

At PPPL THIS WEEK

JUNE 16-JUNE 18

Peer Review of PPPL's Lithium Safety Program
Director's Conference Room

WEDNESDAY, JUNE 17

Colloquium
4:15 p.m. ♦ MBG Auditorium
[Comets and the Origin and Evolution of the Solar System](#)
Professor David Jewitt, University of California, Los Angeles

FRIDAY, JUNE 19

Open Public Tour
10 a.m.
tours@pppl.gov

UPCOMING

WEDNESDAY, JUNE 24

Colloquium
4:15 p.m. ♦ MBG Auditorium
[External Propulsion and the Future of Space Access](#)
Dr. Dmitriy Tselikhovich, Escape Dynamics, Inc.

FRIDAY, JULY 3

Lab closed for Independence Day holiday

WEDNESDAY, JULY 15

Annual Theory and Simulations of Disruptions in Tokamaks Workshop

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Princeton and PPPL projects selected to run on near-exascale computer to be delivered to Oak Ridge Leadership Computing Facility

By John Greenwald

Three Princeton University-related computer programs have been chosen to run on a new supercomputer that will deliver enhanced scientific findings when it begins crunching numbers in 2018. The projects, consisting of a Princeton Department of Geosciences program and two studies involving PPPL, encompass high-performance computer codes to map the interior of the Earth and advance the scientific basis for developing fusion energy to generate electricity.

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Delgado-Aparicio urges middle school students to pursue careers in science and join the quest for fusion energy

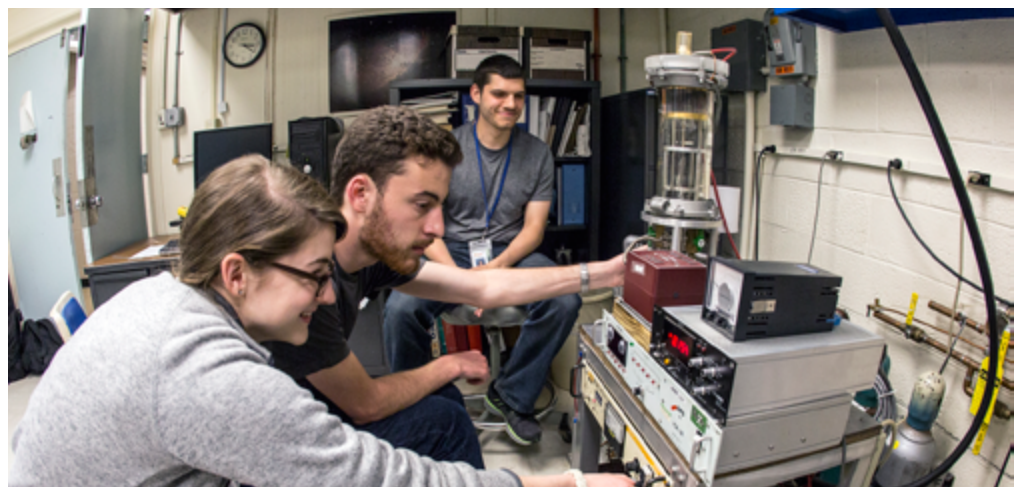
By Jeanne Jackson DeVoe

Physicist Luis Delgado-Aparicio told middle school students attending a conference of Hispanics Inspiring Students' Performance and Achievement (HISPA) at Princeton University to follow their dreams and to pursue careers in science even if the path is difficult.

In a keynote speech to about 100 students on June 5, Delgado-Aparicio said he was already working as an engineer when he decided to become a physicist, a decision that meant many more years of graduate school, first at Princeton University and then at Johns Hopkins University, where he got his PhD before joining PPPL. Many of his friends didn't understand his decision. "My colleagues were telling me, "Do medicine, do law, do engineering. Why do something more complicated?"

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Students get introductory course at start of summer internship



Students adjust dials to create a plasma. From left to right: Amanda Lewis, of Rensselaer Polytechnic in Troy, New York; Ben Israeli, of Columbia University, and graduate student Peter Jandovitz.

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Supercomputer

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The codes will run on Summit, a supercomputer that will approach exascale capacity and have more than five times the computing power of Titan, the current U.S. leader, which can perform up to 27 quadrillion — or million billion — calculations a second. The U.S. Department of Energy's Oak Ridge Leadership Computing Facility, which houses Titan, plans to take delivery of Summit in 2017 and place it in operation the following year. "Summit is the next leap in leadership-class computing systems for open science," Jack Wells, director of science for the National Center for Computational Sciences at Oak Ridge National Laboratory (ORNL), said of the supercomputer, which IBM and Nvidia Corp. processors will power.

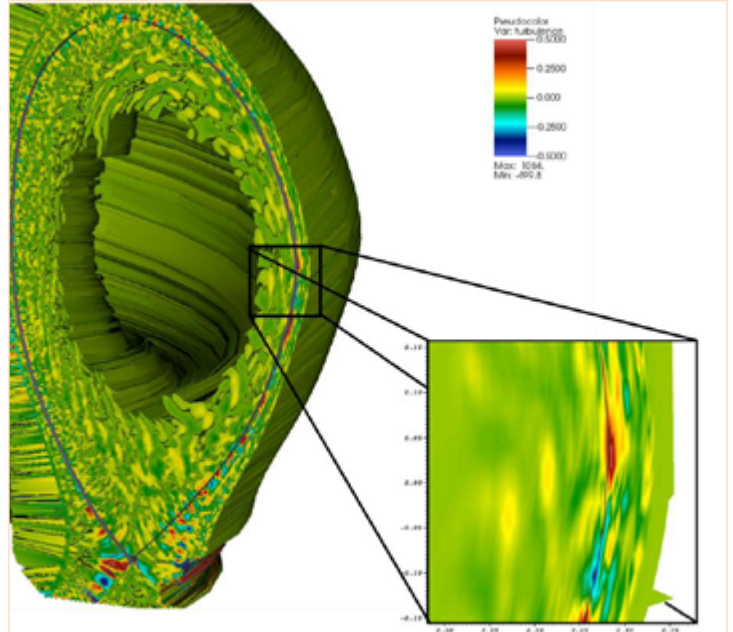
The three Princeton-related projects were among 13 selected to run in the Center for Accelerated Application Readiness (CAAR) program at Oak Ridge. The three projects include:

Mapping the Earth's interior using Big Data

Princeton University researchers led by Jeroen Tromp plan to use Summit to map the planet's interior down to the center of its white-hot inner core. The team previously used Titan to image the Earth's entire mantle, the rocky shelf that extends some 1,800 miles between the Earth's crust and outer core. While that work employed seismic wave data from a few hundred earthquakes, the new study will crunch data from thousands of earthquakes, said Tromp, Blair Professor of Geology and a professor of geosciences and applied and computational mathematics and associate director of the Princeton Institute for Computational Science & Engineering (PICSciE). The new study will also model the propagation of waves with frequencies of just one-to-two seconds to reveal greater detail than current capabilities, which are limited to simulating less frequent waves, are able to produce.

Simulating plasmas from hot core to cold wall

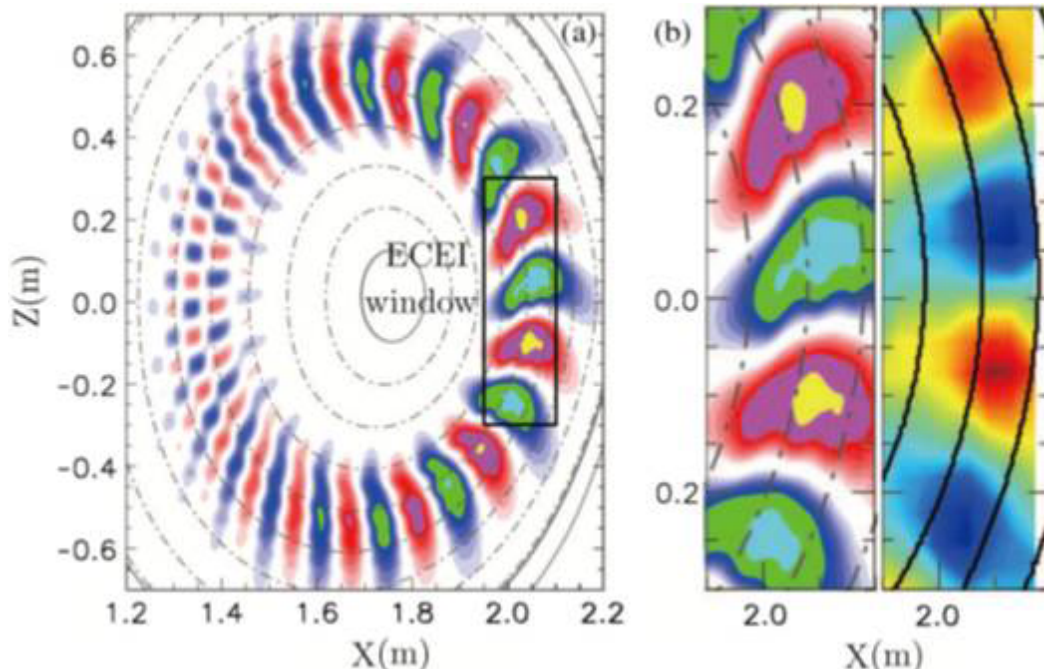
Physicists led by C.S. Chang of PPPL will use Summit to model the dazzlingly complex conditions at the edge of the



Computer simulation and visualization of edge turbulence in a fusion plasma. (Simulation: Seung-Hoe Ku/PPPL. Visualization: David Pugmire/ORNL)

plasma that fuels fusion reactions in magnetic fusion facilities called tokamaks. Of particular interest are conditions that lead to the creation of turbulence that causes plasma to leak from magnetic confinement from the hot core of the plasma to the cold material wall. The team has been using Titan to study a special type of turbulence called "blobs" that have been observed in tokamak experiments and could critically affect the pattern of heat lost to the wall in ITER, the international tokamak under construction in France. Using Summit will enable the team to simulate conditions 10 times faster and in greater detail than current supercomputers allow. Complex runs to study ITER plasma will thus be performed on a daily basis rather than over the lengthier periods now required, said Chang. Results could lead to improved planning for experiments on ITER.

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Left: Simulated contour plot of relative electron perturbation. Right: Comparison of perturbation from simulation at left with experiment on the DIII-D tokamak that General Atomics operates for the DOE. (Zhihong Lin et al.)

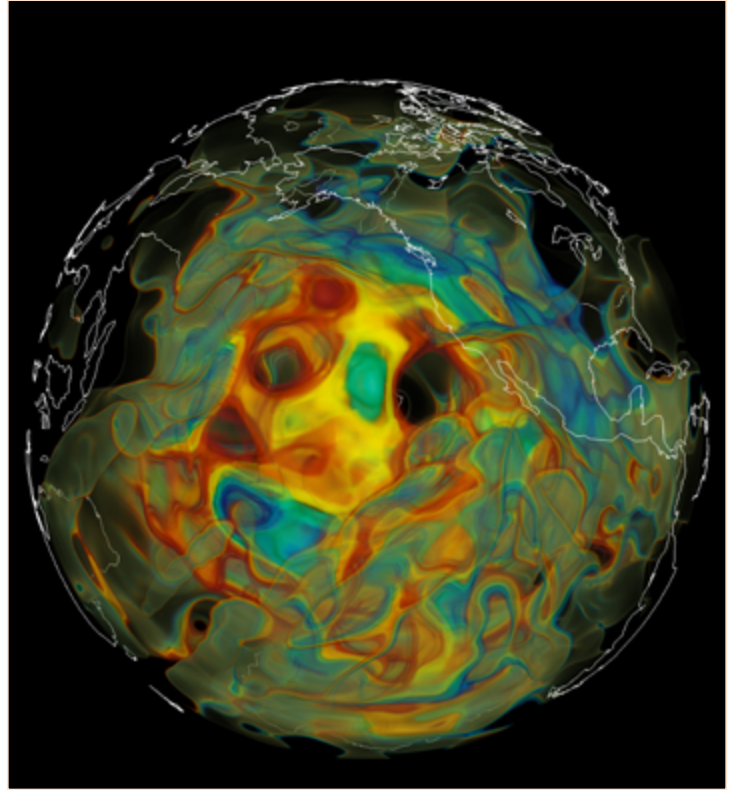
Supercomputer

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Modeling plasma turbulence for sustainable fusion reactions in ITER

This research will model the behavior of billions to trillions of individual plasma particles in multiple dimensions while accounting for the electromagnetic waves these particles excite as they move within a tokamak. Achieving this dual capability represents “clearly a computational grand challenge,” said physicist William Tang of PICSciE and PPPL. Tang serves as co-principal investigator for the project with Principal Investigator Zhihong Lin, professor of physics and astronomy at the University of California, Irvine. The simulations are expected to deepen insight into the conditions required for sustained fusion reactions by enhancing understanding of plasma confinement and the impact of turbulence. The balance between energy losses and the self-heating rate of fusion reactions will ultimately determine the size and cost of a fusion reactor.

Preparing these codes to run on Summit will take months of planning developed through the CAAR program. The new supercomputer, said Wells of ORNL, will enable these and other projects “to address, with greater complexity and higher fidelity, questions concerning DOE’s science and energy-technology mission, increased industrial competitiveness, and fundamental understanding of our place in the world and our world’s place in the cosmos.”



Titan supercomputer image of the Earth’s mantle. (Ebru Bozdog, University of Nice and David Pugmire, ORNL)

PPPL’s bike team racks up miles in Challenge

Congratulations to the 40 members of the five teams participating in PPPL’s Bike Challenge, who finished in the top 20 percent (#291 of 1,348) of groups participating in the national Bike Month Challenge.

Team leader board

Number of trips:

- Easy Riders - 223 (average =28)
- Fusion Flyers - 211 (average = 23)
- Plasma Pedalers - 168 (average =19)

Total Miles:

- Fusion Flyers - 1,925 (average = 214)
- Plasma Pedalers - 1,454.7 (average = 162)
- Easy Riders - 1,541 (average = 181)

Altogether, bike team members took a total of 765 trips last month and biked 5,555 miles, avoiding 4,889 pounds of carbon emissions. And they also got fit, burning a total of 272,220 calories!

Individual Leader Board

Number of Trips:

- Dick Majeski - 52
- Matt Parsons - 42
- Mike Zarnstorff - 41

Total Miles:

- Dick Majeski - 756
- Larry Dudek - 550
- Paulette Gangemi - 356

Delgado-Aparicio at HISPA

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Physicist Luis Delgado-Aparicio (with a photo of Einstein behind him) speaking to middle school students at Princeton University.

“Doing science is not easy”

But Delgado-Aparicio was determined. “I am who I am and I need to pursue what I want. Doing science is not easy,” he said. “If you want to be a scientist, it will be a tricky business. But it pays a lot. You will be happy from the moment you wake up to the moment you go to bed.”

His talk headlined a conference titled, “Take action! Achieve your dreams!” The 150 students attending the event listened to speakers and a panel discussion of Hispanic college students, and took part in workshops and hands-on science experiments. The organization aims to connect students with role models who will encourage them to succeed in school and go on to higher education.

In introductory remarks, Axel Carrión, a division operations manager at United Postal Service, noted that the high school graduation rate has climbed from 54 percent in 1984 to over 80 percent in 2014. But the graduation rate was only 13 percent for Hispanic students enrolled in two-year colleges and just 9 percent for students at four-year colleges. “What we’re really looking for is for that trend to reverse and it starts with everyone in this room,” Carrión said.

Romy Riddick, Princeton University assistant vice-president for Human Resources, noted that Princeton’s graduation had taken place a few days earlier. “I’m hoping that in 10 years we’ll see you walking across campus,” she told the students.

Ivonne Diaz-Claisse, the president of HISPA, spoke of her journey earning a PhD in mathematics as a Puerto Rican student who was less than fluent in English. The room in which Delgado-Aparicio gave his speech is called the Albert Einstein room, she said, because it recreates the look of a lecture room from the era when Albert Einstein taught seminars at Princeton in the 1930s. Einstein and Mexican astronaut Jose Hernandez were two of her role models. She said she hoped students would find their own role models at the conference.

The event drew 180 students and 50 volunteer role models from companies and organizations throughout New Jersey. Founded in 2008, HISPA aims to connect Hispanic middle school students with role models to encourage them to succeed in high school and go on to higher education.

Energy is vital for the future

Delgado-Aparicio’s speech focused on his own experiences and PPPL’s goal of studying the scientific basis for developing fusion as a source of energy for producing electricity. Having sufficient energy in the future is vital for everyone, he said. “You will not be able to follow your dreams if you do not have energy,” he said.

Delgado-Aparicio pointed out that energy consumption around the world has nearly doubled in the last 40 years. Other energy sources have limitations, he said. Some, like natural gas, have a limited supply, while others, like coal, produce greenhouse gases that harm the environment. But fusion energy would not pollute the air and would use hydrogen for fuel, which is in plentiful supply in the world’s oceans. “It is safe, it’s nearly inexhaustible, it’s extremely efficient, and it doesn’t matter where you are, you can build one of those reactors and hopefully it will be available 24-7,” he said.

Delgado-Aparicio recently won a \$2.6 million Early Career Research Award sponsored by the U.S. Department of Energy’s Office of Science. The five-year grant will fund Delgado-Aparicio’s research aimed at eliminating a key barrier to developing fusion energy.

“Immense rewards” of a science career

The physicist said his career in science has already taken him from Peru to the United States and to England and France. He noted that there are fusion experiments all over the world, including Russia, Switzerland, Japan, India, and Korea. An international fusion experiment called ITER, which means “the way” in Latin, is currently being built in Cadarache, France, and could create a plasma by the year 2025. “If any of you do engineering or chemistry, you could work on this machine in the south of France,” he said. “The challenges are great but the rewards are immense.”


He urged students with an interest in science to join him and other scientists in the quest to make fusion energy a reality. “I want to encourage all of you who have even a little bit of a science mind to choose engineering, to choose chemistry or physics, to have the courage to pursue that,” Delgado-Aparicio said. “I would like to ask all of us to achieve our dreams and to develop a star on earth.” 📌

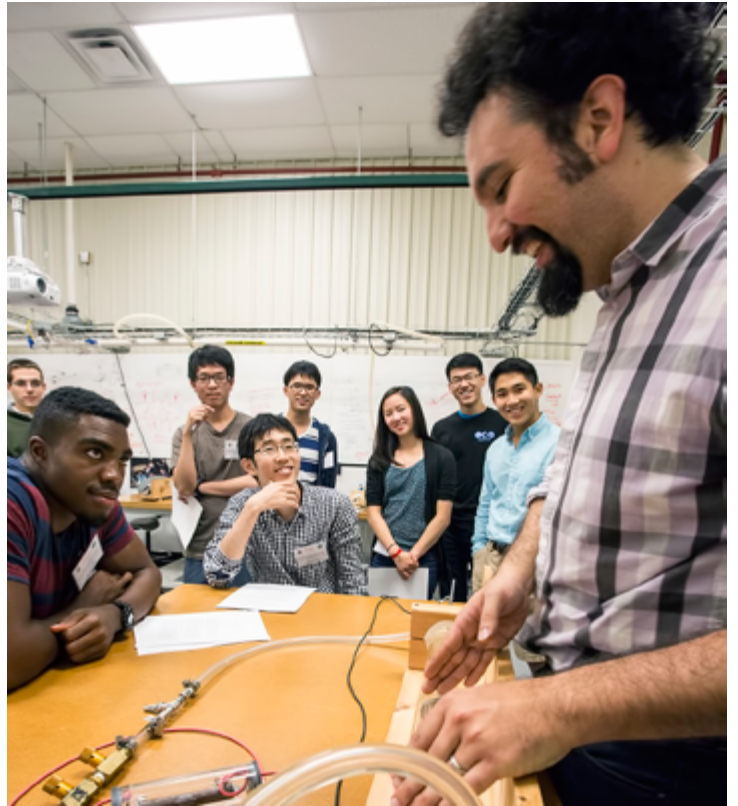


Delgado-Aparicio with Ivonne Diaz-Claisse, the president of HISPA, and some of the middle school students at the Hispanics Inspiring Students’ Performance and Achievement (HISPA) conference.

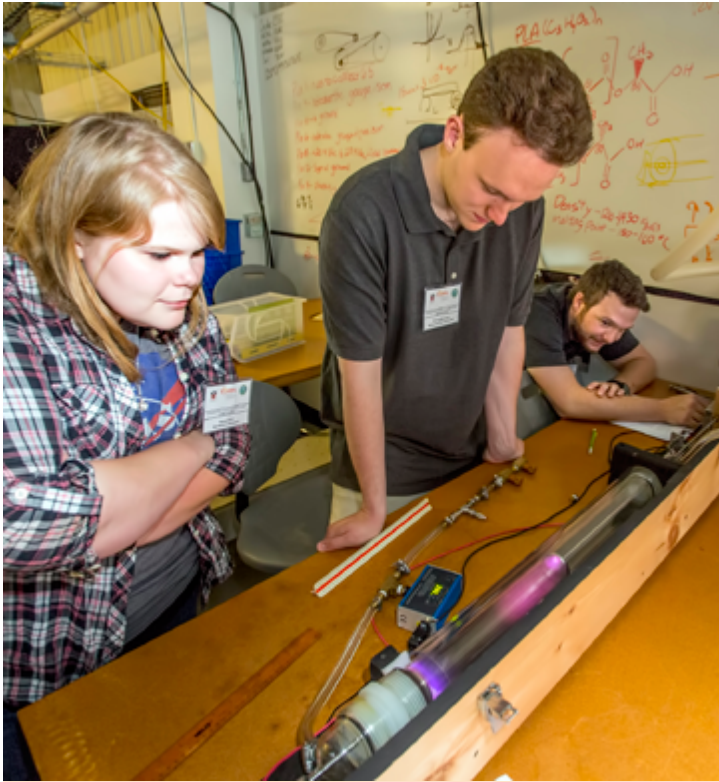
Summer students

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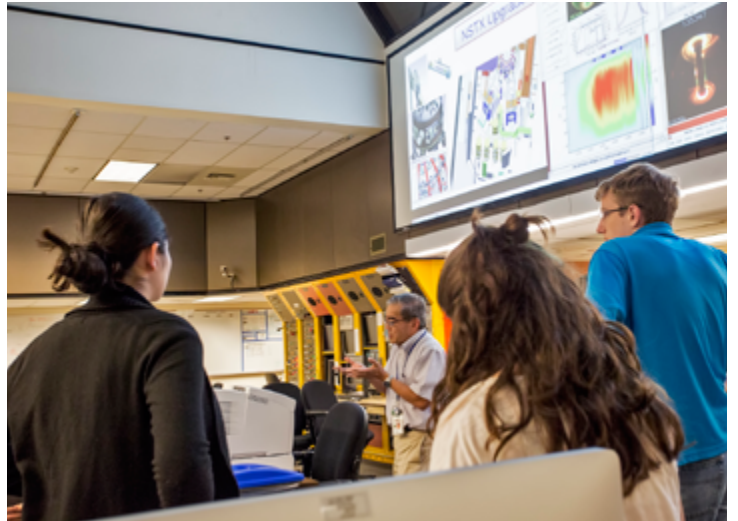
PPPL's Science Education department hosted 32 students in the Science Undergraduate Laboratory Internship program along with two students in the Community College internship program and 14 undergraduates already working with researchers for a one-week introductory course in plasma physics and fusion energy. The students listened to speakers from all over the country and did hands-on science experiments. This week nine of the students will go to General Atomics in San Diego. The remaining students will work with scientists and engineers on research projects. They will present their results at a poster session in mid-August. 



Arturo Dominguez shows a plasma experiment to students as Brannon Jones, an intern working with physicist Sam Cohen, looks on.



Students examine a plasma in the Science Education Laboratory. Left to right: Sarah Gady, Whitworth University, Spokane, Washington; William McCarthy, Worcester Polytechnic Institute, Massachusetts; Nathaniel Wirgau, University of Michigan - Ann Arbor.



Physicist Robert Kaita gives students a tour of the NSTX-U Control Room.



Summer interns, including 32 SULI students and two Community College interns, pose for a group shot in the Commons.



Some 67 scientists from 17 countries in addition to the U.S. attended the International Tokamak Physics Activity (ITPA) conference at PPPL from June 9 to June 12.



Mike Walsh, of ITER, gave a colloquium entitled "ITER and its Diagnostics – Rising to the Challenge," and attended the ITPA conference.



PPPL bids a fond farewell to a retiring employee!

BILL STANTON

Steam plant operator

Engineering/Facilities

PPPL Welcomes New Employees!



DAVID BECKER
Budget analyst
Business Operations



KYLE CASPARY
Associate research physicist
Plasma Science & Technology



SUSAN DEVER
Administrative assistant
Best Practices and Outreach



YONG HONG WU
Project manager
Business Operations



MILTON JONES
Steam plant operator
Engineering/Facilities



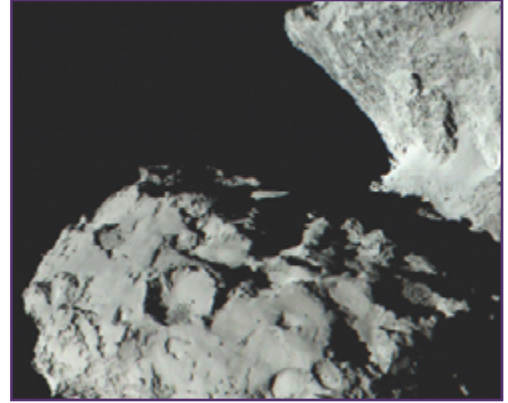
TOM KUCKER
Facilities mechanical CAD designer
Engineering/Drafting



STACIA ZELICK
Chief Information Officer
Information Technology

COLLOQUIUM

Comets and the Origin and Evolution of the Solar System



Professor David Jewitt
University of California - Los Angeles

Wednesday, June 17
4:15 p.m. (coffee/tea at 4 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 June 15	Tuesday June 16	Wednesday June 17	Thursday June 18	Friday June 19
COMMAND PERFORMANCE Chef's Feature	Chicken Francese served with Wild Rice & Vegetable	Vegetable Fried Rice served with Eggrolls & Dumplings	COMMAND PERFORMANCE Carla's Specialty Ravioli Bar	Carved Caribbean Pork Loin served with Mango Salsa & Wild Rice	FATHER'S DAY Outdoor BBQ
Early Riser	Bacon, Cheddar Cheese Omelet Wrap	2 Eggs served with Hash Brown Casserole	Raisin Bread French Toast	Chocolate Banana Pancakes	Broccoli Cheddar Breakfast Pizza
Country Kettle	Italian Wedding Soup	Curried Cauliflower	Beef Noodle	Tomato Bisque	Manhattan Clam Chowder
Grille Special	Beef BBQ Nacho Sub	Hawaiian Spam & Egg Sandwich	Popcorn Shrimp Po' Boy	Bob's Mar-A-Lago Turkey Burger with Pear Chutney	Roast Turkey, Avocado & Bacon grilled on Texas Toast
Deli Special	Egg Salad, Avocado on Whole Grain Bread with Lettuce & Tomato	Marinated Flank Steak & Portobello Mushrooms served over Tossed Salad with Green Goddess Dressing	Sliced Pork on French Bread with Pickled Slaw	Tuna Club with Hard-Cooked Egg, Lettuce & Tomato	Pesto Chicken Salad Croissant
Panini	Italian Sausage, Fresh Mozzarella, Grilled Peppers, Onions & Mushrooms on an Asiago Cheese Roll	Fried Fish & Slaw Wrap with Tartar Sauce	Chicken Cheddar Quesadilla	Veggie Nachos	Roast Beef & Cheddar on an Onion Roll

MENU SUBJECT TO CHANGE WITHOUT NOTICE

Menu Item is in keeping with American Heart Association (AHA)
and U.S. Department of Agriculture (USDA) guidelines.

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/>.