



HOTLINE

PRINCETON PLASMA PHYSICS LABORATORY

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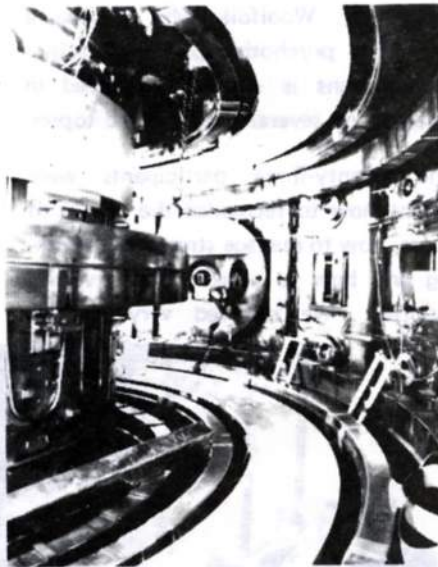
November 14, 1983

PBX

Unbeknownst to many employees, a transformation has been taking place at PDX. Although the machine's outward appearance hasn't changed much, its internal alterations have been anything but subtle. For PDX has now become PBX -- the Princeton Beta Experiment -- and is expected to begin creating kidney-bean-shaped plasmas by year's end. The success of the project could have a major impact in future reactor designs.

Theoretical investigation of bean-shaped plasmas has shown that that shape allows direct access to a second region of plasma stability for ballooning modes. In the ballooning mode, any weakness in the confining magnetic configuration causes the plasma to push through the weakness and diffuse, much like water in a leaky garden hose. This movement of the plasma degrades confinement, making the mode one of the most dangerous instabilities.

As the plasma pressure rises, it creates two opposite effects. The higher pressure makes plasma containment more difficult, while simultaneously modifying the magnetic configuration to increase its resistance to plasma leakage. The ratio of plasma pressure to the magnetic pressure generated by the magnetic fields is defined as beta, usually expressed as a percentage. Once beta is high enough, the "strength" of the configuration increases more rapidly than the force pushing the plasma out, and the plasma becomes more and more stable. This is the second region of stability. The first region of plasma stability ends at betas of about 5%, the second region of stability has no limit.



In an unindented plasma configuration, the second region of stability cannot be reached without going through a zone of instability. Indentation strengthens the configuration enough so that the destabilizing effect is always weaker than its stabilizing counterpart. Thus, direct access to the second region of stability is gained while avoiding many of the instabilities which normally accompany increasing beta values.

Conversion of PDX to PBX proved a cost-effective way to provide an experimental testbed. One PDX divertor coil has been disconnected and pushed aside; another has been relocated at the midplane of the machine, to be used as a "pusher" coil to create the plasma indentation. The pusher coil has been protected from neutral beam impingement and "scouring" by water-cooled graphite armor. The remaining PDX coils have been moved back from the machine midplane to permit bigger plasmas and added instability control. The PBX project has an estimated fabrication cost of about \$1 million.

This photo of the interior of the PBX vacuum vessel shows the pusher coil (center left) that will help create kidney-bean shaped, high beta plasmas. PBX is slated to begin operation by the end of this year.

The bean-shaped plasma is initiated by creating a circular plasma in contact with an inner limiter. While the plasma current is rising, an increasing current in the pusher coil produces an indentation at the inner side of the plasma's major radius. When a fully indented plasma has been formed, the beta is raised by injection of 7 MW of neutral beam power. With a 40 ms energy confinement time (as estimated from the PDX experiment), betas of 10 to 15% are possible.

The plasma current and vertical equilibrium field values will be approximately 20% higher than for PDX, but the toroidal field will routinely operate at 1.0T -- less than half the PDX design value. No specific divertor chamber will be used on PBX; a natural divertor can be formed between the passive stabilizer surface (composed of aluminum plates held on stainless steel supports) and the plasma.

The PBX project also includes a feedback control system, designed to maintain the plasma's balance on the horizontal midplane. Sensors detect any movement of the plasma off the midplane, then alter the complex magnetic fields to reposition the plasma.

PBX will be operating on a rather compressed experimental schedule. Generation of indented plasmas is scheduled to begin in January, with optimization

of beta for the PBX configuration set for July of 1984. Evaluation of the project is slated for September of 1984, when the appropriate next step for the project will be determined.

Michio Okabayashi and Kees Bol are co-heads of the PBX project, with Ray Fonck serving as Associate Head for Diagnostics.

RUN FOR FUN

The 3rd annual Run For Fun is scheduled to be held on Friday, November 18 at 12:30 p.m. This year the event has been dubbed "The 5k Road Race". The 3.1 mile course will begin on the main road near Module II.

Juice will be served to participants. Trophies will be awarded to 1st place male, 1st place female and 1st place team.

Those interested in signing-up or obtaining more information may call Barbara Sarfaty at ext. 2440 or Carol Phillips at ext. 3553.

DANCING



CHEEK TO CHEEK

Final arrangements have been made for this year's annual dinner dance. It will be held on Friday evening, December 9th at Cedar Gardens Restaurant in Hamilton Township. Directions may be obtained from Mary Alice Eubank along with tickets which will go on sale Monday, November 14 through Friday December 2. The cost of the tickets this year will be \$16 per person for the dinner and dance and \$10 per person for the dance only. Cocktails will be served from 6:30 p.m., dinner at 7:30 p.m. The dancing will begin at 9:00 p.m.

As in the past, table arrangements may be made on a first-come, first-served basis by signing-up through Mary Alice.

Those wishing to attend the dinner will have their choice of either Fresh Baked Fish of the Day or Filet Mignon.

PPPL'S TRAINING PROGRAM

On September 30th, as part of PPL's training program, employees were invited to attend a workshop on managing stress. The program was presented by Dr. Robert L. Woolfolk, Associate Professor of Psychology at Rutgers University. Dr. Woolfolk who is also a practicing psychotherapist and trainer of clinicians is currently involved in research on several stress-related topics.

The twenty-three participants were taught how to recognize the causes of stress, how to manage stress while working and how to relax. Steve Iverson reported "We received very positive

feedback from the participants. Most people found the material useful, not only for work situations, but also it gave them a different perspective on how to manage their personal time and life."

Dr. Woolfolk consults regularly for industry and government in the area of stress management. He is the author of "Stress, Sanity, & Survival" and "Clinical Stress Management", and has published over 50 articles in scientific journals.

Personnel plans to offer the workshop again within the year.



Employees listen attentively to Dr. Woolfolk as he explains what to do when stress strikes while on the job.

LABORATORY CLOSING

Just a reminder that the Laboratory will be closed this year from Friday, December 23, 1983 through Sunday, January 1, 1984. December 23, 26, and 30 are scheduled University Holidays. All staff members will have option to charge December 27, 28, and 29, as either vacation or optional holidays. Those who anticipate special problems are urged to talk to their supervisors or to contact the Personnel Office as soon as possible.

The Exempt Staff will receive their December paychecks on Monday, December 19, 1983. The Bi-Weekly paychecks will be available on Friday December 30, 1983 at the PPPL Payroll Office, Building 1-E, Room 115, A-Site, between the hours of 10:00 a.m. and 12:00 noon for those who wish to pick-up their checks. Otherwise, the Bi-Weekly checks will be distributed on January 2, 1984.

It sometimes seems we're constantly being besieged by fund drives. Public broadcasting stations ask for our help in our living rooms, Girl Scouts bring their cookies to our doors, and our mailboxes are crammed with requests for aid from a myriad of groups.

We'd like to help, but how can we be sure these charities are reputable? Will our donations really go to the needy, or toward administrative costs? And how can we pick one or two organizations from the dozens who need our aid?

All these problems are easily solved when you contribute to the United Way. The United Way isn't a charity; rather it unites more than 100 service agencies in the Princeton area into a cohesive group. You'll find day care, family counseling, disaster relief, drug abuse treatment, help for the physically or mentally handicapped, and many other vital services under the United Way banner. Yet not every agency is accepted; stringent screening guidelines insure that member groups are ethical, legitimate service organizations that will answer community needs or problems.

The United Way is also one of the most cost-effective means of charitable contributions. Since the organization is run by volunteers, 87 cents out of every dollar contributed is channeled to member agencies. Citizen review committees make funding decisions, keeping the United Way responsive to the changing requirements of its service area.

But to keep those services coming the United Way needs our help. The annual fund drive is in progress; PPL United Way volunteers are distributing information and donation envelopes. Payroll deduction plans are available to keep your giving going all year 'round, or you can return your donation to your area volunteer in the envelope provided.

In terms of monetary and humane values, the United Way is a real bargain. Please take advantage of that bargain when your United Way volunteer contacts you.



(Top) Assistant Boy Scout Master Phil Thompson (far left) enjoys the "view from the top" on a backpacking excursion with the boys in Troop 88 at Philmont Scout Ranch in New Mexico. Below (far right) John Johnson, Scout Master for the troop, oversees a campsite activity. The Boy Scouts of America is one of the many organizations that receives help thanks to the efforts of the United Way.



SMOKE OUT

The Great American Smokeout, sponsored by the American Cancer Society, will be held on November 17, 1983. Millions of Americans across the country will make a fresh start and try not to smoke for 24 hours. How about you? Why not take a day off from smoking? Here are some tips for quitting, offered by the American Cancer Society:

- Throw out *all* cigarettes by breaking them in half and wetting them down. Clean out all ashtrays in your home, office, or car and put them away.
- When the urge to smoke hits, take a deep breath. Hold it for ten seconds, then release it slowly. Taking deep, rhythmic breaths is similar to smoking only you'll inhale clean air, not poisonous gases.
- Exercise to help relieve tension. Climb stairs rather than take the elevator, take a walk at lunch.
- When tempted to reach for a cigarette, think of a negative image about smoking. Select your worst memory connected with the habit—the time you burned a hole in your suit or when you were left completely breathless running for a bus that pulled away. Imagine this experience for 15 seconds whenever an urge occurs.
- Reward yourself with oral substitutes like sugarless gum, lemon drops, pumpkin or sunflower seeds, apple slices, carrot sticks, unbuttered popcorn.
- Eat three meals. This maintains constant blood sugar levels, thus preventing urges to smoke. Avoid sugar-laden foods and spicy items that can trigger a desire for cigarettes.
- Scramble up your day and change habits connected with smoking. Take a different route to work; eat lunch in a new place; leave the "scene of an urge". At home avoid your

"smoking " chair after dinner, reach for gum rather than a cigarette when answering the phone.

- Cleanse your body of nicotine. Drink liquids—lots of them. Water, herbal teas, fruit juices, and caffeine-free soft drinks all fit the bill. Pass up coffee, caffeinated soft drinks and alcohol, as they can increase your urge to smoke.
- Keep your hand and mind busy. Work on a crossword puzzle, knit a sweater, balance your checkbook, fix something around the house.
- Spend your day with friends who don't smoke.
- Get rid of smokers' breath by brushing your teeth several times. After several hours without a cigarette kiss someone special.
- Go public with your plans to quit. Ask friends to help keep you from backsliding.
- Use money you save from a day of not smoking; make a 3-minute, long distance phone call; play 3 games of Pac-Man; play 3 favorite songs on a juke box.

- Pat yourself on the back. Quitting smoking is hard and you deserve credit for your efforts.
- Treat your body and soul with kindness. Indulge in a bath, massage, nap. Listen to your favorite music. Realize you don't *need* a cigarette to have a good time.

Non smokers can participate too. Be kind to a friend who is trying to quit. Offer moral support, encouragement and incentives to help them get through the day and hopefully longer. The following are just a few ideas for helping a friend quit.

- Don't nag or threaten, do show that you care.
- Provide them with a survival kit of low calorie nibbles - carrots and celery, cinnamon sticks, sugarless gum, etc.
- Take them out for lunch or a special celebration dinner.
- Consider giving up something for the day, too ... candy, desserts, coffee, etc.
- Send flowers for a post-Smokeout "reward".
- If you're an ex-smoker, share your experiences. What worked for you may work for others.

the great ★ american smokeout

PPL IN THE NEIGHBORHOOD

On October 26, gifted and talented students from the West Windsor Regional School District took part in an Energy Symposium coordinated by PPL's Ralph Izzo, and Tony Scannella, Chairman of the Gifted and Talented Program in West Windsor.

Students were divided into three groups and participated in the workshop of their choice. Al von Halle, TFTR Project Engineer discussed fusion - its history, development and near-term projections. Dr. Schlosberg of the Exxon Research Corporation spoke on future energy sources and Mr. Harry Roman of PSE&G discussed energy in its present forms. Each speaker conducted a slide presentation followed by a question and answer period. In preparation for the symposium the students had researched energy production, applications and environmental problems associated with the various methods. The students wrote summaries of what they had learned in the morning portion of the symposium.

During the afternoon, the students convened in the main auditorium to exchange their summaries from which they drew conclusions, and a few of their own projections for the future!!

The entire group then had the opportunity to ask questions of all three speakers. And ask they did! Sophisticated queries about the direction in which neutral beams are shot into the plasma; the exact differences between a tokamak and a spheromak, were posed by the 7th-12th graders. All three speakers agreed that their young audience was quite a challenging group and together with Dr. Izzo graciously agreed to be available for "telephone & letter guidance". Hopefully the symposium will spur the students to do a longer-term energy project. From the sound of things, PPL just might have some future personnel living nearby.



Al von Halle explains the basic concepts of fusion to gifted and talented students from the nearby West Windsor Regional School District.



Listening in with students is Dr. Ralph Izzo (background, far right).



The Forrestal Security office welcomes suggestions from employees for improving security measures in a small area or lab-wide. Employees may write a memo or telephone the Security Office with their ideas. Each PPL employee can contribute to the security of the lab by practicing a few simple preventative measures:

- Make certain that your office or lab is locked whenever you leave.
- Always lock it before going home or to lunch.
- Attractive personal property or sensitive items should never be left unattended. Take such items with you, or lock them in your desk or filing cabinet whenever you are leaving.
- Keep a record of the serial numbers of your personal property including sensitive items, and secure it in a safe place for possible future reference. Information you may want to include: Brand Name; Model No.; Serial No.; Other Descriptive Information.

- Check the whereabouts of your personal property frequently. Misplaced items are easily stolen.
- Keep your auto locked and avoid leaving property where it is visible. Never leave the keys in the vehicle.

Security will engrave your personal property with your name, initials and/or Social Security number if you desire.

Remember, once you have something stolen the best chance for recovering it is a rapid and accurate reporting of ALL the information to the Security Department. Do not wait — report it at once!



The Emergency Services Unit provides fire protection and emergency medical care to the Forrestal campus. The unit is currently seeking volunteers to serve as fire police. Individuals are needed to direct both pedestrian and vehicle traffic in the event of an emergency.

Those interested in becoming part of our fine ESU team should contact Judy Duffy at ext. 3166.

TRANSITIONS

Born — to Morrell Chance (Theory) and his wife Anja, a baby girl, Monica, on October 30. Best Wishes !!

BENEFITS

From time to time employees have questioned why their unused vacation and sick days cannot be converted to compensation.

On the issue of unused vacation days — The liberal vacation policy offered to employees by the University is intended to encourage employees to take time off from the job for relaxation, private business, family contacts, and other non-work-related activities. To pay for unused vacation time would undermine the intent of the vacation policy in that adequate R & R time away from job pressures helps to produce more effective and efficient employees.

"Sick days" insure a secure work environment for employees by providing for pay continuation *should* an illness occur. These days are not considered allowed "time-off" however, and the assumption is that they will NOT be used. In addition, the sporadic sick plan is complimented by the Temporary Disability plan which provides for up to a maximum of 26 weeks of pay during an extended illness. Organizations that pay for unused sick time typically do not have a Temporary Disability Insurance Plan such as ours.

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.
