Deputy Director for Operations Adam Cohen, who served as master of ceremonies for the program. “This is what we’re here to do. We’re supposed to develop these technologies and try to take them to the market.”

Cohen noted that the number of inventions produced by PPPL inventors has increased every year. In fact, there were 30 inventions in fiscal year 2014, compared to 24 in 2013 and 19 in 2012. But Cohen said he is convinced there are many inventors at the Lab who are not taking the steps to disclose their inventions. “There are at least 10 times as many people who should be here based on all the yellow sticky notes with inventions being developed in the Lab,” Cohen said half-jokingly.



Lew Meixler and his wife Deborah holding Meixler’s plaque.

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Patent Recognition Dinner

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PPPL Head of Technology Transfer, Laurie Bagley welcomed the guests and thanked all the people who contributed to PPPL's invention program. "I would like to recognize my predecessor Lewis Meixler, who has been a member of the PPPL family for 40 years," Bagley said. "Lew, thank you so much for everything."

Meixler, the former head of Technology Transfer, who recently retired and who helped organize the patent awards dinner for the last time, was also recognized at the dinner. He received a plaque, which reads, "In recognition and with sincere appreciation for dedication and continuous contributions to the success of the Plasma Physics Lab and Technology Transfer for Princeton University, September 1975 to March 2015." Meixler continued his personal tradition by telling a couple of jokes before thanking everyone for the plaque.

PPPL inventor Larry Grisham was the sole inventor to receive a patent for fiscal year 2014 for his invention for the magnetic insulation of accelerator electrodes in electrostatic acceleration.

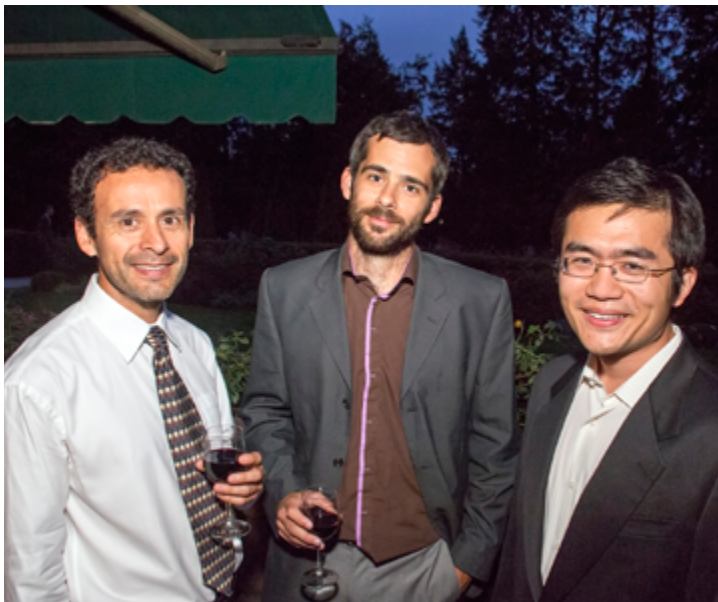
Also recognized were three inventions that are the subject of patent applications. These are an invention to reduce neutron production in small fusion reactors by Samuel Cohen; a novel device for extreme ultraviolet spectroscopy, microscopy and lithography at wavelengths below 100 nanometers by Manfred Bitter, Kenneth Hill and Philip Efthimion; and a new fueling method for small, steady-state, advanced-fuel FRC fusion reactors by Samuel Cohen, Michael Buttolph and Daren Stotler,

The dinner also celebrated 24 other inventions made last year. They are:

Radiative Liquid Lithium (metal) Divertor—Masayuki Ono
A radiative liquid lithium divertor that would provide a protective layer of lithium to protect the divertor in magnetic fusion devices.

Method of Focusing Waves by Inhomogeneous Oscillations of the Underlying Medium—Nathaniel Fisch, Ilya Dodin

A new method of refracting electromagnetic and other waves in a dispersive medium by modulating the parameters of this medium by other waves, which could be used to develop new types of adaptive lenses for focusing.



Celebrating their inventions were: From left to right: Enrique Merino, Renaud Gueroult, and Yuan Shi.



Eliot Feibush, left, and Matthew Lotocki, a student at Princeton University.

Simulation-Based Method for Measuring Spatially Varying Properties of Neutral Atoms and Molecules in Plasmas—Daren Stotler

A simulation-based method for extending the region of applicability of existing visible camera-based techniques for characterizing neutral atoms and molecules in plasmas.

The Double Well Mass Filter—Renaud Gueroult, Jean-Marcel Rax and Nathaniel Fisch

A rotating plasma centrifuge that could be used to separate elements, including separating nuclear materials in nuclear waste and nuclear fuel.

Hybrid Molten Salt Reactor—Robert Woolley

A fusion reactor that integrates an external source of high-energy neutrons produced by either DT fusion or spallation with a critical fission molten salt reactor.

Current Drive for Plasma via Vertically-Structured Permanent Magnet System—Jackson Matteucci and Ali Zolfaghari

An invention that uses pairs of rotating permanent magnets above and below the ferromagnetic core to generate a plasma current in toroidal fusion reactors that would increase the efficiency of the tokamak.

Current Drive for Plasma via Rotation of Superconducting Magnet System—Jackson Matteucci and Ali Zolfaghari

A method of generating a plasma current in toroidal fusion reactors by placing superconducting solenoid magnets around the tokamak and rotating ferromagnetic pathways to induce an efficient plasma current.

Display of Very High-Resolution Data—Eliot Feibush, Michael Knyszek and Matthew Lotocki

An invention that allows users to highlight and explore a very large number of data points in very high resolution.

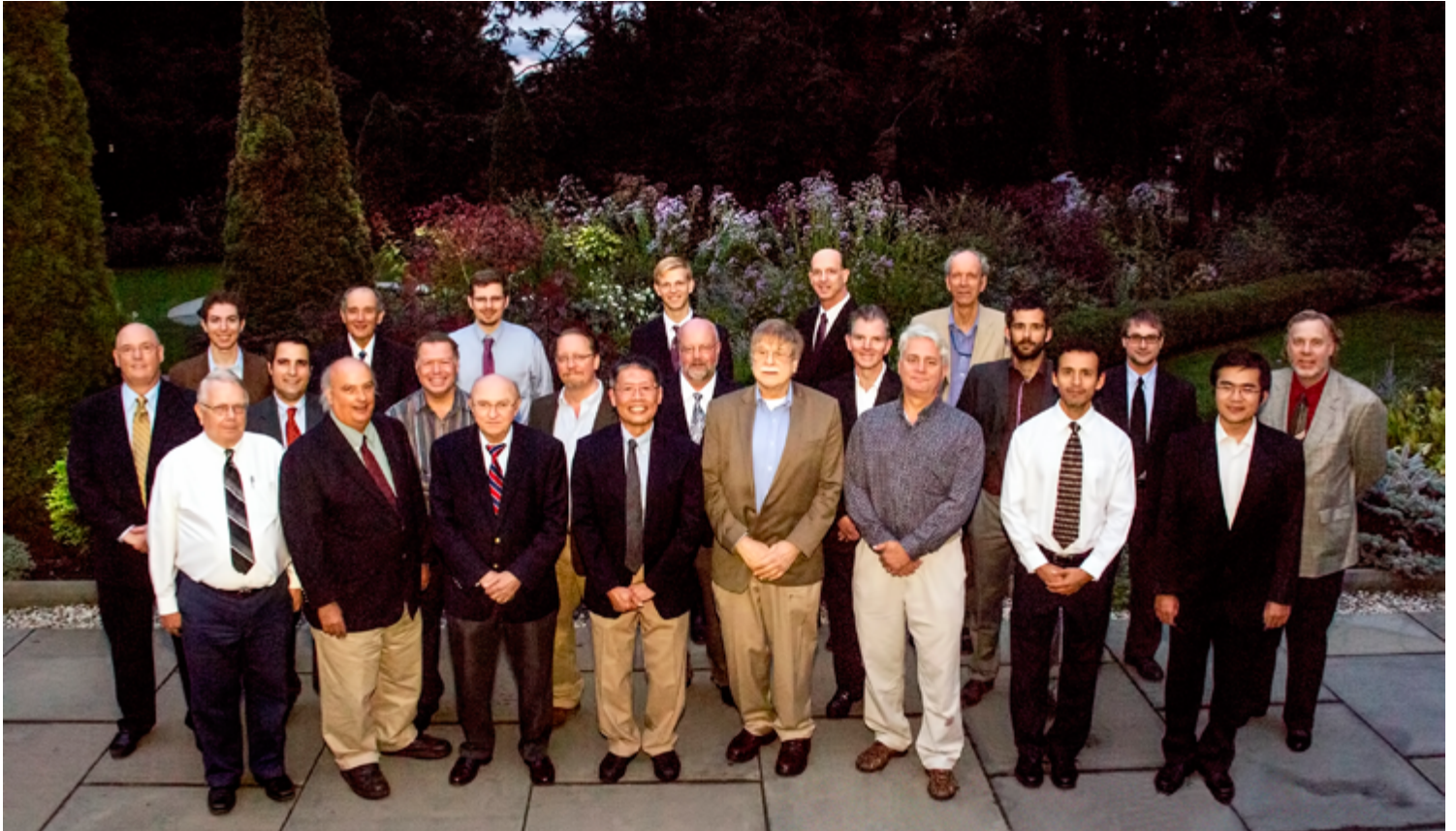
Off-the-Shelf, Multi-Purpose, User-Configurable Signal Interconnection System—Hans Schneider, John Dong and Gary Gibilisco

An electronics signal interconnection system that would allow users to configure their system by combining the number and types of components in order to get the specific channel routing schemes they desire.

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Patent Recognition Dinner

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Inventors honored at the Patent Awards Dinner: From left to right: First row: John Lawson, Larry Grisham, Kenneth Hill, John Dong, Robert Woolley, Michael Duco, Enrique Merino, Yuan Shi; second row: Gregory Tchilinguirian, Michael Viola, David Gates, Bill Davis, Daren Stotler, Renaud Gueroult, Charles Schmitt, Hans Schneider; third row: Jacob Schwartz, Philip Efthimion, Keith Erickson, Matthew Lotocki, Eliot Feibush, and Charles Skinner.

Method of Control of Multiple Contractions in a Volume of Weakly Ionized Plasma by Standing Acoustic Wave Excitation—Mikhail Shneider, Yevgeny Raitses and Igor Kaganovich

A process that uses a standing acoustic wave in a volume of weakly ionized plasma to control the initiation of contraction (the transition to a higher density plasma) in the nodes of the standing wave. Possible applications include plasma-assisted combustion.


Interferometric Method of Measuring the Parameters of Medium Oscillations—Nathaniel Fisch & Ilya Dodin

A new interferometric method of measuring the parameters of an oscillating medium by measuring the phase shift of scattered waves to extract information about the parameters of oscillation.

Mini Enclosure for Isolated Sample Transfer—Charles Skinner

A compact device to prevent oxidation and/or contamination of an experimental sample during transfer between two instruments with controlled atmospheres that allows a sample to be easily transferred without any exposure to air.

Enhanced Efficiency of Otto and Diesel Cycles by Employing Spinning Gas and a Flywheel—Vasily Geyko and Nathaniel Fisch

A new method of gas spinning in an internal combustion engine that employs greater rotation for energy storage in order to improve the thermal cycle efficiency and can also use a flywheel to transfer the energy into rotation of the gas and extract it when needed. 



Phil Efthimion, left, with Kenneth Young, and Lab Director Stewart Prager, right.



Michael Viola, left, and wife, Marianne Tyrrell, with Gary Gibilisco, and wife Donna Gibilisco.

NSTX-U completion

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The new machine passed stringent tests to reach construction completion. On May 11, operators produced 40,000 electron-volts from a second neutral beam — a device used to heat the plasma — to demonstrate the first step in doubling the heating power. Then, on Aug. 10, engineers produced a 100,000-amp plasma — the fuel for fusion reactions. The twin achievements easily met the Key Performance Parameters (KPP) that the project had to satisfy to be completed. “This is not a little spherical torus anymore,” said Al von Halle, the head of NSTX-U engineering and operations. “This machine has 10 times the capability of the original NSTX.”

Reaching this point required some 250 staff members, or more than half the Laboratory, to bring the project in on time within the DOE’s budget. “It took the work of physicists, engineers, technicians and many others to solve all the problems that cropped up along the way,” said Mike Williams, associate director of engineering and infrastructure, who is retiring this month after 39 years at the Laboratory. “This was a joint effort in every sense of the word.”

The many challenges reminded project head Ron Strykowski of remodeling a house that’s already been built. “It’s easier to build a brand new house than to modify one that’s already standing,” Strykowski said. “This forced us to adapt to what was there instead of building from the ground up.”

Among the major hurdles was the need to strengthen every nut, bolt and support system throughout the machine to accommodate the higher magnetic fields. Doubling the fields created torque — or twisting forces — that could have destroyed the machine when it ramped up to full strength

during operation. Analysts led by Pete Titus spent 28,000 hours supporting the Laboratory’s design and cognizant engineers by analyzing the components they designed to tolerate the higher currents and loads required for the upgrade. “This was quite a task,” said Titus, whose team began working three years before construction started and used a software program called ANSYS to analyze and reconfigure the support components.

There were many more challenges to face. The increased power of the machine will require constant monitoring to protect the magnets, and the overall vessel, from forces and stresses that could cause them to fail. To keep constant watch, engineers designed and built a Digital Coil Protection System that makes 1,200 computations every 200 microseconds to ensure that all is running smoothly.

Aligning the second neutral beam that pumps heat into the machine created another big challenge. Engineers headed by Timothy Stevenson had to cut a port into the tokamak vacuum vessel and aim the beam to within 80 thousandths of an inch of the target inside. The spot the beam hit required reinforced armor to keep it from melting right through the vessel. “We had to push the envelope of everything we did,” Stevenson said of the overall upgrade, “and the review was highly complimentary.” Indeed, the DOE committee that conducted the closeout report recognized “the entire project team for their very high-quality work delivered over the course of the project, and resilience in overcoming expected an unexpected obstacles.” 📄



Staffers who worked on the National Spherical Torus Experiment-Upgrade.

PPPL hosts booth at Princeton University's Community and Staff Day

PPPL volunteers wowed the crowd with plasma demonstrations at a booth during Princeton University's Community and Staff Day on Saturday, Sept. 26.

The event was organized by Science Education's Shannon Greco and staffed by volunteers Brian Bozarth, Atiba Brereton, Jeanne Jackson DeVoe and Brian Kraus. (Photos by Brian Bozarth and Jeanne Jackson DeVoe). 📷



Brandy Hale, 11, along with Samantha Shepard, 8, and brother Zack, 4, of Old Bridge, are fascinated by the vacuum chamber that puffs up and then shrivels marshmallows.



Shannon Greco explains a magnet-powered generator to a family.



Atiba Brereton demonstrates how to light up a fluorescent tube with a Tesla coil to Sofia Valencia, 11, of Princeton.



Sarah Hu, of Princeton, with the Van De Graaff generator.



Ethan Konich, 7, of Jackson Township, tries out the Van De Graaff generator.



Organizer Shannon Greco shows a plasma ball to her 1-year-old son Ryan.

State of the Laboratory Address

Date: Monday, Oct. 5, 2015

Time: 1:30 p.m.

Place: MBG Auditorium

After Dr. Prager's presentation, the 2014 Kaul Prize and the 2014 Distinguished Research Fellow Award will be presented.

Refreshments will be served in the lobby following the event.

All staff members are invited to attend.

Sam Barish, of DOE's Fusion Energy Sciences, visits PPPL



Sam Barish, center, the program manager for long pulse stellarators and the Fusion Energy Sciences Advisory Committee, examines the QUASAR stellarator as Hutch Neilson, left, and David Gates, look on. Barish toured the Laboratory during his two-day visit Sept. 28 to 29.

PPPL bids a fond farewell to retiring employees!
Thank you for your many years of service!



JOHN EDWARDS
Engineer
Engineering
38 YEARS



SPENCE HOLCOMBE
Warehouse operations supervisor
Warehouse Operations/Engineering
31 YEARS



JUDY MALSBURY
Head of Quality Assurance
Quality Assurance/Best Practices & Outreach
39 YEARS



LANE ROQUEMORE
Principal engineer
Engineering
36 YEARS



MIKE WILLIAMS
Director for engineering and infrastructure
Engineering
39 YEARS

Safeguards and Security Audit Oct. 6 to Oct. 9

The U.S. Department of Energy will conduct a Safeguards and Security review from Tuesday Oct. 6 to Friday, Oct. 9, in which they will evaluate the Laboratory's security program management, including PPPL's Emergency Service Unit, the physical protection systems, information security, cyber security, materials control and accountability related to nuclear materials, and foreign

visitors and assignments. This DOE review takes place every three years. Please contribute by making sure your badge is visible at all times and by making yourself available to auditors if they ask you questions. Not wearing badges in a visible manner has been identified as a finding at other sites so we know it will be included in this review.

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 October 5	Tuesday October 6	Wednesday October 7	Thursday October 8	Friday October 9
COMMAND PERFORMANCE Chef's Feature	Chicken Parmesan served with Pasta & Steamed Broccoli	Baked Mushroom & Spinach Lasagna	COMMAND PERFORMANCE Create Your Own Carla's Pasta Bar	BBQ Meatloaf with Caramelized Onions served with Mashed Potatoes & Vegetable	Seafood Newburg served over Puff Pastry
Early Riser	Steak & Egg Cheese Quesadilla	Egg & Hash Brown Taco with Beans, Onions, Cheese, Avocado & Cilantro	Corned Beef Hash & 2 Eggs any Style	Cranberry Pancakes	Ham, Egg & Cheese Croissant
Country Kettle	Beef Chili	Manhattan Clam Chowder	Chicken Vegetable	Vegetarian Chili	White Bean & Ham
Grille Special	Corned Beef & Swiss Melt with Coleslaw	Kielbasa & Kraut Torpedo with Fried Pierogies	Blackened Tilapia Caesar Salad with Mango	Pierogies served with Sour Cream & Apple Sauce	Potato Pancakes served with Sour Cream & Apple Sauce
Deli Special	Veggie Frittata served with Caesar Salad	BBQ Chicken Cobb Salad Wrap	The Cubano	Grilled Tuna Nicoise Salad with Olives, Potatoes, Green Beans & Hard-Cooked Egg	NATIONAL HOAGIE DAY Assorted 6-Foot Hoagies Cut to Order at \$1 an Inch
Panini	BBQ Pulled Pork & Beans Wrap	Open-Faced Crab Bread with Cheddar Cheese	Greek-Style Chicken Salad served with Pita Chips	Eggplant Parmesan Ciabatta	Italian Meatball Sub with Provolone

MENU SUBJECT TO CHANGE WITHOUT NOTICE

VEGETARIAN OPTION

WEEKLY

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

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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/>.