PPPL U.S. DEPARTMENT OF ENERGY

PRINCETON PLASMA PHYSICS LABORATORY WEEKLY

MONDAY, APRIL 9, 2012

At PPPL THIS WEEK

MONDAY, APRIL 9

The Andlinger Center
5:30 p.m. ◆ Main Campus
Friend Center 101

Congressman Rush Holt Will Speak on Energy, Science Education, and Policy

Rep. Rush Holt (D-NJ12)
(U.S. House of Representatives)

WEDNESDAY, APRIL 11

GFDL Events and Seminars
Noon - 1:15 p.m. ◆ GFDL
Smagorinsky Seminar Room

Changing Currents and Changing Climate

Michael Winton (GFDL)
www.gfdl.noaa.gov/events
(Gov't, Univ. or 2 other forms of I.D. needed)

PPPL Colloquium
4:15 p.m. ◆ M.B. Gottlieb Auditorium

Science and Technology at DHS: Resiliency of Our Physical and Social Infrastructure

Mitchell Erickson (Dept. of Homeland Security)

CLICK HERE FOR ABSTRACT

THURSDAY, APRIL 12

The Andlinger Center
4:30 p.m. - 5:30 p.m. ◆ Main Campus
EQuad Room B205

Germany's Historic Exit from Nuclear Energy

Rolf Katzenbach
(Technical University of Darmstadt)

FRIDAY, APRIL 13

DIII-D Science Meeting
1 p.m. ◆ B-233

Grad Student Schmit Lands Prestigious Truman Fellowship

By Patti Wieser

Paul Schmit

Paul Schmit, a graduate student in Princeton University's program in plasma physics, has been selected as a 2012 Harry S. Truman Fellow by Sandia National Laboratories. Schmit, one of two selected out of a pool of 35, will begin the three-year appointment at Sandia's Albuquerque, N.M., location late this fall after completing his Ph.D. thesis. He is the only plasma physicist to be chosen in the history of the award.

Sandia established the President Harry S. Truman Fellowship in National Security Science and Engineering in 2004 to attract the best nationally recognized new Ph.D. scientists and engineers. The fellowship is named for President Truman who charged Sandia in 1949 with providing "an exceptional service in the national interest."

"The Truman Fellowship is a singular honor that recognizes both the terrific contributions that Paul Schmit has made so far, as well as his brilliant scientific potential," said Princeton University Professor Nathaniel Fisch, who is the Director of

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Oh, Pioneers!

Greene Cluster Adds Computing Power

By Patti Wieser

John Dawson, Robert Ellis, Martin Kruskal, Tom Stix, and now John Greene.

These were some of the giants — pioneers in the burgeoning field of plasma physics. The mathematical, computational, and physics whizzes.

Now, Dawson, Ellis, Kruskal, Stix, and Greene — computer clusters named after the distinguished scientists — burble behind sliding doors in a climate-controlled room, crunching calculations at a furious rate in PPPL's Computer Center.

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At right, Paul Henderson with the Greene Cluster.

Schmit Lands Fellowship

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the University's Program in Plasma Physics. "Paul is the kind of graduate student who makes mentoring fun. I will sorely miss our wonderful interactions at Princeton, but I am comforted by the thought that he will for many years be contributing — from wherever he may be — at the forefront of the field of plasma physics. I certainly expect great things from him." Fisch is also the Associate Chair of Astrophysical Sciences at the University and the Associate Director for Academic Affairs at PPPL.

Schmit, who researches wave-particle interactions in non-stationary plasma, is elated by the fellowship news. "There are few post-doctoral opportunities as amazing as this one for a plasma physicist fresh out of grad school, and I'm beyond excited to jump into the fray at Sandia and do very meaningful and cutting-edge work of interest both to the fusion program and to the broader national security mission," he said.

In his thesis, the honoree studies how the behavior of waves in plasma changes when the plasma itself is changing with time. "In the course of our investigations, we've uncovered ways that waves can make plasmas more compressible, ways to accelerate particles through wave compression, and ways to amplify waves and then use them to produce sudden bursts of heat, electric current, magnetic energy, and voltage in a switch-like manner," Schmit explained.

This research and the tools he developed are applicable to inertial confinement fusion (ICF) research. At Sandia, Schmit will be the principal investigator of his own proposed research project in the Inertial Confinement Fusion Target Design Group under the scientific tutelage of Charles Nakhleh. Schmit, who also is the recipient of Princeton's Charlotte Elizabeth Procter Honorific Fellowship for his final year of graduate school, has worked on a range of projects at PPPL, including developing a novel concept to increase the efficiency of plasma thrusters. His latest work will be useful in studying how waves might be utilized to push fusion plasma potential even further in inertial experiments at Sandia.

Schmit lauded his PPPL mentors — Nathaniel Fisch, Greg Hammett and Ilya Dodin — giving particular praise to Fisch, his thesis advisor and primary mentor. "There is no way I could have made it this far without the critical role played by my thesis advisor. Professor Fisch has been an exceptional and singularly scholarly influence for me these last five years," he said. "I fully believe that having had the opportunity to work and learn from him is one of the primary factors that has enabled me to have the chance to enjoy these successes. His ability to bring the best out of his students and isolate compelling and cutting-edge problems that become the seeds for great Ph.D. theses make him a real standout academic powerhouse at Princeton."

Schmit received a bachelor's degree in physics from Arizona State University in 2007, and became interested in plasma physics as a National Undergraduate Fellow (NUF), a summer internship program administered by PPPL. "NUF allowed me to dive right into the nitty gritty of plasma physics and work on meaningful problems right away," he said. Schmit spent the first NUF week at PPPL for orientation and then eight weeks at MIT to conduct research on the C-MOD experiment.

The graduate student takes occasional breaks from waves research to spend time with his wife, Erica, and the newlyweds look forward to being located closer to their families in Arizona. "We are both originally from Phoenix and are desert-dwellers through and through," Schmit said. A daredevil, he also has a passion for severe weather and skydiving. He continues to chase tornados and storms — and entertained a career in severe weather research — but has retired as a skydiver after 45 dives with one exception: a jump into the challenging and exciting field of ICF research.

"It's got to be the same kind of deal," he quipped.

Paul Schmit (left) with his thesis advisor Nathaniel Fisch.

Computing Power

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"Each cluster is named after a famous Princeton scientist," said Paul Henderson, Head of the Systems and Networking Division for PPPL's IT Department. All have a connection to PPPL and plasma physics.

The Greene

The latest is the Greene, a new cluster recently deployed, boasting 576 CPUs and 1.5 terabytes of memory. CPU is short for central processing unit, and is the "brains" of the computer — the place where calculations occur. A terabyte is 1 trillion bytes. In comparison, a computer in use just a few years ago would typically have had only 512 million bytes of memory.

"The Greene was added specifically to do theoretical simulations," Henderson said. The new cluster has been up and running for a few months. "It is used primarily by theorists, along with graduate students and post-docs." Theoretical scientists perform simulations on the cluster, using 256 to 326 processors in parallel, typically running jobs for 64 to 300 continuous hours.

"The scientists can develop their computer codes to scale up to larger supercomputing sites like NERSC at Lawrence Berkeley National Laboratory, getting quicker scientific results," Henderson said, noting that having a local resource leads to faster results, too.

The Greene was funded through a DOE Office of Science grant for $205,000 in FY11. Situated in the upgraded cluster rack at the Computer Center, it is the highest performing system the Lab has ever deployed, according to Henderson. It has the most CPUs and the most memory per square feet of floor space, residing in a 4-square-foot space (2x2).

Henderson's team installed the system in February. "We spent two weeks to get it up and running, and another two to configure it and iron out the bugs," he said. "Putting the stuff together is a lot of fun." The team included Henderson, Irena Johnson, Cassandra Pugh, Ken Tindall, and Kevin Ying.

Henderson noted a jump in the use of clusters over the past few years. "Researchers can run larger jobs more reliably — scaling code into bigger sizes — so there has been an 82 percent increase in use," he said. The increase has been seen across the board of research areas — Theory, Engineering, NSTX, ITER, DIII-D simulations, JET, and TRANSP. DIII-D is a tokamak at General Atomics in California, JET is the Joint European Torus in England, and TRANSP is a special analysis code for tokamak experiments.

Post-doctoral researchers are responsible for the largest leap in use. Of the 800 users, the bulk is internal, with collaborators next, and then graduate students.

"Post-docs are really into computing. They submit a few hundred jobs — looking at subtle differences in calculations to see which has better results. They have a different mindset and use the clusters as a tool to see what's better," Henderson said, adding that most of the increase is from internal PPPL users. "This is a big change — everyone wants to get results quickly."

He said the clusters lead to increased productivity and efficiency for the scientists, and naming them after recognized scientists with a PPPL connection is a nice legacy. John M. Greene, a distinguished research physicist and applied mathematician, spent 27 years as one of the leading theoretical physicists at PPPL.

"It's an important facility for the fusion community," Henderson said.

The Laboratory has earned the following safety awards from the State of New Jersey for performance in calendar year 2011:

PPPL – *Recognition Award for having a low incidence of away-from-work lost time injury/illness cases.*

PS&T Department – *Commissioner's Continued Excellence Award for working six (6) consecutive years (257,826 hours) without an away from work lost time injury/illness case.*

These awards will be presented at an upcoming Governor's Occupational Safety and Health Awards Program Area dinner.

COLLOQUIUM

Science and Technology at DHS: Resiliency of Our Physical and Social Infrastructure

MITCHELL ERICKSON
Department of Homeland Security

Wednesday, April 11

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

University Medical Center of Princeton at Plainsboro

OPEN HOUSE Saturday, May 12 • Noon to 6 p.m.

1 Plainsboro Road, Plainsboro

Volunteers Needed for PPPL Exhibit

Volunteers are needed to staff the PPPL exhibit at Communiversity on Saturday, April 28, from noon to 5 p.m. Communiversity is an annual town-gown community arts festival sponsored by Princeton University students and the Arts Council of Princeton. If you can volunteer for an hour or two at our table, please contact Patti Wieser at pwieser@pppl.gov.

Brock PPPL Café Menu

BREAKFAST ..... 7 a.m. – 10 a.m.
CONTINENTAL BREAKFAST..... 10 a.m. – 11:30 a.m.
LUNCH ..... 11:30 p.m. – 1:30 p.m.
SNACK SERVICE ..... until 2:30 p.m.

	MONDAY, APRIL 9	TUESDAY, APRIL 10	WEDNESDAY, APRIL 11	THURSDAY, APRIL 12	FRIDAY, APRIL 13
COMMAND PERFORMANCE CHEF'S FEATURE	 Darcie's Chicken over Rice and Vegetable	 Carved Cajun Turkey with Mashed Potatoes	 *Create Your Own...* Over Stuffed Baked Potato	 Chicken & Cheese Enchilada w/Rice & Beans	 Lemon Garlic Tilapia with Roasted Potatoes
EARLY RISER	Crispy Crunch French Toast	Sausage Pancakes	Pork Roll, Egg & Cheese on a Fresh Baked Croissant	The XL Western Omelet with Home Fried Potatoes	Egg Whites, Turkey Sausage, Pepper Jack Wrap
COUNTRY KETTLE	Home Style Chicken and Rice	Cream of Celery	Vegetarian Vegetable	New England Clam Chowder	Navy Bean
GRILLE SPECIAL	Cheddar BBQ "O" Burger with Fries	Crispy Chicken and Cheese Grilled Wrap with Fries	Triple Sliders with Fries	The XXL Turkey Burger Wrap with Onion Rings	BBQ Pulled Chicken Quesadilla
DELI SPECIAL	Crispy Chicken BLT	Roast Beef, Cheddar, Red Onion, Tomato, Mayo	Classic Italian Hoagie	Honey BBQ Grilled Chicken, Cheddar, Bacon	Turkey, Swiss, Bacon and Cranberry Mayo
PANINI	Tuna, Cheddar, Bacon and Tomato Melt	Sicilian Eggplant Parmesan	3 Cheese Tomato and Bacon Griller	Asian Style Grilled Vegetable Wrap	Swiss Ham and Cheese Griller

MENU SUBJECT TO CHANGE WITHOUT NOTICE

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WEEKLY

Editor: **Patti Wieser** ◆ Copy Editor /Graphic Design: **Gregory Czechowicz**
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Send to: pwieser@pppl.gov ◆ Comments: commteam@pppl.gov ◆ **PPPL WEEKLY** is archived on the web at: http://www.pppl.gov/ppplweekly.cfm