HOTLINE

PRINCETON PLASMA PHYSICS LABORATORY

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FED Design Taking Shape

In 1980, the U.S. Department of Energy charged its Energy Research Advisory Board (ERAB) to appoint a panel to recommend a future course of action for the magnetic fusion program. One of the ERAB panel's recommendations called for the construction of a Fusion Engineering Device (FED) as the next major step in that program.

The FED will be a deuterium-tritium fueled tokamak somewhat larger than the Tokamak Fusion Test Reactor (TFTR). Physicists and engineers will use it to help solve the various problems commercial fusion power plants pose. FED will integrate the subsystems needed for a working reactor (such as superconducting coils and tritium breeding blankets) into a single machine. Physicists will study the machine's long pulses, which will last at least 100 seconds compared to about 1 second for TFTR.

The machine will confine a toroidal plasma with a D-shaped minor cross-section, a major radius of 4.8 m and minor radii of 2.1 m vertical by 1.3 m horizontal. The mean plasma density will be about 8×10^{13} particles/cm^3, the ion temperature 100-130 million °C, and the plasma current 5 million amperes.

The ionized gas will be confined by a toroidal field of 36,000 gauss. This field will be generated by ten superconducting coils, operating at the same magnetic field as those tested in the Large Coil Program at Oak Ridge. They will be made from a niobium-titanium alloy, and cooled to -269°C by liquid helium. Stainless steel will shield the coils from neutrons.

Each TF coil will be associated with a section of vacuum vessel and its integral tritium-breeding blanket module. There will be two types of modules. One type will be used to calculate the tritium yield of the breeding compound, probably lithium oxide. Engineers will use the second type to study heat transfer in the blanket, where most of the energy will be deposited. The combination of FED's long pulses, high duty cycle (40 seconds between pulses) and neutron power flux of about 500 kw/m^2 will heat the modules to temperatures comparable to those attained in a commercial reactor's blanket.

Impurities in the plasma will be controlled either by divertors or advanced limiters. If a poloidal divertor is used, the divertor coil will be placed outside the vacuum vessel and shield for protection from the neutron flux. Limiters would be equipped with exhaust vents to remove helium created by the fusion reactions.

The most likely means of auxiliary heating for FED is radio-frequency (rf) waves, with neutral beams a second choice. RF sources are preferred because they are easier to shield from neutron flux; the rf generator can be located away from the tokamak, and the energy piped into the plasma by waveguides. Scientists propose to use a 30 MW source at 55 megacycles/sec, which is twice the deuterium ion-cyclotron frequency.

The basic FED machine will be updated as new techniques are developed, becoming the center for reactor-scale tests of many new ideas. Of particular interest are induction of plasma currents by rf waves (permitting steady-state operation) and the use of charged particle beams for auxiliary heating.

Present plans assume a total cost of about 1 billion (1980 dollars). The ERAB panel recommended that FED be operational by the end of the 1980's. PPL personnel are involved in the activities of the Technical Management Board, which was established by DOE to provide design and direction for the FED. In addition, PPL will contribute in a major way to the necessary supporting reasearch for the FED. Specific FED relevant experiments will be carried out on PLT, PDX, and TFTR.

The site for FED has not yet been chosen.

Relocation

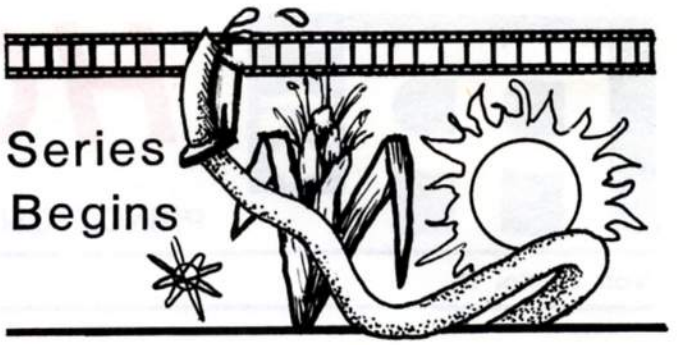
The Security Department has moved its main headquarters to the second floor of the Chem Science Building at B-Site. Although the department will maintain one office at C-Site, all parking permits and ID cards will now be issued at B-Site.

The general department number is 683-2893, while Jim Kopliner's number is ext. 2894. The captain's office number is ext. 2895, and the proctors may be reached at ext. 2896.

Thank You

Crayton Miller and his family thank all PPL employees for their kindness and donations. God bless you all.

Crayton Miller



An Energy Awareness lecture and film series, sponsored by the Training and Development section of the Personnel Department, will begin April 14 at noon. The series, to be held in the Melvin B. Gottlieb auditorium, will continue at noon every Tuesday and Thursday throughout April and May.

The first speaker in the series will be Dr. Rob Goldston, who will present an informal talk on the basics of fusion plasma physics. Following Dr. Goldston's talk, a short videotape of one of the first experiments in atomic power, "The Day After Tomorrow", will be presented.

The goal of the series is to maintain a level of awareness of energy issues. Films for future programs include "Energy Update" on April 16; "The Ultimate Energy", April 21; "The Great Energy Freeze", April 23; "Gasohol", April 28; "Rethinking Tomorrow", April 30; "Running on Empty", May 5; "The Superconducting Dipole Magnet", May 7; and "The Silent Power", May 12.

All PPL employees are invited to attend.

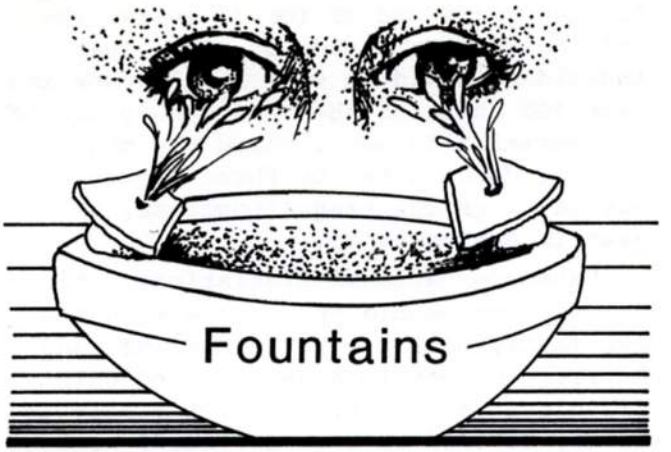
Cashier Hours

In order to facilitate cash procedures and better organize the workflow, the A-Site cashier's hours have been changed. The new hours, which are effective immediately, are from 9 to 10 a.m. and from 2 to 3 p.m.

All travel advances, petty cash reimbursements and check cashing services will take place during these hours on all normal workdays. Emergencies will be handled as they arise, but will require the approval of Harold Phelan.

C-Site check cashing procedures remain the same.

Emergency Eye Wash



Several new eye wash stations were recently installed at PPL. Like any piece of emergency equipment, it is important to know how to use them. If you forget to wear splash goggles, the use of an emergency eye wash may be your last line of defense against permanent eye damage.

To use this equipment, there are several steps to remember:

1. When an individual gets a chemical splash in the eyes, the eyes involuntarily clamp shut. The patient must therefore be led to the nearest eye wash fountain without delay; the first minute or two following the splash is crucial. Ideally, two people should assist the patient to the emergency unit. This is no time to be proud: GET HELP!
2. The eye wash unit should be turned on and the patient's face positioned in the water stream. The eyes must be opened, and held open until both eyes are thoroughly flushed. This can be accomplished by using the thumb and forefinger of each hand to keep the eyes open.
3. While irrigating, the eyes should be rolled so that water flushes around the entire eyeball.
4. The recommended time period for flushing is 15 minutes. Since it is difficult to time and flush at the same time, it is advisable that someone else time and monitor the patient.
5. Contact lenses should NEVER be worn when working with chemicals. If this type of emergency occurs with contacts, they MUST be removed before flushing begins.
6. Water -- and only water -- should be used for flushing. Leave further treatment to a qualified physician.

During an emergency is no time to start looking for an eye wash. Familiarize yourself with the location and operation of the unit nearest your work area now.

If you work with corrosive chemicals and liquids and have any questions, contact Ken Semel, Health and Safety, ext. 2531.

Loan Rates

The interest rates on loans obtained through the Princeton University Employees' Federal Credit Union were revised as of April 1.

Borrowers will be charged a 13.5 percent interest rate on unsecured personal loans and used car loans. A 13 percent interest rate will be charged on new car loans, where the maximum repayment period is up to three years. For new car loans, with a maximum repayment period of four years, the interest rate is 14 percent.

FHA home improvement loans will carry a 13 percent interest rate, while a 10 percent interest rate will be charged on loans in which a member's shares are used as collateral.

Loan protection life insurance is provided at no extra charge on loans of $10,000 or less, as is 100 percent disability insurance.

To The Editor Of HOTLINE

You have probably heard about that young Cro-Magnon man, who through a freak of Nature was able to come to Princeton recently. After trips to a

barber and the U-Store, where he picked up some clothes, he regularly walked on campus and attended classes. Nobody ever gave him a second look.

The whole thing is probably just a story, but it could have been true. The body has not changed materially from Cro-Magnon Man to Supermarket Man. As a result, we still have to abide by specifications that were promulgated 15,000 years ago. If we don't, we pay the penalty of faulty tissues, broken down organs and death itself.

Take smoking as an example. Cigarette smoking was not among the Mesolithic design criteria. If Cro-Magnon Man occasionally inhaled smoke while sitting at a camp fire, his lungs would suffer no permanent damage. Lung cells were continuously being replaced, with the worn out cells moved up and out by the cilia in the windpipe. A few extra cells due to smoke damage now and then would not overload the repair system.

The trouble with some modern individuals is that they believe the repair capacity of their own lungs is much greater than it really is. They ignore the amber and red lights past the point of no return.

The de Haas Rule of One Thousand

From 1972 to 1974, I performed studies (Transac. N.Y. Ac. J. of Sciences, Nov. 1974) which led to a rule for smokers as simple as Ohm's Law:

If the product of D and Y exceeds 1000, the individual runs a risk of 10% or more of contracting lung cancer (which in itself has a five-year survival rate of only 8%)

where D = the number of cigarettes smoked per day and
Y = the number of years that the person has smoked at the D level.

If the Smoking Product (DY) is less than 500, the risk of contracting the disease is vanishingly small.

The total Smoking Product is the sum of partial products to date. If somebody has smoked ten cigarettes per day for ten years and 20 for 15 years, the Smoking Product stands at 400. That individual would do well to allocate the last 100 units to the remaining years of the normal life span, which may mean cutting down to two or three cigarettes per day - or quitting altogether, whichever is easier to do.

Based on national statistics, between one and two people per year within the PPL family will break the One Thousand Barrier and get into serious medical trouble as a result. The PPL family is hereby defined as the 1200 staff members and their 3200 relatives, producing a population sample of 4400 with the standard age distribution.

Besides causing lung cancer, oversmoking also contributes to heart disease. However, the numbers cannot be formulated as clearly as in the D.Y. product above, except by stating that the number of cases of heart trouble due to smoking exceeds those of lung trouble. One might call that a negative bonus added to the rule of One Thousand.

PPL is fortunate to have a strong Safety group, which is augmented as needed by the zealous Plainsboro Fire Inspector. If those people find a circuit breaker for 300 MVA exposed to 310, or they notice that a fire lane is less straight than an arrow, they may close down an experiment or chase occupants out of the building - as they should. But they ignore the fires that burn less than 100 millimeters from staff members' lips, and rightly so, because those fires are not or not yet within their charter.

In a way, that is an inconsistency that costs us a few lives per year, every year. If the cause were anything other than cigarette smoking - say radiation exposure - OSHA would have shut down PPL a long time ago and we would all be looking for work.

I am very interested in getting a reaction from you and the readers of Hotline about what can or should be done about this inconsistency.

E. de Haas

ppl people

Farewell to a Friend

This edition of PPL PEOPLE is devoted to Millie (Willerton) Lefler. Millie recently retired from the laboratory, but we couldn't let her go without this fond farewell from her co-workers.

That most employees knew Millie was no accident. No matter how busy she might have been, Millie could be counted on for a helping hand or a sympathetic ear. She always knew what was happening throughout the lab, because she took a sincere interest in the people behind the projects.

Everyone was important to Millie. Her enthusiasm helped fire the enthusiasm of others, forging those she worked with (whether on the ERC, the SOSS, the picnic committee or PDX) into an effective team. Work was more pleasurable with Millie around.

Her thorough knowledge of the people and the past of PPL made it seem as if she'd been with the lab for years. Many people will be surprised to learn that Millie joined PPL as a research department project secretary in February 1975, followed by her promotion to office coordinator in October 1978.

But titles and dates aren't the way to measure Millie's impact on PPL. She touched a lot of people here, and we asked some of them to tell us about Millie.

Dale Meade (Head of Experimental Division): Millie came at a time when we were just starting PDX up, and she was a great help to us. She worked with Jim and me during this period, and her concern extended to the laboratory, to that program, and to Jim and me. When there was anything that needed doing,

she'd come in early or stay late. I never had to ask her; she came in on her own initiative.

She set up a number of committees, and got the bowling league going. She created a family-like atmosphere for us, and she was the glue that held it together. I think she did that for the entire laboratory too; in this spread-out place, she helped people come together and have some fun.

It's hard to come up with enough superlatives to describe Millie. She never gave us a day of difficulty; she was always working like mad here... Millie is extremely conscientious.

Millie is interested in the laboratory, not just as a job but as part of her life. She is certainly not the kind of worker who comes in from 9 to 5, just putting in time. She seemed to think of the laboratory as her home, her extended family.

Her biggest concern (when she was leaving) was what we were going to do to carry on; she was worried about the job, and about me. I can't say enough about Millie; I was extremely sad to see her leave.

Jim Sinnis (S-1): Mildred always hustles and bustles; she has to be busy. She'd always take on a great deal of work...Even when she went for a walk at lunch, she was picking up acorns, pinecones and dried flowers for her plaques and arrangements. She is a very dynamic individual.

Mildred is like the Royal Canadian Mounties -- she always gets her man. Once, when Dale was a meeting in Europe two or three years ago, something came up at the lab and we had to get in touch with him. Millie got hold of a program for the meeting, found out when the coffee break was scheduled, made allowances for the time differences, got a lab employee who spoke German to stand by in case she got a German operator, placed the call -- and within an hour, we were talking to Dale. Millie had gotten her man!

Dick Palladino (Experimental Group -- Laser Diagnostics): Millie is one of the best organizers to come along; she was more the den mother to our group than the secretary. She got along quite well with everyone.

Millie... took all the little burdens off people; she did a lot of things she didn't have to do, things that weren't in her job description. She really kept the machinery going!

Millie also has a maturity that you don't find in many people; she is a very stable person. She dug right in and got

to work. Many people want authority, but not the responsibility that goes with it, but Millie tended to go the other way -- a refreshing change.

She was always a bundle of energy. Her natural pace is to go full speed ahead... She has more imagination and ideas than one person can exploit in a lifetime.

(Although she's only been here since 1975), she carried the impact of someone who'd been here for 15 or 20 years. She certainly blessed a lot of us!

Dick Holzbaur (Laser Lab): We swapped ideas, and talked about various kinds of crafts. She was always our 'informant'; since she left, we don't know what's going on around the lab. I hope they can send us another one like Millie!

Howard Holzbaur (Laser Lab): Millie was one of the nicest gals I ever met. If she could do a favor for you, she'd do it without batting an eye. She helped everyone; I guess she just liked people. She organized just about everything that went on here.

She was interested in everything that was going on. She gave everyone a lift just to see her; she'd always pick you up, not push you down. We liked her over here, and she's always welcome in T260. In fact, we'd be mad if she came back and didn't come to see us!

Millie's a well-liked individual; I don't think there's anyone who can say anything bad about her. She's gonna leave a big gap in this organization. We miss her candy jar -- but not as much as we miss Millie herself.

Bernie Giehl (Picnic committee member, 1979-80). Millie really entertained the kids at the picnic. She worked hard to keep them amused...she was there when the gates opened, and she circulated through the crowd the entire day. Millie was one of the outstanding members of the committee; she worked very hard organizing things, and she also served as secretary for the committee.

Mary Ann Brown (Chairman of the SOSS during Millie's tenure): As chairman of the Secretarial and Office Support Staff, I had considerable contact with Millie regarding meetings and SOSS programs. Millie was always very enthusiastic -- most helpful and always cheerful.

Sara Paterson (ERC secretary): Millie... was especially looking out for secretaries' rights. She organized the typing course here...She also started the women's bowling league by contacting the alleys, organizing teams, holding meetings, persuading the lab to donate a team trophy, and organizing the awards banquet.

Mary Alice Eubank (President, women's bowling league): Millie started it all (the league), and provided the impetus for us. Every week now, we have a good time because of her.

I'll miss Millie's supply of information and knowledge; I depended on it to help me do my job. She is one of the best secretaries around; she is very interested in the laboratory, and she took her job seriously. And personally, she's a neat person!

Chris Ritter (Alleycat Captain): We were on the same bowling team, and... Millie helped us keep our sense of humor. When things were going badly, and we weren't bowling our averages, she told us to "kiss the ball" so we'd get a strike or a spare. And surprisingly, it often seemed to work!

Ilse Gusciora (Travel Services) When (the women's bowling team) started, we were all "green", and Millie was very patient with us. We all grew with the league, and it's been running smoothly ever since. We won't forget who got us started, and I'll miss Millie. She is very vivacious, and has a lot of enthusiasm.

Debbie Anastasio (Photo Lab): Millie gave me lots of confidence I didn't really have when I started here. I appreciate everything she did for me; she's always been really nice...she always went out of her way to help you, to get things done for you. If you needed anything, you just had to ask her. She always had something nice to say; I never heard her say a bad word about anyone.

Gloria Pokwrya (Millie's replacement in PDX): When I first came here, I was a Kelly Girl, and I had never done technical typing before... Millie... really taught me everything I know today about technical typing.

Everyone is familiar with Millie's creativity, her arts and crafts. In fact, Millie had tried to form an arts and crafts club here at work, where everyone would have the opportunity to display their arts and crafts in the cafeteria.

She always told me she tried to do one kind thing every day. She was also a confidante of some of the people here, and anything they told her was always held in strictest confidence.

She was the dynamo that kept PDX going in its early days...I've never seen anyone work as hard as Millie -- she never sat down!

Sandy Dreskin (chairman of the ERC Committee during Millie's tenure): Millie is the type who tried to get involved, who is extremely sincere in her efforts to help. She did whatever she could to smooth out the daily problems that popped up in the laboratory. She could sense when things needed to be changed, and she tried to improve them.
She has a much greater sense of civic duty than most employees here...Millie recognized problems, and attempted to solve those problems without being abrasive or offensive...she is an active member of the ERC.

She felt we needed to help the secretarial people, and provide an opportunity for the secretaries to improve their skills. She was involved in starting courses for technical typing, and in any number of other programs on the committee. She always helped out...she is a nice lady!

Betty Cary (Experimental Group): Millie is such a warm, considerate, understanding person. She helps others without taking any credit herself, and she's

got such a sparkling personality! When she bought "Bingo" (the monkey puppet she used at last year's picnic) in San Francisco, she put on a show for the children on the plane coming back!

I think Millie loves and enjoys every minute of life. She also loves flowers, and has beautiful roses in her yard. I think I'll miss picking her up in the morning and evening, never knowing what... I never knew what I was going to be lugging home or bringing in with me for Millie.

Sallie Young (Applied Physics Division): I met Millie when I started to work at the lab, some six and a half years ago. I think we started within a few months of each other. Our careers took vastly different paths, however, as... Millie plunged into the turmoil of helping PDX get off the ground.

What a time that was for her! I recall I would see her on my infrequent visits to C-Site, almost always trying to track down an elusive physicist late for a meeting.

I have always felt that Millie embodied what some people have left behind, in that she was constantly willing to help in any way she could with any project, always with a cheerful heart and a sunny smile.

Gloria Pollit (Former Captain of the Alleycats, Millie's bowling team): Millie is so helpful and enthusiastic, at work at the lab as well as in personal contact with her. She's thoughtful, and always willing to help...I haven't had a great deal of contact with Millie at work, but any contact I have had with her has been a pleasure!

"MILLIE"

Though to some it sounded silly
She would answer "This is Millie"
When you dialed Dale Meade's number on your phone.
With her manner light and airy,
She's a perfect secretary
She puts you at ease and makes you feel at home.

If you needed a suggestion,
Or an answer to a question
A call to Millie got results without a story.
We all know she wasn't fired
It's just that she's retired
And for sure we'll miss her at the laboratory.

A better friend you could not find,
She was gentle, warm and kind
And with those with whom she worked, she sure was fun.
Now she's walking down new paths,
Working on her arts and crafts
Hope her future days are bright. This poem is done.

"A Friend"

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 Communications Office, Module 2, C-Site, James Forrestal Campus, ext. 2754.