PPPL PRINCETON PLASMA PHYSICS LABORATORY
A Collaborative National Center for Fusion & Plasma Research
U.S. DEPARTMENT OF ENERGY
WEEKLY
January 22, 2018

THIS WEEK

TUESDAY, JAN. 23

Research Tour
2 p.m.
See page 3 for information.

WEDNESDAY, JAN. 24

Colloquium
4:15 p.m. ◆ MBG Auditorium
Exoplanet Snapshots, from Precision Optics to Precise Astronomical Measurements
Laurent Pueyo, Space Telescope Science Institute

FRIDAY, JAN. 26

Celebration for employees
1:30 p.m. ◆ LSB Lobby

SATURDAY, JAN. 27

Science on Saturday
9:30 a.m. ◆ MBG Auditorium
Magnetic Explosions in the Plasma Universe
Amitava Bhattacharjee, PPPL

UPCOMING

SATURDAY, FEB. 3

Science on Saturday
9:30 a.m. ◆ MBG Auditorium
Synthetic Muscle for Deep Space Travel
Lenore Rasmussen, Ras Labs

INSIDE

Theoretical physicist Elena Belova named to editorial board of Physics of Plasmas

By John Greenwald

Elena Belova, a principal research physicist in the Theory Department at PPPL, has been named to the editorial board of the *Physics of Plasmas*, a monthly peer-reviewed scientific journal published by the American Institute of Physics. Duties of board members, selected for their high degree of technical expertise, range from suggesting topics for special sections to adjudicating impasses between authors and referees that arise over manuscripts.


Elena Belova

Belova, a PPPL physicist for more than 20 years, is expert at developing computer codes, such as simulations of wave-particle interactions and models of global stability in fusion plasmas that are widely used in fusion research. "I like code development because it is algorithmic and codes can really help to understand the experimental results," she said. "But it still surprises me when theory works the way it's supposed to. I also like that you can perform the simulation and look "inside" the device – which is not always possible in a real experiment. Visualizing things through computer simulations allows one to 'see a picture,' which is, as they say, better than a thousand words."

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PPPL receives higher grades from DOE in FY 2017 but many areas still need improvement, Hawryluk tells staff

By Jeanne Jackson DeVoe

PPPL received high marks for its scientific research program and the Lab improved in five out of eight performance goals in the U.S. Department of Energy (DOE) Office of Science's (SC) yearly appraisal for fiscal year 2017, Rich Hawryluk, PPPL's interim director, told staff at a Jan. 18 meeting. But, he said, the Laboratory still has many areas that need improvement.


Rich Hawryluk, PPPL's interim director, speaks to staff at the Jan. 18 meeting. *(Photo by Elle Starkman)*

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Information sessions explore how to live core values at PPPL

More than 30 people attended information sessions on PPPL's core values Jan. 16 and 17 in Room B318. Members of the Core Values Team gave an overview of PPPL's core values and briefly discussed the values of responsibility, innovation, safety and engagement (RISE). Participants broke into four groups to brainstorm ways to implement the core values. Attendees received "Ask me about RISE buttons" and were dubbed "Core Values ambassadors."

Margaret Kevin-King gives an overview of the core values. *(Photo by Elle Starkman)*

Margaret Kevin-King gives a chocolate prize to Renee Sullivan for responding to a question at the Jan. 16 session. Looking on are Jane Feng and Jorge Gonzalez Teodoro in the front row and Atiba Brereton and Mary Payne in the back row. At center front is John Greenwald. *(Photo by Elle Starkman)*

A group discusses responsibility. From left to right, Raphael Rosen, Devon Battaglia, Jeanne Jackson DeVoe, Jorge Gonzalez Teodoro, and Ford Morrison. *(Photo by Elle Starkman)*

Jeanne Jackson DeVoe discusses the core value of responsibility. *(Photo by Elle Starkman)*

Erik Gilson discusses innovation. *(Photo by Elle Starkman)*

Alana Coleman discusses safety. *(Photo by Elle Starkman)*

Tori Sikkema discusses engagement. *(Photo by Elle Starkman)*

Elena Belova

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Fusion, the reaction that powers the sun and most stars, is the fusing of light elements that generates massive amounts of energy. Researchers seek to replicate fusion on Earth for a virtually inexhaustible supply of energy by controlling plasma, the hot, charged state of matter composed of electrons and atomic nuclei, or ions, that fuels fusion reactions. Theorists create computer models that simulate the processes involved, which experiments then test in attempts to confirm.

Recent experiments at PPPL validated a code of Belova's to predict a way to suppress a type of plasma instability that can halt fusion production. The method could prove useful to ITER, the international fusion facility under construction in France to demonstrate the ability to produce 10 times more power than it consumes.

Belova, 53, joined PPPL in 1997 as the second female physicist to work in the Theory Department. Among her honors has been the Katherine E. Weimer Award for Women in Plasma Physics, a national honor named for the first woman theorist at PPPL, which Belova received in 2005.

As a high school student in the former Soviet Union, Belova grew interested in mathematics and spent three years in an after-school program sponsored by the Moscow Institute of Physics and Technology. "In math you don't really need to know anything," she said. "You just solve puzzles. At least, this is what I thought in high school."

She earned a bachelor's degree in applied mathematics in 1984 and a master's degree in plasma physics in 1987, both from the Institute, though relatives had tried to persuade her not to switch subjects. "They said physics was too hard for a woman," she recalled.

But math had become too abstract for Belova and physics, while more difficult, was also more practical and exciting. She worked as a research engineer at the Space Research Institute in Moscow from 1987 to 1989 and as a junior research scientist from 1989 to 1992. While space physics is no longer her subject, her knowledge has served her in good stead. "There are many common approaches in fusion and space plasma physics," she said.

Belova and her husband, also a physicist, left Russia for the United States in 1992. She had been accepted in the graduate program at Dartmouth College, and became a research assistant in the Department of Physics and Astronomy. While she had learned technical English terms as an undergraduate student in Russia, her command of the broader language was still a bit shaky. "In my first year as a teaching assistant I would sometimes just write equations on the board and would point them out to students rather than trying to explain," she said.

After earning her doctorate in physics from Dartmouth in 1997 she worked as an associate research physicist at PPPL until 2004, a research physicist until 2008 and a principal research physicist since then. Among the scientific articles she has written at the Lab have been 15 invited papers for workshops and conferences around the world.

Belova is the fourth PPPL staff member to be appointed to an editorial position in recent years. Richard Hawryluk, interim director of the laboratory, chairs the editorial board of the journal *Nuclear Fusion*; David Gates, principal research physicist and Stellarator Physics Division Head at PPPL, is editor-in-chief of the new online journal *Plasma*; and Igor Kaganovich, principal research physicist and deputy head of the PPPL Theory Department, serves as associate editor of *Physics of Plasmas*.

Peek behind the scenes of PPPL's research experiments

Tuesday, Jan. 23
2 p.m.

PPPL employees are invited to get a behind-the-scenes look at PPPL's experiments on the first monthly in-depth tour of PPPL's research facilities.

Sign up here or contact Deedee Ortiz, dortiz@pppl.gov, ext. 2785.

Meeting on performance goals

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"We want to be the best in class of SC labs and we're not. We need your commitment to do better. The lab management needs to do better," Hawryluk told staff members in the MBG Auditorium and the cafeteria. "It was a really hard year. I know many of you worked very hard. What DOE is telling us is there's room for further improvement and there are things we need to address."

Dave McComas, Princeton University vice president for PPPL, said he sees progress in the grades. "There is some very good news in these grades," he said. "We've actually moved up more than any other lab. There is much, much more to do, but this shows that we are actually starting to turn the ship in a measurable way."

The A- in scientific research is up from a B last year. The DOE praised PPPL's research team for producing "high-quality, original and creative research results that advance science and technology." The DOE said PPPL's research team is "recognized for its adaptive and effective mission accomplishment despite the interruption of NSTX-U operations."

PPPL received a grade of B+, up from a C in 2016, for the design and construction of research facilities. This includes the NSTX-U Recovery plan and contributions of components for the steady state electrical network to power the international fusion experiment ITER. "NSTX-U is absolutely critical," Hawryluk said. An upcoming DOE assessment of PPPL's recovery plans Feb. 6 to 8 will be crucial.

PPPL received a B- in its management of the research program, up from C+ last year. The DOE found that PPPL did a good job overseeing and providing a vision for its research program. The Laboratory "took significant steps toward re-establishing its core competencies," the DOE said. It singled out PPPL's long-term vision for operating NSTX-U with metallic lithium coated-walls and a flowing liquid lithium divertor. It also commended the Theory Department for leading an Exascale Computing Project and praised PPPL's work on analyzing DIII-D results.

However, the DOE noted that PPPL failed to acquire an expert project manager for the NSTX-U Recovery Project. The DOE's Office of Science also had concerns regarding PPPL's ability to put engineering and project management practices in place that would guarantee projects are completed. PPPL has since addressed some of those issues, by naming Russ Feder as the NSTX-U Recovery Project manager. PPPL is developing a whole set of new procedures through the Integrated Corrective Action Plan (ICAP), including a new set of engineering procedures.

Rich Hawryluk discusses PPPL's PEMP scores. *(Photo by Elle Starkman)*

PPPL received a B- for leadership, up from a C- last year. The DOE commended PPPL's leadership for addressing "a plethora of serious long-standing" issues, particularly in engineering and project management. But the DOE marked PPPL down for not hiring a new director. The DOE also took a dim view of PPPL's decision not to implement a Lab-wide plan tying merit increases to PEMP scores, limiting the plan to the Lab Leadership Council. The DOE also indicated that Princeton University must become more active in improving the Laboratory.

The University has developed a set of 14 key performance indicators (KPIs) that it will use to help measure and evaluate PPPL's performance. "We've set expectations for where we want the Lab to be in these key areas," McComas said.

PPPL's grade for its integrated safety, health, and environmental protection program was a B, down from a B+ in FY 2016. The DOE noted several positive developments, including the fact that PPPL had the lowest number of recordable injuries in FY 2017 since FY 2008. PPPL also got high marks for successfully remediating areas contaminated with tritium.

The DOE cited the following incidents when describing the reason for the lower grade: a worker on the IOI project struck a live electrical conduit with an electrical saw; a PPPL employee knowingly crossed a red danger tape; there were a few safety violations on the IOI project that resulted in a DOE-directed safety stand down. Although no one was injured in these incidents, the DOE said they "demonstrate inattention to hazards." "Everyone needs to follow safety rules all the time," Hawryluk said. "We must be proactive in mitigating risks."

Dave McComas, Princeton University vice president for PPPL, left, talks to staff as Hawryluk looks on. *(Photo by Elle Starkman)*

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Meeting on performance goals

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PPPL's business systems received a B-, down from a B last year. PPPL's Business Operations succeeded in reducing costs by 2 percent last year. The accounting group performed well and the procurement group completed a number of corrective actions. However, the DOE marked PPPL down for failing to hire a permanent Human Resources (HR) director, not having a fully-functioning learning management system in place, having an inadequate diversity and inclusion plan and not having an approved quality assurance plan in place.

There has been progress in the search for a new HR director, Hawryluk said. The learning management system is nearly complete though work remains and PPPL has worked with Princeton University HR to improve the diversity and inclusion plan. The Quality Assurance program description was approved in December.

PPPL received a B+ for its operation and improvement of facilities, up from a B- last year. "This was an area of significant improvement," Hawryluk said. The DOE was pleased that the IOI project has been on schedule and budget. It also praised PPPL's utilization of space, noting that PPPL got rid of trailers and other storage spaces and was able to reclaim 59,000 more square feet of space.

Finally, PPPL received a B+ for its integrated safeguards and security management and emergency management systems, down from an A- last year when PPPL received a high grade for implementing the Duo Authentication program before any other national laboratory. The DOE commended PPPL's emergency management program and said PPPL made progress in cyber security and held a successful emergency exercise.

Both McComas and Hawryluk urged staff to help change the way the Laboratory operates in order to improve PPPL's performance in the coming year and beyond. "We're not going to be able to change the way we do business unless everybody at this Lab is willing to get on board," McComas said.

"This is a time of change at the Laboratory," Hawryluk said. "A number of our colleagues are retiring. We have to look forward and find ways to do business differently in the future."

Ronald E. Hatcher
Science on Saturday LECTURE SERIES

Jan. 27	**Magnetic Explosions in the Plasma Universe** **Amitava Bhattacharjee,** PPPL
Feb. 3	**Synthetic Muscle for Deep Space Travel** **Lenore Rasmussen,** Ras Labs
Feb. 10	**Electromagnetic Screening for Airport Security** **Carey Rappaport,** Northeastern University

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

Celebration for employees

Friday, Jan. 26
1:30 p.m.
LSB Lobby

Come have some cake and coffee and bid farewell to the employees taking a voluntary separation from the Laboratory.

Lots of good energy as Ronald E. Hatcher Science on Saturday lecture series kicks off with talk on batteries

Craig Arnold, Princeton University professor of mechanical and aerospace engineering and director of the Princeton Institute for the Science and Technology of Materials, delivered this year's first Ronald E. Hatcher Science on Saturday lecture on Jan. 13. In his lecture, "From Lemons to Lithium, Squeezing More Life out of Batteries," Arnold detailed for a packed house of community members the historical development of batteries and current research around stored energy technologies. You can view Arnold's lecture here. The Jan. 20 lecture, "Improbable Research and the Ig Nobel Prizes," was by Marc Abrahams, editor of the journal *Annals of Improbable Research*. The Jan. 27 lecture will be by PPPL's Amitava Bhattacharjee, head of the Theory Department and Princeton professor of astrophysical sciences, on "Astrophysical Plasmas."

Craig Arnold, Princeton University professor of mechanical and aerospace engineering and director of the Princeton Institute for the Science and Technology of Materials, talks to Science on Saturday host Andrew Zwicker. *(Photo by Elle Starkman)*

Host Andrew Zwicker, head of PPPL's Communications and Outreach, introduces the lecture. *(Photo by Elle Starkman)*

Craig Arnold discusses the history of and current research on batteries at the first Science on Saturday lecture. *(Photo by Elle Starkman)*

Council Café Lunch

This Week:

Mike Zarnstorff,

Deputy Director for Research

Wednesday, Jan. 24
12 p.m., PPPL Café

IOI project drawing to a close as C Site-MG Building nears completion

The Infrastructure Operational Improvement (IOI) project is drawing to a close, according to Les Hill, head of the IOI project. Business Operations staff and staff formerly housed in the Mod 6 trailer have all moved into new quarters in the LSB Annex. Work on the C Site-MG Building is nearing completion and machinery from the RESA building will be moved in this week, Hill said. With tech shops moved out of the RESA building, the building will be converted into a modern storage building. Hill said preparation to demolish Mod 6 will begin in February and the building will come down in March.

View indicating the length of the C Site-MG Building. *(Photo by Elle Starkman)*

Electricians working on the site, from left: Pete Ortiz, Rich Nicolas and Ron Nicholas. *(Photo by Elle Starkman)*

Most of the work has been completed on the C Site MG Building. *(Photo by Elle Starkman)*

The walls of the building have been sheetrocked and a few areas still need painting. *(Photo by Elle Starkman)*

The C Site-MG Building will soon house tech shops. *(Photo by Elle Starkman)*

Submit your questions for Plasma 101 Lunch & Learn

Please submit your questions about fusion energy, plasma, or any of the research we do here in the box in the LSB lobby.

Sample questions:
What is plasma?
How is what we do different from "nuclear power?"
Why don't we have fusion energy on the grid yet?

COLLOQUIUM

Exoplanet Snapshots, from Precision Optics to Precise Astronomical Measurements

Laurent Pueyov
Space Telescope Science Institute

Wednesday, Jan. 24
4:15 p.m., M.B.G. Auditorium, Lyman Spitzer Building

BROCK

NICK PETTI
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 Jan. 22	Tuesday Jan. 23	Wednesday Jan. 24	Thursday Jan. 25	Friday Jan. 26
COMMAND PERFORMANCE **Chef's Feature**	**Chicken Saltimbocca** with Risotto	**Baked Potato Bar**	**Sushi Day**	**"Super Salad"**	**Beefaroni** with Garlic Bread
Early Riser	**Bacon, Egg & Cheese Croissant**	**Sausage, Egg and Cheese Biscuit**	**Chocolate Chip Pancakes** served with Choice of Breakfast Meat	**Ham, Egg and Cheese Sandwich**	**2 Eggs, 1 Pancake,** Choice of Breakfast Meat & Potatoes
Country Kettle	**Vegetable Noodle**	**Beef Barley**	**Cream of Mushroom**	**Tuscan Chicken and Pasta**	**Seafood Chowder**
Deli Special	**Capicola** with Provolone and Hot Pepper Relish	**Hummus Turkey Wrap**	**Sushi Day**	**Deviled Egg Salad Croissant**	**Chicken, Mozzarella,** Red Onion, Basil, Arugula and Balsamic Tomatoes on French Bread
Grill Special	**Patty Melt**	**Shrimp Tacos**	**Pork Torta** on Ciabatta	**Portobello Mushroom "Cheesesteak"**	**Apple Cheddar Melt**
Panini	**Tomato, Fresh Mozzarella, Spinach and Pesto Hoagie**	**Grilled Eggplant, Spinach and Tomato Parmesan**	**Sushi Day**	**Sausage and Peppers**	**Cuban Sandwich**

MENU SUBJECT TO CHANGE WITHOUT NOTICE

HEART HEALTHY

VEGETARIAN OPTION

WEEKLY

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