

THIS WEEK

WEDNESDAY, MAR. 7

Council Café Lunch

12 p.m. ♦ Cafeteria
Phil Efthimion
Head of the Plasma Science
& Technology Department

Colloquium

4:15 p.m. ♦ MBG Auditorium
A Fascination with Fluid Mechanics
Howard Stone, Princeton University

FRIDAY, MAR. 9

Employee Tour

10-11:30 a.m. ♦ LSB Lobby
[See page 6 for details.](#)

SATURDAY, MAR. 10

Science on Saturday

9:30 a.m. ♦ MBG Auditorium
**Control in the Sciences of Vast
Length and Timescales**
Herschel A. Rabitz, Princeton
University, and Andrea Woody,
University of Washington

UPCOMING

WEDNESDAY, MARCH 14

American Red Cross Blood Drive

8 a.m.-1 p.m.
[See page 6 for details.](#)

Council Café Lunch

12 p.m. ♦ Cafeteria
Kristen Fischer
CFO and head of Business Operations

Colloquium

4:15 p.m. ♦ MBG Auditorium
**Science with Neutrons at the NIST
Center for Neutron Research**
Robert M. Dimeo, NIST Center for
Neutron Research

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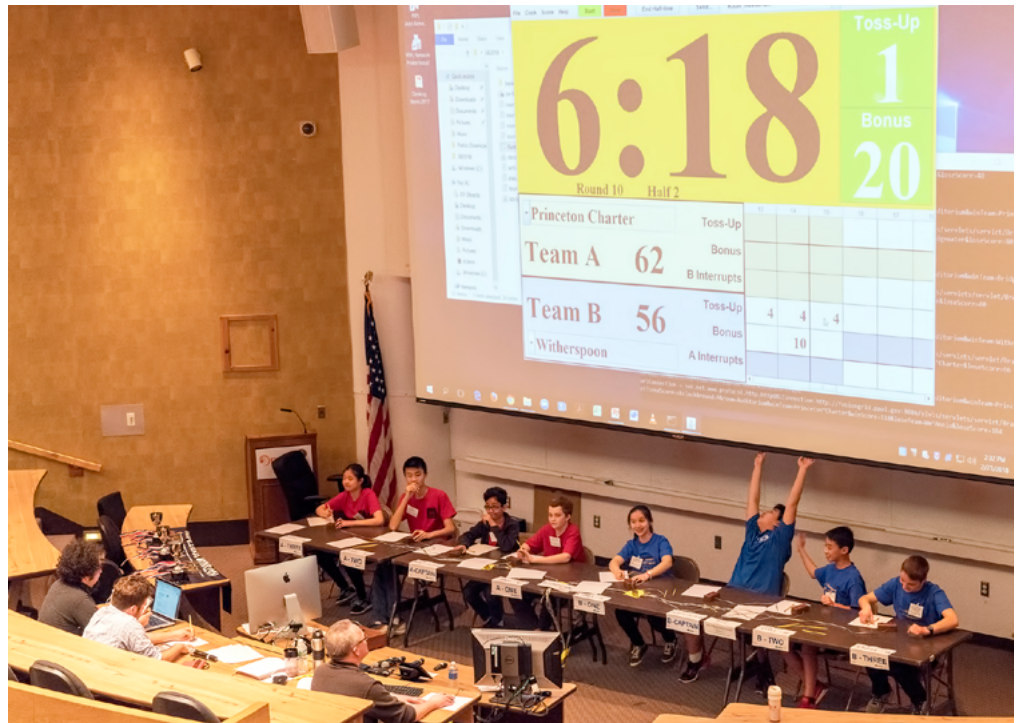
Menu **7**

A battle of the brains between local rivals at Science Bowl

By Jeanne Jackson DeVoe

As the final competitions took place at the Olympics in South Korea, a battle of the brains was taking place at PPPL on Feb. 23 and 24 where two local teams won the New Jersey Regional Science Bowl and the chance to compete in the DOE's national contest in Washington, D.C.

"Who knew this could be so exciting!" said Andrew Zwicker, head of Communications and Public Outreach and Science Education, at the conclusion of the middle school contest. "To see how much you know and how you figure things out when you start talking together and watch how you collaborate is really remarkable. We expect you to come back here and help us with fusion when you are done with school."



The battle of the Princeton middle schools: The winning Princeton Charter Team in red competes with the John Witherspoon Middle School team in blue. (Photo by Elle Starkman)

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Plasma bubbles help trigger massive magnetic events in outer space

By Raphael Rosen

Scientists at PPPL have discovered key conditions that give rise to fast magnetic reconnection, the process that triggers solar flares, auroras, and geomagnetic storms that can disrupt signal transmissions and other electrical activities, including cell phone service. The process occurs when the magnetic field lines in plasma, the hot, charged state of matter composed of free electrons and atomic nuclei, break apart and violently reconnect, releasing vast amounts of energy. This happens in thin sheets of plasma, called current sheets, in which electric current is strongly concentrated.

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Science Bowl

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The winning West Windsor-Plainsboro North High School Team in competition. (Photo by Elle Starkman)

In the high school contest, the finalists were two high schools from the same school district, West Windsor-Plainsboro South, the reigning champions for the past three years, and West Windsor-Plainsboro North. The two teams went to a 13th round and were tied with less than a minute left, when West Windsor-Plainsboro North scored four points to win 86 to 82. The Ridge High School team from Basking Ridge, New Jersey, won third place.

The middle school contest came down to a close match between two Princeton teams: the John Witherspoon Middle School, last year's winners, and the Princeton Charter School team, which came in second last year. The two teams played two final rounds with Princeton Charter narrowly defeating John Witherspoon in the first round 106 to 104, and 96 to 54 in the final round. William Annin Middle School, of Basking Ridge, won third place.

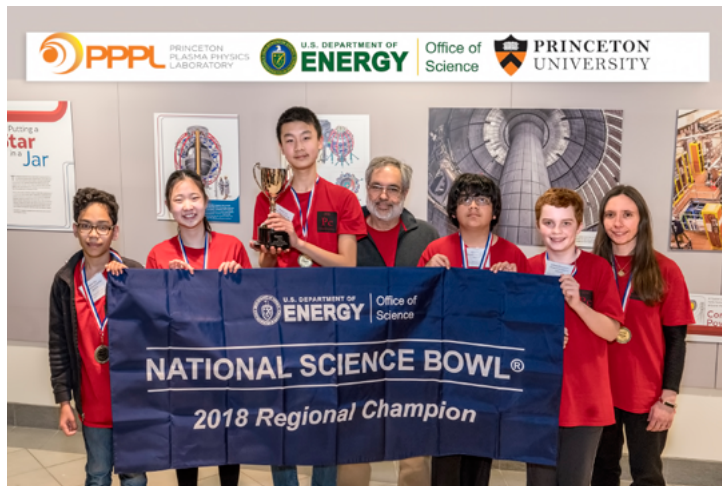
The winners of each competition won an all-expense paid trip to the DOE's National Science Bowl® in Washington, D.C., April 26 to 30. The middle school winner will compete against 49 other regional teams, while the high school champion will compete against 64 other teams.

"This is great! It's been a long haul," said Mark Schlawin, the Princeton Charter School coach. "We came in second two years in a row now. This time we managed the victory." Akash Jim, who competed in the middle school team for the third year said the suspense was intense. "In the last half I was turning to jelly," he said.

This was the 25th year PPPL has hosted the Science Bowl. Teams come from all over New Jersey and the region to compete. The State College Area High School from State College,



The Princeton Charter School team, left, in competition. Volunteers, at right, from front to back, are: Geena Elghossain; Andrew Zwicker, head of Communications and Public Outreach and Science Education; and Chris Smiet. (Photo by Elle Starkman)



The winning Princeton Charter middle school team with their banner. (Photo by Elle Starkman)

Pennsylvania, traveled four hours to get to the contest. "The kids did great," said Coach Susan Braun. "It was a lot of fun."

Lawrence Middle School didn't come home with any medals but "they still had a good time," said Coach Tracy Bozarth. "It's nice because they see all their hard work pay off. Even with teams way over our ability, it's nice when they have points on the board. That's a success for them."

Deedee Ortiz, the PPPL organizer of the event, received a round of applause from the audience both days for her work on the event. She noted that 50 PPPL volunteers come in on Saturday to work as moderators, judges and scorekeepers. "This event would never be possible without our amazing volunteers," she said. 📷



The John Witherspoon Middle School team, which came in second place, enjoys a laugh. (Photo by Elle Starkman)



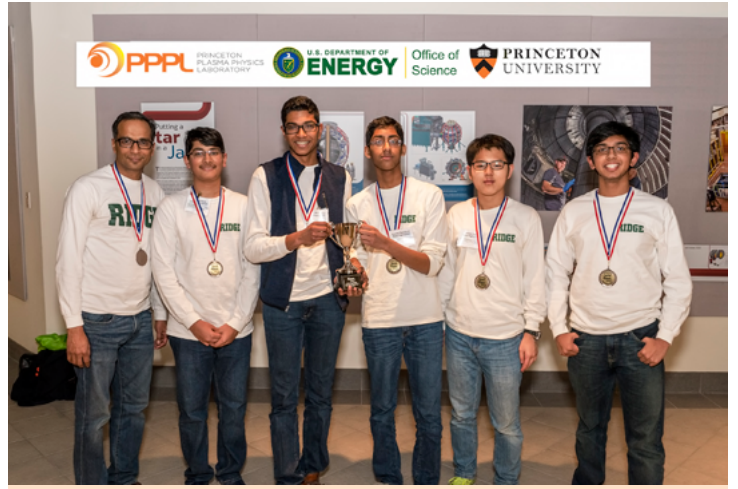
The West Windsor-Plainsboro High School South team, which came in second, buzzes in during one of the final rounds. (Photo by Elle Starkman)

Science Bowl

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Volunteer Angela Powell, left, and Deedee Ortiz, the Science Education program manager who organized the Science Bowl, take a break from their duties during the high school Science Bowl. (Photo by Jeanne Jackson DeVoe)



The Ridge team, from Basking Ridge New Jersey, won third place in the high school competition. (Photo by Elle Starkman)



The Lawrence Middle School team during an intense moment. (Photo by Elle Starkman)



The Bridgewater-Raritan High School team enjoys a laugh during competition. (Photo by Elle Starkman)



Mountain Lakes High School's all-girl team. (Photo by Elle Starkman)



Volunteers Kevin Lamb, left, who was a science judge, and Atiba Brereton, who was a timekeeper and moderator, confer on a question during the middle school competition. (Photo by Elle Starkman)



Volunteers Chris Smiet and Geena Elghossain take a break between rounds at the middle school competition. (Photo by Elle Starkman)



PPPL volunteers during the high school competition on Saturday, from left: Ken Bauer, Jacob Schwartz, and Dennis Bell. (Photo by Elle Starkman)

Plasma bubbles

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By incorporating computer simulations, the findings add to an earlier theory of fast reconnection developed mathematically by physicists at PPPL and Princeton University. The new results incorporate a new predictive model that gives a more complete description of the physics involved.

The impact of reconnection can be felt throughout the universe. The process may cause enormous bursts of gamma-ray radiation thought to be associated with supernova explosions and the formation of ultra-dense neutron stars and black holes. “A gamma-ray burst in our Milky Way galaxy, if pointing towards Earth, could potentially cause a mass extinction event,” said PPPL physicist Yi-Min Huang, lead author of a paper reporting the findings in *Astrophysical Journal*. “Clearly, it is important to know when, how, and why magnetic reconnection takes place.”

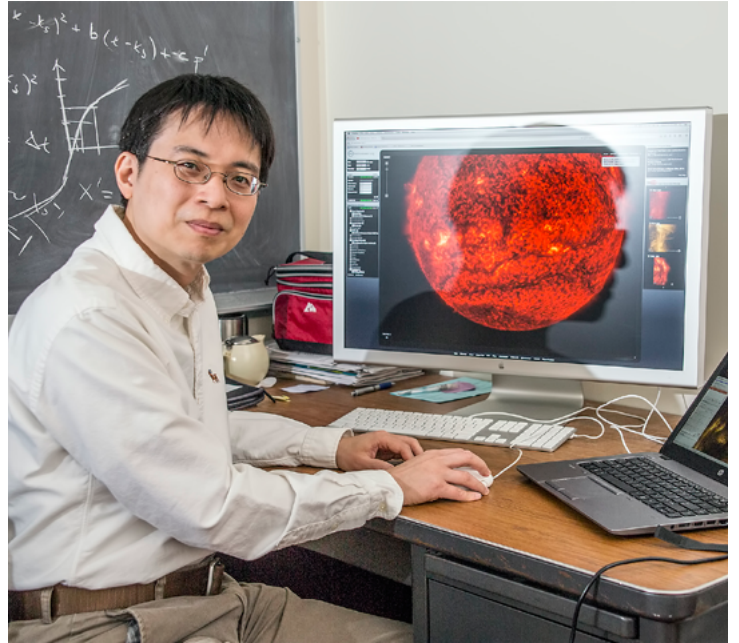
Scientists have observed that reconnection happens suddenly, after a long period of quiescent behavior by magnetic fields inside current sheets. What exactly causes the magnetic fields to separate and reconnect, and why does the reconnection take place more quickly than theory says it should?

Using computer simulations and theoretical analysis, the physicists demonstrated that a phenomenon called the “plasmoid instability” creates bubbles within plasma that can lead to reconnection when certain conditions are met:

- The plasma must have a high Lundquist number, which characterizes how well it conducts electricity.
- Random fluctuations in the magnetic field of the plasma provide “seeds” from which the plasma instability grows.

Taken together, these conditions allow plasmoid instabilities to give rise to reconnection in current sheets. “Our study suggests that disruption of the current sheet caused by the plasmoid instability may provide a trigger,” Huang said.

The trigger breaks up two-dimensional sheets of electric current within plasma into bubbles, or plasmoids, and many smaller sheets. The growing number of sheets creates more opportunity for magnetic lines to break apart and join together. Reconnection also occurs in more than one place, causing the aggregate rate for an entire system to increase.



Yi-Min Huang (Photo by Elle Starkman)

The smaller size of current sheets speeds up reconnection as well. Electromagnetic forces tend to propel the plasma between sheets, producing motion that accelerates when the sheets break into smaller ones. The accelerating plasma brings magnetic lines together more quickly and leads to faster reconnection rates.

Huang and fellow physicists would like to test their new model using experimental machines with additional capability. While no such machine exists at present, researchers look forward to a new unit that is coming online.

Funding for this research was provided by the National Science Foundation and the DOE’s Office of Science. The simulations were performed by supercomputers at the Oak Ridge Leadership Computing Facility and the National Energy Research Scientific Computing Center, a DOE Office of Science User Facility at Lawrence Berkeley National Laboratory in Berkeley, California. Coauthors include Amitava Bhattacharjee, head of the Theory Department at PPPL, and Luca Comisso, a former PPPL and Princeton University physicist now at Columbia University. [@](#)

Can I do a **STOP** observation with someone else?



Yes!

Don’t go it alone! You can conduct STOP observations in pairs (or more). List all observers on one card.

**Safety first:
Use the STOP program!**

COLLOQUIUM

A Fascination with Fluid Mechanics

Howard Stone
Princeton University

Wednesday, March 7
4:15 p.m., M.B.G. Auditorium, Lyman Spitzer Building

Ronald E. Hatcher Science on Saturday LECTURE SERIES

March 10

Control in the Sciences of Vast Length and Timescales

Herschel A. Rabitz, Princeton University
Andrea Woody, University of Washington

March 17

On the Path to Clean Fusion Energy

Michl Binderbauer, TAE Technologies

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

Volunteer for the Young Women's Conference March 22

There will be 750 girls from all over New Jersey at this year's Young Women's Conference March 22 at Princeton University. Volunteers are needed to help out with PPPL and Liberty Science Center tables, registration, and other tasks.

[Click here to register to volunteer.](#)

Please contact Deedee Ortiz, dortiz@pppl.gov, ext. 2785,
for more information

American Red Cross Blood Drive

Wednesday, March 14

8 a.m.-1 p.m.

Appointments are preferred. Please call the OMO at ext. 3200 or go to redcrossblood.org and enter sponsor code PPPLPrinceton.

You can make a difference! Your blood donation matters!

Thank you!

—American Red Cross, Occupational Medicine Office and Human Resources

Tour the Laboratory on an employee tour!

Who: PPPL Staff

What: See the NSTX-U Control Room, test cell, and other areas of the Laboratory on an employee tour

When: March 9, 10-11:30 a.m.,
and the second Friday of each month at 10 a.m.

Where: Meet in the LSB Lobby

Why: Learn more about our research and mission

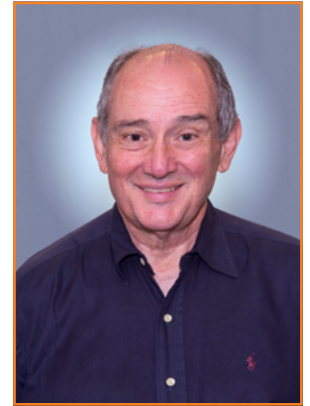
How: [Sign up here](#) or contact tours@pppl.gov

Council Café Lunch

This Week:

Phil Efthimion,

Head of the Plasma Science & Technology Department



Wednesday, March 7
12 p.m., PPPL Café

March 14: Kristen Fischer

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 March 5	Tuesday March 6	Wednesday March 7	Thursday March 8	Friday March 9
Early Riser	Kielbasa and Eggs	Greek Breakfast Wrap	Chicken Omelette	Frittata of the Day	Breakfast Pizza
Country Kettle	Spring Vegetable	Chicken Noodle	Tuscan Bean	Split Pea	New England Clam Chowder
Deli Specialty	Turkey Caesar Wrap	The Carnegie: Pastrami, Corned Beef, Swiss, Russian Dressing and Coleslaw on Rye	Roast Beef with Asian Slaw and Wasabi Mayo	Sushi	Italian Chopped Antipasti Wrap
Grill Specialty	The Plasma: Chicken, Bacon, and Swiss on French Bread	Beef Quesadilla	The Simple Man Burger		Potato Pancakes with Applesauce
COMMAND PERFORMANCE Chef's Feature	Stuffed Shells with Roasted Vegetables and Garlic Bread	Chili Pot Pie with Tossed Salad	Vegetable Lasagna		Fried Fish with Potato Salad and Greens
Grilled Panini	4 Cheese Panini	Spicy Pepperoni Ciabatta	Pretzel Melt with Ham and Swiss		Tuna Melt on Rye 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/>.