DOE Princeton Plasma Physics Laboratory Vol. 23, No. 10 • August 12, 2002

HOTLINE

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

Fusion Researchers Congregate at Snowmass

A group of scientists at the Snowmass 2002 Fusion Energy Sciences Summer Study in July at Snowmass Village, Colorado.

More than 280 fusion researchers, including at least 30 non-U.S. participants, concluded a two-week Fusion Summer Study in Snowmass, Colorado, on July 19. The gathering provided a forum for the critical assessment of major next steps in the U.S. fusion energy sciences program, with the aim of providing crucial community input to the long-range planning activities undertaken by the U.S. Department of Energy and its Fusion Energy Sciences Advisory Committee (FESAC).

A primary focus of the meeting was to review three proposed magnetic fusion burning plasma experiments — Ignitor, the Fusion Ignition Research Experiment (FIRE), and the International Thermonuclear Experimental Reactor (ITER) — and to review progress and plans in the area of inertial fusion energy.

For magnetic fusion energy (MFE), the forum concluded that the study of burning plasmas, in which self-heating from fusion reactions dominates plasma behavior, is at the frontier of magnetic fusion energy science. The next major step in magnetic fusion research should be a burning plasma program, which is essential to the science focus and energy goal of fusion research.

The three experiments proposed to achieve burning plasma operation range from compact, high field, copper-magnet devices to a power-plant-scale superconducting-magnet device. These approaches address a spectrum of both physics and fusion technology, and vary widely in overall mission, schedule, and cost.

Ignitor, FIRE and ITER would enable studies of the physics of burning plasma, advance fusion technology, and contribute to the development of fusion energy. The contributions of the three approaches would differ considerably. Ignitor offers an opportunity for the early study of non-stationary burning plasmas aiming at ignition. FIRE offers an opportunity for the study of burning plasma physics in conventional and advanced tokamak configurations under quasi-stationary conditions and would contribute to plasma technology. ITER offers an opportunity for the study of burning plasma physics in conventional and advanced tokamak configurations for long durations with steady state as the ultimate goal, and would contribute to the development and integration of plasma and fusion technology.

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There are no outstanding engineering-feasibility issues to prevent the successful design and fabrication of any of the three options. However, the three approaches are at different levels of design and R&D. There is confidence that ITER and FIRE will achieve burning plasma performance in high-confinement mode based on an extensive experimental database. Ignitor would achieve similar performance if it either obtains H-mode confinement or an enhancement over the standard tokamak low-confinement mode. However, the likelihood of achieving these enhancements remains an unresolved issue between the assessors and the Ignitor team.

The development path to realize fusion power as a practical energy source includes four major scientific elements:

1) Fundamental understanding of the underlying science and technology, and optimization of magnetic configurations.
2) Plasma physics research in a burning plasma experiment.
3) High performance, steady-state operation.
4) Development of low-activation materials and fusion technologies.

A strong base science and technology program is needed to advance essential fusion science and technology and to participate effectively in, and to benefit from, the burning plasma effort. In particular, the development path for innovative confinement configurations would benefit from research on a tokamak-based burning plasma experiment.

Further details are posted on the 2002 Fusion Summer Study web site (http://web.gat.com/snowmass/) or may be requested from G. Navratil by sending an e-mail to navratil@columbia.edu.

The magnetic fusion energy conclusions will be reviewed by a panel of the FESAC during an August meeting and by the full FESAC in September.

For inertial fusion energy, the forum concluded:

1) The National Ignition Facility (NIF) is expected to produce a burning inertial fusion plasma. The National Nuclear Security Administration is currently building the National Ignition Facility.
2) Laser systems for inertial fusion energy have made impressive progress in efficiency, pulse rate, and lifetime. Krypton-fluoride (KrF) lasers require further improvement in lifetime, and solid-state lasers require improvement in the cost of major components.
3) The heavy ion fusion program has made excellent progress in basic beam science. Several new science experiments have recently begun operations. Integrated experiments at moderate beam energy and current, including focusing intense beams in the chamber environment, remain the important technical issues.
4) There has been impressive progress in z-pinch targets and good progress in conceptual power plant designs. Producing economical recyclable transmission lines at low cost remains the most important issue.
5) Chamber technology and target fabrication and injection are being placed on a sound scientific basis. For example, experiments on dry-wall damage limits are underway. Scaled hydraulics experiments have identified nozzle designs that can create all liquid jet configurations required for thick liquid chambers, and a target injection experiment is under construction. For heavy-ion fusion there is now a chamber design where the final focus magnets and chamber structures have predicted lifetimes exceeding 30 years.
6) There is broad international interest in fast ignition. If fast ignition is successful, it will produce higher energy gains than conventional targets. So far the target experiments have been encouraging, particularly the recent Japanese results. Fast ignition power production is at a rudimentary level for all drivers. An integrated research plan is required.

Additional details are posted on the 2002 Fusion Summer Study web site (http://web.gat.com/snowmass/) or may be requested via e-mail to ROBangerter@lbl.gov.●

Hotline

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The HOTLINE is issued by the Princeton Plasma Physics Laboratory, a research facility supported by the United States Department of Energy. It is primarily an internal publication. Correspondence and requests to reprint material should be directed to the Editor, PPPL HOTLINE, P.O. Box 451, Princeton, NJ 08543; Interoffice correspondence should be addressed to MS-38, LSB Bldg., C-Site; fax 609-243-2751; telephone 609-243-2757; e-mail pwieser@pppl.gov.

Born to be Wild ...PPPL Bikers Take a Spin

A loop around Stellarator Road may be a good way to relieve stress and improve health.

That's why the Lab supported Bike-Time, an on-site employee bicycle ride program that promotes employee wellness. From April through July, about 40 PPPL employees participated in one or more of the 12 sessions.

The once-a-week lunchtime bicycle rides, guided by Bike-Time creator Tom Flaherty, included about 10 PPPL'ers in each session. Rides lasted about 50 minutes, covered at least 6.5 miles, and began with a full body stretch, as well as bicycle operation and safety information.

"I enjoyed it. It was a very convenient way to get a little bit of exercise and enjoy the outdoors during the lunch hour," said PPPL mechanical engineer Mike Kalish.

Added PPPL Tech Transfer Head Lewis Meixler, "I thought it was great. I looked forward to getting out at lunch time and riding because I really enjoy biking. I hope Bike-Time is offered again in the fall."

PPPL's Regina Worthy, who coordinated the activity at the Lab, said the routes varied. One jaunt began at Stellarator Road and encompassed the Princeton Landing development and a return trip via Campus Road.

"It gave me a newfound respect for bikers," noted Worthy. The group always took a spin around the PPPL site, as well as ventured into the Plainsboro area, including through the woods path to College Road. Flaherty talked to each rider along the way, offering encouragement, said Worthy.

The Lab paid for Bike-Time; staff could participate at no cost.

Bike-Time provided helmets, water and bottles, and the correct-sized bike — a cross between a 10-speed and a mountain bike. Each week, Flaherty posted sign-up sheets in the Lobby for the next session.

Riders met in the upper lot, where Flaherty had the bikes and equipment all set up. "It's a wonderful idea. Possibly we will do more sessions in the fall or spring," said Worthy, noting that the activity encourages a healthy lifestyle. ●

At left, Dianne Nunes gets ready for a ride. Above, top, PPPL'ers participate in Bike-Time. Below, Bike-Time creator Tom Flaherty sets up the equipment for a bicycling session at the Lab.

ATM Installed

PPPL's Rosemarie Fuchs-Smith makes a transaction at the new ATM at PPPL.

The Princeton University Federal Credit Union recently installed an Automatic Teller Machine (ATM) at PPPL. Located off the Lyman Spitzer Building Lobby on the first floor across from the ESU communications desk, it is available to everyone at or visiting the Laboratory. This ATM will accept all ATM/debit cards from any financial institution. Best of all, the Credit Union will charge no fees associated with its usage. However, your banking institution may charge a fee to use the machine.

Great Convenience

Said PPPL's Steve Iverson, "On behalf of everyone at the Laboratory, I have extended our deep appreciation to the Credit Union Board of Directors, which generously purchased this machine for use at our facility. We believe it will be a great convenience for PPPL staff."

Any questions may be directed to Iverson at ext. 2007 or Gary Kater at ext. 2683. ●

Female Students Take in a Day of Science at PPPL

On July 9, twenty-one female students participating in Rutgers University's Douglass Science Institute came to PPPL for a day of science. Alex Ilic took the young women on a tour of the National Spherical Torus Experiment and Virginia Finley and Jennifer Mkwayaya discussed PPPL's environmental efforts. The visitors also had an opportunity to hear about careers at PPPL from various members of the staff, including Martha Redi, Phyllis Roney and Regina Worthy.

In addition, students participated in hands-on physics activities in the new Science Education Laboratory. The Douglass Science Institute offers pre-college women, who are interested in science and engineering, a chance to explore scientific research in a collegiate setting and learn the skills needed to be successful female scientists. The PPPL visit was coordinated by the Lab's Science Education Program staff. ●

PPPL's Virginia Finley (left) gives a presentation about the Lab's environmental efforts to a group from the Rutgers University Douglass Science Institute.

Thank You

Your kindness and sympathy are more deeply appreciated than any word of thanks can ever express.

Thank you all for your support during our time of sorrow. Paul was special to so many people, and your prayers are a comfort to us.

— The Family of Paul Kivler

Paul Kivler died in July. He had retired last May after 19 years at PPPL. He is survived by his wife, Joan, daughter, Kathleen, son, Michael, grandchildren, brothers and sisters.