PPPL PRINCETON PLASMA PHYSICS LABORATORY
A Collaborative National Center for Fusion & Plasma Research
U.S. DEPARTMENT OF ENERGY
WEEKLY
AUGUST 12, 2013

At PPPL THIS WEEK

WEDNESDAY, AUGUST 14

Summer Intern Poster Session
10 a.m. ◆ LSB Lobby

On behalf of the Science Education Department, you are invited to attend the annual Student Poster Session taking place Wednesday, August 14, 2013, from 10 a.m. to 2 p.m. in the LSB Lobby.

Students will be on-hand to present their hard work during the summer. Please stop by! We look forward to seeing you!

UPCOMING EVENTS

At Plasma Camp, teachers experience research front and center

By Constance Kaita

For one week every summer, a small group of teachers gathers at PPPL to relive student days. At this year's Plasma Camp, a professional development program for science educators, 10 high school physics teachers lived together in a college dormitory, got lost together as they navigated the circuitous laboratory building, and learned as they created new plasma-based curricula.

These teachers spent the week of July 15 to 19 performing plasma-based experiments, learning about plasma and fusion, and touring the physics laboratories at the PPPL and Princeton University campuses. They also connected with other physics teachers from across the country, both during the day in the Lab and each evening after leaving when, as a group, they had the chance to explore downtown Princeton.

Wendy Dlakic, a physics and earth science teacher from Livingston, Mont., examines a plasma with Nick Guilbert, Master Teacher and Collaborator from The Peddie School at this year's Plasma Camp for physics teachers at PPPL from July 15 to 19.

Looking for the best candidates

The 10 were chosen from a pool of 27 applicants as the best candidates for the program. "We look for people who have innovation in their curricula," Science Education program administrator Aliya Merali said. "These are people that we believe will really put plasma in their classroom and disseminate the information to their students and their coworkers."

Plasma Camp aims to attract teachers from across the U.S. and from school districts of varying socioeconomic backgrounds. In order to make it available to everyone, all airfare, lodging, and meals are paid for by PPPL so the entire program costs the participants and their schools virtually nothing. This year, the participants ranged from as near as Summit, N.J. to as distant as Livingston, Mont.

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From the Netherlands to PPPL

Student reflects on his study of light

By John Greenwald

Dutch graduate student Jasper van Rens recently completed a three-month assignment at PPPL to study a diagnostic technique that will be crucial to the success of ITER, the huge international fusion facility under construction in France.

Working with Fred Levinton and Howard Yuh of PPPL subcontractor Nova Photonics, Van Rens investigated the impact of reflected light on the ITER Motional Stark Effect (MSE) instrument, which measures the internal magnetic configuration of fusion plasmas.

Jasper van Rens

Van Rens, who has completed the first year of a two-year master's degree program at the Eindhoven University of Technology, discussed his findings and experiences at the Laboratory with PPPL science writer John Greenwald.

What brought you to PPPL?

I'm an applied physics major and everybody has to do an external internship abroad or with a company, and I just wanted to go to America. I asked my professor [Maarten de Bock], "Do you have any connections in America?" He's one of the people responsible for the MSE system in ITER and he came up

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Plasma Camp

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Each came in search of professional development to enhance his or her science courses and left with a unique experience to bring to students.

Physics teachers from across the country

Wendy Dlakic from Livingston, Mont. traveled the farthest of this year's Plasma Camp participants. She is in her fourth year of teaching and currently teaches physics and earth science at Park High School.

"I have a goal where every year I try to find professional development that is in a field where I'm teaching," Dlakic said. She started teaching physics only recently, and she said, "A program like Plasma Camp is ideal in helping me develop unfamiliar curriculum."

For Dlakic, the material was a perfect fit because of her teaching responsibilities in two separate fields of science. "It's a nice correlation for both physics and earth science because of the [applications to] energy," she said. "I'm excited that I can get something for both classes."

Like Dlakic, Jonathan Everett from Millerstown, Pa. was looking for material from plasma camp to apply to the two science classes that he teaches. Everett teaches 8th grade science as well as 11th grade physics at Greenwood Middle High School.

Although he is a seasoned educator and has been teaching for 13 years, Everett also seeks out science professional development every summer with a specific goal for each program. "I want to understand how some of the more advanced equipment works and bring that into the classroom to provide lab experiences for the students," he said.

Experience in a working research lab

One of the highlights for Dlakic was touring PPPL and viewing the research sites. "We were able to see the nuts and bolts of how this research is actually carried out," she said. "It's one thing to talk about the theory but another to see it being carried out. Seeing the control rooms and where projects are spinning off – to me, that's really fascinating."

Everett found the lectures in this unique environment particularly exciting because they broke the isolation to which he was accustomed. "In my home environment, I am the only physics teacher within 60 or 70 square miles," he said, "so I found it really awesome to work with a bunch of other physics teachers."

The highlight of the lectures for Everett was the lesson on fusion and fusion reactors, taught by Andrew Zwicker, head of Science Education and co-creator of Plasma Camp. All participants were eager to become thoroughly well-versed on this particular topic. "This was a very inquisitive group that challenged me with their questions in the best way possible," Zwicker said. "They really wanted to get at the physics, economics, and politics of energy and fusion."

Jonathan Everett, right, a physics teacher from Millerstown, Pa., works with Mark Edwards, a physics teacher from West Branch, Iowa to study the breakdown voltage in plasmas under different pressures.

Curriculum plans

Throughout the week, the participants developed new plasma-based curricula that relied heavily on hands-on experimental work. They played around with plasma equipment, getting accustomed to the lights randomly turning on and off when someone needed to see something in the dark and hearing crackling noises as others studied the breakdown voltage of plasmas under different pressures.

At the end of the week, the participants had a group discussion about how to integrate plasmas into their curriculums. "Talking with 10 other physics teachers – you always learn stuff," Dlakic said. "These are all educators that are driven and ambitious so they're going to have all kinds of great ideas." In the end, each was able to find a specific point in the year to introduce the subject.

Everett approached the task of applying Plasma Camp to his teaching by using plasmas to enhance and solidify concepts in topics already found in the standard science curriculum. He plans to include plasmas in the unit on states of matter in his 8th grade science class. He has already planned a hands-on activity in which his students will be able to experience plasmas firsthand in a safe environment by observing the motion inside a plasma ball. "I think they're going to find it really interesting," he said.

As for his 11th grade physics class, Everett will introduce plasma to his unit on waves at the beginning of the school year by performing an experiment to find the wavelength of spectral emissions. He will later reintroduce plasmas into the section on electricity and magnetism by showing the influence of magnetism on plasmas.

Dlakic plans to focus an entire unit on plasmas in her physics class. She will place the topic after mechanics and before electricity and magnetism because she believes that plasmas will be a fantastic way to introduce students into the following chapters. "Plasmas have great hands-on hook activities to bring in the students," she said. "Then, when we get more in-depth to photoelectric effects, we have all these great experiments to hook back to, especially since it's a really important concept with energy needs."

For Everett, the discussion on curriculum planning tied the experience together. "It was a great end-ofthe-week opportunity to make a difference in the classroom," Everett said.

Perhaps the most exciting thing for all the Plasma Camp participants, though, is that the teachers each leave with a plasma kit containing basic experimental tools used throughout the week, including a plasma globe and a half-coated fluorescent light bulb, and they have the rare opportunity to apply for a $2,000 grant for additional lab equipment.

Teachers and students learning together

Plasma Camp gave these teachers insight into a unique subject that many had no prior experience with. The participants will be bringing back this brand new material to their students this fall. "It's given me a whole new perspective and a lot of knowledge about this field and its possibilities," Dlakic said. "To me, that's pretty exciting."

Dutch Student

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with a project that people have been struggling with for a couple of years.

What was that project?

It's about reflections in a tokamak. The MSE system measures the direction of the polarized light from neutral beams in a tokamak. [The waves in polarized light all point in the same direction.]

But there's a lot of background light too. Because ITER is such a big machine there will be a lot of this background noise and that's bad for the signal-noise ratio. And, on top of that, these reflections could polarize the background light and that would be disastrous for the MSE measurement because it also looks at the polarization of light.

How did you do your research?

I used a software program called LightTools to retrace light rays through a model of the ITER system. I looked at the light from both thermal radiation and Bremsstrahlung [another type of radiation].

What did you discover?

I found out that this thermal light is actually not that bad compared to the Bremsstrahlung noise. We didn't know how big a problem the thermal light would be and it turns out not to be a showstopper. That's one of my results. I also found out that there are no specular [mirror-like] paths by which a big part of the thermal radiation could polarize the light. Specular reflections would be very dangerous because they would polarize the background light and that would be very bad.

How would you describe your experience at PPPL?

I could recommend this place. All the people are very nice and friendly and helpful. I got a great office with a big computer screen and it was a very pleasant office to work in. I got some good results and made a group of friends. Every lunch I come to PPPL [from Nova Photonics] and have lunch with grad students. I also joined their softball team — the Tokabats. We are first in the league and are in the playoffs. [The Tokabats went on to win the University summer league softball championship.]

What's next for you this summer?

Four of my friends from the Netherlands will come over and we'll do a giant journey through America. We'll spend five days in New York and fly to Los Angeles and rent a car and go. We'll be traveling for three-and-a-half weeks.

And then?

Next year I will start research about cold electron beams or cold ion beams, I'm not very clear about which one yet. And after that I will have my master's and could see myself doing a Ph.D.

On-site Effectiveness Review starts Aug. 19

PPPL will be hosting an on-site review Aug. 19 - 23 to determine the effectiveness of corrective actions implemented in response to the March 2012 incident involving the Skid-steer. The review will be conducted by a team of experts from other DOE Laboratories (JLab and Brookhaven), Princeton University, and PPPL. DOE observers also will be on site to witness the review.

"We are very interested in the results," said Adam Cohen, deputy director for operations. "These results will provide key measures to evaluate whether the actions we implemented had the desired impact."

There is much information for the team to examine, said Jim Graham, head of best practices. "Many people at the Lab have put in a lot of effort over the past year and half -- strengthening operator qualifications, developing equipment inspection checklists, working more closely with contractors, improving communications, developing procedures, improving maintenance of equipment, and reinforcing safety practices and culture," Graham said.

The review team includes the following members: Michael Gaffney, senior safety engineer, BNL; Gregory Cantrell, associate director for environmental health and safety, Princeton University; Marcelo Pena, production plant engineer and maintenance manager, JLab; Al Von Halle, head of electrical engineering, PPPL; Jim Graham, head of best practices, PPPL. The DOE observers will be: Karl Moro, assistant manager for safety, Technical and Infrastructure Services, DOE-SC-CH Integrated Support Center; and Steve Terpening, safety professional, Technical and Infrastructure Services, DOE-SC-CH Integrated Support Center.

The group has several objectives to pursue. It will examine whether corrective actions have been implemented as intended. It will study whether the implementation effectively addresses the root causes and judgments of need as identified. It also will look at procedures and practices, whether actions represent an institutional approach and whether they insure that similar events will not recur. In addition, it will investigate whether the actions are sustainable, whether processes have improved, and whether there are unintended consequences that need correction.

The actions were taken in response to an accident that occurred on March 8, 2012, in which an employee was seriously injured while operating an apparatus known as a Skid-steer to dig holes on the PPPL campus. The employee has recovered and returned to work.

The review team will be conducting interviews, reviewing documentation, examining equipment, and witnessing field work related to the corrective actions. The review will start with an entrance meeting on Monday, Aug.19, and conclude with an exit meeting on the morning of Friday, Aug. 23.

Congratulations PPPL Tokabats!

The PPPL graduate student softball team, the Tokabats, won the Princeton University Summer Softball – B Division championship on Aug. 1. beating the William Street Pumps and Hoses (from Chemical and Biological Engineering) 22-17 in a seven-inning game at the West Windsor Fields in Princeton. The Tokabats' record this season was 20-2.
The winning team members standing back row left to right: Seth Davidovits, Adam Fox, Dennis Boyle, Jake Nichols, Mark Hughes, Daniel Ruiz. Bottom row left to right: Ben Faber, Tyler Abrams, Matt Lucia, Brendan Lyons, Jasper Van Rens, Michael Hay. Not pictured is Jeff Parker, Peter Bolgert and Jon Jara-Almonte.

Photo by Melanie Fox

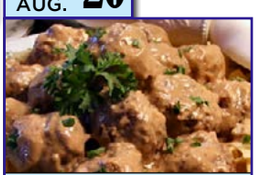
Brock Café at PPPL Menu

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. 12 AUG.	TUE. 13 AUG.	WED. 14 AUG.	THU. 15 AUG. OUTDOOR BARBECUE	FRI. 16 AUG. BRATWURST FESTIVAL
COMMAND PERFORMANCE CHEF'S FEATURE	 EGGPLANT PARMESAN	 CHICKEN TENDERS with MAC & CHEESE	 CHICKEN TRATTORIA	 CHEF'S CHOICE POT LUCK	 BEER BRAISED BRATWURST
EARLY RISER	Corned Beef Hash & 2 Eggs	Tomato, Basil, Fresh Mozzarella Omelet	Italian Sausage, Peppers & Onion Omelet	Rio Grande Omelet	Egg Whites, Turkey Sausage and Tomato Wrap
COUNTRY KETTLE	Seafood Chowder	Velvet Corn Cilantro Soup	Chili con Carne	Chicken Sausage Gumbo	Summer Squash and Corn Chowder
GRILLE SPECIAL	Santa Fe Chicken Sandwich	Crab Cake Sandwich	Cumin Grilled Chicken Breast Sandwich	OUTDOOR BBQ Fill Your Plate Burgers, Chicken, Veggies + more	BBQ Bacon Cheddar Burger
DELI SPECIAL	Tuna Club Wrap	Turkey, Swiss, & Coleslaw on Rye	Grilled Portobello with Tomato, Peppers and Fresh Mozzarella	Chunky Chicken Salad on Multigrain Bread	Spinach Pie Served with Greek Salad
PANINI	Shredded Chicken Quesadilla	Italian Panini	Hot Beef & Cheddar on a Kaiser Roll	Cheese Quesadilla	Boardwalk Italian Sausage & Peppers

NEXT WEEK

	MON. 19 AUG. NATIONAL POTATO DAY	TUE. 20 AUG.	WED. 21 AUG.	THU. 22 AUG.	FRI. 23 AUG.
COMMAND PERFORMANCE CHEF'S FEATURE	 BAKED POTATO BAR	 SWEDISH MEATBALLS OVER RICE	 CHICKEN PECAN WITH STUFFING	 SPAGHETTI WITH TURKEY MEATBALLS	 CARVED TURKEY WITH STUFFING
EARLY RISER	Breakfast Pot Pie	Blueberry Pancakes with Sausage	Peanut Butter Pancakes	Mushroom Cheese Omelet	French Toast With Bacon
COUNTRY KETTLE	Beef Barley	Chicken Rice	Minestrone	New England Clam Chowder	Split Pea
GRILLE SPECIAL	Veggie Burger with Mushrooms and Pepperjack Cheese	Buffalo Chicken Wings Served with Fries	Kielbasa & Kraut Torpedo with German Potato Salad	French Dip with Baked Potato Wedges	Mexican Style Turkey Burger
DELI SPECIAL	Shrimp Caesar Wrap	Portabello Mushroom With Swiss	Santa Fe Wrap Served with Tortilla Chips	Turkey Cobb Sandwich Wrap	Chicken Salad & Bacon Club Sandwich
PANINI	Egg Salad, Avocado and Watercress on Whole Grain	Grilled Chicken and Peppers	Breaded Chicken Cordon Bleu On Ciabatta Bread	Cuban Panini	Veggie Burgers with Cheese and Mushrooms

MENU SUBJECT TO CHANGE WITHOUT NOTICE

VEGETARIAN OPTION

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WEEKLY

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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 Thursday. Other stories should be submitted no later than noon on Wednesday. Comments: commteam@pppl.gov ◆ **PPPL WEEKLY** is archived on the web at: http://www.pppl.gov/ppplweekly.cfm

The PPPL WEEKLY is currently on a biweekly summer schedule. The next issue will be published on August 26.