

Calendar of Events

WEDNESDAY, JAN. 13

PPPL Colloquium
4:15 p.m. ♦ MBG Auditorium
[Frontiers in Plasma Science: A High Energy Density Perspective](#)
Dr. Bruce A. Remington, Lawrence Livermore National Laboratory

SATURDAY, JAN. 16

Ronald E. Hatcher Science on Saturday Lecture Series
9:30 a.m. ♦ MBG Auditorium
[The Wild and Wacky World of Epigenetics](#)
Professor Shirley Tilghman, Princeton University

UPCOMING

TUESDAY, JAN. 19

Laboratory Management Review
8:30 a.m. to 1:30 p.m.

SATURDAY, JAN. 23

Ronald E. Hatcher Science on Saturday Lecture Series
9:30 a.m. ♦ MBG Auditorium
[Using Physics and Chemistry to Understand the Genome](#)
Professor Mary Jo Ondrechen, Northeastern University

WEDNESDAY, JAN. 27

4:15 p.m. ♦ MBG Auditorium
[COLLOQUIUM: The MaRIE \(Matter-Radiation Interactions in Extremes\) Project](#)
Dr. Cris Barnes, Los Alamos National Laboratory

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Discovering a mechanism that halts solar eruptions before they blast into space

By John Greenwald

Among the most feared events in space physics are solar eruptions, massive explosions that hurl millions of tons of plasma gas and radiation into space. These outbursts can be deadly: if the first moon-landing mission had encountered one, the intense radiation could have been fatal to the astronauts. And when eruptions reach the magnetic field that surrounds the Earth, the contact can create geomagnetic storms that disrupt cell phone service, damage satellites and knock out power grids.

Coronal mass ejection

The violent eruptions, called “coronal mass ejections,” stem from a sudden release of magnetic energy that is stored in the sun’s corona, the outermost layer of the star. This energy is often found in what are called “magnetic flux ropes,” massive arched structures that can twist and turn like earthly twine. When these long-lived structures twist and destabilize, they can either erupt out into the solar system or fail and collapse back toward the sun.

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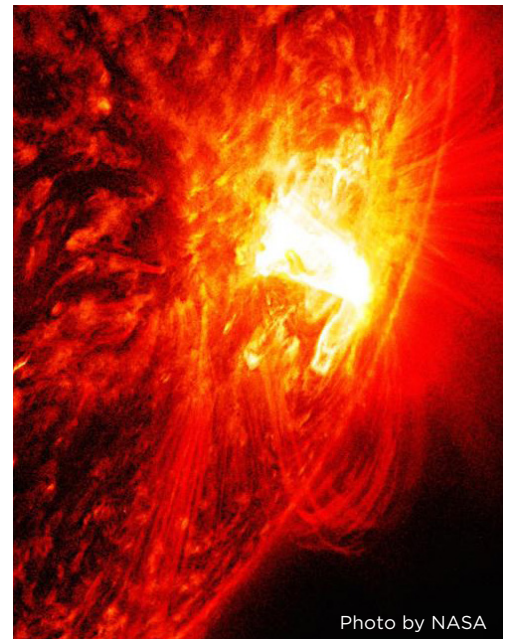


Photo by NASA

This solar flare occurred at the peak of the solar cycle in October 2014 with no observed eruptions. PPPL researchers say this is a promising candidate for studying the effect of guide magnetic fields.

PPPL physicists win Torkil Jensen Award to conduct key experiments on DIII-D

By John Greenwald

Physicists Luis Delgado-Aparicio and Egemen Kolemen of PPPL have won a national scientific competition to conduct a full day of experiments on the DIII-D National Fusion Facility that General Atomics operates in San Diego for the DOE. The honor, known as the Torkil Jensen Award, is named after the late and internationally recognized scientist who was a member of the General Atomics Fusion Group for 44 years.

The PPPL physicists will use their opportunity to test the recently proposed cause of the density limit, a daunting problem that keeps doughnut-shaped facilities called tokamaks from operating at peak efficiency. The cause, according to a theory advanced by PPPL physicist David Gates and colleagues at the Laboratory, lies in the tendency of bubble-like islands that form in the plasma that fuels fusion reactions to shed heat and grow exponentially — a runaway growth that disrupts the crucial current that completes the magnetic field that holds the plasma together.

“We want to understand the physics of this island growth and see if it causes the density limit,” said Delgado-Aparicio. “We want to be able to tell a really coherent story.” This work is supported by the DOE Office of Science.

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Torkil Jensen Award

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The theory holds that impurities kicked up from the interior walls of a tokamak collect inside the islands and cause them to radiate away their heat. Raising the density of the plasma increases the heat loss. Countering this cooling is heat that researchers pump into the plasma. But when the thermal balance in the islands shifts to net cooling, the islands rapidly expand and the plasma falls apart.




Egemen Kolemen and Luis Delgado-Aparicio at PPPL

Testing in a number of ways

The researchers will test this hypothesis in a number of ways. Kolemen will inject heat directly into an island to see if that offsets the cooling effect and causes the island to shrink rather than grow. The experiments will also add pellets of fuel to the core of the plasma to see if the direct heating can allow the density to increase without incident. And neon and argon impurities will be inserted into the islands to investigate whether the direct heating can overcome the radiated cooling effect. “What we are after is a microscopic description of what limits the density,” said Kolemen. “And if we are right the next step will be to try to eliminate the problem.”

The experiments, to be conducted in the first quarter of 2016, are in keeping with the spirit of the Torkil Jensen Award, which allots DIII-D time for research with the “potential for transformational results.” DIII-D is the nation’s largest magnetic fusion program, and the facility draws more than 500 researchers and institutions from around the world each year.

Experiments that lead to an understanding of the density limit, a vexing puzzle for more than 50 years, could facilitate the development of fusion as a safe, clean, and virtually limitless source of energy for generating electricity. 

Solar Eruptions

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The researchers found in laboratory experiments that such failures occur when the guide magnetic field — a force that runs along the flux rope — is strong enough to keep the rope from twisting and destabilizing. Under these conditions, the guide field interacts with electric currents in the flux rope to produce a dynamic force that halts the eruptions. PPPL has discovered the importance of this force, called the “toroidal field tension force,” which is missing from existing models of solar eruptions.


The researchers discovered this importance using the Laboratory’s Magnetic Reconnection Experiment (MRX), the world’s leading device for studying how magnetic fields in plasma converge and violently snap apart. The scientists modified the device to produce both a flux rope, which stores a significant amount of energy that seeks to drive the rope outward, and a “potential magnetic field” like the ones that enclose the rope in the solar corona.

Potential magnetic field

This potential magnetic field is composed of magnetic “strapping” and “guide” fields, each of which provides restraining forces. Eruptions burst forth when the restraining forces in the strapping field become too weak to hold the rope down, creating what is called a “torus instability” that shoots plasma into space. The guide field, which reduces the twist in the flux rope, had long been thought to be of secondary importance.

But the researchers found that the guide field can play an important role in halting eruptions. When the flux rope starts to move outward in the presence of a sufficiently powerful guide field, the plasma undergoes an internal reconfiguration — or “self-organization” — that causes the eruption to lose energy and collapse.

“The presence of a substantial guide field should therefore indicate a reduced probability of eruption,” said associate research physicist Clayton Myers, who led the research.

Solar physicists should thus be on the lookout for guide fields, which can be found in relatively simple reconstructions of the sun’s potential magnetic field. One promising candidate for study is the largest active region in the peak solar cycle that took place in October 2014, which produced many large flares but no observed eruptions. Preliminary analysis of this region shows that a number of these flares were associated with failed eruptions that could have been caused by the mechanism the MRX experiments found. 

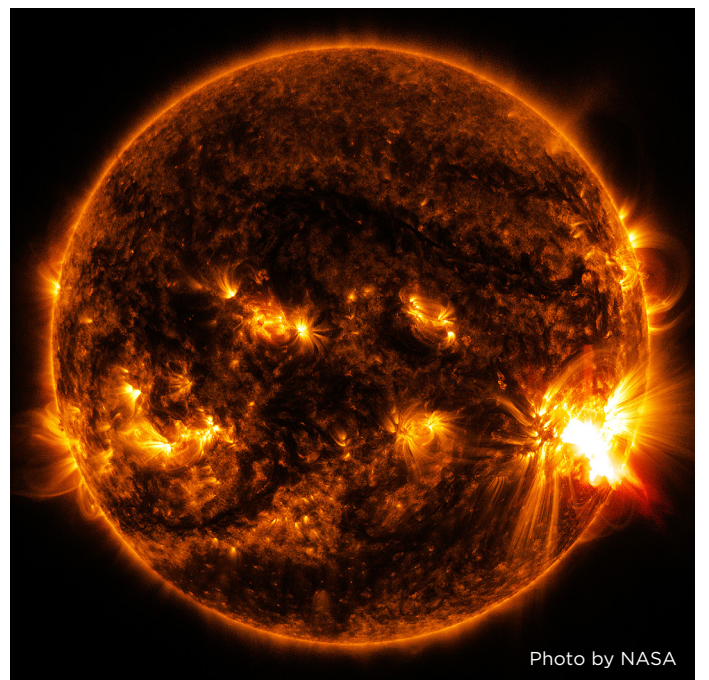


Photo by NASA

Holiday festivities at PPPL: holiday party

PPPLers kicked off the holiday season by donning their holiday apparel and bringing their appetites to the annual PPPL holiday party on Dec. 23. The festivities began with a luncheon buffet for the staff with desserts provided by staff members. 🍷



Brian Tomasko shows off his holiday hat.



The Christmas tree in the PPPL lobby.



Getting ready for their holiday feast are from left to right: Kyle Palmer, Olivia Merrill, Elliott Baer and Dan Ascione.



Virginia Finley and Ed Jenkins show off their holiday attire.



Dressed in their holiday best, from left to right: Nakia Townsend, Andrea Moten, Marissa Zara, Margaret Kevin-King, and Arlene White.



Raffle winners from left to right: Yuantao Zhang, Robert Hager, Bill Bryan, Nakia Townsend, Arturo Dominguez, Julia Toth, Young Seok Park, Marc Sibilia, Jack Berkery, Kyle Caspary, Robert Miller, Robert Herskowitz, Jose Lopez, Gerrit Kramer, Mark Karlik and Kathleen Lukazik.

Holiday festivities at PPPL: holiday skit

Following the holiday luncheon, a group of PPPL thespians who are part of the “Not Ready for Tritium Players,” delivered their satirical take on the year at the Laboratory in the “World Famous Skit: PPPL Mission Impossible” in the auditorium. 🎭



Sharing a laugh and a song during the skit are from left to right: Arturo Dominguez, Erik Gilson, and Al von Halle.



Ray Camp as Stewart Prager and Gretchen Zimmer as Kristen Fischer. The drummer behind them is Max Zwicker, Andrew Zwicker’s son.



Performing in the skit as engineers working on the center stack, played by Arturo Dominguez, were Erik Gilson and Andy Carpe.



Erik Gilson as A.J. Stewart Smith in the performance.



Dana Eckstein played Paulette Gangemi, and Bill Slavin was John DeLooper in the skit.

New policy on site access during leaves of absence

HR implemented a new process to help ensure site protection and continuity of operations during an employee's leave.

If an employee is on a full, continuous leave of absence expected to last three weeks or more, the employee's site and system access (e-mail and token) may be deactivated for the duration of the leave. The employee's supervisor will be notified via e-mail should the deactivation occur. When the employee returns from leave, his/her access will be reactivated within a business day.

Please direct any questions or concerns about the process to Paulette Gangemi in HR.

PPPL Retirement: Carl Scimeca



PPPL bids a fond farewell to **Carl Scimeca**, a technical associate in Information Technology, who was a PPPL employee for 37 years.

Ronald E. Hatcher Science on Saturday LECTURE SERIES

Jan. 16

The Wild and Wacky World of Epigenetics
Shirley Tilghman, Princeton University

Jan. 23

Using Physics and Chemistry to Understand the Genome
Mary Jo Ondrechen, Northeastern University

Jan. 30

Dealing with Iran's Nuclear Program
Frank von Hippel, Princeton University

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, U.S. Department of Energy, Office of Science

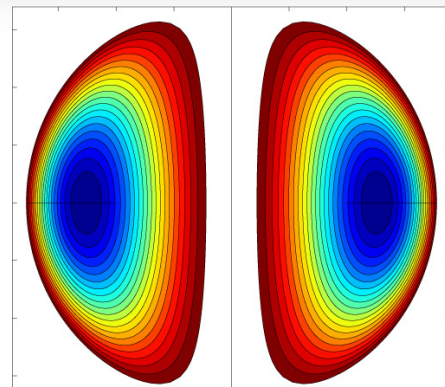
Mar. 12

Taking the Universe's Baby Picture
David Spergel, Princeton University

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

COLLOQUIUM

Frontiers in Plasma Science: A High Energy Density Perspective



Dr. Bruce A. Remington
Lawrence Livermore National Laboratory

Wednesday, Jan. 13
4:15 p.m., M.B.G Auditorium, Lyman Spitzer Building

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 January 11	Tuesday January 12	Wednesday January 13	Thursday January 14	Friday January 15
COMMAND PERFORMANCE Chef's Feature	Chicken Parmesan Served with a Side of Pasta & Garlic Bread	Assorted Quiche served with Caesar Salad	Carved Grilled Eye of Round Steak with Chimichurri Sauce, Roasted Potatoes & Collard Greens	Meat & Cheese Lasagna served with Garlic Bread	Baked Tilapia with Tomatoes & Parmesan served over Couscous with Sautéed Spinach
Early Riser	Italian Omelet with Mushrooms, Onions, Mozzarella, Marinara & Hash Browns	Scrambled Eggs with Cheddar Ham Biscuits	Breakfast Tortilla with Ham, Green Onions & Cheddar Cheese Sauce	Corned Beef Hash with 2 Eggs any style	Banana Chocolate Chip Pancakes
Country Kettle	Pasta e Fagioli	Turkey Corn Chowder	Creamy Potato with Cabbage & Cheddar	White Turkey Chili	Black Bean Cilantro
Grille Special	BURGERLICIOUS -The Simple Man Grilled Beef Burger with American Cheese, served with Sweet Potato Fries (Available All Week)	Hot Pastrami & Cheddar Cheese on French Bread	Fish & Chips Wrap with Tartar Sauce, Malt Vinegar and a Side of Slaw	Chicken Breast on a Pretzel Roll with Caramelized Onions & Mushrooms with Pepper Jack Cheese	Potato Pancakes served with Sour Cream & Apple Sauce
Deli Special	Veggie Wrap: Hummus, Avocado, Roasted Peppers, Feta Cheese & Basil Served with Glazed Pears	Roast Beef & Swiss Club Sandwich with Bacon on Choice of Bread	Southwest Pulled Pork on a Brioche Bun served with Pickled Slaw	Fish Cake Po' Boy	Smoked Turkey & Swiss Cheese on French Bread with Lettuce & Tomato
Panini	Open-Faced Pepperoni Pizza with Mushrooms, Olives, Peppers & Pimento	Creamed Tuna served over Rice	Turkey & Stuffing Wrap served with Gravy & Cranberry Sauce and a side of Fries	Veggie Burger with Guacamole, Tomato, Cilantro, Red Onion & Salsa on a Kaiser Roll served with Corn Chips	Cheddar French Dip on Ciabatta served with Fries

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**

The PPPL WEEKLY is published by the [PPPL Office of Communications](#) on Mondays throughout the year 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/>.