PPPL PRINCETON PLASMA PHYSICS LABORATORY
A Collaborative National Center for Fusion & Plasma Research
U.S. DEPARTMENT OF ENERGY
WEEKLY
February 1, 2016

Calendar of Events

SATURDAY, FEB. 6

Ronald E. Hatcher Science on Saturday Lecture Series
9:30 a.m. ◆ MBG Auditorium
Plastic Electronics
Lynn Loo, Princeton University

UPCOMING

WEDNESDAY, FEB. 10

PPPL Colloquium
4:15 p.m. ◆ MBG Auditorium
Assessing First Wall Materials at the Atomic Scale and Energy Writ Large at Princeton
Professor Emily Carter, Princeton University

SATURDAY, FEB. 13

Ronald E. Hatcher Science on Saturday Lecture Series
9:30 a.m. ◆ MBG Auditorium
Title to be announced
Professor Edgar Choueiri, Princeton University

FEB. 19–FEB. 20

New Jersey Regional Science Bowl

SATURDAY, FEB. 20

No Science on Saturday

INSIDE

PPPL team wins 80 million processor hours on nation's fastest supercomputer

By John Greenwald

The U.S Department of Energy (DOE) has awarded a total of 80 million processor hours on the fastest supercomputer in the nation to an astrophysical project based at PPPL. The grants will enable researchers led by Amitava Bhattacharjee, head of the Theory Department at PPPL, and physicist Will Fox to study the dynamics of magnetic fields in the high-energy density plasmas that lasers create. Such plasmas can closely approximate those that occur in some astrophysical objects.

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Shannon Greco: a self-described "STEM education zealot"

The program leader in PPPL's Science Education office will be honored as a "woman of excellence" by the YWCA Princeton

By Jeanne Jackson DeVoe

Shannon Greco, a science education program leader at PPPL, has been named one of the YWCA Princeton's "women of excellence" for her work with young women and disadvantaged youth, including her help in starting two all-girls robotics teams for the YWCA Princeton.


Shannon Greco

Greco organized PPPL and Princeton University volunteers to coach and advise two teams of girls ages 9 to 14 competing in a Lego robotics project for the FIRST LEGO® League and coached one team herself. Greco is also working on fostering a partnership with the Northstar Academy in Newark, and is leading Science Education's high school internship program. She established an energy camp for Trenton High School students last summer that taught students about various types of energy.

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A huge cleanup at PPPL after a record snowfall.

see story on page 2

Lab reopens on time after snowstorm due to hard work of crews

By Jeanne Jackson DeVoe

A crew of 22 people worked 'round the clock Friday night to Sunday afternoon to allow PPPL to reopen on Sunday at 2 p.m. after a winter storm dumped 22 inches of snow in the area.

The crews worked 16-hour overlapping shifts to clear parking lots, sidewalks and outdoor areas of snow. Longford Landscaping, a private contractor from Trenton, assisted with snow plowing. ESU officers, the cryogenic operations crew, and the boiler operators also worked from Friday to Sunday to avoid having other staff come in during the storm.

Several vehicles were out plowing snow outside the LSB building early Sunday morning.

The Laboratory was closed from 10 p.m. on Friday through Sunday with the work crews and ESU officers the only ones allowed onsite. "I think they did great considering how much snow we had, how long it snowed, and how deep it snowed," said John DeLooper, acting deputy director for operations.

John Lacenere, acting head of Facilities and Site Services, said the crews did an "amazing" job, especially considering many businesses remained closed on Monday. "I was very proud of the guys and the way they handled the snowstorm and worked so hard," Lacenere said.

The snow crews worked all day Friday getting salt and equipment ready for the storm. In between shifts, they caught some sleep on cots set up for them.

Tim Conwell, one of the team leaders in charge of the snow crew along with T.J. Levis, said it was the worst snowstorm he can remember. At times, there was no visibility due to the heavy snowfall, he said. "It was unbelievable," he said. "The guys all pulled together. I was really impressed."

DeLooper noted that no one is allowed to enter PPPL's grounds when the Laboratory is closed unless they have been officially designated as essential for the emergency.

Planning for the storm began on Monday when meteorologists began predicting a major storm. On Friday, Fran White, the head of Site Protection, consulted with emergency personnel at Princeton University. (The University was closed from Saturday to Sunday at noon). After a conference call, PPPL managers decided to close the Laboratory at 10 p.m. and cancel the Jan. 23 Ronald E. Hatcher Science on Saturday lecture.

"We close the Laboratory for a couple of reasons," DeLooper said. "One, we don't want people traveling on the roadway coming to the Laboratory because there are unsafe conditions with the snowstorm. And two, when people come to the Laboratory, they park on the parking lots we're trying to clear. So it's critical people stay away when we close the Laboratory."

The following people were part of the snow crew: Kareem Armstrong, Mike Barowsky, Jay Basler, Mike Bernardo, Jason Conklin Tim Conwell, Chad Ennis, Phil Fauntleroy, Ken Feeley, Ron Grabinsky, Chuck Herbert, Brett Hudnett, Mark Kijek, Andy Konca, T.J. Levis, Rich McDonough, Jason Niatas, Akeem Robinson, Adam Salmon, Van Snyder, Brian Tomasko, Martin Umana, and Carl Wojtkowiak.

ESU officers at PPPL during the storm were: Jamie Dunnigan, emergency planning and training coordinator; Wes Foraker, acting captiain; Emergency Services Officers Christina DeZuani, Paul Sobke, John Mazukewicz, Robert Walker, and Erin Ruhl; Captains Howard Caruso and Kevin Rhoades; and Driver/Operators Sean Galie and Robert Lamb.

The 24-7 cryogenic operations crew during the storm were: Steve Sabo, Will Sloyer, Lance Smith, and Bill White.

The boiler operators were: George Ochs, Rico Fernandez, and Sean Rogers.

The photos on this page and page 3 were taken by team leader Tim Conwell early on the morning of Sunday Jan. 24, except where noted.

more photos on next page

Photographer Elle Starkman shot this photo of a deer in the snow in the woods opposite the LSB after PPPL'ers got back to work.

Snowstorm cleanup

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Trucks begin plowing after the storm let up late Saturday night or early Sunday morning.

T.J. Levis, one of the team leaders for the cleanup, poses in front of a pile of snow.

A new Ventrac vehicle with a built-in snowblower got a workout during the cleanup.

Snow overhangs a shed next to the warehouse.

A lone plow near the upper parking lot.

Tim Conwell next to a pile of snow. (Photo by T.J. Levis).

A view of the road next to the D Site Parking lot.

INCITE

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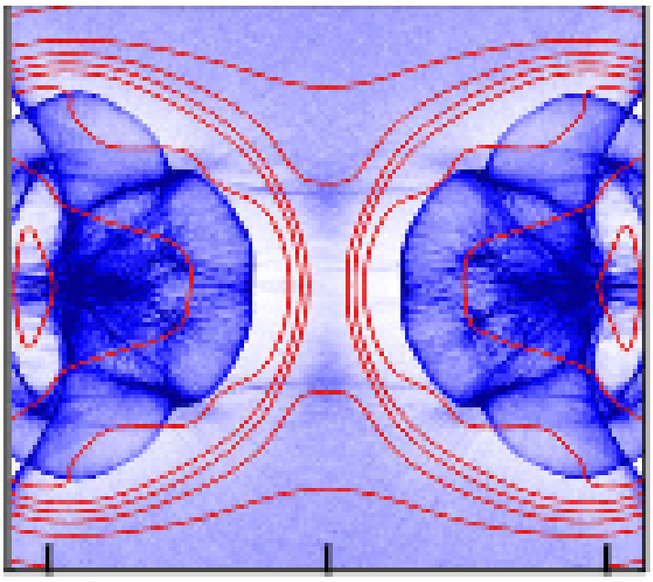

Model of colliding magnetic fields before magnetic reconnection. (Model by Will Fox courtesy of Physical Review Letters 113, 105003 2014)

The awards consist of 35 million hours from the INCITE (Innovative and Novel Impact on Computational Theory and Experiment) program, and 45 million hours from the ALCC, (ASCR — Advanced Scientific Computing Research — Leadership Computing Challenge.) Both will be carried out on the Titan Cray XK7 supercomputer at Oak Ridge National Laboratory. This work is supported by the DOE Office of Science (ASCR).

The combined research will shed light on large-scale magnetic behavior in space and will help design three days of experiments in 2016 and 2017 on the world's most powerful high-intensity lasers at the National Ignition Facility (NIF) at the DOE's Lawrence Livermore National Laboratory. "This will enable us to do experiments in a regime not yet accessible with any other laboratory plasma device," Bhattacharjee said.

The supercomputer modeling, which is already under way, will investigate puzzles including:

Magnetic field formation. The research will study "Weibel instabilities," the process by which non-magnetic plasmas merge in space to produce magnetic fields. Understanding this phenomena, which takes place throughout the universe but has proven difficult to observe, can provide insight into the creation of magnetic fields in stars and galaxies.

Magnetic field growth. Another mystery is how small-scale fields can evolve into large ones. The team will model a process called the "Biermann battery," which amplifies the small fields through an unknown mechanism, and will attempt to decipher it.

Explosive magnetic reconnection. The simulations will study still another process called "plasmoid instabilities" that have been widely theorized. These instabilities are believed to play an important role in producing super high-energy plasma particles when magnetic field lines that have separated violently reconnect.

The NIF experiments will test these models and build upon the team's work at the Laboratory for Laser Energetics at the University of Rochester. Researchers there have used high-intensity lasers at the university's OMEGA EP facility to produce high-energy density plasmas and their magnetic fields.

At NIF, the lasers will have 100 times the power of the Rochester facility and will produce plasmas that more closely match those that occur in space. The PPPL experiments will therefore focus on how reconnection proceeds in such large regimes.

Joining Bhattacharjee and Fox on the INCITE award will be astrophysicists Kai Germaschewksi of the University of New Hampshire and Yi-Min Huang of PPPL. The same team is conducting the ALCC research with the addition of Jonathan Ng of Princeton University. Researchers on the NIF experiments, for which Fox is principal investigator, will include Bhattacharjee and collaborators from PPPL, Princeton, the universities of Rochester, Michigan and Colorado-Boulder, and NIF and the Lawrence Livermore National Laboratory.

Increased reimbursement for safety shoes

After evaluating what other laboratories reimburse employees for safety shoes, PPPL managers have decided to increase PPPL's reimbursement amount. As of Feb. 1, PPPL will reimburse up to $125 for safety shoes.

Shannon Greco

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"Shannon's leadership, passion for science, and being a role model for this unique all-girl team has resulted in empowering girls through scientific literacy and positioned the teams for their first competition in November 2016," said Cheryl Rowe-Rendleman, the first vice-president of the YWCA's Board of Directors, who nominated Greco for the award.

The award, which Greco will receive at the Y's "33rd Annual Tribute to Women Awards Dinner" on March 3 at the Hyatt Regency in Princeton, is given to women who "embody the YMCA's mission of eliminating racism and empowering women."

"I'm incredibly honored," Greco said. "It's very nice to be recognized for doing something that you love and that makes you feel like you're making an impact."

Science programs for under-served youth

"I might be a STEM (science, technology, engineering, and mathematics) education zealot," Greco admits. "I'm all right with that. When something's that important to you, you get excited about it, and it comes across. I think people are surprised by how animated I am but then they get excited, too."

Greco firmly believes that science education is a critical component of every youngster's education and gives him or her skills they can use in every aspect of their lives. "It helps them think critically and have a healthy respect for the data," she said. "It protects them from getting the wool pulled over their eyes and helps them make decisions about their health and their family. It even helps them with their voting decisions. And if they actually go into one of these STEM fields, they can contribute to solving the energy crisis or climate change."

Greco leads a tour of Princeton University Alumni for Princeton Reunions.

A part-time job becomes a career

After graduation, she spent a few years traveling around the world. When she wasn't traveling, she came home to sleep on her mother's couch and work as a temporary employee at Princeton University. She began working part-time for Wole Soboyejo, a professor of mechanical and aerospace engineering who was forming the U.S./Africa Materials Institute. She also worked part-time for Dan Steinberg, the Education Director for the Princeton Center for Complex Materials (PCCM), a research center supported by the National Science Foundation. She met her husband, Scott, an entrepreneur, in 2003 and the two married in 2009.

Greco with Trenton High School students during an energy camp last summer.

Greco grew up in Houston until she was 15 when her father got a job in Saudi Arabia and Greco attended an international boarding school in Switzerland. She then went to the University of Arizona where she studied international studies and spent a semester living in Mali. She said she regrets an early decision to switch out of chemical engineering but she had the mistaken idea that she would be isolated in a laboratory as an engineer. "Nobody told me I could have worked at CERN!" she said half-jokingly.

Greco spent 11 years as an education outreach coordinator at PCCM. Steinberg became her mentor and encouraged her to pursue a master's degree in science education from Montana State University. She defended her thesis when she was six weeks pregnant, took a year off from her studies, and returned to the university with her then 16-month-old in tow to finish her coursework.

When Greco came to PPPL for an interview two years ago and was asked why she wanted to come to work in PPPL's Science Education program, she replied, "It seems like you guys have more fun over here!" She said she appreciates the camaraderie and the passion everyone in Science Education has for science education. "The way all our different roles interact works out really well," she said. Andrew Zwicker, a physicist and head of Science Education, leads the group, while Arturo Dominguez

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Shannon Greco

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Greco and the "Orange Power" Lego robotics team she coached jump for joy during a practice presentation.

is a physicist and senior program leader and Deedee Ortiz is the program manager and organizer. "I always tell people I've never laughed so much at work," she said. "To be able to do cool things and get people excited about science, you can't beat that."

Zwicker said he hired Greco not only because of her science education background but also for her ability to evaluate programs. He cites the example of Greco's surveys of students involved in the Science Undergraduate Laboratory Internship (SULI) program, a summer internship program at PPPL for college students. The surveys will show how many go on to graduate programs or to careers in science. "That's where I believe she has actually improved our overall programmatic value," Zwicker said. "She's taken that background and applied it to existing and new programs."

Greco uses solar-powered cars to teach students about solar energy during PPPL's energy camp

Greco's colleague Arturo Dominguez, a senior program leader, said Greco has reinforced some basic science education principles such as the value of repetition, the importance of using analogies and the importance of not overestimating what people know. "She's very engaged, she is very thorough, she doesn't mind if it takes time for the explanation to get through, she makes sure students are really understanding it, even if she has to repeat it or change the approach," he said.

Making physicists dance

Dominguez recalls watching Greco at the recent American Physical Society's expo brief physicists volunteering on how to explain states of matter to young people. Greco made them learn a dance she created to explain each state of matter. Soon she had a group of serious scientists doing a dance that required them to stand still and wiggle to demonstrate what molecules do in a solid, move around a bit more for a liquid, move around a lot for a gas, and finally fling a badge or scarf to the side to demonstrate electrons breaking free from the atoms in a plasma.

The silliness has some serious research behind it, Greco said. As a science educator, she knows that kinesthetic learning in which learners move their bodies around, is a great way to teach a difficult concept. "I don't care what age you are, I'm still going to make you do the states of matter dance," said Greco. "I've seen adult teachers get their world rocked by this approach. It's not just kids that this works for."

Atiba Brereton, an engineer at PPPL who coached one of the Lego robotics teams alongside Greco, recalls first meeting her in 2014. Then "visibly pregnant," she was delivering a presentation on basic science education principles for tours. "I found the presentation so useful that I asked her for permission to share it with my old fabrication lab at Howard University to aid with training students to give tours," Brereton said.

Balancing parenthood and career

Balancing a demanding career with raising two young children, Lukas, who is almost 4, and Ryan, who is 16 months, when both she and her husband are working is "really hard," Greco says. Her children are in day care and her mother, who recently retired, is a tremendous help, she said.

But Greco added that there are ways in which her professional life enriches her life as a mother, and vice versa. "I feel it's made me a better parent because I'm applying all these things I've learned on my own kids to help them figure out how things work in the world. But also, they're my little lab rats. I'm testing things out on them all the time."

One way Greco copes is to sometimes bring Lukas or Ryan along to after-work activities. "She often attended meetings with her robotics team with her young child comfortably nestled in a baby carrier over her shoulder," the Y's Rowe-Rendelman said. "This is more than a heart-warming picture. It truly sends a message to the young girls and teens that one can be both a scientist and a mother. One does not need to choose between the two demanding and rewarding roles."

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 12 to March 15. Judging for the elementary division (grades 4 to 5) and the junior division (grades 6 to 8) takes place Sunday, March 12. Judging for the senior division takes place March 12 and March 13. Additional information about the fair is available at https://mercersec.org/about/msef.

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

Ronald E. Hatcher

Science on Saturday LECTURE SERIES

Feb. 6	**Plastic Electronics** **Lynn Loo,** Princeton University
Feb. 13	**TBA** **Edgar Choueiri,** Princeton University
Feb. 20	**No Science on Saturday due to DOE New Jersey Regional High School Science Bowl**
Feb. 27	**Brutal Efficiency: How Mating and Reproduction Influence C. Elegans Longevity** **Coleen Murphy,** Princeton University
Mar. 5	**Reimagining the Possible: Scientific Transformations Shaping the Path Towards Fusion Energy** **Ed Synakowski,** DOE
Mar. 12	**Taking the Universe's Baby Picture** **David Spergel,** Princeton University

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

Announcing a new opportunity for undergraduates, graduate students and postdocs: **Princeton Research Day**

Juniors, seniors, graduate students and postdoctoral researchers are encouraged to present at the inaugural Princeton Research Day, a celebration of research and creative works to be held **May 5, 2016** at Frist Campus Center. Presenters will gain valuable experience in communicating across disciplines to a nonspecialist audience. Resources — including workshops, practice sessions and technical help — will be available to help presenters prepare for the event. Types of presentations include posters, talks, performances, exhibitions and videos. See researchday.princeton.edu for more information and to apply.

Applications will be accepted through Feb. 5, 2016

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 **February 1**	Tuesday **February 2**	Wednesday **February 3**	Thursday **February 4**	Friday **February 5**
COMMAND PERFORMANCE **Chef's Feature**	**Chicken Enchilada** with Yellow Rice & Beans	COMMAND PERFORMANCE **Create your own Burrito Bar**	**Cincinnati Beef Chili** served with Corn Bread	**Teriyaki Chicken Thighs** served with Rice & Vegetable	CELEBRATING SUPER BOWL **Beef Nachos Grande**
Early Riser	**Spanish Omelet** with Home Fries	**Cream Chipped Beef over Biscuits** served with 2 Eggs any style	**Scrapple & 2 Eggs any style**	HYDRATION THURSDAY **Ham, Egg & Cheddar Croissant**	**Banana-Stuffed French Toast**
Country Kettle	**Beef Chili**	**French Onion**	**Chicken Noodle**	**Tomato Tortellini**	**Navy Bean & Ham**
Grille Special	BURGERLICIOUS **As Gouda As It Gets Burger** Grilled Beef Burger smothered with smoked gouda, caramelized onions, and garlic roasted wild mushrooms topped with Applewood bacon jam on a grilled brioche roll (Available All Week)	**Potato Skins stuffed with Pulled Pork** served with Slaw and Chipotle Lime Sour Cream	**Homemade Tuna Burger** served on a Wheat Roll	**Country-Fried Chicken Breast & Waffles** with Syrup or Country Gravy	**Buffalo Style Chicken Wings** served with Blue Cheese, Celery Sticks & Fries
Deli Special	**Tuna Hoagie** with Bacon & Hard-Cooked Egg	**Egg Salad Wrap** with Bacon & Avocado	**New Orleans Muffaletta**	**Crispy Chicken,** Pepper Jack, Bacon & Chipotle Mayo on a Kaiser Roll	**Italian Hoagie** Cut from a 6-Footer!!
Panini	**The Cubano** Roast Pork, Ham, Swiss, Pickles & Dijonnaise on a Ciabatta	**Open-Faced Crab Bread**	**Breaded Chicken Cutlet** on Ciabatta Bread with Ham, Salami, Provolone & Marinated Roasted Peppers	**Soft Pretzel** with Nacho Cheese Sauce Served with a Cup of Soup	**Pulled Pork Sliders** served with Coleslaw & Onion Rings

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**

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Comments: commteam@pppl.gov ◇ **PPPL WEEKLY** is archived on the web at: http://w3.pppl.gov/communications/weekly/.