PPPL PRINCETON PLASMA PHYSICS LABORATORY
A Collaborative National Center for Fusion & Plasma Research
U.S. DEPARTMENT OF ENERGY
WEEKLY
September 15, 2014

At PPPL THIS WEEK

WEDNESDAY, SEPT. 17

NJ Chamber of Commerce Meeting & Tour of the Lab
10 a.m.

PPPL Colloquium
4:15 p.m. ◆ MBG Auditorium
The Main Results from the C-2 Device
Michel Tuszewski - Tri Alpha Energy

UPCOMING EVENTS

September 24

PPPL Colloquium
4:15 p.m. ◆ MBG Auditorium
Evolution of Coil Design and Manufacturing at PPPL
Jim Chrzanowski - PPPL

October 15

PPPL Group Photo Shoot
11 a.m. ◆ Meet in Lobby at 10:50 a.m.

October 27-31

56th Annual Meeting of the APS Division of Plasma Physics
New Orleans
http://www.aps.org/

Inside - NEW FEATURE

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Ronald Davidson receives FPA Distinguished Career Award

By John Greenwald

Ronald Davidson, director of PPPL from 1991 to 1996 and a leading contributor to fusion and plasma science research, has been honored with a 2014 Distinguished Career Award from Fusion Power Associates (FPA), which promotes the development of fusion energy.

Ronald Davidson

In citing Davidson's achievements, FPA directors noted his "decades of outstanding career contributions as a scientist, educator, manager and advisor in the areas of both magnetic and inertial confinement fusion."

"I am greatly honored to receive the 2014 Distinguished Career Award from Fusion Power Associates," said Davidson, who noted that many of his long-time scientific mentors and heroes in plasma science and fusion research had received this recognition from FPA. (Previous Princeton recipients of the FPA Distinguished Career Award include Lyman Spitzer Jr., Melvin Gottlieb, Harold Furth, Paul Rutherford, Thomas Stix, Dale Meade, and Edward Frieman.)

"I have long admired Fusion Power Associates for the outstanding job it has done in actively promoting the development of fusion energy, both nationally and internationally, for nearly four decades, and I am very grateful for receiving this important recognition," he said.

"Ron Davidson's accomplishments that underlie this award are astounding," said PPPL director Stewart Prager. "They begin first and foremost with his

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PPPL scientists take key step toward solving a major astrophysical mystery

By John Greenwald

Magnetic reconnection can trigger geomagnetic storms that disrupt cell phone service, damage satellites and black out power grids. But how reconnection, in which the magnetic field lines in plasma snap apart and violently reconnect, transforms magnetic energy into explosive particle energy remains a major unsolved problem in plasma astrophysics. Magnetic field lines represent the direction, and indicate the shape of magnetic fields.

Now scientists at PPPL have taken a key step toward a solution, as described in a paper published this week in the journal Nature Communications. In research conducted on the Magnetic Reconnection Experiment (MRX) at PPPL, the scientists not only identified how the mysterious transformation takes place, but measured experimentally the amount of magnetic energy that turns into particle energy. This work was supported by the U.S. Department of Energy's Office of Science as well as the NSF-funded Center for Magnetic Self-Organization.

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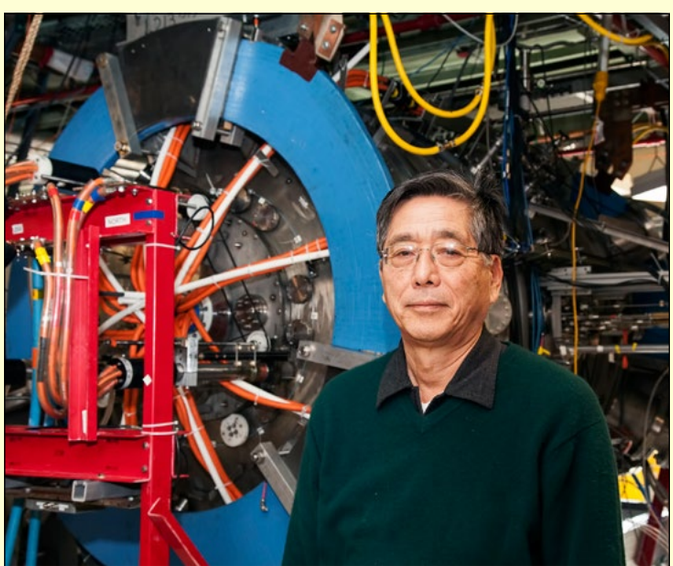

Masaaki Yamada at the MRX.

I am the Lab

This week, the PPPL Weekly begins a new monthly feature, "I am the Lab," which profiles some of the many PPPL'ers who contribute so much to the Laboratory every day. We'll be asking PPPL staff members from various departments to tell us a little about their jobs at PPPL and about themselves.

Our first profile is of Svetlana Drapkin, who just began a brand new position as a cost compliance analyst at PPPL in June. Drapkin was the one who first suggested this column as a way for PPPL'ers to share information about their jobs outside their departments. "We all work so hard and sometimes you want others to understand what you're doing and vice versa," she explained. The title comes from something Drapkin and Maria Huber used to say to each other when they were working together in Accounting. They would remark that their work doesn't just reflect on their department, it also reflects on the whole Lab. "We are the Lab," they would say.

If you have suggestions of other people to profile, please email Jeanne Jackson DeVoe, jjackson@pppl.gov.

Name:

Svetlana Drapkin

What is your position at PPPL?

I am the cost compliance analyst in the Cost Compliance Division.

What department are you in?

Business Operations

Please briefly describe your job.

It is a new job. We are in the process of putting this together. My primary responsibility is the oversight of PPPL's subcontracts. What it entails is I have to make sure that what the subcontractors are billing us for is in the contract and is allowable for the contract, meaning we can pay them with federal money. I obtain their documentation and make sure that what we paid them for is what they performed. It's checks and balances. It's the same sort of steps that would be involved in an audit. The reviews will actually start in October.

How long have you been at PPPL?

This is my third year at PPPL. I started out in the Accounting Department in October of 2011. Earlier this year, I switched over to Cost Compliance, a new division in Business Operations.

What is the most fun or rewarding thing about your job?

The most rewarding part of my job is knowing that I can help PPPL subcontractors comply with the terms of their subcontracts; and that my work can show a real return, measured in real dollars, that can be fed back into programs and projects.

What was your most memorable experience at PPPL?

I really enjoyed the retreat at Princeton University that Business Operation hosted in June of 2013. We are all so busy on a daily basis working in our own divisions, that it was nice to spend a day with the entire staff of Business Operations. We had an opportunity to discuss our roles and responsibilities and see how our work fits into Business Operations as a whole.

Where do you live?

I live in Bucks County Pa., more specifically in Langhorne, Pa.

Where did you grow up?

I grew up in Northeast Philadelphia.

What would you like to tell us about your family? (Spouse, kids, pets?)

My husband, Michael and I have been married for 16 plus years, and are the proud parents of two boys, Greg, 13 and Matt, 11. This year they are both in middle school and are avid basketball players.

What do you like to do when you're not at work? (What are your hobbies, passions, community service projects etc.?)

When not at work, I enjoy spending time with my family and attending the boys' basketball games. A lot of my time is spent on my children's school-related activities, whether it is volunteering in the school or helping out with the various fundraisers. I am also pursuing my MBA at LaSalle University with a specialization in accounting.

What do you tell your friends about PPPL?

First, I always point out how exciting it is to be a part of an institution that is involved in such groundbreaking research as fusion energy. But most important is the quality of people I come in contact with every day. PPPL has some of the nicest people I have ever met. It is truly a pleasure to come to work every day! I get to interact and work with people who have enormous expertise in many different areas, and I have an opportunity to learn from all of them.

What is one thing you'd like PPPL'ers to know about you or your job?

I tend to think of myself as someone who is constantly learning, as I embrace new learning opportunities and challenges. As a cost compliance analyst I look forward to working with many individuals from around the Lab to ensure that the Laboratory's subcontractors maintain the highest standards in the areas of accounting and contract execution.

Davidson

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prodigious output of seminal contributions to theoretical plasma physics and include his long mentorship of students, authorship of textbooks, leadership of major community activities, and directorships of major institutions. An amazing record of achievement."

Varied scientific and managerial roles

Davidson's scientific and managerial roles have been remarkably varied. He was first director of the Plasma Fusion Center at MIT (now the Plasma Science and Fusion Center), where he served from 1978 to 1988, and he has authored more than 500 journal articles and four graduate-level books. He is editor-in-chief of Physics of Plasmas, the leading international journal in its field, and has chaired or co-chaired numerous national reviews of scientific topics ranging from accelerator physics and plasma science to high energy density physics and inertial fusion energy. His previous awards include the James Clerk Maxwell Prize in Plasma Physics awarded by the American Physical Society in 2008, the highest national honor in plasma physics.

These varied roles all stem from his core scientific interest. "I've never thought of myself as anyone but a plasma physicist," Davidson said. "I try not to put people or research areas in boxes." He views magnetic fusion and inertial fusion as "different scientific and technological approaches to the common goal of developing fusion energy as an environmentally attractive energy source for mankind.

"The enormously attractive feature of plasma science," he said, "is that many of the underlying principles are strongly interconnected by Maxwell's equations, non-equilibrium statistical mechanics, and Newton's laws of motion — the three pillars of my scientific passion!"

Davidson grew up on a family dairy farm near Norwich, Ontario, where he learned disciplined work habits and the value of completing seasonal tasks promptly — lessons he would later apply to meeting the annual demands of a laboratory budget cycle and proposal writing. He was driving a tractor on the family farm by age 11 and attended elementary school in a one-room, eight-grade schoolhouse located on a corner of the farm. "I am really grateful for having such terrific elementary school teachers while growing up in rural Ontario," Davidson said.

Finding interest in plasma physics

He came upon his major scientific interest by happenstance. While studying physics at McMaster University in Hamilton, Ontario, he chanced upon a monograph by physicist Hannes Alfvén on magnetohydrodynamics, a major topic in plasma science, while browsing in the campus bookstore. The subject fascinated Davidson, "and drew my attention to plasma physics and the role of plasma in fusion energy," he recalled.

Physicist David Pines at the University of Illinois heavily recruited Davidson to attend graduate school there and he was ready to sign up. But his fiancée, Jean, whom he had met in high school, lobbied for Princeton instead. She was a fan of author John O'Hara, who lived in Princeton and set many of his stories in the eastern Pennsylvania-Greater New York region. "I ended up thinking more deeply about this important career decision and decided to come to Princeton, which I have never regretted," Davidson said.

He went on to earn a doctorate in just three years from the then-new Princeton Program in Plasma Physics, which was directed by Thomas Stix, and held a succession of positions after graduating in 1966. These included a postdoctoral research post at the University of California-Berkeley, and faculty teaching positions at the University of Maryland, where he arrived in 1968 and was a professor of physics from 1973 to 1978. While at Maryland he spent a year at Los Alamos National Laboratory as a visiting senior scientist and served as assistant director for applied plasma physics at DOE from 1976 to 1978.

Led MIT's Plasma Fusion Center

MIT tapped Davidson to run its Plasma Fusion Center at a time when Alcator C — the forerunner of today's Alcator C-Mod tokamak — had just been completed, and Alcator C-Mod itself was entering the planning stage. The center needed room to grow and spied it in a huge warehouse that cookie-maker Nabisco Brands owned on Albany Street near the edge of the MIT campus.

Jerome Wiesner, the then-president of MIT and former top science advisor to President John F. Kennedy, "had a big dinner and invited the Nabisco brass," Davidson recalled. "Within a few months Nabisco announced its plan to gift the warehouse to MIT," which turned the sprawling two-acre building — now known as the "Nabisco Laboratory" — into the home of Alcator C-Mod and several other experimental research facilities.

Director of PPPL

Davidson was recruited by Princeton University to become director of PPPL in 1991, and led the Laboratory's preparations for the first use of high-powered deuterium-tritium (D-T) fuel in the Tokamak Fusion Test Reactor (TFTR), PPPL's major fusion facility at the time. He headed the Laboratory throughout the exciting D-T years as TFTR set several acclaimed records for heating and fusion power and garnered worldwide headlines. "My most exciting time as director was certainly the D-T experiments on TFTR," he said. "It was great to be part of those historic scientific achievements by such an exceptional research team and dedicated PPPL workforce."

While overseeing the experiments he also served as associate chair for plasma physics in the Princeton Department of Astrophysical Sciences, and as a professor of astrophysical sciences — two positions that he held until he became a Princeton professor emeritus in 2011.

"Enormous" progress in plasma physics

Looking back over a nearly 50-year career in plasma science, Davidson noted that "scientific progress in fusion research has been enormous. What the field has accomplished with increasingly sophisticated diagnostic tools, major experimental facilities, and advanced numerical simulations is really quite stunning." Although developing fusion as an energy source has proven more challenging than the fusion pioneers foresaw, he said, "the worldwide progress has been outstanding scientifically."

Davidson's own scientific interests have never slackened. He remains a senior research scholar and professor emeritus in the Department of Astrophysical Sciences and currently heads a project at PPPL supported by the DOE Office of High Energy Physics to explore the scientific basis for the next generation of particle accelerators. "When you talk about physicists working," he said of his research, "you should keep in mind that they are engaged in activities that they enjoy very much."

Solving a mystery

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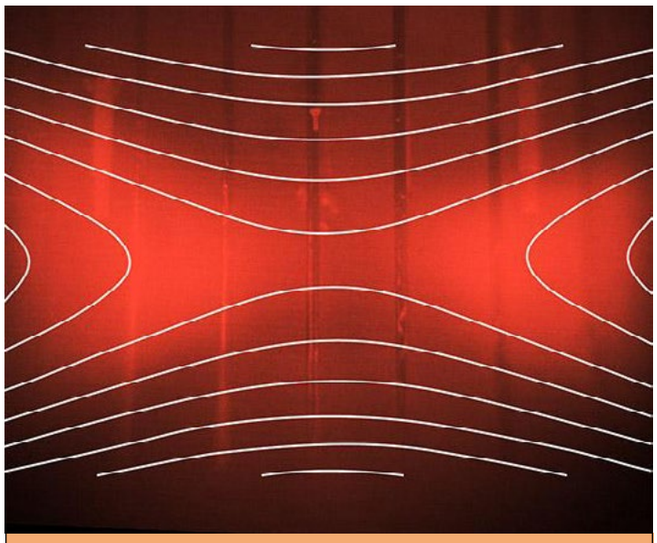
The investigation showed that reconnection converts about 50 percent of the magnetic energy, with one-third of the conversion heating the electrons and two-thirds accelerating the ions — or atomic nuclei — in the plasma. In large bodies like the sun, such converted energy can equal the power of millions of tons of TNT.

"This is a major milestone for our research," said Masaaki Yamada, the principal investigator for the MRX and first author of the Nature Communications paper. "We can now see the entire picture of how much of the energy goes to the electrons and how much to the ions in a prototypical reconnection layer."

The findings also suggested the process by which the energy conversion occurs. Reconnection first propels and energizes the electrons, according to the researchers, and this creates an electrically charged field that "becomes the primary energy source for the ions," said Jongsoo Yoo, a postdoctoral fellow at PPPL and coauthor of the paper. Also contributing to the paper were physicists Hantao Ji and Russell Kulsrud, and doctoral candidates Jonathan Jara-Almonte and Clayton Myers.

If confirmed by data from space explorations, the PPPL results could help resolve decades-long questions and create practical benefits. These could include a better understanding of geomagnetic storms that could lead to advanced warning of the disturbances and an improved ability to cope with them. Researchers could shut down sensitive instruments on communications satellites, for example, to protect the instruments from harm.



A fast-camera image of plasma during magnetic reconnection with rendering of the magnetic field lines, shown in white, based on measurements made during the experiment. The converging horizontal lines represent the field lines prior to reconnection. The outgoing vertical lines represent the field lines after reconnection.

Photo credit: Jongsoo Yoo

The PPPL team will eagerly watch a four-satellite mission that NASA plans to launch next year to study reconnection in the magnetosphere — the magnetic field that surrounds the Earth. The team plans to collaborate with the venture, called the Magnetospheric Multiscale (MMS) Mission, by providing MRX data to it. The MMS probes could help to confirm the Laboratory's findings.

Please visit the Princeton University Health Services website for information for travelers on the following topics:

Travelers Medical Kit

Jet Lag Reduction

Food and Water Precautions

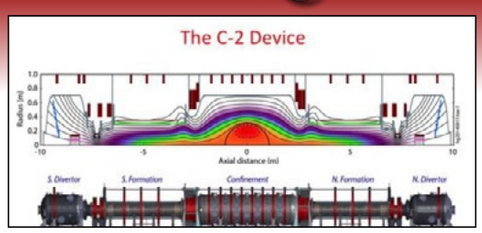
Illnesses Due To Travel

Aquatic Hazards

Insect And Animal Protection

After Your Trip

COLLOQUIUM



The Main Results from the C-2 Device

MICHEL TUSZEWSKI
Tri Alpha Energy

Wednesday, September 17

4:15 p.m. (Coffee/Tea at 4 p.m.)
M.B.G Auditorium, Lyman Spitzer Building

COLLOQUIUM

Evolution of Coil Design and Manufacturing at PPPL

JAMES CHRZANOWSKI
Princeton University

Wednesday, September 24

4:15 p.m. (Coffee/Tea at 4 p.m.)
M.B.G Auditorium, Lyman Spitzer Building

DOE requires green purchasing at PPPL

Did you know that the Department of Energy requires PPPL employees buy sustainable products designated as environmentally preferred products (EPP) whenever possible? Look for sustainable products whenever you make purchases. Green purchasing helps PPPL decrease energy, reduce water and waste and supports our Environmental Management System. Just follow these simple steps:

First, find out if your item requires sustainable attributes by going to the Sustainable Facility Tool (SFTool.gov).

Then, look for environmentally preferred products on GSA Advantage, (gsaadvantage.com) with the following sustainable requirements:

- Recycled Content
- USDA Biobased
- EPEAT (Electronics)
- EnergyStar
- Water Sense Product
- FEMP (Facilities)
- Non Ozone Depleting Substances
- Non Toxic/Less Toxic Alternative

Contact Environmental Services at ext. 2599 or Lmeyer@pppl.gov for help and further information or visit PPPL's EPP webpage.

SPD•TIP•OF•THE•WEEK•

Building Evacuation Procedures

Evacuation drills are conducted on a semi-annual basis. Notice may or may not be given in advance of a drill; however, all building occupants are required to cooperate for their own safety.

EVACUATION PREPARATION
Determine in advance:

- The nearest exit from your work location
- The route you will follow to reach that exit in an emergency
- An alternate route in the event your route is blocked or unsafe
- Know the outside evacuation assembly area for accountability

EVACUATING
When notified to evacuate, do so in a calm and orderly fashion using the nearest exit from your location:

- Turn off computers or any electrical device
- Turn cell phones on silent
- Walk, don't run
- Keep conversation level down and listen for evacuation announcements
- Take your valuables, important personal items, and outer garments
- Close but do not lock all doors behind you
- Use the stairs, not the elevators; stay to the right, use the handrails
- Help others in need of assistance
- Follow instructions from emergency personnel
- Move to your designated evacuation assembly area unless instructed otherwise (example: inclement weather may require evacuation to an alternate location – follow emergency personnel instructions)

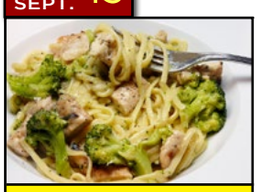
ASSEMBLY AREA
Once you have exited the building:

- Move quickly away from the building
- Find and stay with your Building Evacuation Monitor (BEM)
- Provide your name to the BEM for accountability
- Notify BEM of any guests/visitors in the building
- Keep roadways and walkways clear for emergency vehicles
- Do not reenter the building until notified by emergency personnel
- ESU will conduct all rescue and medical duties

BROCK Café at PPPL Menu

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.

*— **MARK GAZO**, Chef Manager*

	MON. 15 SEPT.	TUE. 16 SEPT.	WED. 17 SEPT.	THU. 18 SEPT.	FRI. 19 SEPT.
					
COMMAND PERFORMANCE CHEF'S FEATURE	Linguine with Broccoli & Chicken or Meatballs	Vegetable Fajita served with Beans & Rice	Beef Moussaka served with a Greek Salad	Sweet & Sour Pork served over Rice	Honey Mustard Glazed Salmon served with Fried Rice
EARLY RISER	Grilled Cheese with Ham, Fried Egg & Cheese	Spanish Omelet	Egg White Omelet with Broccoli, Spinach & Potatoes	Pumpkin Cranberry Pancakes	Triple Cheese Omelet served with Choice of Meat & Potatoes
COUNTRY KETTLE	Summer Squash & Corn Chowder	Broccoli & Cheddar	Thai Chicken Noodle	Loaded Potato Soup	Beef Barley
GRILLE SPECIAL	Jersey Burger with Bacon, Onion, Mushrooms & Swiss Cheese	Kielbasa & Sauerkraut Torpedo	Chicken Finger Parmesan Hoagie	Oven Fried Chicken BLT Melt with Smoked Bacon	Classic Tofu Reuben on Rye
DELI SPECIAL	Veggie Burger with Cottage Cheese & Fruit Salad	Roast Beef Melt with Peppers, Cheddar & Guacamole	Capicola & Salami Hoagie	Tuna Avocado Club	Apple Cranbery Chicken Salad on a Kaiser Roll
PANINI	Grilled Chicken Breast with Ham, Swiss, Tomato & Honey Mustard	Tuna Salad with Artichokes & Garbanzo Spread	Turkey on French Bread with Jalapeno Cheddar Cheese	Fried Zucchini Parmesan Torpedo	Roast Beef & Swiss with Tomato & Horseradish on a Kaiser Roll

MENU SUBJECT TO CHANGE WITHOUT NOTICE

VEGETARIAN OPTION

CLICK HERE FOR A PRINTABLE WEEKLY MENU

WEEKLY

Editor: **Jeanne Jackson DeVoe** ◆ Layout and graphic design: **Gregory J. Czechowicz**
Photography: **Elle Starkman** ◆ Webmaster: **Chris Cane**

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