



# HOTLINE

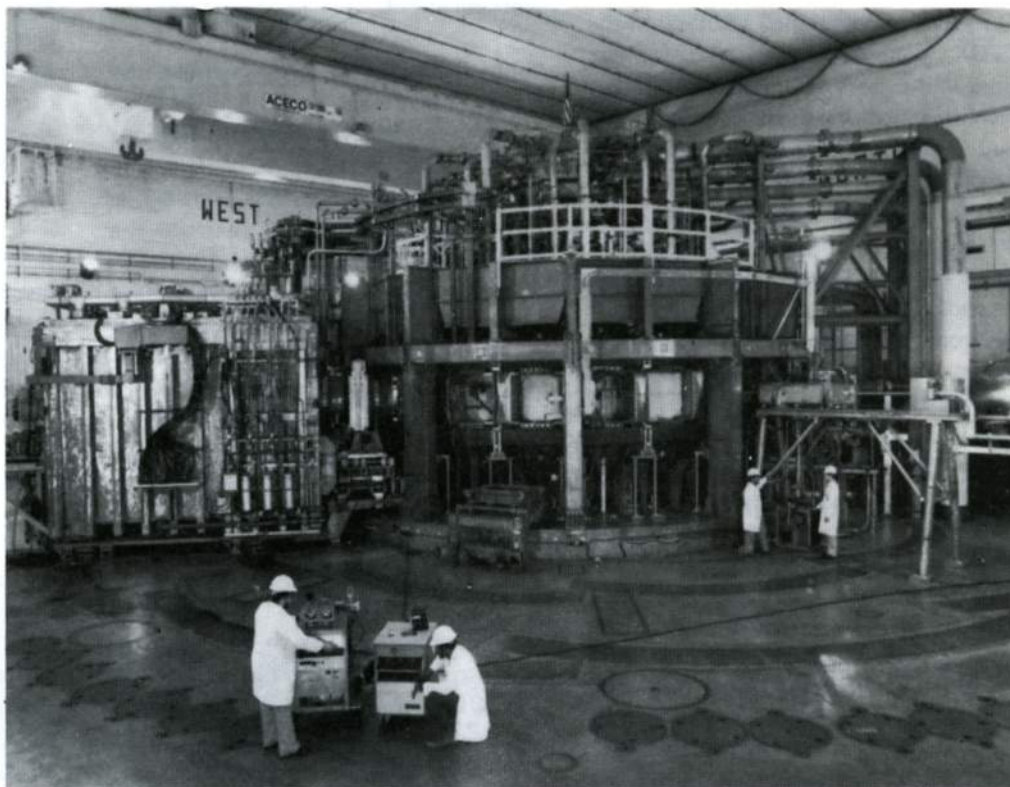
PRINCETON PLASMA PHYSICS LABORATORY

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## TFTR UPDATE

*TFTR, January, 1984.*



If the Guinness Book of World Records authors kept tabs on the fusion community, progress in large tokamak programs would be giving them fits. Recent experimental runs on TFTR yielded energy confinement times of 0.3 seconds, approximately 50% higher than the previous tokamak record that was set by TFTR last year.

The present energy confinement mark was set with a 1-MA plasma current, a plasma temperature of 18 million degrees C, and a plasma density of approximately  $2.7 \times 10^{13} \text{ cm}^{-3}$ . The result suggests that confinement increases as the cube of the plasma size, a more rapid increase than had been expected. Such a scaling law would enhance confidence that TFTR will be able to

achieve its scientific feasibility goal, and that even larger tokamaks will have the confinement required for self-sustained fusion.

The recent experimental run concentrated on studies of how the TFTR plasma confinement time varied with plasma density, plasma current, minor radius, and major radius. An essential part of these experiments was the installation and operation of new plasma diagnostics. In particular, the Thomson scattering system was put into operation by Dirck Dimock, Dave Johnson, Boris Grek, and others in the Laser Group.

Thus far, TFTR plasmas have been ohmically heated by currents of up to

1.5 million amperes for one second. When the first of TFTR's neutral beams begins operation in early summer of this year, plasma temperatures should start their climb toward the 100 million degree C level required for a fusion reactor. Additional beams will be installed next year, in preparation for TFTR scientific break-even experiments in 1986. Those experiments will involve burning deuterium and tritium, producing a fusion power of about 30 million watts for one-half second.

No sooner had TFTR personnel announced their results than JET (Joint European Torus) announced confinement times in the same region (about 300 ms).

# TFCX

PPL has been named lead laboratory for preconceptual design studies on the Tokamak Fusion Core Experiment (TFCX), the device expected to provide the link between TFTR and a demonstration power-producing tokamak fusion reactor.

The DOE commissioned studies into the TFCX concept after the Magnetic Fusion Advisory Committee (MFAC) recommended that an ignited, long-pulse equilibrium burn reactor be built. TFCX will burn deuterium and tritium in its D-shaped vacuum vessel for periods of up to five minutes, compared to TFTR burn times of one-half to one second. Due to the vast number of neutrons thus released, TFCX will have to have virtually total remote maintenance systems.

While the size and shape of certain TFCX components have yet to be established, the overall machine should be about 50% larger than TFTR. TFCX may incorporate superconductors into its coil system, particularly in the poloidal field coils. Three types of toroidal field coils are being considered: all copper coils, all superconducting coils, or a design incorporating both. Selection of the preferred option is a major decision to be made this summer.

PPL has been appointed to manage the TFCX effort, which is not yet an official DOE construction project. About \$7 million has been allocated for the TFCX preconceptual design in FY84; another \$13 million will be required to continue conceptual design in FY85. If Congressional funding is approved for FY86, TFCX would achieve first plasma in late 1992 following a seven-year final design and construction period. The cost of TFCX will depend on the options chosen, but rough estimates for construction are \$800 million in 1983 dollars.

Although Princeton is serving as headquarters for planning, the TFCX design is a national effort. Laboratories partici-

pating in major subsystem design include Argonne National Laboratory, the Massachusetts Institute of Technology, Oak Ridge National Laboratory, Idaho National Engineering Laboratory, Los Alamos National Laboratory, and the DOE Fusion Engineering Design Center in Oak Ridge. A total of about 60 people are presently working fulltime on the TFCX design, including about 25 working at PPL.

John Schmidt of PPL manages the TFCX design team, presiding over three offices (which will become divisions once TFCX becomes a construction project). These include the Engineering Office, headed by George Sheffield; the Physics Office, headed by John Schmidt; and the Resource Management Office, headed by Milt Machalek. The Engineering Office is responsible for the preconceptual design and the narrowing of machine options into a baseline design. The Physics Office supports Engineering by providing the physics parameters to be adhered to. Budgets, schedules, procurement, and administration are the responsibility of Resource Management. Although many of the TFCX personnel at PPL presently reside in 1-P, the laboratory plans to establish 1-0 as the TFCX headquarters, and will relocate the remainder of TFCX staff to the 1-0/1-P complex early in 1984.

Industrial involvement in TFCX will begin by mid-1984. In July, PPL expects to bring in three industrial design teams to produce a conceptual design for TFCX. After the conceptual design is complete, industrial bidding will again be conducted to select a single subcontractor for TFCX. The subcontractor will be expected to handle final design, fabrication, installation, assembly, testing, commissioning and operational support of the TFCX facility.

Although site selection for TFCX is at least one year away, PPL is considered a prime candidate for the TFCX site. The TFTR buildings and facilities could be used to support the new machine, and elements of the TFTR project (which will have achieved its Q=1 mission as

TFCX construction begins) could make a smooth transition to TFCX. The use of the TFTR site for TFCX would represent a savings of about \$300 million over new construction.

If TFCX is constructed with copper coils, the 500 to 600 MW of power required cannot be supplied with conventional motor generator sets. However, PPL is located less than ten miles from one of the "stiffest" electrical points on the East Coast power grid and the power company already owns the right-of-way from this point to the laboratory. There are few fusion laboratory sites in the U.S. with such attractive power sources.

If TFCX is built at Princeton, the TFTR test cell would be used as a TFCX remote maintenance hot cell. TFCX, which will be substantially larger than TFTR, would require its own test cell to be built adjacent to the TFTR test cell.

A TFCX Technical Advisory Committee has been formed to evaluate the physics and engineering basis of TFCX. The committee, chaired by Paul Rutherford, reports to PPL Director Harold Furth and consists of representatives from national fusion laboratories and other fusion-related groups. The 15-member panel meets quarterly and is expected to remain active at least through TFCX conceptual design, which should be complete by late 1985.

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## BENEFITS

With the advent of the University's new benefit plan several procedures will change. Processing of claims no longer requires authorization from the Personnel Office. Aetna insurance forms for medical claims processing are now available at C-site in the reception area of the LOB and at B-site in the Sayre Hall reception area.

If you have any questions, you may call Aetna collect at (215) 371-6128, Eleanor Schmitt, ext. 2046, or Mary Moore ext. 2043.



## BRUSHING UP



*Math "whiz kids" (left to right) Andrew Baird, Miguel Martinez, teacher Ernst de Haas, Jake Gavruskenko, Halsey Allen (presenting certificate) Roy Jensen, Carol Phillips, and Glenn Northey.*

Several PPL staff members recently received certificates after successfully completing a course in basic mathematics. The course was taught by Dr. Ernst de Haas in an effort to sharpen the skills that form a base for much of the work carried out at the laboratory. Scheduled to be repeated later this winter, the course ran two hours per week for 12 weeks.

Courses in basic mathematics and physics are being held as a cooperative effort between the laboratory and the employee. Typically, the employee puts in one hour of his own time. The only expense to the employee is for the purchase of the textbook.

Interested personnel should obtain permission from their supervisor and call ext. 2290 to sign up.

## CONSUMER ENERGY AWARENESS

People are becoming more and more energy conscious in their homes. Adding insulation, solar panels or rooms, and wood-burning stoves are just a few of the energy-saving investments that many families are making for the future. Homeowners must beware, however, of any adverse effects that may occur as a result of their improvement effort.

Underwriters Laboratories, Inc. has recently issued a warning that adding thermal insulation to a household electric water heater could be unsafe. Incorrectly installed insulation might damage the heater's wiring system and increase fire and electrical risks.

Electric water heaters usually have their own thermal insulation between the water tank and the outer shell. If additional insulation is incorrectly added, temperatures on the heater's electrical components could become excessive,

and that could increase the risk of damage to the electrical wiring system. Consumers who want to add extra insulation should be sure that it's kept away from heater controls, access covers over the controls, and the connection box where the heater is hooked up to the house wiring.

Incorporating energy conservation measures in your home is commendable, but be careful not to "undo" the good you are trying to achieve by overlooking a potential safety hazard.

## STAFF NOTES



Dr. H. Fredrick Dylla has been elected to serve as Chairman of the Fusion Technology Division of the American Vacuum Society. Dr. Joseph Cecchi has been elected to serve on its Executive Committee. The Fusion Technology Division has approximately 500 scientists working in the aspects of fusion

research that involve vacuum science and technology.

"Atomic and Molecular Physics of Controlled Thermonuclear Fusion" co-edited by Dr. Douglass Post, has been published by Plenum Press in cooperation with the NATO Scientific Affairs Division.

Drs. Patrick Colestock and Douglass Post have been selected to serve as U.S. delegates to the International Tokamak Reactor (INTOR) workshop and design effort. A total of eight scientists from the U.S. will participate in the two year study organized by the IAEA. INTOR was established in 1979 to define the basis for credibility of the tokamak design. Drs. Paul Rutherford and John Schmidt (both of PPL) have served as delegates in the past.

If you or a colleague have recently received an award or appointment, HOTLINE would like to know. Please forward appropriate items to HOTLINE, C-Site, Module II.



## SPOTLIGHT ON THE PPL DISPENSARY

*Dispensary team includes (left to right)  
Jane McCormick, Dr. John Tobin, Faith  
Robak, and Beverly Leider.*

The next best thing to Mom and chicken soup when you're feeling under the weather just may be the PPL Dispensary, located at A-site in the SW corner of Bldg. 1-0. The unit is headed by Dr. John S. Tobin who is assisted by occupational health nurses Faith Robak and Jane McCormick, and medical secretary Beverly Leider.

The team offers two types of services. Preventive services include physical examinations and monitoring procedures such as hearing tests. Treatment services are available for most occupational illnesses and accidents. When major repair work is required, employees are referred to consultants.

Currently, the dispensary has a testing room, an examination room, and a treatment room, along with three offices for staff. The testing room is equipped with an audiometer to test employees hearing; an electrocardiograph for testing the heart; and a pulmonary testing device to check breathing capacity.

The dispensary can also help employees with chronic problems by administering allergy shots and blood pressure checks on a routine basis. "We will be happy to provide an employee with a copy of his record for his personal physician's use," emphasized Dr. Tobin.

A rehabilitation program for alcoholics has recently been approved. Employees who think they may have a drinking problem can obtain confidential counseling at the dispensary. Supervisors who identify faulty work performance in an employee may also refer him or her to the dispensary. All treatment and counseling records are kept in strict confidence and not released to anyone without the employee's permission.

The dispensary sees all newly hired personnel for a general checkup. Each person fills out a questionnaire noting any past or present health problem. The type of examination depends on the nature of each person's work. For

example, a person who would be working with lasers would have his eyes examined and vision tested at the time of hire and periodically thereafter.

The dispensary exists to help anyone who comes there with a medical problem or injury, but is not designed to replace your family doctor. The Emergency Services Unit responds to employees who cannot get to the dispensary due to the severity of their problem. If the problem is serious or extensive enough that the dispensary cannot provide total treatment, the ESU will take the employee to Princeton Medical Center. It should be noted, however, that it is laboratory policy that ALL occupational injuries *must* be reported, even if the employee does not require treatment at the time of the injury. It is the employee's responsibility to notify his supervisor.

The next time you're feeling badly, don't call Mom. Call the dispensary at ext. 3200. It is here to help you.

## VOLUNTEERS: PEOPLE PEOPLE

Why not list volunteering as one of your New Year's resolutions? The theme for the Voluntary Action Center (VAC) in 1984 is "Volunteer, lend a hand." VAC is a United Way Agency that acts as a clearinghouse, matching individuals and groups to community needs.

*The following opportunity has been supplied by the Middlesex County VAC. For further information call VAC (201) 249-8910.*

A newly formed group has been established. The Volunteers Action Center - Singles Aiding the Community (VAC-SAC) brings together unmarried adults for volunteer activities. Group projects include providing services for the elderly, the handicapped, children, and others in genuine need. Members spend some of their free time in useful activities, while enjoying themselves with other singles.

*The five volunteer opportunities that follow have been supplied by the VAC of Morris County. Further information is available at (201) 538-7200.*

Newly arrived refugees need help finding their way through the maze of the American supermarket. Why not consider sharing your bargain-finding know-how by inviting one to accompany you on your weekly shopping excursion?

VAC is desperately seeking teachers who can instruct in English as a second language. Your assistance in helping our new neighbors assimilate to America would be deeply appreciated.

Put your graphic artist's skills to work. A public relations group needs someone to illustrate with pen and ink drawings. Some training is required, but the work can be done in your own home.

VAC needs volunteers to work one-on-one with men, women, and youngsters who have had a brush with the law. A training course is offered to participants. It only takes 3 or 4 hours a week to befriend an individual.

There are many 8-to-13-year-old boys who also need a friend. Open your heart and give one of them the opportunity to learn what friendship really means.

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## LOCKERS

Additional lockers have been placed in the first floor hallway connecting the RF Building to the shop area.

These lockers may be used for weekly storage of athletic equipment on a first-come, first-served basis. Overnight locks are allowed and sharing is encouraged.

The lockers will be cleaned each Friday afternoon after 2 p.m., and any articles remaining in the lockers at that time will be deposited in Room 127, Module I.

## TRANSITIONS

Born - to Valerie and Andrew Vanisko, both of PPL, a baby girl, Heather, on November 16; and to Jean and Gerry Satkofsky, also of PPL, a girl, Laura, on November 23. Congratulations!

Born - to Karen Tuttle-Frank (PPL), a daughter, Sara, on November 30; and to Tom Fratticcioli (PPL) and his wife, a son, Nicolas, January 6. Congratulations!

Married - Suzen Bayer and Larry Owen, both of PPL, on February 14; and Lee Benson (PPL) and Beth Dallenbach, on November 19. Best Wishes.

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## NEW ADDRESS

Charles Daughney, a physicist who worked with the PPL Spectroscopy and Laser Groups, would appreciate hearing from his former co-workers. His new address is:

200 Woodbury Avenue  
Ottawa, Ontario  
Canada K1J 743

Charlie is now working in the Canadian fusion program.

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*The PPL Hotline is issued by the Princeton University Plasma Physics Laboratory, a research facility supported by the U. S. Department of Energy. Correspondence should be directed to PPL Information Services, Module 2, C-Site, James Forrestal Campus, ext. 2754.*

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## TOUR GUIDES



There was no "fall" in the number of tourists during the fall months. Sixty-nine tour guides led 1,078 visitors through the halls of PPL. Many thanks to our hearty leaders!

### OCTOBER

Suzen Bayer  
Stefano Bernabei  
Fred Boody  
Charlie Bushnell  
Sam Cohen  
Ernst de Haas  
Anthony DeMeo  
Fred Dylla  
Robert Fleming  
Harold Furth  
Ralph Izzo  
Jack Joyce  
Naren Kokatnur  
George Levitsky  
Dennis Manos  
George Martin  
Lorand Meray  
Raj Mukherji  
Dr. J. Tobin  
Michael Pereira  
Carl Pierce  
Maurice Sabado  
Gerd Schilling

J. R. Thompson  
Ken Wakefield  
Masaaki Yamada  
Ken Young  
Irving Zatz

### NOVEMBER

Dale Ashcroft  
Suzen Bayer  
Paul Bellomo  
John Bradish  
William Cary  
Dave Ciotti  
Anthony DeMeo  
Fred Dylla  
Donald Harnsberger  
Phil Heitzenroeder  
Harold Johnson  
Robert Kaita  
Donald Knutson  
Milton Machalek  
George Martin  
Holt Murray  
Carl Pierce

Michael Pereira  
Joseph Rushinski  
Keith Sapp  
Fred Tenney

### DECEMBER

Suzen Bayer  
Bryon Benson  
Dave Ciotti  
John Coonrod  
Ernst deHaas  
Robert Ellis  
Donald Harnsberger  
Ralph Izzo  
Stephan Jardin  
George Martin  
Patrick Murray  
John McCann  
Michael Pereira  
Greg Rewoldt  
Rusty Walton  
Michael Viola  
Al von Halle