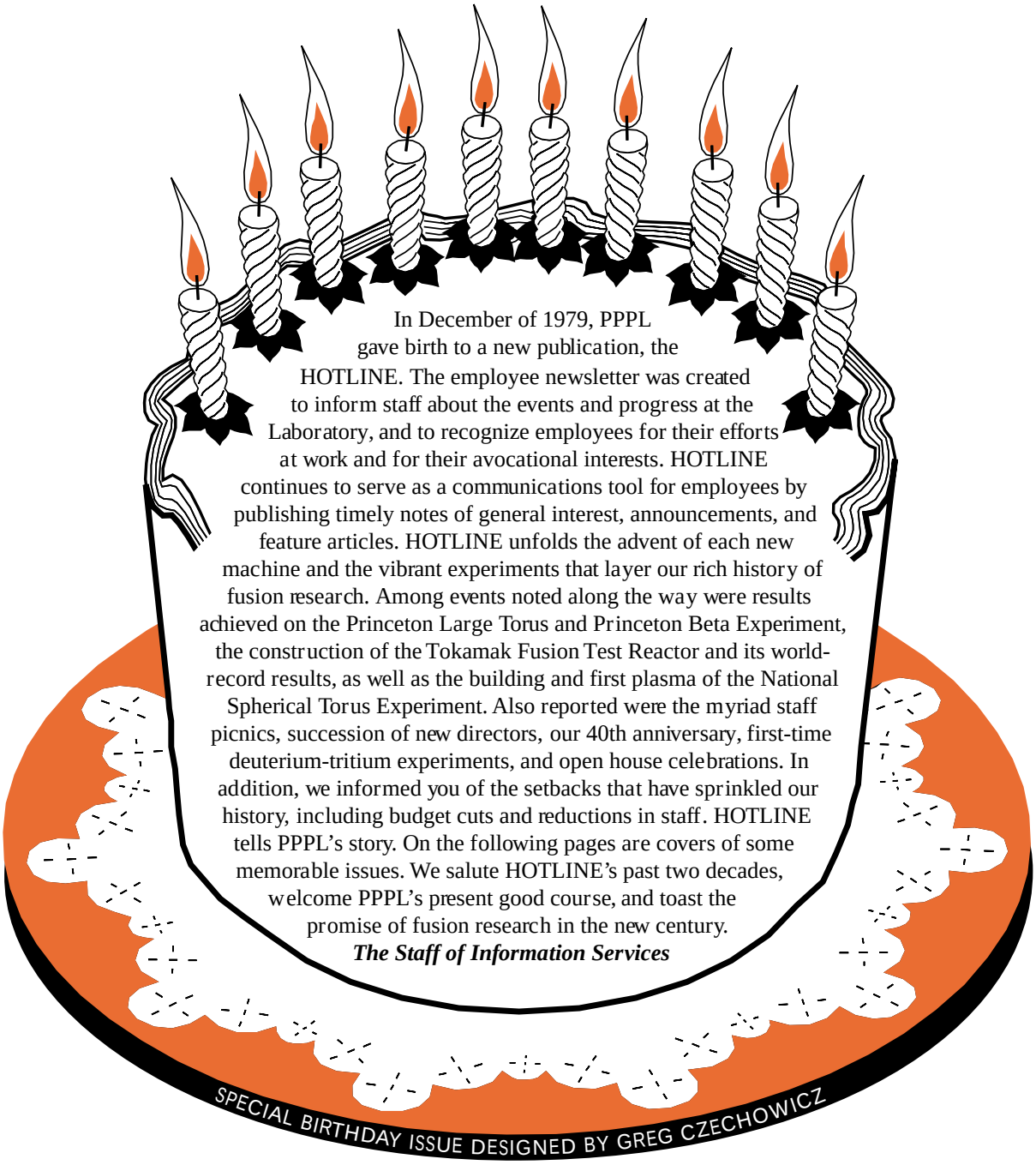
Princeton Plasma Physics Laboratory Vol. 21, No. 4 • December 7, 1999

HOTLINE

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

Happy 20th Birthday, HOTLINE!



In December of 1979, PPPL gave birth to a new publication, the HOTLINE. The employee newsletter was created to inform staff about the events and progress at the Laboratory, and to recognize employees for their efforts at work and for their avocational interests. HOTLINE continues to serve as a communications tool for employees by publishing timely notes of general interest, announcements, and feature articles. HOTLINE unfolds the advent of each new machine and the vibrant experiments that layer our rich history of fusion research. Among events noted along the way were results achieved on the Princeton Large Torus and Princeton Beta Experiment, the construction of the Tokamak Fusion Test Reactor and its world-record results, as well as the building and first plasma of the National Spherical Torus Experiment. Also reported were the myriad staff picnics, succession of new directors, our 40th anniversary, first-time deuterium-tritium experiments, and open house celebrations. In addition, we informed you of the setbacks that have sprinkled our history, including budget cuts and reductions in staff. HOTLINE tells PPPL's story. On the following pages are covers of some memorable issues. We salute HOTLINE's past two decades, welcome PPPL's present good course, and toast the promise of fusion research in the new century.

The Staff of Information Services

SPECIAL BIRTHDAY ISSUE DESIGNED BY GREG CZECHOWICZ

HOTLINE

PRINCETON PLASMA PHYSICS LABORATORY

Vol. 1 No. 1 — December 18, 1979

Welcome to The PPL Hotline

The PPL Communications Office is pleased to introduce this new publication designed to inform staff on a more timely basis. The *PPL Hotline* as its name implies, will be issued more frequently than the *PPL News*, which has been discontinued.

The *Hotline* will contain brief, timely notes of general interest in a newsletter format. In the near future, it will be published weekly and supplemented with the publication of a PPL employee feature magazine, issued every other month. In the meantime, the *Hotline* will serve two functions – the presentation of brief notes and announcements and the occasional presentation of longer feature articles.

During fiscal year 80 (which began October 1) the population at PPL will increase by approximately 250. Now, as never before, there is an urgent need for efficient communication. We hope that all PPL staff members will view the *PPL Hotline* as their vehicle for communication.

Information for publication should be sent to:

The *PPL Hotline*
c/o PPL Communications Office
Aerolab Building

Fusion Technology Symposium–Neutral Beam Experiments

Dr. Harold Eubank, Section Head, Neutral Beams, presented the first of a series of fusion technology symposia to PPL professional technical and technical associate staffs on Tuesday, December 11 in Sayre Hall Auditorium. Dr. Eubank's presentation centered on the status of neutral beam experiments on PLT, the use of neutral beams on PDX and TFTR, and the results of neutral beam experiments at Oak Ridge. *cont. on pg. 2*

FUSION IN THEIR FUTURE . . . . *PPL Director, Mel Gottlieb, and children from the Penrose School in Philadelphia stand before the full-size mock-up of Princeton's Poloidal Divertor Experiment (PDX) which is on indefinite loan to the Franklin Institute. The occasion was the dedication of the Mock-up on Wednesday, November 7, at the Institute which houses a permanent fusion energy exhibit.*

December 18, 1979

HOTLINE

PRINCETON PLASMA PHYSICS LABORATORY

Vol. 2, No. 12 — March 30, 1981

CARTER VISITS PPL

PPL Associate Director for Research Paul Rutherford (left), describes the Princeton Large Torus (PLT) experiment to former President Jimmy Carter as laboratory Director Dr. Harold Furth (right) looks on. Mr. Carter visited PPL for an hour-long tour as part of his Princeton visit last week.

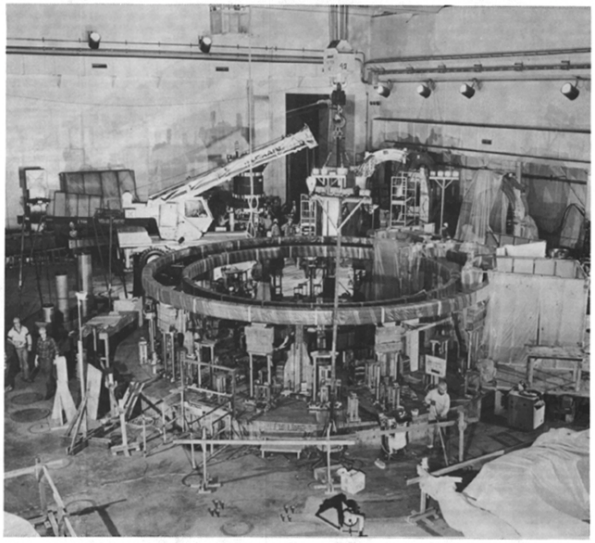
March 30, 1981

HOTLINE

PRINCETON PLASMA PHYSICS LABORATORY

Vol. 3, No. 10 — April 8, 1982

TFTR Update



The various components that will eventually comprise TFTR are continuing to come together in the D-Site Test Cell. In this picture, taken in February, the large poloidal field (PF) coils are being connected in place around the machine base. Piled against the wall on the right of the exit are three toroidal field (TF) coils awaiting installation. The inner support structure/PF coil subassembly, which will form the "hole" in TFTR's "doughnut", is visible to the left of the exit near the crane. The upper PF coils began arriving at the test cell March 29.

April 8, 1982

HOTLINE

PRINCETON PLASMA PHYSICS LABORATORY

Vol. 4, No. 9 — January 25, 1983

TFTR FIRST PLASMA ACHIEVED

Laboratory Director Dr. Harold Furth knew something special was in the air this Christmas Eve. "There was the general expectation that the spririt of Christmas would step in and do something," he reported.

Whether the result of friendly spirits or the round-the-clock dedication of PPL employees, TFTR achieved its first plasma at 3:06 a.m. December 24. The success capped an intensive effort by the laboratory community to reach the first plasma stage by the end of 1982.

At a December 28 press conference attended by representatives of the major broadcast and print media, Dr. Furth explained that the plasma formed was only maintained for approximately 50 milliseconds. "But the characteristics of this first plasma are not what's important," he emphasized. "It's like Columbus finding land: for a start, he didn't care how big it was. The important thing is that the machine is basically fine."

Reporters were shown a videotape made in the TFTR control room during those early morning hours on Christmas Eve. It depicts a tense crowd of physicists, listening to an Apollo-type countdown by TFTR Facility Operations Branch Head Milt Machalek. Anticipation is plainly visible as the button that will create first plasma is pushed. Milliseconds later, wild cheering and handshaking erupts as TFTR proves itself a success.

Dr. Furth recalled his reactions as the "magical event" grew nearer. "It started with me being extremely nervous, gloomy, concerned, and contemplating the possibilities for things to go wrong," he remembered. "(The night) ended with me feeling the way you just saw Don Grove act . . ."

"I'm extremely pleased and satisfied that we were able to do what we said we were going to do," he continued. "That gives us confidence, and it gives the government confidence that our predictions are realistic: that when we say in 1986 we will take ten (plasma) shots in deuterium-tritium, and the tenth one is going to be breakeven, that we will really do it."

In response to a question on funding, Dr. Furth contended that "In a sense, one could say that this administration supports fusion very strongly, because in this climate of retrenchment, they have maintained the budget (for fusion) . . .TFTR has not been cut; (its) budget has been slightly increased under the present administration. Our project has had good, steady support."

And what of TFTR's future? "Our problem is how to fill in, both scientifically and technically, the space between TFTR and . . .(the Engineering Test Reactor) so as to guarantee that that much larger step will indeed be successful."

"It is our hope that our experimental results will speak for themselves," he concluded. "If TFTR comes along as we expect and hope, then around 1985 we won't have to shout. We will just say 'look at this', and (the government) response will be 'how would you like to go on and do an ignition experiment?' That's our hope."

January 25, 1983

HOTLINE

PRINCETON PLASMA PHYSICS LABORATORY

Vol. 5, No. 7 — April 30, 1984

PBX

The conversion effort to transform PDX into the Princeton Beta Experiment (PBX) moved closer to completion March 13, when the PBX vacuum vessel was officially closed. The device is now undergoing discharge cleaning, control circuit testing, and conditioning of the vacuum vessel in preparation for creation of its first kidney-bean-shaped plasmas early in April.

A "changeover" ceremony was held at the machine to celebrate the vessel closing. Deputy Director of Technical Operations J.R. Thompson presented a citation and a bottle of champagne to each of the staff members who were most closely involved in the transformation. Coming in for commendations were Senior Lab and Shop staff member Les Gereg, who headed the conversion work force and "orchestrated the modifications," according to PBX co-head Kees Bol; and assistants Steve Styner, Rich Krsnak, Chuck Johnson, Ken Quadland and Dan Bollenbacher. "These guys lived inside the vacuum vessel for a long time," explained Dr. Bol.

Sam Hand, who served as PBX outside coordinator, was credited with maintaining the flow of hardware

(continued)

PBX project co-head Kees Bol (right) looks on as Deputy Director of Technical Operations J.R. Thompson lowers the sign officially renaming PDX to PBX. The "new" machine is expected to begin producing kidney-bean-shaped plasmas this month.

Taking a break from making alterations within the PBX vacuum vessel are (left to right) Ken Quadland, Rich Krsnak, Dan Bollenbacher, Les Gereg and Steve Styner. The five received commendations and champagne for their participation in the PDX/PBX conversion.

April 30, 1984

HOTLINE

PRINCETON PLASMA PHYSICS LABORATORY

Vol. 6, No. 9 — February 7, 1985

S-1 ACHIEVES INITIAL GOALS

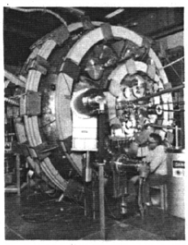
Perhaps from now on the S-1 spheromak should be billed as "the reborn S-1." The device recently reached the initial milestones established when the S-1 project was proposed in 1979. Those early milestones have now been followed by an even more ambitious experimental plan for the coming years.

The initial goal of the S-1 program was to obtain hot (100 eV) plasmas with lifetimes of 1 msec or more. With passive stabilizing coils, these spheromak plasmas were also expected to be stable against gross magnetohydrodynamic (MHD) instabilities. S-1 has accomplished all those achievements in the past three to four months.

Dr. Masaaki Yamada, who serves as co-head of the S-1 project with Dr. Robert Ellis, credited the dramatic improvement in machine performance to improvements made during last summer's machine opening, and to the perseverance and enthusiastic performance of the S-1 team. The program had been stalled by problems resulting from cracks in the flux core liner. Experimentation was halted while the original liner was replaced by a 20 mil thick, epoxy-backed Inconel liner. The flux core power feedthrough was strengthened during the same period, allowing more coil current to be fed through the core. Members of the Coil Shop and the Vacuum Shop designed and carried out the flux core modification with enthusiasm and dedication to minimize S-1 down time. After the repairs, the vacuum faults which had plagued the program disappeared, and S-1 began functioning very reliably.

Other hardware refinements continued to improve S-1's performance. The installation of figure eight coils during the fall made a significant improvement in S-1's ability to resist gross MHD plasma instabilities. The coil system had been successfully tested on the Proto-S-1 device, but worked even better when installed on the S-1 machine itself.

Prior to installation of the figure eight coil system, the plasma was subject to constant shifting and tilting instabilities, affecting not only plasma lifetimes but also the diagnostic reproducability of S-1 results. Once operation resumed with the figure eight system, creation of well-defined spheromak plasmas detached from the flux core which formed them became routine. Instabilities were suppressed, allowing for formation of cleaner, hotter plasmas with lifetimes over 1 msec. S-1 is now reaching toroidal currents of over 300 kA, electron densities in the



The S-1 device

mid to upper 10^{13} range, and measured peak temperatures often exceeding 100 eV.

The most important observation in recent S-1 experiments is that the electron temperature is no longer limited by the impurity radiation loss. After the S-1 vacuum condition and the gross MHD plasma stability were improved, there was strong evidence that the temperature increases with plasma current. This observation is very similar to the scaling observed in RFP (reverse field toroidal pinch) machines. This is a very promising sign, according to Dr. Yamada; if S-1 follows this trend with increased plasma current, as well as with current density increased by adjusting the plasma size, the machine should be able to achieve electron temperatures in the 200-300 eV range "in the foreseeable future."

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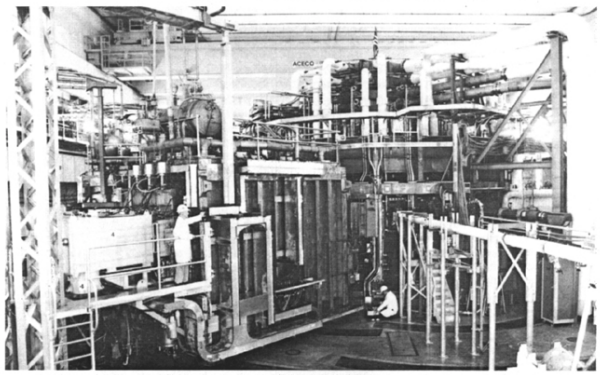
February 7, 1985

HOTLINE

PRINCETON PLASMA PHYSICS LABORATORY

Vol. 7, No. 10 — August 7, 1986

TFTR HITS 200 MILLION °C



Exceeds Original Objectives

During July, PPL physicists succeeded in producing plasma temperatures of 200 million degrees Celsius on TFTR. This is the highest temperature ever produced in a laboratory -- more than ten times the temperature at the center of the sun.

The US DOE made the announcement Thursday, August 7. Secretary of Energy John S. Herrington commented that "This marks a major milestone in progress toward the development of fusion energy. The temperature achieved is in the range required for a fusion reactor. These promising results bring us closer to the goal of fusion energy."

The levels of plasma temperature and heat confinement achieved in TFTR experiments during July exceeded the objectives specified for TFTR when the project was authorized in March 1976. The recent experiments required the use of only about one-half the neutral-beam heating-power (30 million watts) that will ultimately become available.

Progress Towards Break-Even

The objectives of the TFTR project include the demonstration of "scientific breakeven," where the power produced by fusion reactions equals the power required to keep the fuel hot. In order to reach break-even, two separate conditions must be met: both the plasma temperature and the quality of heat insulation must exceed threshold values. The quality of heat insulation is measured by the Lawson parameter $n\tau$ -- the product of plasma particle

(continued)

August 7, 1986

PPPL HOTLINE

PRINCETON PLASMA PHYSICS LABORATORY

Vol. 8, No. 15 — May 8, 1987

PPPL OPEN HOUSE DRAWS 2,200

Nearly 2,200 employees, their families and friends, and interested members of the community took the opportunity to visit the Laboratory during PPPL's Family and Community Day Open House on Saturday, May 2.

For five hours, adults and children wandered through the Laboratory viewing slide presentations, taking part in live demonstrations, talking with employees about their research, looking at displays, and touring the TFTR, PLT, PBX-M, and S-1. Many rode the red, double-decker bus which circled C- and D-Sites giving the visitors an overall view of the facility.

"Just right" and "Very interesting" were the comments most often heard by employee participants Sally Connell and Glenn Pearson. Bob Soltmann felt that PPPL neighbors were very appreciative of the Laboratory for opening its doors to the community. "I saw one man take the time to find out who Harold Furth was and then seek him out and thank him personally," he said.

Refreshments prepared and served by PPPL volunteers were available in the courtyard. Eileen Rabiger thought "It was great fun to see Harold Furth, Don Grove, Jim Clark, and others cooking the hot dogs." A personal taste test by Marjorie Barnett confirmed that "The hot dogs were nice and juicy, full of salt and calories, and oh so good."

In all, Harold Furth and his group of PPPL chefs cooked over 1,600 hot dogs and distributed 1,800 cans of soda. Over 60 gallons of coffee and juice and 134 dozen doughnuts were also consumed.

Rounding out the day's activities, souvenirs were provided for everyone. Nearly 2,000 red, white, and blue baseball

(continued)

We would like to thank everyone who helped make Family and Community Day a big success. An event of this magnitude simply cannot take place without the help and cooperation of everyone -- planners, organizers, and workers. We wanted to help our families, friends, and the community understand a little better what the Princeton Plasma Physics Laboratory is all about. We think we accomplished our goal. Thank you.

May 8, 1987

PPPL PRINCETON PLASMA PHYSICS LABORATORY **HOTLINE**

Volume 9, No. 10 — February 24, 1988

FY89 FUSION FUNDING PROPOSED BY PRESIDENT REAGAN

President Reagan's FY89 budget, submitted to Congress on February 18, proposes $74.3 million for the continuation of research on the Tokamak Fusion Test Reactor (TFTR) and $27 million in funding for R&D, design, and initial construction of Compact Ignition Tokamak (CIT). The budget must now be approved by Congress.

"We are encouraged by the strong support for the Laboratory's work that TFTR, including preparations underway for the attainment of 'scientific breakeven'. The budget also supports progress in the design and engineering of CIT during 1989. Our goal is to bring the new experiment on-line during the mid 1990's, after TFTR is shut down."

TFTR's primary goal is the attainment of "scientific breakeven," where the fusion power produced by the ing pulses lasting a few seconds, without the need for auxiliary heating.

Both TFTR and CIT are designed to use small quantities of plasma fuel consisting of deuterium and tritium, the heavy isotopes of hydrogen. To date only hydrogen and deuterium have been used in fusion experiments. A deuterium-tritium fuel mixture is required for the breakeven and ignition experiments. The President's FY89 TFTR budget would allow PPPL to

Excellence in Plasma Physics Research Award Shared by PPPL Physicists

Efforts of TFTR Team Recognized

by Carol Phillips

PPPL physicists Rob Goldston, Rich Hawryluk, and Jim Strachan were presented the American Physical Society Prize for Excellence in Plasma Physics Research at the recent American Physical Society (APS) Division of Plasma Physics meeting in Hollywood, Florida. The prize, which includes a $5000 cash award and a Certificate, is given annually in recognition of a recent outstanding achievement in plasma physics. Rob, Rich, and Jim were selected for their efforts on TFTR that have led to the achievement of world record plasma temperatures greater than 300 million degrees Centigrade.

In the news release announcing the award TFTR Project Head Dale Meade said, "It was their inventiveness and systematic experimental research which led them and their colleagues to the discovery of the high-temperature enhanced-confinement plasma regime in the TFTR. In receiving this award, Goldston, Hawryluk, and Strachan represent the efforts of the TFTR team of some 80 physicists, 200 engineers and support staff, who also contributed their insights and efforts

(Photo by John Peoples and Dietmar Krause)

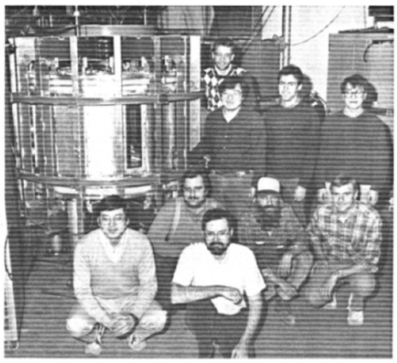
Rob Goldston, Jim Strachan, and Rich Hawryluk (left to right) were recently honored at the banquet of the American Physical Society Division of Plasma Physics with the prize for Excellence in Plasma Physics Research. They will donate the $5000 cash prize to Princeton University with the stipulation that it be used at PPPL.

1988

PPPL PRINCETON PLASMA PHYSICS LABORATORY **HOTLINE**

Volume 11, No. 8 — March 16,1990

CDX-U Produces First Plasma: Meets DOE's Milestone for Start Up



The CDX-U device, shown in the upper left-hand corner of the photo, replaces the CDX device, which ended experimental operation on January 2 of this year. In little more than six weeks, the CDX was dismantled and in its place the CDX-U assembled. PPPL staff responsible for the project are, in the back row, left to right, graduate students Cary Forest, Yong-Seok Hwang, Ted Jones, and Won Ho Choe; in the middle row, left to right, Tech Shop technician Tom Signs and CDX-U technicians Jim Taylor and Bill Kineyko; in the foreground, left to right, CDX-U Project Head Masa Ono and physicist Glenn Greene. Others who have contributed to the project include engineer Phil Heitzenroeder, who consulted on the machine design and fabrication techniques, and physicists Doug Darrow and Tom Stix.

by Carol A. Phillips

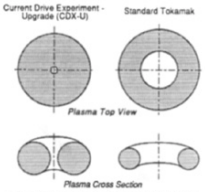
The Current-Drive Experiment-Upgrade (CDX-U) achieved first plasma on February 15, successfully meeting its U.S. Department of Energy milestone for start up.

The CDX-U is the latest in a series of small tokamak devices, including ACT (Advanced Torus Concepts), ACT-1, and CDX (Current Drive Experiment), that have operated since the summer of 1979.

The main physics goals for CDX-U are to investigate the physics of steady-state current drive in plasmas and to develop a method to produce steady-state currents in future tokamak fusion reactors. Steady-state currents, that is, continuous currents, could be used to maintain plasmas for longer times. The device will also be used to study plasma transport properties — what causes plasma particles and heat to escape — and how plasma transport is affected by plasma fluctuations, radial electric fields, and plasma aspect ratio (how skinny or fat the plasma is).

Two types of plasma current drive will be studied in CDX-U: direct current (dc) helicity injection current drive and transport driven current drive. In dc-helicity injection, a high-current, low-energy electron beam is injected along the magnetic field at the edge of the plasma and the current is carried into the plasma center. Transport current drive is a natural current in the plasma. It is driven by the plasma flowing outward from the plasma interior.

The CDX-U device is unique among existing tokamaks in that the "doughnut hole" or center core formed by the inner toroidal field (TF) coils is very small, about 6 inches as compared to 40 inches for standard-sized tokamaks. The closeness of the coils causes the toroidal fields near the plasma's inner edge to be much higher than those on its outer edge. In CDX-U plasmas, the ratio of the high field region to the low field region can vary by up to a factor of 6 (sometimes called the mirror ratio); in a



The CDX-U device differs from other present-day tokamaks in that the size of its "doughnut hole" is very small: 6 inches as compared to 40 inches for standard-sized tokamaks. Nevertheless, 160-turn water-cooled toroidal-field coils surround the vacuum vessel.

March 16, 1990

PPPL PRINCETON PLASMA PHYSICS LABORATORY **HOTLINE**

Volume 12, No. 5 — November 26, 1990

PPPL Directorship: A Changing of the Guard

Outgoing PPPL Director Harold Furth converses with incoming Director Ron Davidson during the Lab-wide reception which was held on Friday, November 9. (More pictures on page 4.) Photo: John Peoples

Barnes Encourages Questions for United Way Campaign

As a first-time chairman of PPPL's United Way campaign, Dori Barnes recently spoke with the area Campaign Director, Janice Carson, to learn more about the organization for which she has become the resident spokesman. And she liked what she heard.

"I was very impressed with Janice," she said, "particularly when she told me a story about her first experience with United Way.

Long before Janice had any professional association with it, she worked for a company that supported the organization, much as ours does. One day after the company campaign, Janice was called into her bosses' office and was told that she hadn't donated enough. She couldn't believe it! And as a result of that experience, she has a strong philosophy against arm-twisting, which is

continued on page 2

November 26, 1990

PPPL PRINCETON PLASMA PHYSICS LABORATORY **HOTLINE**

— 40th Anniversary Special Issue —

Volume 13, No. 2 — October 23, 1991

PPPL's 40th Anniversary

Past Accomplishments, Future Goals

"The Princeton Plasma Physics Laboratory has a destiny, and our 40th Anniversary gives us the opportunity to look at what's been accomplished so far. It's a wonderful time for celebrating together and looking into the future as well," says PPPL Director Ron Davidson. "I encourage all employees and their families to attend as many of the activities as possible."

Activities to mark the 40th Anniversary range from the fun of Family and Community Day on Saturday, October 26, to the symposium on PPPL's role in fusion research and fusion's potential contribution to the world's energy mix. The symposium is on Thursday and Friday, October 31 and November 1. This issue of HOTLINE lists these activities.

"For the symposium, we're looking forward to welcoming many people who have helped to make the Laboratory what it is today and to highlighting the results of 40 years of dedicated work to make fusion a reality," notes Deputy Director Dale Meade.

Rush Holt, Assistant Director of the PPPL Office for External Affairs, says, "I am pleased with how well the arrangements have fallen into place and appreciate the efforts of so many Lab employees."

From logistics to displays and demonstrations, from food and souvenirs to science activities, many people are working hard to create a celebration to remember. Come on out and enjoy!

Astronomer Sagan to Speak

Carl Sagan

During the 40th Anniversary Banquet on October 31, Dr. Carl Sagan will speak, focusing his remarks on fusion-related issues and the contributions of Lyman Spitzer, founder of PPPL. Spitzer had directed him towards astrophysics when he was in high school. If his track record for knowing how to fascinate a broad audience on a scientific subject holds true, then Sagan's talk will be both entertaining and fascinating.

Carl Sagan's ability to encourage the scientific interest of people

Continued on Page 3

PPPL 40 years — Fusion is for everyone.

Banquet Highlights Celebration

"We've planned a very special banquet to highlight our 40th Anniversary, and planning is moving along at a breathtaking pace," says Banquet Chairman Geoff Gettelfinger. "We're looking forward to a delightful evening and an interesting talk by Carl Sagan."

The banquet will be Thursday, October 31, with cocktails at 7 p.m. and dinner beginning at 8 p.m. It will be held in the very attractive Marriott Ballroom, in the Forrestal Village across Route 1 from PPPL. Ticket sales have been extended until Friday, October 25. Tickets are $25 and are on sale in the LOB Lobby daily between 11:30 a.m. and 1:00 p.m.

October 23, 1991

PPPL PRINCETON PLASMA PHYSICS LABORATORY **HOTLINE**

Volume 14, No. 1 — October 5, 1992

A Bright Future for Technology Transfer

Meixler Appointed Office Head

Lew Meixler, recently appointed Head of the PPPL Office of Technology Transfer, has a deep interest in technology development, inventions, and patents. This interest stems from his many years as a practicing research and development engineer.

Says Meixler, "The fact that intellectual property, something of tangible value—patents, copyrights, trademarks—can be created out of people's ideas has always fascinated me."

Meixler is anxious to promote the transfer of the Laboratory's expertise to private industry as a means of increasing the industrial competitiveness of the U.S. and as a way of bringing new and interesting projects to the Laboratory.

Two part-time staff members, Secretary Barbara Tomie and Consultant Dick Rossi, are supporting this effort as well. Says Meixler, "Barbara and Dick have been most helpful during this transition period."

Meixler notes, "Since 1986, by law, technology transfer has been mandated as a *primary mission* of the Laboratory, including the right to enter into cooperative research and development agreements with industry. It's exciting to head up such an effort, especially since it is so important to increase the international competitiveness of the U.S."

Meixler has numerous priorities in his new position. "A major priority," he says, "is to initiate a number of Cooperative Research and Development Agreements (CRADAs) between projects at PPPL and private industry."

Lew Meixler, recently appointed Head of the Technology Transfer Office.
Photo: D. Applewhite

He adds, "To facilitate such exchanges, the Office will stimulate and aid in the preparation and development of proposals for Personnel Exchanges, CRADAs and Work-For-Others (WFO) projects."

"Such projects benefit both the Laboratory as a whole and the scientific and engineering staff through bringing in new work and maintaining the skill level of the staff," observes Meixler.

"Licensing of Laboratory inventions for use by industry is another crucial area. Not only does licensing provide substantial financial rewards to the inventors, but also it creates a means by which taxpayer- financed research can be used in the industrial marketplace," Meixler notes.

In addition, Meixler would like to see more User Facilities at the Laboratory. These types of facilities would provide a means for industry to utilize the resources available at the Laboratory and to provide an additional source of funding for the operation of the facilities at the Laboratory.

Of Rossi's role, Meixler says, "He is providing expertise in the marketing of the Laboratory's technologies and capabilities to industry, as well as helping in the preparation of CRADA proposals."

continued on page 2

October 5, 1992

PPPL PRINCETON PLASMA PHYSICS LABORATORY **HOTLINE**

Volume 15, No. 3 — November 12, 1993

Discovery of Twin Stars Brings Hulse the Nobel Prize

When Russell Hulse's radio alarm went off at 7 a.m. the morning of October 13, little did he expect his own name to come beaming across the airwaves. Surely he must be dreaming! But the announcement that he had joined the ranks of his boyhood idols who were Nobel Prize winners was very real.

Hulse, a principal research physicist at PPPL, and Joseph Taylor Jr., a physics professor at Princeton, had indeed won the Nobel Physics Prize jointly, along with $825,000, for their 1974 discovery of the first binary pulsar—a twin star system that provides a rare natural laboratory in which to test Albert Einstein's prediction that moving objects emit gravitational waves, as well as other aspects of his general theory of relativity.

Later that day, Hulse joined Taylor at a standing-room-only press conference at Princeton University, where he told the audience that he had chosen pulsars as his graduate thesis topic because it combined his interests in physics and radio astronomy. He described winning the Nobel Prize as "a rather incredible culmination of an extraordinary graduate student career."

In his letter of congratulations to Hulse, Lab Director Ron Davidson, said, "On behalf of the Princeton Plasma Physics Laboratory, please accept our enthusiastic congratulations on receiving this well-deserved recognition of your extraordinary scientific achievements. Your award brings great honor and distinction to the Laboratory and to the University, and we are very proud of your accomplishments."

Photo: Deirdre Krause

1993 Physics Nobel Laureates Joseph H. Taylor (left) and Russell A. Hulse answer a question during the news conference at Princeton University on October 13.

It is unusual for graduate students to be recognized along with their thesis advisors even if they have done the greater part of the work on a project. Hulse was deeply appreciative of the honor, but noted that his thesis advisor had made the greater contribution to binary pulsar research. Said Hulse, "Dr. Taylor has continued to work in the field, while for the last sixteen years I've been doing fusion research at PPPL."

The Story of the Discovery

Just how did this wonderful discovery of the first binary pulsar occur?

It all started back in '74 after Taylor, then an enthusiastic young professor at the University of Massachusetts in Amherst, encouraged grad student Russ Hulse to do his thesis research pulsar-hunting via a 300-meter-diameter radio telescope built over a bowl-shaped valley in Arecibo, Puerto Rico.

Radio telescopes were certainly not new to Hulse, who had built his first one from homemade antennas and television antennas while still in high school. He had also helped build a radio telescope of chicken wire and telephone poles at the University of Massachusetts. Said Hulse, "Radio telescopes are really just big radio or TV antennas, and pulsar signals are pretty close to the TV spectrum."

In preparation for his work, Hulse developed a computer program to

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November 12, 1993

PPPL PRINCETON PLASMA PHYSICS LABORATORY **HOTLINE**

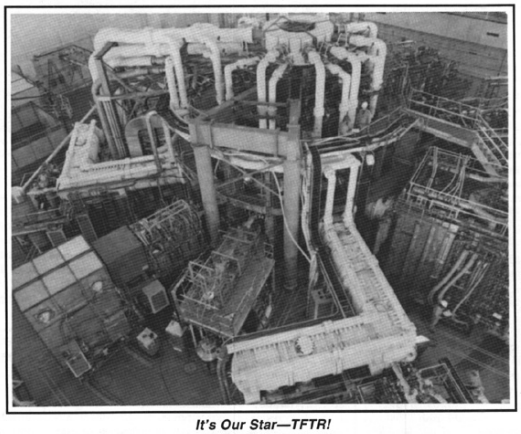
Volume 15, No. 5 — December 20, 1993

TFTR Sets Fusion World Record

"TFTR set a world record of more than three million watts of controlled fusion power during the first approximately 50-50 deuterium-tritium (D-T) experiment," according to PPPL Director Ron Davidson. "The first high power shot occurred at 11:08 p.m. on Thursday, December 9. This record was broken with more than six million watts on Friday, December 10."

"We're all delighted that the TFTR has so readily surpassed the goal of reaching five megawatts of power in 1993," observed Davidson. "The TFTR team is to be congratulated for this superb accomplishment. We now look forward to the rest of the D-T experimental campaign with great pride and anticipation."

These experiments are the world's first on a tokamak to use a plasma made up of equal parts deuterium and tritium in a tokamak—the mix required for practical fusion power reactors.❖



It's Our Star—TFTR!

Watch for a special edition of HOTLINE in January highlighting events before, during, and after these first historic experiments.

December 20, 1993

Princeton University • Plasma Physics Laboratory — *Vol. 16, No. 16 • July 27, 1995*

Hotline

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

"Hot" Times at PPPL Picnic

Considering the Lab's high-temperature achievements during recent experiments, the weather for the PPPL Picnic on July 15 should have been no surprise. As one PPPL employee commented, "We're into record temperatures here."

While the temperature in the Princeton area soared to 101 degrees, nearly 350 employees, retirees, family members, and friends braved the heat and humidity to gather at the PPPL Grounds for a barbecue, music, conversation, water balloon tosses, egg throws, pony rides, dunking, and a few ad libbed activities.

So, how did everyone cool off?

"The big hit was the fire truck spraying everyone," said PPPL'er Scott Linton, whose wife and three children accompanied him to the picnic.

Shortly after 1 p.m., Support Services Department Head John DeLooper requested Security and Emergency Preparedness workers to bring a fire truck to the grounds and provide a water spray.

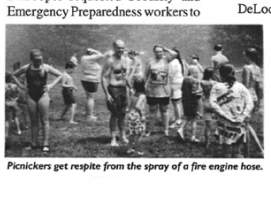
Once the truck was there, more effort was needed to bring clean water to the vehicle since the only hydrant on the grounds provided canal water.

"The crew stretched another hose from a potable hydrant on C-Site to feed the water to the truck," said DeLooper. "Stretching the supply line from the hydrant was the toughest part of the job because the line had to be hand carried the entire distance in the extreme heat."

Showering Fire Engine

But what a welcome the showering fire engine received from the picnickers. Within seconds, a crowd had gathered underneath. Security Captain Ron Ciraolo, who, along with others, operated the fire truck hose, said, "We're pumping out about 250 gallons of water."

DeLooper noted that besides cooling off those at the PPPL bash, the fire department also had to respond to a fire alarm at D-Site. And after the picnic, the crew had to pick up the hose and restore it on the engine in order to be ready for an emergency.



Picnickers get respite from the spray of a fire engine hose.

Youngsters cool off in the wading pool.

Other cooling measures included the dunk tank, where potential dunkees lined up with hopes of multiple dunkings.

One participant commented to Office of Human Resources and Administration Head Steve Iverson, who was about to climb aboard the dunking seat, "You've *got* to go into the dunk tank. This is fun."

Many of the picnickers sought shelter under the tents, limiting their activities to a little conversation and dining.

"It's wonderful," said Mary Ann Brown, who sat with her husband, Martin, under the shade of a brightly colored tent.

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July 27, 1995

Princeton Plasma Physics Laboratory Vol. 17, No. 10 • July 31, 1996

Hotline

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

PPPL Staffers Receive First-time Employee Recognition Awards

Honored by their co-workers for their "outstanding professional achievements and personal characteristics," twenty-eight PPPL employees received the newly created Employee Recognition Program awards on Wednesday, July 24.

The 1996 recipients are J.W. Anderson, Wilbert Barlow, Dori Barnes, Michael Bell, Robert Cancel, James Chrzanowski, Lloyd Ciebiera, Connie Cummings, Michael Diesso, John Garboski, Gerald Hart, Sue Hill, Larry Jones, Paul Kivler, John Krzywulak, Dolores Lawson, Antonio Morgado, Richard Palladino, Subrahmanya "Raki" Ramakrishnan, Christine Ritter, John Robinson, Lane Roquemore, Barbara Sarfaty, James Taylor, Kenneth Tindall, Walter Weyman, Raymond Whitley, and Virginia Zelenak.

The recipients of the Employee Recognition Awards for 1996 are, from left (seated), Dori Barnes, Virginia Zelenak, Barbara Sarfaty, Dolores Lawson, Connie Cummings, and Christine Ritter; (standing) Lloyd Ciebiera, James Chrzanowski, John Krzywulak, J.W. Anderson, Larry Jones, Paul Kivler, Antonio Morgado, Kenneth Tindall, Richard Palladino, John Robinson, Michael Bell, and Lane Roquemore. Not pictured are Wilbert Barlow, Robert Cancel, Michael Diesso, John Garboski, Gerald Hart, Sue Hill, Subrahmanya "Raki" Ramakrishnan, James Taylor, Walter Weyman, and Raymond Whitley.

Respectful Work Environment

"I congratulate the recipients on their overall contributions to the Laboratory mission and for their efforts toward a congenial and respectful work environment," said PPPL Director Ronald C. Davidson. "You are all role models for the entire staff."

The first-time recipients of the annual awards were honored at a luncheon at the Lab and later at an awards ceremony in the LOB Lobby. Employee Recognition Awards Review Committee member Barbara Sobel presented the certificates to the recipients during the ceremony, which was open to all staff.

Said Sobel, "It is important that the humanistic and professional qualities of employees be recognized as factors in the attainment of Laboratory goals and objectives. This year's recipients were nominated by their fellow workers because of the positive impact — both professionally and personally — that they have had on the Laboratory as a whole."

The Director's Advisory Committee on Women and the Quality Improvement and Renewal Committee established the Employee Recog-

Continued on page 2

July 31, 1996

Princeton Plasma Physics Laboratory Vol. 18, No. 13 • August 22, 1997

Hotline

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

New Director Addresses Staff

Goldston Lays Out Plans for PPPL; Exciting Scientific Program in the Works

By Patti Wieser

Photo by Denise Applewhite

Robert Goldston

Robert Goldston is a man with a vision. As the newly appointed Director of PPPL, Goldston's vision for the Laboratory — filled with optimism for continued creativity, teamwork, and scientific breakthroughs — is expected to guide the Lab into the 21st century.

"We have an exciting scientific program ahead of us — in collaborations, understanding plasmas, and innovation," Goldston said in an energetic — and at times humorous — first address to staff during his third day on the job.

Goldston, named the Lab's fifth director on July 1, outlined his plans for a less expensive, more streamlined approach to fusion research.

PPPL continues its mission to develop fusion as an attractive, sustainable energy source, but the focus in the near term will be on medium-sized projects, collaborations, and new plasma applications.

Collaborative, National Center

"Three key words in our vision is that we are a collaborative, national center," said Goldston. "Collaboration is the way our political system assures that good science is going on all over the country. That means we have to involve people from all over the country in the types of things we do. Because we have tremendous capabilities in terms of our people and technological resources, we will be a center for them to come to."

Calling fusion a "long-term investment," Goldston said, "We will get our rewards later — hopefully not in the *next* world — but we also want to get some rewards in the nearer term." Some of these rewards will come from non-

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INSIDE ...

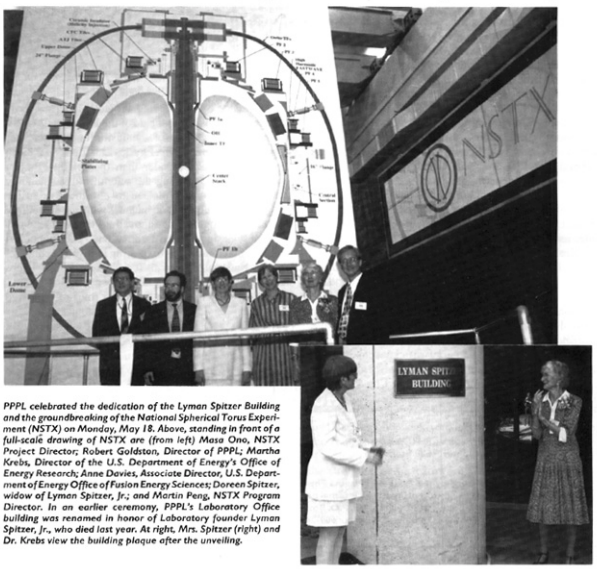
August 22, 1997

DOE Princeton Plasma Physics Laboratory Vol. 19, No. 8 • May 29, 1998

Hotline

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

Spitzer Building Dedication and NSTX Groundbreaking Create Magical Day



PPPL celebrated the dedication of the Lyman Spitzer Building and the groundbreaking of the National Spherical Torus Experiment (NSTX) on Monday, May 18. Above, standing in front of a full-scale drawing of NSTX are (from left) Masa Ono, NSTX Project Director; Robert Goldston, Director of PPPL; Martha Krebs, Director of the U.S. Department of Energy's Office of Energy Research; Anne Davies, Associate Director, U.S. Department of Energy Office of Fusion Energy Sciences; Doreen Spitzer, widow of Lyman Spitzer, Jr.; and Martin Peng, NSTX Program Director. In an earlier ceremony, PPPL's Laboratory Office building was renamed in honor of Laboratory founder Lyman Spitzer, Jr., who died last year. At right, Mrs. Spitzer (right) and Dr. Krebs view the building plaque after the unveiling.

May 29, 1998

Princeton Plasma Physics Laboratory Vol. 20, No. 6 • February 16, 1999

HOTLINE

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

NSTX Achieves First Plasma

Photo by Patti Wieser

PPPL staff see the first plasma on a monitor in the Control Room. From left are Tom Egebo, Raffi Nazikian, Ken Young, Ron Strykowsky, Steve Sabbagh (seated), Charles Gentile, Eric Fredrickson, PPPL Director Rob Goldston (seated at front wearing suspenders), Martha Redi, Hutch Neilson, and NSTX Program Director Martin Peng (far right at front).

Amid the cheers and jubilation of PPPL staff, the National Spherical Torus Experiment (NSTX) achieved first plasma on Friday, February 12, at 6:06 p.m. Its flash across the monitors in the Control Room signaled the successful construction of the Laboratory's new experimental fusion device, heralding the start of an exciting research adventure at PPPL.

"We've created a star again in the Laboratory," noted PPPL scientist Henry Kugel.

Throughout the afternoon, technicians, physicists, engineers, and interested staffers began filling up the NSTX Control Room to wait for first plasma. The researchers conducted a series of tests on the magnetic coils and diagnostics for the machine before attempting to produce a plasma. At 3:20 p.m., some members of the NSTX Program Advisory Council (PAC) filed in to catch

Continued on page 2

February 16, 1999