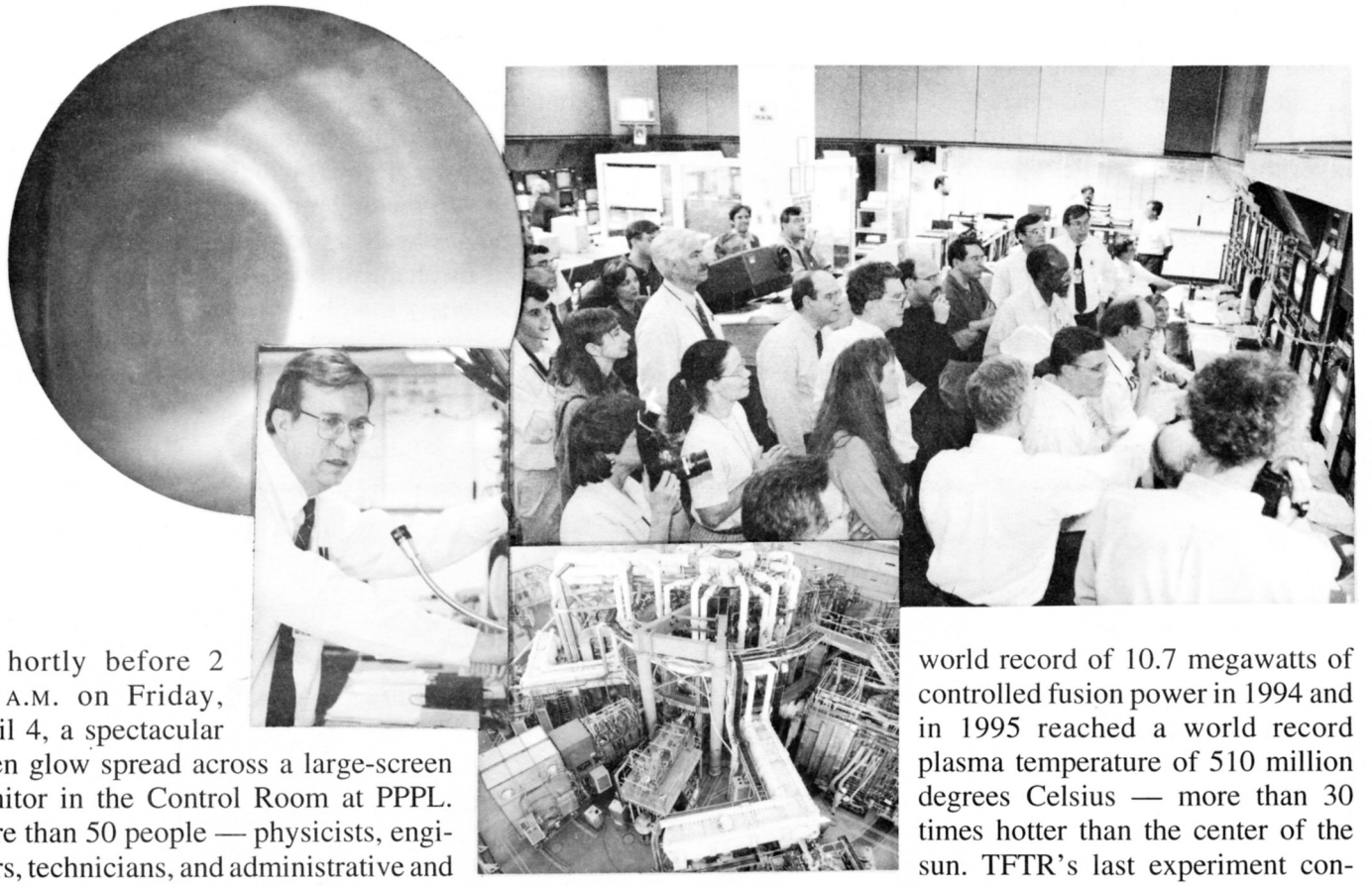
Princeton Plasma Physics Laboratory *Vol. 18, No. 11 • April 14, 1997*

Hotline

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

TFTR Produces Last Plasma



Shortly before 2 A.M. on Friday, April 4, a spectacular green glow spread across a large-screen monitor in the Control Room at PPPL. More than 50 people — physicists, engineers, technicians, and administrative and clerical staff — crowded around the monitor to witness an historic experiment being projected from a building several hundred yards away.

"That was the last shot on TFTR," said Richard Hawryluk, referring to the final plasma discharge from the Tokamak Fusion Test Reactor, PPPL's flagship experimental fusion machine. Hawryluk is the Head of PPPL's Tokamak Confinement Systems and of TFTR.

Despite the premature conclusion of experiments on TFTR, which was being shut down due to a cut in government funding, the enthusiasm of PPPL's scientific and technical staff prevailed. Indeed, enthusiasm peaked as the new — and final — experiments were mapped out. PPPL scientists had hoped to break new ground with the concluding experiments on the tokamak, which set a world record of 10.7 megawatts of controlled fusion power in 1994 and in 1995 reached a world record plasma temperature of 510 million degrees Celsius — more than 30 times hotter than the center of the sun. TFTR's last experiment concentrated on producing high-power results, and ultimately reached one of the highest performance discharges ever attained by the machine by producing 7.8 *megawatts* of *power*. The second to the last shot that day produced 7.1 *megajoules* of fusion *energy* — the second highest value ever achieved. Both discharges were deuterium-tritium,which are heavy forms of hydrogen used as the fusion fuel. (Power is the rate of use of energy, i.e., one megawatt equals one megajoule per second.)

Staffers, reporters, and family and friends gathered around the monitor to watch the results, offering a swell of applause as the screen was lighted by a colorful glow that reflected the plasma inside the tokamak. Plasma — a hot, ionized gas — is produced when light hydrogen atoms fuse at high temperatures, releasing energy. Fusion

is the same process that powers the sun and the stars, and the goal of fusion research is to harness that energy as a clean, limitless source of generating electricity. TFTR, which produced more than 70,000 discharges as the centerpiece of the nation's fusion program, was the largest operating magnetic fusion experiment in the U.S.

Sadly, just a few days before the final TFTR experiment was run, Lyman Spitzer, the founder of PPPL, died at his home. He was world-renowned for his contributions to plasma physics and astrophysics.

Hawryluk, characterizing the conclusion of TFTR's experiments as "bittersweet," lauded the staff for its efforts during the machine's 14 years of operation. "We have all been a part of history, and while we have some tough days ahead, you should feel proud of the accomplishments on TFTR," he said.

The Laboratory had pushed for the continuation of TFTR because of the machine's potential for physics experiments that would take the nation a step closer toward making fusion commercially viable. "It is tragic to stop the experiments at this time," said PPPL Deputy Director Dale Meade.

The closing of TFTR also marks the last page in the fusion careers of many at PPPL. The Laboratory faces a staff reduction this summer of up to 200 of its 500-plus employees. Many, who have pursued fusion as a lifelong dream, or who have devoted years of their lives to work surrounding TFTR, will be forced to look at other occupational options.

PPPL Interim Director John Schmidt stated, "The decade and a half of TFTR experimental operations has been marked by tremendous achievement of parameters and scientific understanding. In addition, the safe operation of TFTR is a credit to all of the individuals associated with TFTR. This serves as a demonstration that fusion devices can be safely operated with tritium fuel and associated fusion power production."

Steve Scott, PPPL Principal Research Physicist, said he has been drawn to fusion since he was 14, when his father presented him a book about plasma physics. "The idea of bringing a star to earth is pretty nifty to me. That's all I've ever wanted to do."

Pointing to the technicians and engineers at work in the Control Room, Scott added, "Some of those guys have worked in front of those terminals for 10 years."

The shutdown of TFTR will occur during the next six months, and will include removing and transporting tritium off-site, as well as shutting down the electrical systems and mechanical operations. Then the tokamak will be indefinitely mothballed.

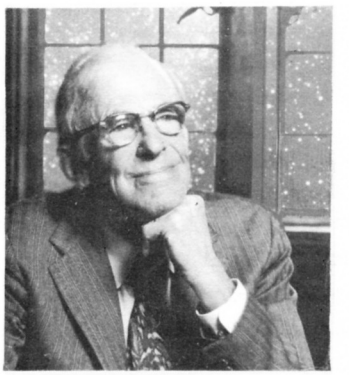
In a note to staff the morning of the final plasma, Hawryluk said, "No further tokamak experiments are planned on TFTR. Activities as part of the shutdown of the facility will begin immediately." ● ***—Patti Wieser***

In Memory

A memorial service for Lyman Spitzer, Jr., the founder of PPPL, is scheduled at 3 P.M. on Wednesday, April 16, at the Princeton University Chapel.

Spitzer, a giant in theoretical astrophysics and plasma physics who was revered for both his pioneering scientific achievements and personal attributes, died on March 31. He was 82. In addition to founding the Princeton Laboratory, Spitzer conceived a large-scale observatory that became the Hubble Space Telescope. Friends and colleagues remember the beloved scientist for his kindness, humanity, and personableness, as well as for his scientific brilliance.

In lieu of flowers, donations may be made to the American Alpine Club Inc., 710 10th Street, Golden, Colorado, 80401. (A complete obituary about Dr. Spitzer is available on the PPPL Home Page (http://www.pppl.gov/) and the Princeton University News Page (http://www.princeton.edu/pr/news/yr/mo/).



Lyman Spitzer

HOTLINE

Editor:	**Patti Wieser**	**Graphic Artist:**	**Greg Czechowicz**
Photography:	**Dietmar Krause**	**Layout:**	**Patti Wieser**

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 Room B366, LOB Bldg., C-Site; fax 609-243-2751; telephone 609-243-2757; e-mail pwieser@pppl.gov