

# HOTLINE

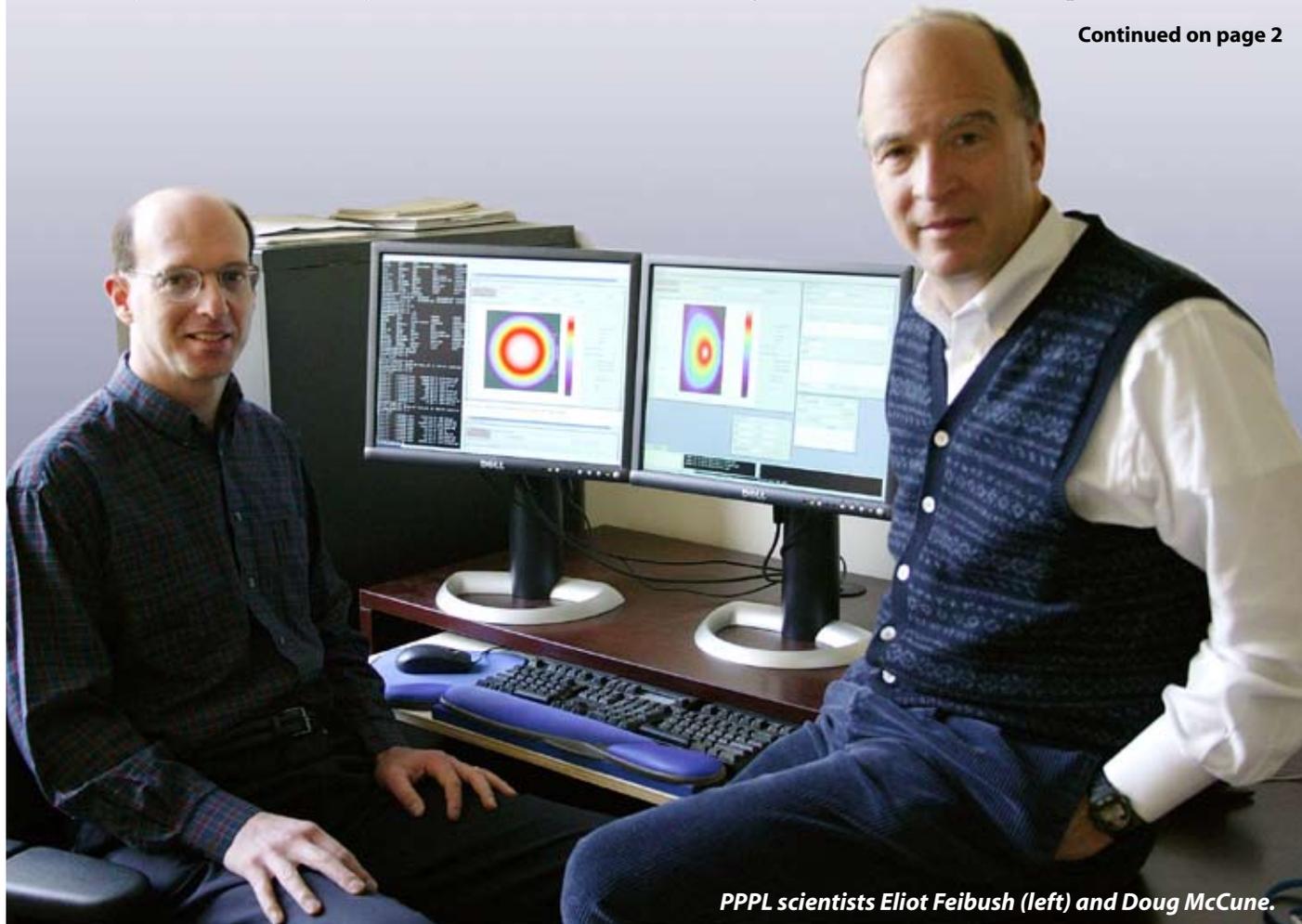
*The Princeton Plasma Physics Laboratory is a United States Department of Energy Facility*

## PPPL Develops Internet-Based Simulation Capabilities

By Anthony R. DeMeo

**T**wo years ago Raffi Nazikian, Deputy Head of PPPL's Off-site Research Department, worried about traffic jams. He wasn't concerned about the kind of bottlenecks that develop along Route 1, but about roadblocks to the accessibility of plasma simulation tools by fusion researchers. He observed that the users of these computer codes were nearly always the software's developers themselves. "To put this problem into context, if the developers of Microsoft Word were the only folks who knew how to use it, there might be no more than 100 people in the world running Word. If you wanted to run it, you would have to be a software engineer," said Nazikian. He expressed his concern

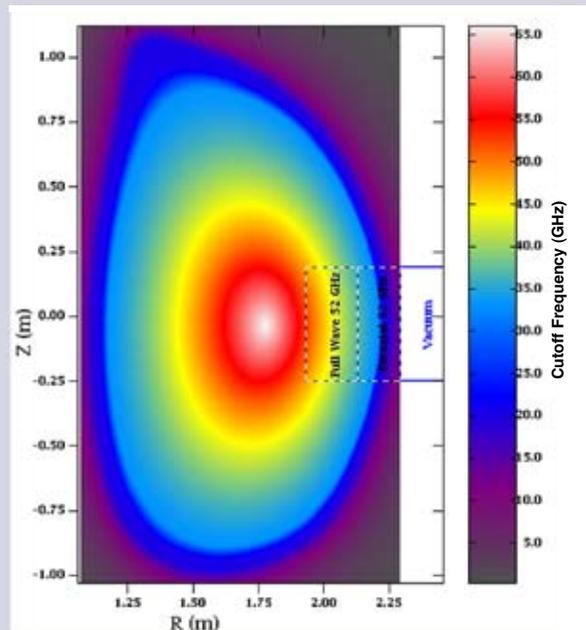
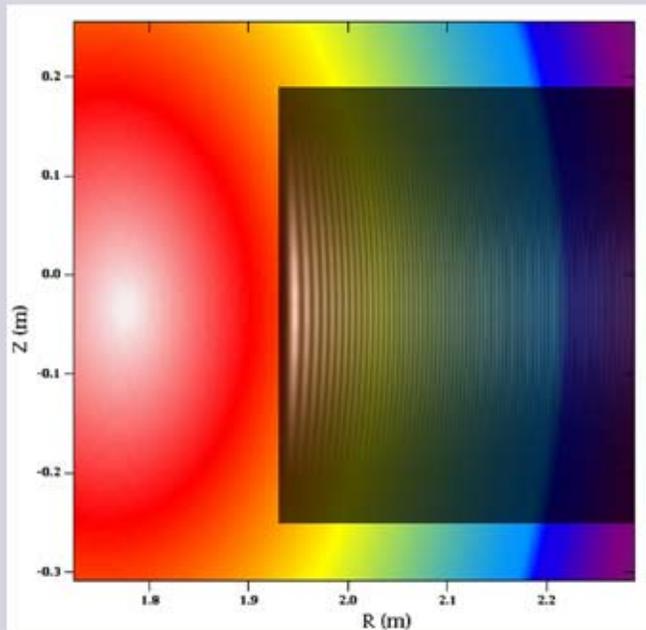
**Continued on page 2**



*PPPL scientists Eliot Feibush (left) and Doug McCune.*

## Simulation

Continued from page 1



*At the right is a graphic depicting a cross-section of a DIII-D plasma. This graphic was created using a reflectometer code developed by Ernie Valeo and uses actual experimental data processed by the TRANSP code. The colors indicate the distance radio-frequency waves of various frequencies will penetrate into the plasma before they are reflected. The color code (right) indicates that higher frequency waves will penetrate further into the plasma. The graphic at the left shows the simulated reflection of a 52-GHz wave within the DIII-D plasma.*

to Doug McCune of PPPL's Computational Plasma Physics Group (CPPG). As a result of this interaction and subsequent efforts of the CPPG and Ernie Valeo of PPPL's Theory Department, an unprecedented improvement in accessibility and use of plasma codes is on the horizon.

Currently, if researchers want to utilize a plasma simulation code such as TRANSP, they usually seek the assistance of a computational specialist with the detailed knowledge required to access and run the program. But the code experts are often overloaded with demand, resulting in a huge backlog. "So we ration the applications of these tools, resulting in major bottlenecks in the interpretation and understanding of experimental data and the planning for future experiments," said Nazikian.

It's not surprising that Nazikian and his associates, who share the world's fusion facilities and software remotely, would be the first to realize this pressing problem. "On a small scale, we are dealing with the very same issues that the broader fusion community is going to have to face on ITER. A very large number of scientists, located around the world, will work remotely on this one facility, conducting a relatively small number of experiments. To do this efficiently, they're going to have to design experiments in excruciating detail before they run them. Consequently, ITER researchers will have to simulate these experiments thoroughly beforehand, so they're going to need easy access and use of simulation codes," Nazikian explains.

Now, innovative work by McCune and fellow computational scientist Eliot Feibush may solve this problem well in advance of ITER by providing plasma physicists with web-based access to powerful computer codes.

## Hotline

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**Photographer:** Elle Starkman    **Layout:** Patti Wieser and Elle Starkman

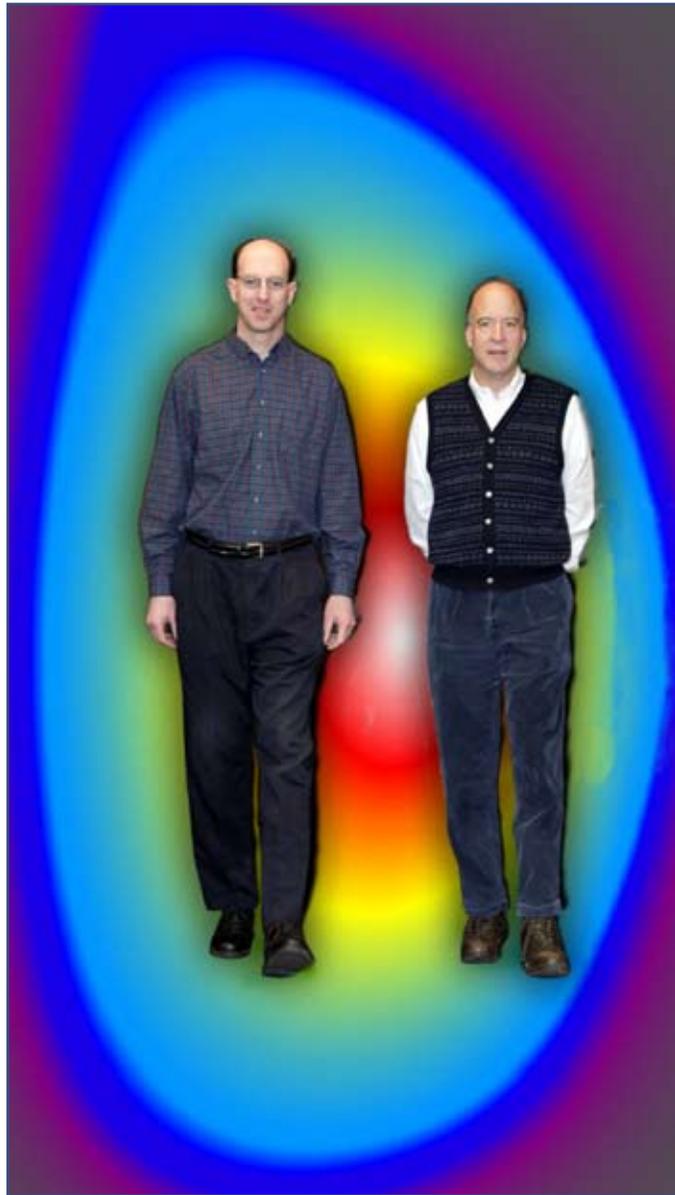
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“Plasma physics has a lot of immensely complicated codes that are labor intensive to move around to different labs. There is considerable engineering cost to get these humongous programs to run correctly on different, incompatible computers. It would be great if folks who are not located at PPPL could use our simulation programs via the web, and if we could access their software, without us all having to download and install the large codes on our individual computers,” notes McCune. The idea is to have physicists who are not necessarily code developers interact with shorter, simpler web-based interfaces that communicate with computer servers at various laboratories.

To this end Eliot Feibush is working on a web-based graphical user interface for the simulation of reflectometer measurements in plasmas. These simulations run codes developed by PPPL’s Gerrit Kramer and Ernie Valeo. PPPL researchers and their collaborators worldwide build and install reflectometers as diagnostic tools that measure plasma turbulence. The reflectometer sends a radio-frequency wave field into the plasma, which is reflected at a specific location. The interference pattern that comes back to the reflectometer is indicative of the turbulence at that location.

### Graphical Interface

Feibush’s graphical interface allows users to access and input real experimental data, including various plasma parameters such as electron density and temperature and magnetic field strength into their simulations, yielding realistic results. Physicists will be able to test specific reflectometer designs before the devices are built, saving time and money. Web access will enable effective collaboration in reflectometry by permitting colleagues at other labs to utilize the advanced simulation capability developed and hosted at PPPL. Users will always have the latest version of the



*A graphic that depicts a cross-section of a DIII-D plasma is shown behind PPPL’s Eliot Feibush (left) and Doug McCune .*

software at their disposal, so they will no longer have to worry about compatibility.

The graphical user interface program under development at PPPL is Java-based. Programs written in this language can run on either PCs or Macs, eliminating the need for distinct versions of software for each platform, such as required for Fortran, C++, and other compiled languages. Furthermore, Java has built-in graphical and user interface components, such as buttons and sliders. It was designed for the Internet and is currently used extensively for selling merchandise on the web.

But scientific applications are much more complicated than accessing an on-line catalog to buy a pair of shoes or clothing. Feibush said, “After setting up the input parameters and starting a run, the interface software monitors a simulation that performs much more computation than typical commerce programs. Visualizations of the results enable the physicists to evaluate the effectiveness of simulated reflectometers. The challenge is to develop quality scientific graphics applications in Java that work over the web with existing physics codes.”

As a result of Feibush’s work, PPPL will soon unveil to the fusion community a robust web-browser-based user interface for the reflectometer code that comes packaged with sophisticated graphics capability. The interface will allow physicists to run simulations of complex, sophisticated experiments effectively without having to learn about the underlying code’s file structures, subroutines, directories, platforms, and naming conventions. “We are now trying to come up with a standard for duplicating this interface tool for any plasma simulation code. We have an idea of how this is going to translate generically to make other codes available to the broad user community. So I think this is the beginning of a major sea change in our way of thinking about computational tools in the fusion community and how we use them,” said Nazikian. ●

# Grad Student Parrish Wins Science Writing Contest

An astonishing view from New Mexico of “pearly stars arranged in a band diagonally crossing the dark night sky,” a gift for writing, and a desire to communicate science to the public led to a first-place science writing prize for PPPL grad student Ian Parrish. Parrish recently received the top honors in the Department of Energy’s Computational Science Graduate Fellowship 2005 Annual Essay Contest for his piece, “Not Enough Milk in the Milky Way.”



*Ian Parrish*

The article is about how today’s physicists are using modern scientific computing to gain insight into what is missing in our understanding of the Milky Way. Parrish writes, “Now that we know where all the stars are in the sky and how big they are, we should have a good understanding of our galaxy — or so we thought.”

(A pdf of the article is available on the web at [www.science.doe.gov/Sub/Newsroom/News\\_Releases/DOE-SC/2006/CSGF/Compose\\_2005.pdf](http://www.science.doe.gov/Sub/Newsroom/News_Releases/DOE-SC/2006/CSGF/Compose_2005.pdf).)

Parrish, a graduate student in Princeton University’s Department of Astrophysical Sciences, Program in Plasma Physics, is working on a Ph.D. with a focus on computational magnetohydrodynamics and space plasmas. He’s also keen on helping the public to understand science.

“I’m interested in science advocacy and in magazine writing,” says Parrish. “It’s important to have people who can understand technical issues communicate these issues to policy makers in a non-technical way.”

Parrish, who has been taking an astrophysics class on galactic dynamics, decided to enter the DOE writing contest since it offered a way to combine two of his primary interests — computational astrophysics and communicating science to the layperson. “Since this field of study [galactic dynamics] is one of those areas where computational physics is very compelling, writing the article was a good way to highlight computational methods,” says Parrish.

He spent time thinking about the article and then about five hours writing it, an occupation he has always liked. “I’ve enjoyed writing since grade school, but as I progressed in science, I had less and less opportunities for technical writing that is accessible to the public. It was good to have that opportunity again through the essay contest.”

The Department of Energy’s Computational Science Graduate Fellowship Program launched the writing competition in 2005 to encourage better communication of the societal value of computational science and engineering to non-expert audiences. The contest, open to current and past Fellows, requires them to write a popular science essay on a topic of personal importance written for a non-science audience. Parrish was among 20 Fellows who participated in the first-time contest.

He received a \$1,000 prize and was honored at a luncheon ceremony in Seattle in November. Parrish says he plans to use the prize award for a trip to Europe, and is as convinced as ever about the necessity of helping non-scientists understand what scientists are doing. “It’s important to communicate science to the general public.” ●



## **Emergency Number Works from Cell Phones**

**D**uring an emergency at the Lab, staff now may call the **3333** Emergency Line from their cell phones, as well as from land-line phones. When calling from a cell phone, you must dial the full number starting with the area code — **(609) 243-3333**. ●

## **Blood Drive**

*Sponsored by the American Red Cross and PPPL*

**Wednesday, March 29**

**8 a.m. to 2 p.m.**

The American Red Cross Van will be parked in front of the LSB Building on the circular driveway. For an appointment, please send an e-mail to [occmed@pppl.gov](mailto:occmed@pppl.gov) or call the Occupational Medicine Office at ext. 3200.

**BLOOD SUPPLY IS CRITICALLY LOW.** For more information please visit the American Red Cross website at: <http://www.pleasegiveblood.org/>

# Third NCSX Modular Coil Winding Form Arrives



The third of 18 modular coil winding forms for the National Compact Stellarator Experiment (NCSX) at PPPL has arrived. Manufactured by Energy Industries of Ohio (EIO), the three-ton component is ready for winding at PPPL's modular coil manufacturing facility.

NCSX, a fusion experiment being constructed at PPPL in partnership with Oak Ridge National Laboratory, is scheduled to begin operation in 2009. Modular coils provide uniquely shaped magnetic fields key to stellarators. The first winding form arrived in October and has been wound. The second arrived in December and is in the process of being wound.

"Manufacturing the NCSX winding forms is a very difficult task. The EIO team has overcome many engineering and management challenges to deliver the first three and we now expect winding forms to start arriving on a more frequent basis, every four to five weeks, until all 18 are delivered," said NCSX Project Head Hutch Neilson. ●

*At left, Doug Voorhees works on the second coil in the NCSX Coil Winding Facility at D-site.*

## Cyber Security Tips

**B**elow are cyber security tips for the PPPL community. If you have specific questions about cyber security, please contact the Help Desk at ext. 2275 or Cyber Security Officer Jim Hirsch at ext. 3388.

### Be Wary of E-mail Attachments

PPPL's e-mail system automatically quarantines zip attachments, but be aware that zip attachments are a common carrier of viruses and worms, and should be treated with extreme caution when received at home via a personal e-mail account. **DO NOT OPEN A ZIP ATTACHMENT** unless you have verified with the sender it is a legitimate file.

- Never open an e-mail attachment from an unknown person.
- Be wary of attachments on e-mails from people who you think you know. E-mail addresses can be "spoofed." Moreover, if the e-mail or the attachment doesn't look right, use caution.
- Even attachments that are Microsoft Word documents, graphics, or Adobe files (.pdf files) are suspect. Call the Help Desk to consult about an attachment if you are concerned.
- If you open an attachment that looks suspicious, call the Help Desk or Cyber Security Officer.

### Don't Insert "Outside" Media Devices in Your PC

This includes but is not limited to floppy disks, data and music CDs, DVDs, thumb drives (flash drives), and memory sticks of unknown or questionable origin.

Be especially suspicious about anything that arrives in the U.S. mail or by other carriers. When in doubt, call your Help Desk or Cyber Security Officer.

If the media device is from a non-PPPL employee or unknown source, don't insert it in your PC or other workstation. Call your Help Desk for assistance if you think you need data on the device for your work.

### Don't Tell Anyone Your Password

Never tell anyone your password. This includes other employees and individuals from the Help Desk. **Help Desk or other support staff should never ask for your password.**

- Passwords should never be shared among employees.
- Never write down your password.
- If your password is revealed to any other person, for any reason, change your password as soon as possible. To change your password visit <https://password.pppl.gov/> ●

# PPPL Hosts Regional Science Bowl

Thirty-two high school teams from 21 area schools came to PPPL on February 25 to compete in the New Jersey and Eastern Pennsylvania Regional Competition of the National Science Bowl®. This is the fourteenth year the Lab has hosted the Jeopardy-like tournament in which all the categories were disciplines of science. Competing teams were quizzed on biology, chemistry, physics, astronomy, earth science, general science, and mathematics.

For the third consecutive year, a team from East Brunswick High School won first place at the competition. Bergen County Academies received the second-place prize, Millburn High School, Team A, took home the third-place prize, and West Windsor-Plainsboro High School North, Team A, placed fourth.

James Morgan, PPPL Science Bowl Coordinator, said, "Science Bowl offers a wonderful opportunity to students, scientists, and volunteers to interact with one another. It also encourages students to continue their science and math education in a friendly, competitive manner."

PPPL hosts one of 65 regional competitions, all of which are sponsored by the U.S. Department of Energy. The top winners of the regional competitions receive all-expense paid trips to the National Science Bowl® this spring in Washington, D.C. ●



*A team from West Windsor-Plainsboro High School North participate in the bowl.*

## Thank You, Science Bowl Volunteers!

Kristin Baumgartner, Bristol-Myers Squibb  
 Steve Baumgartner, PPPL  
 Bill Blanchard, PPPL  
 Josh Breslau, PPPL  
 Bill Davis, PPPL  
 Michael Del Corso, Merck & Co., Inc.  
 John DeLooper, PPPL  
 Seth Dorfman, Princeton University  
 Eliot Feibush, PPPL  
 Abe Fetterman, Princeton University  
 Stefan Gerhardt, PPPL  
 Terry Greenberg, PPPL  
 Rich Hawryluk, PPPL  
 Bob Herskowitz, PPPL  
 Felix Huang, Princeton University  
 Dave Johnson, PPPL  
 Josh Kallman, Princeton University  
 Margaret King, PPPL  
 Paul LaMarche, Princeton University  
 Daniel Lundberg, Princeton University  
 Tom McGeachen, PPPL  
 Brandee Murphy  
 Cynthia Murphy, PPPL  
 Joie Murphy

Jeremy Olson, Princeton University  
 Nickki Parlet, Bristol-Myers Squibb  
 Carolyn Pommier, Bristol-Myers Squibb  
 Austin Roach, Princeton University  
 Angela Ross, Sarnoff Corporation  
 Patrick Ross, Princeton University  
 Barbara Sarfaty, PPPL  
 Barbara Sobel, PPPL  
 Tony Sties  
 Dana Stotler  
 Daren Stotler, PPPL  
 Patti Wieser, PPPL  
 Kyron Williams, PPPL  
 Randy Wilson, PPPL  
 Irving Zatz, PPPL



*PPPL Science Bowl Coordinator James Morgan chats with New Providence High School student Jash Bansal, who competed in this year's bowl.*

*PPPL honored three longtime Science Bowl volunteers for their special efforts and dedication. At right, the honorees (from left) are Barbara Sarfaty, Irving Zatz, and Michael Del Corso. They each received a plaque with the citation, "For outstanding commitment to increasing educational excellence in your community through volunteering for the annual New Jersey Regional Science Bowl." Congratulations, Barbara, Irving, and Michael!*



# PPPL and Japanese Institute Sign Agreement

On March 3, Professor Osamu Motojima, Director General of the National Institute for Fusion Science (NIFS) in Japan, led a Japanese delegation on a visit to PPPL. During the visit, an agreement on scientific exchange and cooperation between NIFS and PPPL was signed by Director General Motojima and PPPL Director Rob Goldston.

The day also included scientific talks by PPPL and NIFS scientists and leaders, and a tour of the Laboratory. ●



*PPPL Director Rob Goldston and National Institute for Fusion Science (NIFS) Director General Osamu Motojima sign a collaborative agreement between their two institutions.*



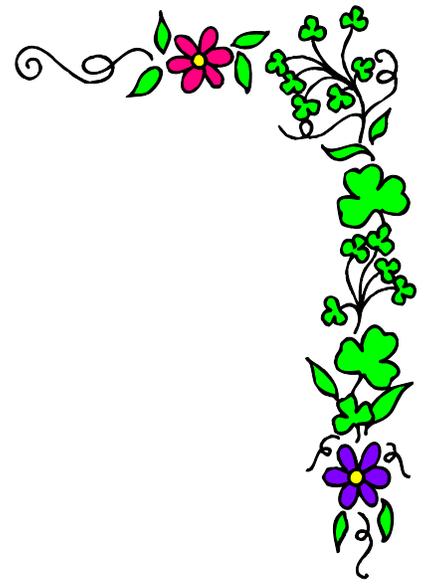
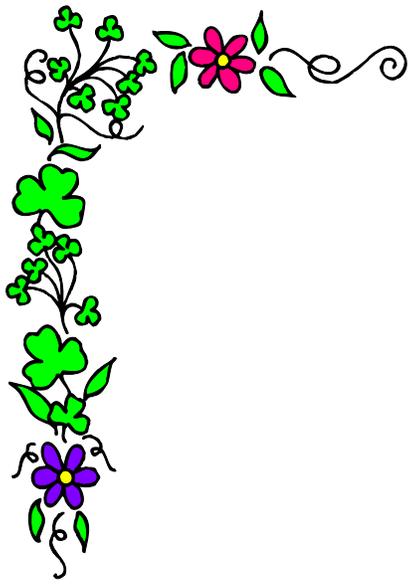
*PPPL's Masa Ono (far left) leads the NIFS group on a tour of the National Spherical Torus Experiment Control Room. Ono is assisted by Rajesh Maingi (seated).*



*PPPL and NIFS representatives watch the agreement signing in the Director's Conference Room.*

## Middle School Science Bowl Volunteers Needed April 1

About 30 volunteers are needed for the Middle School Science Bowl on Saturday, April 1, at PPPL. Volunteers are needed from 8:30 a.m. to 3 p.m. If you are interested in serving as a judge, timekeeper, moderator, scorekeeper, or hydrogen car race timer, please send an e-mail to James Morgan at [jmorgan@pppl.gov](mailto:jmorgan@pppl.gov). No experience necessary! ●



# HAPPY ST. PATRICK'S DAY

