DOE Princeton Plasma Physics Laboratory

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PPPL NEWS

The Princeton Plasma Physics Laboratory is a United States Department of Energy Facility

Becoming an *ENERGY STAR®* Partner

Earth Week Marks PPPL Designation

U.S. Environmental Protection Agency Deputy Administrator Marcus Peacock (right) congratulates PPPL Director Rob Goldston on PPPL being designated as an ENERGY STAR® partner during PPPL's Earth Day celebration.

Energy efficiency matters! That was the Earth Day message demonstrated April 22 at PPPL, as it was welcomed as an ENERGY STAR® partner by the DOE and the U.S. Environmental Protection Agency (EPA). DOE and EPA officials made the announcement during a special Earth Day celebration at PPPL in the Auditorium. ENERGY STAR® partners are facilities that take action to improve energy efficiency, protect the environment and reduce greenhouse gases.

"Princeton's designation as the first Department of Energy facility to become an ENERGY STAR® partner highlights the Laboratory's commitment to reducing it's footprint on the environment through increased energy efficiency and reducing greenhouse gas emissions while conducting cutting edge research," said DOE Under Secretary for Science Dr. Raymond L. Orbach in a statement. "The Laboratory, as part of an overall Department of Energy initiative, is also focusing on increasing use of renewable energy, reducing water use and implementing sustainable design into its operations. Princeton Plasma Physics Laboratory is a model for all Department of Energy facilities."

EPA Deputy Administrator Marcus Peacock recognized the Laboratory for its commitment to sound energy management through investments in energy efficient lighting, energy management systems, and energy benchmarking in facilities and operations.

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ENERGY STAR

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"What better day than Earth Day to recognize a facility that is helping EPA achieve our environmental protection goals through a promising partnership," said Peacock. "We are encouraged to see the Princeton Plasma Physics Lab, a distinguished member of the scientific community, serve as a model to other organizations, proving you can conduct outstanding scientific research while saving energy and money. PPPL's pioneering fusion research has the potential to dramatically improve America's energy security while significantly reducing air pollution and emissions of greenhouse gases." Peacock joined DOE Princeton Site Office Manager Jerry Faul in announcing the partnership at PPPL's Earth Day celebration.

In partnership with ENERGY STAR®, PPPL will measure and track the energy performance of the organization's facilities and operations by using tools offered through the program. PPPL will also develop and implement a plan consistent with the ENERGY STAR® energy management strategy to achieve energy savings and promote the importance of energy efficiency to its staff and community.

In addition to the ENERGY STAR® partnership announcement, PPPL's Earth Day events included remarks by Faul and EPA's Alan Steinberg, a presentation about the Lab's energy and environmental performance by PPPL Materiel and Environmental Services Division Head Rob Sheneman, and the presentation of 2008 PPPL Green Machine awards to employees who have made a special effort to save energy, reduce waste and improve PPPL's environmental performance.

Faul read a congratulatory letter to staff from DOE Under Secretary for Science Orbach, which also noted two awards bestowed on PPPL.

At the Magnetic Reconnection Experiment, PPPL physicist Hantao Ji (right) discusses the experiment with EPA's Marcus Peacock (next to Ji) and Alan Steinberg. Peacock and Steinberg toured PPPL following the Earth Day presentation.

PPPL Materiel and Environmental Services Division Head Rob Sheneman gives a presentation about the Lab's energy and environmental performance during Earth Day.

PPPL has received the DOE Office of Science Pollution Prevention (P2) Star Award for "Outstanding Recycling in FY07" and a DOE Office of Science Honorable Mention award for the Laboratory's Compressed Natural Gas and B20 Program.

Said Sheneman, "In celebrating Earth Day we are also celebrating the Laboratory's success in improving our environmental performance. The commitment of PPPL's staff is reflected in our selection for two prestigious pollution prevention awards and our partnership with ENERGY STAR®. PPPL is clearly a leader among DOE facilities in the area of environmental stewardship and sustainability."

The day also featured environmental and recycling displays in the Lobby by the Geophysical Fluid Dynamics Laboratory, the Mercer County Improvement Authority, Corporate Express Office Supply, and PPPL. The Lab's exhibits were about its recycling program, alternate fuel vehicles program, environmentally preferred purchases, water conservation, sustainable landscaping, and energy conservation. Outside were hybrid cars and fuel efficient cars, as well as PPPL's alternative fuel vehicles and biogators.

Earth Day activities, headed by T.J. McGeachen and Margaret King, are coordinated through the Lab's Materiel and Environmental Services and Maintenance and Operations groups.

ENERGY STAR® was introduced by EPA in 1992 as a voluntary, market-based partnership to reduce greenhouse gas emissions through energy efficiency. Now in partnership with DOE, EPA works with more than 8,000 organizations to improve the energy efficiency of products, homes and businesses. The ENERGY STAR® label appears on more than 40 kinds of consumer products. To learn more about ENERGY STAR®, visit EnergyStar.gov or call 1-888-STAR-YES.

Peacock concluded his remarks to PPPL staff by saying, "With your addition, Energy Star will shine brighter and brighter – Happy Earth Day." ●

PPPL NEWS

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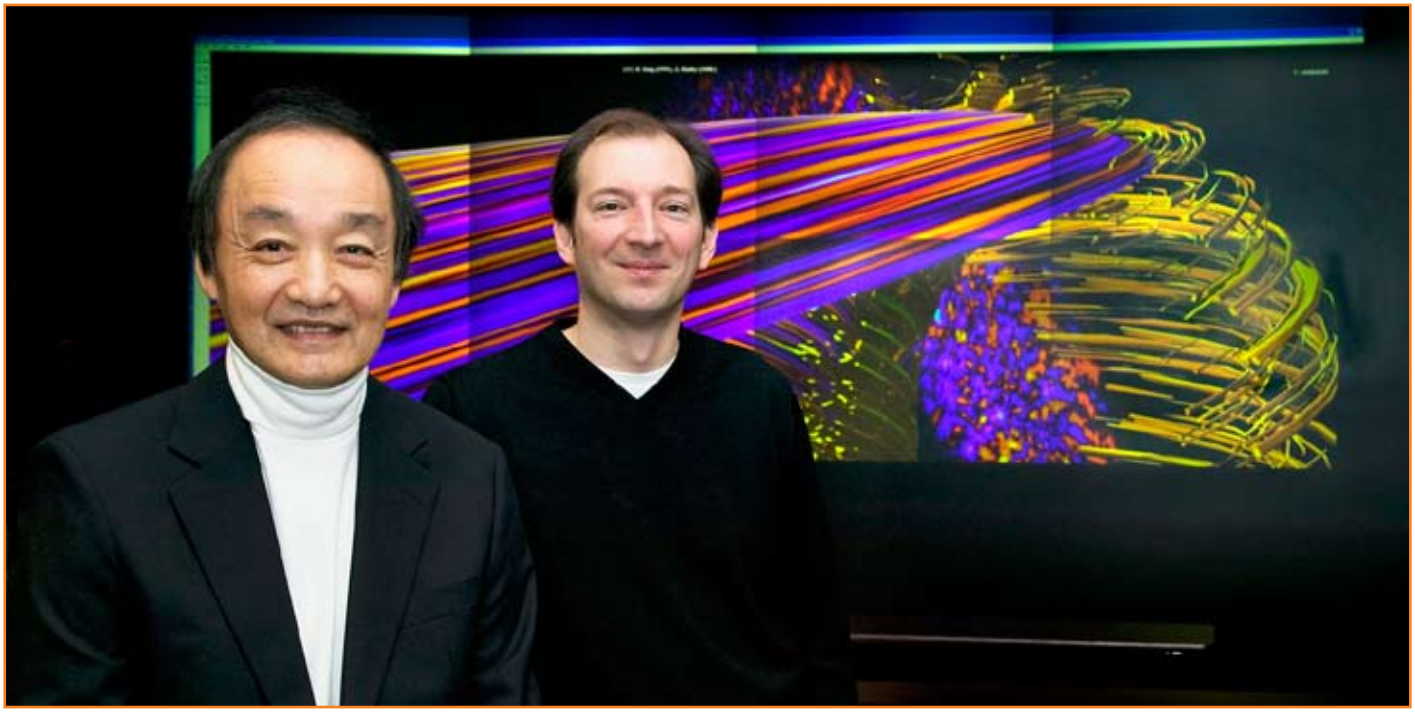
Two Million Hours of Supercomputing Time Awarded



PPPL Chief Scientist Bill Tang (left) and PPPL computational scientist Stephane Ethier are at the Lab's High-Resolution Wall. In the background is a plasma turbulence simulation.

PPPL Chief Scientist William Tang has been awarded two million processor hours on the new IBM Blue Gene/P supercomputer at Argonne National Laboratory in Illinois. He and his close collaborator, Stephane Ethier of the Computational Plasma Physics Group at PPPL, will be using the time for fusion energy related research.

Tang heads one of 55 scientific projects recently awarded a total of 265 million hours by the U.S. Department of Energy's (DOE) Office of Science. Announced January 17, the awards are made through the 2008 Innovative and Novel Computational Impact on Theory and Experiment (INCITE), a DOE program that supports computationally intensive, large-scale research projects.

"The Department of Energy's Office of Science has two of the top ten most powerful supercomputers, and using them through the INCITE program is having a transformational effect on America's scientific and economic competitiveness," DOE Under Secretary for Science Raymond L. Orbach said. "Once considered the domain of only small groups of researchers, supercomputers today are tools for discovery, driving scientific advancement across a wide range of disciplines. We're proud to provide these resources to help researchers advance scientific knowledge and understanding and thereby to provide insight into major scientific and industrial issues."

Tang's project focuses on gaining a better understanding of turbulence as a primary mechanism by which particles and energy diffuse across the confining magnetic field in toroidal fusion systems. Results from these studies may have direct relevance to the future performance of the international fusion experiment called ITER being planned for construction in France. Plasma is a hot, gaseous state of matter used as the fuel to produce fusion energy — the power source of the sun and the stars. This INCITE project will commence within the next month and extend over a year, with expected renewals in the subsequent two years.

Tang said, "My colleagues and I are grateful for the INCITE award and are excited by the opportunity to use the new IBM Blue Gene/P at Argonne National Laboratory to accelerate the pace to fresh scientific insights about the complex nature of turbulence in hot thermonuclear plasmas."

Ethier noted that a research project requiring two million processor hours would take 228 years to complete using a single processor. "With 100,000 processors working in parallel — the final configuration of the Blue Gene/P supercomputer at the Argonne National Laboratory — the same two million processor-hour calculations will take only 20 hours. The real challenge is to orchestrate the work and the communication among these 100,000 processors. If a single processor falls behind, it will slow down the others since they must work in unison. As the number of processors increases, keeping them in sync becomes quite arduous," he said.

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Two Million Hours

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Co-investigators with Tang and Ethier on this INCITE project are Scott Klasky of DOE's Oak Ridge National Laboratory (ORNL) in Tennessee and Mark Adams of Columbia University in New York. Also, Tang said that Hal Finkel, a DOE Computational Science Graduate Fellow (CSGF) from Yale University, will be joining this effort for three months this summer to carry out his CSGF practicum project at PPPL.

In addition to his role at PPPL, Tang is Associate Director for the Princeton Institute for Computational Science and Engineering, which was recently established at Princeton University to stimulate progress in innovative computational science via interdisciplinary alliances involving computer science, applied mathematics, and prominent applications areas in the physical sciences and engineering disciplines. Tang played a prominent leadership role for the DOE's development of its multi-disciplinary program in advanced computational science, SciDAC [Scientific Discovery through Advanced Computing] and chaired the SciDAC 2007 Conference in Denver.

The 2008 INCITE projects were awarded time at DOE's Leadership Computing Facilities at ORNL and Argonne Laboratory, as well as at the National Energy Research Scientific Computing Center (NERSC) at Lawrence Berkeley National Laboratory in California, and the Molecular Science Computing Facility at Pacific Northwest National Laboratory in Washington. Of the 31 new projects and 24 renewal projects selected, eight are from industry, 17 from universities, and 20 from DOE labs as well as other public, private and international researchers. Including Tang's project, Argonne will be hosting 20 INCITE projects this year on the IBM Blue Gene/P supercomputer. To read about all the 2008 INCITE awards, go to the DOE Office of Science home page at: http://www.science.doe.gov. ●

Engineers Make A World of Difference

Engineers use technology, mathematics, and scientific knowledge to solve practical problems.

— Wikipedia

At PPPL, engineers design, build, and operate experimental fusion devices and systems, as well as take care of the Laboratory's infrastructure. This work includes a broad spectrum of engineering talents in the fields of mechanical and electrical engineering, computer systems, and environmental management.

The Lab honored its engineers on February 20 with a pizza luncheon in the LSB Commons, followed by a special colloquium, "Engineering in the Modern World," by Princeton University Professor Michael Littman in the Auditorium. Special thanks to PPPL's Ray Camp and Rose Fuchs for organizing these events for National Engineers Week, celebrated February 17-23. At the luncheon, PPPL Engineering Head Mike Williams, who hosted the celebration, noted that the National Academy of Engineering recently identified 14 Engineering Grand Challenges. "Providing energy from fusion was second on the list," Williams said. Above are many of PPPL's engineers at the pizza party. ●

KSTAR Milestone Marked

Above are U.S. participants in front of KSTAR and, in photo at bottom, are President Roh Moo-hyun of the Republic of Korea (third from right), ITER Director General Kaname Ikeda (second from right) and other dignitaries unveiling the completed KSTAR device.

The world fusion community marked the end of the construction phase of the Korean Superconducting Tokamak Advanced Research (KSTAR) Project in a ceremony in Daejeon, Republic of Korea, last fall. Emphasis now shifts to preparations of the device for first plasma, scheduled for August 2008. The main objective of KSTAR is to demonstrate steady-state operation of a high performance advanced tokamak device. KSTAR is expected to operate through 2025.

The construction milestone ceremony, attended by Republic of Korea President Roh Moo-hyun, ITER Director General Kaname Ikeda, and other dignitaries, followed a two-day workshop on the status of the U.S. KSTAR team's efforts. Under the U.S.-Korea bilateral agreement, collaboration programs have been carried out with joint funding, including the Electron Cyclotron Heating launcher, innovative shutter system, diagnostic cassette design, and control system development. PPPL physicist Hyeon Park (recently retired) represented the Laboratory at the workshop and ceremony. ●

Chatting Up ITER

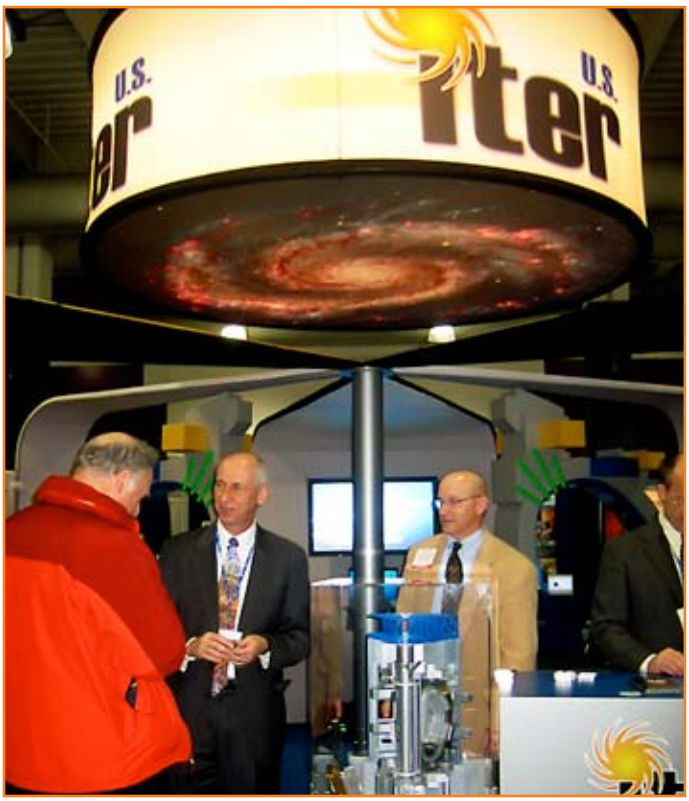

Photo by Carol DeLooper

PPPL External Affairs Head John DeLooper (middle) helped operate the U.S. ITER exhibit February 15 through 17 at the American Association for the Advancement of Science meeting in Boston. At right is Carl Strawbridge, U.S. ITER Deputy Project Manager. ●

PPPL Hosts Middle School Science Bowl

Princeton's Witherspoon School Takes Top Prize

Witherspoon Middle School team members James Schure (green shirt) and David Wright race their model hydrogen fuel cell car at the New Jersey Regional Competition of the National Middle School Science Bowl® at PPPL on April 12. The Witherspoon Middle School team took first place. The U.S. Department of Energy sponsors the regional middle school competition. ●

And the Honors Go To ...

Science Bowl Volunteers Feibush and McGeachen

On a wintry Saturday morning every year, they trade snoozing in and lingering over coffee for simple addition and timekeeping, reading and ruling on complex questions, and welcoming teams.

These are the Lab's Science Bowl volunteers, numbering at least three dozen annually. They include PPPL employees, families, and friends, Princeton University staff and students, and others from local institutions who serve as scorekeepers, timekeepers, judges, moderators, and other helpers.

From left are Science Bowl honorees Eliot Feibush and Tom McGeachen with their plaques.

This year, the Lab recognized two extraordinary volunteers for their Science Bowl efforts — PPPL scientist Eliot Feibush and PPPL engineer Thomas McGeachen. The two received "Outstanding Volunteer" Awards for their continuing efforts during the February 23 opening of the U.S. DOE Regional Science Bowl for high school teams hosted by PPPL. Feibush was noted for developing a clock program for Science Bowl that is computer portable and allows for better viewing, and McGeachen for his many years of service dedicated to the event.

Feibush remembers watching the College Bowl on TV with his father in the late '60s.

"Later, in high school, I moderated a Quiz Bowl between a student team and a faculty team. Naturally I was intrigued by the Science Bowl at PPPL. I've volunteered as a judge during the past four years," he says.

He saw the clock running on some very old Apple computers that were maintained just for the event. "That's when I decided we would benefit from a technology upgrade. The weekend after the 2006 Science Bowl, I wrote a new clock program in Java so it would run on any contemporary laptop," Feibush says. "Then my two Science Education summer interns spent a week adding enhancements based on user feedback from the timekeepers. This year we connected the laptops to projectors so everyone had a better view of the clock."

Feibush called the Science Bowl "very worthwhile." "I am glad to help with it. I continue to be amazed by the students who answer the challenging questions so quickly," he adds.

McGeachen began volunteering as a timekeeper in 1996. "I like the timekeeping chore. It's pretty structured. I've got it down. I use the program Eliot did and also use my wrist watch when time runs out and for the five-second toss-up questions," McGeachen says.

Why does he consistently give up a Saturday morning every year? "It's good for me to encourage younger people to become interested in science and engineering," he says. "And part of the draw is watching the competitions."

This year — the sixteenth for PPPL to host the bowl — 30 teams from 19 area schools participated, with High Tech High School winning first place. And 40 volunteers were here to help with the day. Hats off to all the volunteers! ●

If You Show Them Science *They Will Come*

About 200 area female students, grades 7 through 12, came to PPPL March 14 for the Expand Your Horizons Young Women's Conference in Science, Math and Technology at PPPL.

The conference included talks by various women in the sciences, as well as exhibits and a lunchtime presentation by NASA Goddard Space Flight Center aerospace engineer Aprille Ericsson. In addition to NASA, other presenting and exhibiting organizations were the Fashion Institute of Technology, Bristol-Myers Squibb, the Delaware Valley Innovation Network, the Geophysical Fluid Dynamics Laboratory, Liberty Science Center, Princeton University, and PPPL. PPPL's Chris Ritter, Lena Scimeca, and Tiana Dodson organized the event, with many staff volunteers.

Above, Dodson (far left) talks about science and engineering to a group of young participants.

Below, PPPL environmental scientist Virginia Finley (far right) shows the girls water samples collected from the site. The samples included aquatic invertebrates, which are biological indicators of water quality. ●

Success Marks 24th Year for PPPL's *Science-on-Saturday*

Princeton University Professor Iain D. Couzin delivers a talk, "Collective Motion and Decision-making in Animal Groups," on February 9 as part of PPPL's 2008 Science-on-Saturday lecture series. The series, organized by PPPL's Ronald Hatcher and James Morgan, included nine talks ranging from computation in astrophysics and wound healing to the science and art of population-based health care. Featured on several January through March Saturdays in the Lab's Auditorium, the talks drew hundreds of students, teachers, parents, and community members each time. The series marked its 24th consecutive year with an exciting collaboration with the Liberty Science Center, which offered four of the talks broadcast live from its Interactive Theater in the Jennifer A. Chalsty Center for Science Learning and Teaching. Below, Princeton University Professor Jean Schwarzbauer gives a talk, "Scrapes, Scabs, and Scars — a Wound Healing Saga," on January 26. ●

Spotlight

Name: Alba Castano

Position: Castano is a Radio Frequency (RF) Operator and Technician in PPPL's Experimental Heating Systems Branch, Electrical Engineering Division. She works on RF systems during outages and operates RF sources for NSTX experiments. Castano also edits and revises procedures for RF as needed. In addition, she has supported electronics fabrication and testing efforts, as well as NCSX vacuum vessel coil wiring. Castano received an associate's degree in electronics engineering from DeVry University and worked on RF for another company before joining PPPL's staff in December of 2006.

Quote: "I always liked pulling things apart and putting them back together," says Castano, explaining that as a youngster she was intrigued by how small household appliances were engineered. One time her mother tossed out a radio that had broken and when she returned from work, Castano was listening to it. She had retrieved it from the trash, taken it apart to see what was inside, and fixed it. A week later, the blender broke and her mom told her, "Fix it."

A typical day for Castano at PPPL begins with checking e-mails and then heading to an area of the RF Building nicknamed "The Dungeon," where she and her workmates discuss the work plan for the day over coffee and then tackle projects centered around repairing, testing, and running RF heating components and instruments. Of the force that rules her job, she offers, "I have respect for electricity." Before she came to PPPL, the largest units she built measured a half-inch by two inches and the capacitors were not larger than a grain of rice. "At PPPL everything is so much bigger. When I came here I was like a kid in a candy store," Castano says.

Born in Colombia, Castano moved to the U.S. with her mother and six sisters as a teen. While she enjoyed taking apart and reassembling items, she aspired to join the medical field. "As a kid, I always wanted to be a doctor, but a math teacher convinced me I would be better at engineering," she says. "But I still like blood and guts. I like helping people, basically."

Other Interests: Four years ago, Castano found a way to fulfill her wish of serving in the medical field. She completed 140 hours of Emergency Medical Technician (EMT) training and began volunteering as an EMT in her hometown of North Brunswick. Now she is on call two nights each week — one as the primary responder and the other as a secondary responder — providing services to patients ranging from heart attack victims to expectant mothers.

"One time I delivered a baby. It was the coolest thing — scary — but great," says Castano, herself the mother of two daughters, Paola, 15, and Sandra, 12. Alba was inside the ambulance with the soon-to-be-mom. "I had my gloves on, but the OB kit was not even opened and the baby was right there," she recalled. "First I cleared out the baby's nose and throat and warmed the baby up. I put clamps on the umbilical cord and my partner — who by this time had gotten to the back of the ambulance from the driver's seat — cut the cord. Delivering that baby was definitely the best experience I've ever had as an EMT." She also is an Advance Rescue Technician, responsible for extricating patients from cars, collapsed buildings, and other places a patient can't be removed with conventional methods.

Castano also enjoys travel and camping, often pitching a tent for herself and her daughters at area parks, and has coached her daughters' soccer teams.

Castano says she didn't know much about fusion when she began at PPPL, but immediately fell under its spell. "Every day I learn something new — I don't think I'll ever stop learning here." ●