

## At PPPL THIS WEEK

**OCT. 27 - OCT. 31**
**56th Annual Meeting of the  
APS Division of Plasma Physics**  
New Orleans  
<http://www.aps.org/>
**OCT. 27 - NOV. 14**
**Open Enrollment for Princeton  
Healthcare Plans**

### UPCOMING EVENTS

**November 4**
**PPPL Colloquium**  
4:15 p.m. ♦ MBG Auditorium

HTS and ARC for Fusion

**Dennis Whyte - MIT**
**November 11**
**PPPL's America Recycles Day  
Celebration**

10:30 a.m. to 1 p.m. ♦ LSB Lobby

**November 11**
**Electronics Recycling Collection**  
7 - 10 a.m. ♦ Lower Parking Lot

**November 14**
**TFTR 20th Year Megawatt  
Anniversary**

 1 p.m. ♦ Labwide celebration  
(Ice Cream and Cake served)

 2 p.m. ♦ Colloquium  
**Michael Bell, PPPL**
**November 19**
**PPPL Colloquium**  
4:15 p.m. ♦ MBG Auditorium

Antibiotic Resistance: A Global Challenge

**Dr. Laxminarayan  
Princeton University**

## Inside...


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## Bob Ellis designs a PPPL first: A 3D printed mirror for microwave launchers

By John Greenwald

**W**hen scientists at the Korea Supercomputing Tokamak Advanced Research (KSTAR) facility needed a crucial new component, they turned to PPPL engineer Bob Ellis. His task: Design a water-cooled fixed mirror that can withstand high heat loads for up to 300 seconds while directing microwaves beamed from launchers to heat the plasma that fuels fusion reactions.

Ellis, who had designed mirrors without coolant for shorter experiments, decided to try out a novel manufacturing process called 3D printing that produces components as unified wholes with minimal need for further processing. 3D printing would enable the mirror to be built for less cost than a non-water-cooled mirror produced by conventional manufacturing, Ellis said, "and that was a very nice thing to find out about."

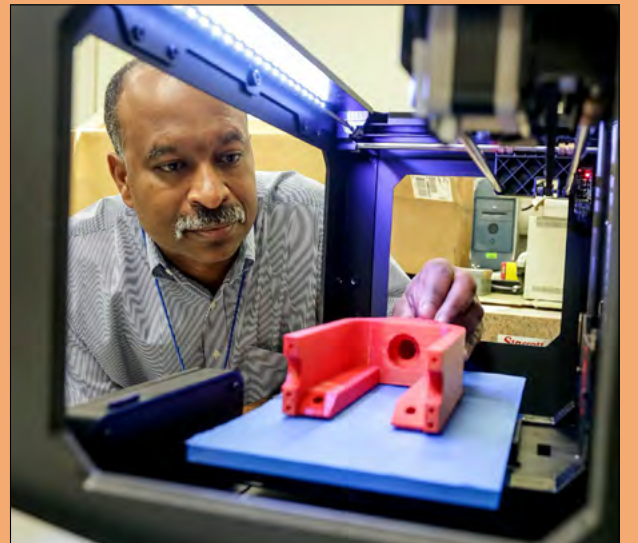
The project marked a first for PPPL, which had previously used 3D printers to build plastic models but had not employed the process for creating metal parts. "Metal came into 3D printing about five years ago and was sort of exotic then," said Phil Heitzenroeder, who heads the Mechanical Engineering Division at PPPL. "Now 3D is beginning to drift down into real-world metal products."

Ellis created a CAD-CAM model of the shoebox-size mirror system and delivered it to Imperial Machine & Tool Co. to produce the stainless steel and copper component through metal 3D printing. The process puts down hair-thin layers of stainless steel powder and fuses the powder in each layer with lasers. The parts are thus built from the bottom up layer by layer — another name for 3D printing is "additive manufacturing" — and follow every twist and turn of the CAD-CAM design.

The stainless steel granules have the consistency of talcum powder before they are fused, said Christian M. Joest, president of the 70-year-old Columbia, N.J., machining and fabricating company. The 3D process took about 20 hours to complete, Joest said.

The process proved ideal for the water-cooled mirror, which PPPL shipped to KSTAR in early October. The part consists of a thin sheet of polished copper mounted atop a stainless steel base, with serpentine channels for water winding through the base's center. Conventional construction could have required the base to be built in

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*3D printing, bottom left: completed stainless steel and copper mirror system; top left: completed mirror system with initial version of the stainless steel part; right: Bob Ellis with a 3D-printed plastic prototype for another part of the launcher.*



## Recyclable design contest seeks creative entries

# Contest celebrating PPPL's America Recycles Day will feature recyclable art, inventions and fashion

By Jeanne Jackson DeVoe

PPPL'ers with a talent for invention, an eye for design and a flare for fashion are invited to find new uses for PPPL's compost, stock room items, recyclables or trash. The Green Team is looking for entries in recyclable design content for PPPL's America Recycles Day celebration on Nov. 11.

The idea is to pick one category (compost, stock room items, recyclables or trash) and turn items from that category into a new creation – an invention, a work of art or a work of fashion.

"The purpose of the contest is to encourage people to think about the materials that they throw away at the Lab and to think about things they can do with them other than throwing them away," said Dana Eckstein, one of the organizers of the contest. (Last year she designed a CD dress for the America Recycles Day fashion show at PPPL).

This year, the Green Team is inviting people to not only create fashions but also to create inventions, art work or other uses for the items people at the Laboratory dispose of every day.

The creations will be displayed in the LSB Lobby on Nov. 11, with a fashion show at 11:45 a.m. and 12:30 p.m.



*A dress by Margaret Kevin-King made out of compostable items (compostable trash bags, napkins and photos of food items) is on display in the LSB lobby. The Green Team is asking PPPL'ers to create inventions, art work and fashion out of compostable, recyclable and trash items, as well as stock items such as CDs for PPPL's America Recycles Day celebration Nov. 11.*

PPPL'ers will have a chance to vote on the best fashion show and the best invention/work of art. The winners will receive gift certificates to the Plasma Hutch or the cafeteria.

The creations can include anything that gets thrown away, recycled or composted at PPPL. While using banana peels or other food items is discouraged, pictures of food are encouraged, as well as paper towels, paper plates or any of the take-out items in the cafeteria. Recycled items include cans, bottles, newspapers, cardboard and paper; stock items include CDs and other stock items and trash includes anything that doesn't fit into that category such as plastic bags.

Please contact Dana Eckstein, [danae@pppl.gov](mailto:danae@pppl.gov) (ext. 2588) or Nicole Allen, [nallen@pppl.gov](mailto:nallen@pppl.gov), (ext. 2503) by Nov. 7 to register for the contest. They can also help you with ideas and can help you get materials. CDs and other stock items that are recycled at PPPL are available in the bins outside the stock room.

The Recycling Day celebration will also include lobby displays, prizes for early arrivals, and an electronics recycling collection from 7 to 10 a.m. in the Lower Parking Lot. 🗑️

## Thank you PPPL'ers




Thanks to everyone whose hard work made the PPPL holiday card video shoot possible!



## Bob Ellis

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multiple pieces so that the channels could be drilled, with the pieces then welded back together. "3D printing allows you to produce components in a single piece," Ellis said, "and that's a huge advantage."

Ellis now is designing a steerable mirror for KSTAR that can be controlled by computer to direct microwaves into different parts of the plasma. Ellis dubs this mirror, to be delivered next year, "Generation 2.0," since it will have flat cooling channels rather than the round ones on the fixed mirror. The flat channels will increase the efficiency of the coolant, he said, which will be important for shedding heat from the constantly moving steerable mirror. 

## Open Enrollment continues through Nov. 14

PPPL's HR Director Paulette Gangemi announced last week that due to changes in PPPL's HR structure, Princeton University's Main Campus Human Resources office will handle PPPL's employee benefits.

**Open enrollment for benefits began on Oct. 20 and will continue through Nov. 14.** There are several changes to the Princeton Health Plan this year, including the addition of a new health plan and several incentive programs. More information is available at Princeton University's website <http://www.princeton.edu/hr/benefits/>.

PPPL'ers can call the University's Benefits Helpline at Main Campus (609) 258-3302 or email [benefits@princeton.edu](mailto:benefits@princeton.edu) with any questions or concerns.

Gangemi said the PPPL HR Office will continue to provide on-site support for managing leaves of absence (once an employee has called the helpline for first line questions and understands the process).



PPPL'ers got information on benefits at the annual Benefits Fair on Oct. 23. Here, staff members chat with Chris Rossi from PayFlex, a flexible spending account for health expenses. From left to right: Jane Feng, Wenping Wang, Rosemarie Fuchs Smith and Janet Cheslock.

## NPR reporter at PPPL



Public radio reporter Flora Lichtman, who covers science, interviews Adam Cohen, accompanied by Director of Communications Kitta MacPherson, right. The segment will air later this year.

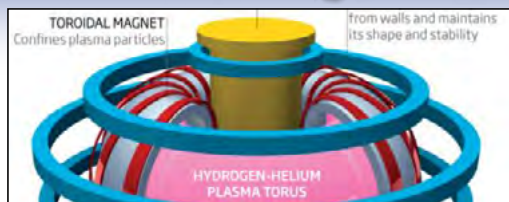
## Thank you PPPL blood donors!

PPPL'ers contributed 20 pints of blood in the American Red Cross blood drive this month. Thank you to everyone who gave blood!

For regular donors and those who've never given before, keep in mind that The Spring Blood Drive will be in March 2015!



## COLLOQUIUM



### HTS and ARC for Fusion

**PROFESSOR DENNIS WHYTE**  
Massachusetts Institute of Technology

**Wednesday, November 4**

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



## Save the date: TFTR megawatt anniversary celebration Nov. 14

All PPPL staff members are invited to enjoy cake and ice cream on Nov. 14 at 1 p.m. in the LSB Lobby to celebrate the 20th anniversary of TFTR producing 10.7 megawatts of fusion energy on Nov. 2, 1994. PPPL physicist Michael Bell will give a colloquium on the anniversary at 2 p.m. in the MBG Auditorium. Left: a photo of TFTR.





## How to sign up for the Hertz Gold service for business travel

Hertz Gold Plus will qualify PPPL'ers who travel for business for benefits that include upgrades, coupons and free rental days. Please use this [link](#) to sign up.

The \$50 fee has been waived for PPPL employees who use the card for business travel. The preferred discount program will be stored in your profile and will appear when you reserve a car. Please go to this [link](#) for information on the benefits that Gold Plus membership offers.

You will be asked to provide some personal information when you register including: Your driver's license number and expiration date with the state where it was issued; your T credit card number you would use when renting a car; the billing address of the credit card.

When you are done, please contact the travel office [travel@pppl.gov](mailto:travel@pppl.gov) to include the Gold card in your travel reservations.

Please note that you will be asked for your credit card and license the first time you use the card for a reservation.

## SPD • TIP • OF • THE • WEEK

### Parking at Princeton University for PPPL'ers

The assigned parking areas on main campus for PPPL'ers have been changed.

Current valid PPPL parking decals are valid in the following areas:

- Lot 21 (by Jadwin Gym)
- Lot 23 (the visitor lot off Elm Drive, which is the first open lot East of the Garage)

**Note:** Parking in the West Garage will no longer be permitted with the PPPL parking decal, as the Garage will become gated in the very near future.

PPPL decals are valid until the end of calendar year 2016 at PPPL and at Lot 21 and Lot 23 only.

#### University Parking Map:

[http://www.princeton.edu/parking/Parking\\_Lots.pdf](http://www.princeton.edu/parking/Parking_Lots.pdf)

#### University Transportation & Parking Office:

<http://www.princeton.edu/parking>

#### PPPL Parking, Traffic & Bicycle Regulations:

<http://www-local.pppl.gov/docs/ParkingRegs.pdf>

# TIGER TROT

## FOR HUNGER

### 5K Friday, Nov 7th

### 3pm - Dillon Gym

T-shirts to the first 150 who pre-register by Mon., Nov 3rd

TO REGISTER GO TO: [WWW.PRINCETON.EDU/CAMPUSREC](http://WWW.PRINCETON.EDU/CAMPUSREC)  
Email Form to: [jessward@princeton.edu](mailto:jessward@princeton.edu), or bring to Rm. 104 Dillon Hall.

RACE DAY REGISTRATION FROM 1:45 - 2:30 P.M.

Entrance fee is a non-perishable food item or donation to:  
The Crisis Ministry of Princeton and Trenton

5K Run or Walk

## BROCK Café 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*

COMMAND PERFORMANCE  
CHEF'S FEATURE

MON. 27  
OCT.



**Spaghetti & Meatballs served with Garlic Bread**

TUE. 28  
OCT.



**Create your own Burrito Bar**

WED. 29  
OCT.



**Create your own Omelet Bar served with Hash Browns or Home Fries**

THU. 30  
OCT.



**Pork Fried Rice served with an Egg Roll**

FRI. 31  
OCT.



**Tilapia Francaise served with Rice and Vegetables**

EARLY RISER

Grilled Cheese with Ham, Fried Egg & Cheese

Spanish Omelet

Egg White Omelet with Broccoli, Spinach & Potatoes

Pumpkin Cranberry Pancakes

Scrambled Eggs over Peppers, Onions, Mushrooms, Potatoes and Cheddar

COUNTRY KETTLE

Turkey Corn Chowder

Broccoli & Cheddar

Chicken Rice

Loaded Potato Soup

Beef Barley

GRILLE SPECIAL

Jersey Burger with Bacon, Grilled Onions, Mushroom & Swiss

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

Turkey & Cranberry Flatbread

Capicola & Salami Hoagie

Tuna Avocado Club

Apple Cranberry Chicken Salad on a Kaiser Roll

PANINI

Grilled Chicken Breast with Ham, Swiss, Tomato and Honey Mustard

Tuna Salad with Artichokes and Garbanzo Spread

Turkey on French Bread with Jalapeno Cheddar Cheese

Fried Zucchini Parmesan Torpedo

Roast Beef & Swiss Cheese with Tomato and 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**

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](mailto:commteam@pppl.gov) ♦ PPPL WEEKLY is archived on the web at: <http://w3.pppl.gov/communications/weekly/>.