HOTLINE

PRINCETON PLASMA PHYSICS LABORATORY

Vol. 2, No. 6 December 23, 1980

Grant Announced

The Princeton University Department of Astrophysical Sciences recently announced receipt of a grant to support graduate study in plasma physics from the Westinghouse Educational Foundation.

According to foundation Executive Director Dr. George E. Moore, foundation trustees approved a grant of $16,000 payable in 1981 and 1982 at their November meeting. The monies will fund six two-year graduate prizes in plasma physics at Princeton, with three awards made each year. Each prize grants $2,650 to be paid to the recipient during the first two years of his or her studies.

PPL's Associate Director for Academic Affairs Dr. Thomas Stix was strongly enthusiastic about the grant. He noted that the prizes, which supplement students' assistantship support, can play a critical role in attracting outstanding students into plasma physics and to the Princeton program.

Dr. Stix added that the Westinghouse Corporation has been active in plasma physics research continuously since 1953, and that there has always been close cooperation between Princeton and Westinghouse.

Energy from Heaven and Earth

He admits that Enrico Fermi called him "The only monomaniac with several manias." But in speaking at PPL, Dr. Edward Teller was single-minded in his message: We need more energy.

In a wide-ranging discussion of a variety of energy sources —— oil, wind, ocean thermal energy conversion, solar cells, synfuels, nuclear energy, fusion —— he kept hammering home his central thesis that the U.S. and its Western allies face grave fuel shortages that would, according to Dr. Teller, make the "energy problems of today negligible compared to those we will face in the near future." Only more energy production now can lessen the impact.

In a Research Department colloquium held December 11 before a standing-room-only audience, Dr. Teller reiterated his strong support for nuclear

power and stressed the need for advance planning for energy emergencies.

As for fusion, Dr. Teller said that "There is little doubt in my mind that fusion will work." But for him, the economics of fusion power are yet to be proved.

Course Offered

A five-day course, "Introduction to Analog Programming", will be offered at PPL during the week of January 12 in the auditorium of Building 1-N. The course, which includes demonstration and workshop activities, is being offered for members of the engineering, scientific and research staffs.

The course will cover concepts, techniques and procedures necessary to simulate continuous systems on an analog computer. Programming, scaling and checking techniques will also be discussed.

For further information or to register for the course, contact Training and Development Manager Larry Holpp at ext. 2401.

Deadline Approaching

All employees are reminded that their 1980 year-end Major Medical bills must be submitted to Personnel by January 1, 1981. If you have any questions on the program or the procedure for submitting bills, contact Eleanor Schmitt at ext. 2035.

We Get Letters.....

I would like, personally, to express thanks and commend the HOTLINE staff for an outstanding job in the preparation of our employee newsletter. It is an effective communications vehicle that is both informative and knowledgeable reading.

Keep up the good work!

Leonard S. Thomas
Employee Relations Supervisor

New Hires

If an ounce of prevention is worth a pound of cure, then Ken Semel has been providing those ounces for the laboratory since he became PPL's industrial hygienist in October.

Ken earned his bachelor's degree in environmental science from Cook College, a division of Rutgers University. After working as a sanitarian, he enrolled in Temple University, where he received his master's degree in occupational health and safety. Prior to joining the laboratory staff, Ken worked as an occupational health consultant for the New Jersey State Department of Labor and Industry.

In his job as PPL industrial hygienist Ken will apply "the science or art of recognition, evaluation and control of workplace hygiene hazards." A hazard can be described as any chemical, physical or biological agent which may cause discomfort, disease or impair the health and well-being of a worker.

His job in actuality isn't always so clearly defined, however. He deals with a "whole spectrum of hazards," many of which have long-term cumulative effects. His investigation begins with a survey of the work area, gathering data from the physical environment and the workers involved. That on-site inspection helps determine whether further testing for potential or real hazards is necessary.

"It's a hybrid science," Ken explained, "combining chemistry, physics, statistics, biology and so on. You're a jack of all trades, but it's an interesting position; you're dealing with something different every day."

There is no 'typical' day for an industrial hygienist. Ken may find himself giving instructions on the use of a respirator one day, evaluating the protective value of specific work gloves the next, and attempting to track down a mysterious odor the third.

"Mysterious odors are the hardest things to deal with," Ken believes, "because our instruments can only measure concentrations in parts per million, while the nose can sometimes detect parts per billion. You can often get combinations of smells as well, smells that individually might go unnoticed."

Often substitutions can be made for substances causing specific problems. In other cases (such as noisy environments), hazards can be engineered out or (in the case of certain chemicals) workers can be protected with gloves or a respirator. But Ken admitted that sometimes he's stymied by a problem, and in certain situations his findings and recommendations can only go so far. "Unfortunately, I don't have any magic bag that I can pull solutions to problems out of."

For the future, Ken would like to institute a regular respirator program. Each employee receiving a respirator would be given a short course in its use and maintenance.

Also in the offing is a hearing conservation program, which would test workers' hearing and keep them informed of available protection equipment. Ken would like to establish an ongoing program, so that new employees could be 'plugged into' the program and trained as they join the laboratory community.

Ken emphasized that his job is service-oriented; "I'm here for the people, to let them know about potential hazards, provide options and direction. An industrial hygienist provides a different way of looking at things."

Employees with questions are urged to contact Ken at the Health and Safety Office, ext. 2531.

Tree-nappers Beware!

Although this may be the season of giving, PPL is not giving out free Christmas trees. No employees are permitted to cut down trees under any circumstances. Violators will be prosecuted, according to Security.

Crane Failure

On Thursday, December 11, a crane failure occurred during assembly of the second motor-generator being constructed for use on the Tokamak Fusion Test Reactor (TFTR). No one was injured in the mishap.

The failure allowed a 350-ton 25-ft. diameter cylindrical stator to fall 15 feet while it was being positioned around a rotor assembly on the second of two motor-generators which will be used to store energy for use on the TFTR experiment. An assessment of the extent of damage is now being made by officials of the U.S. Department of Energy.

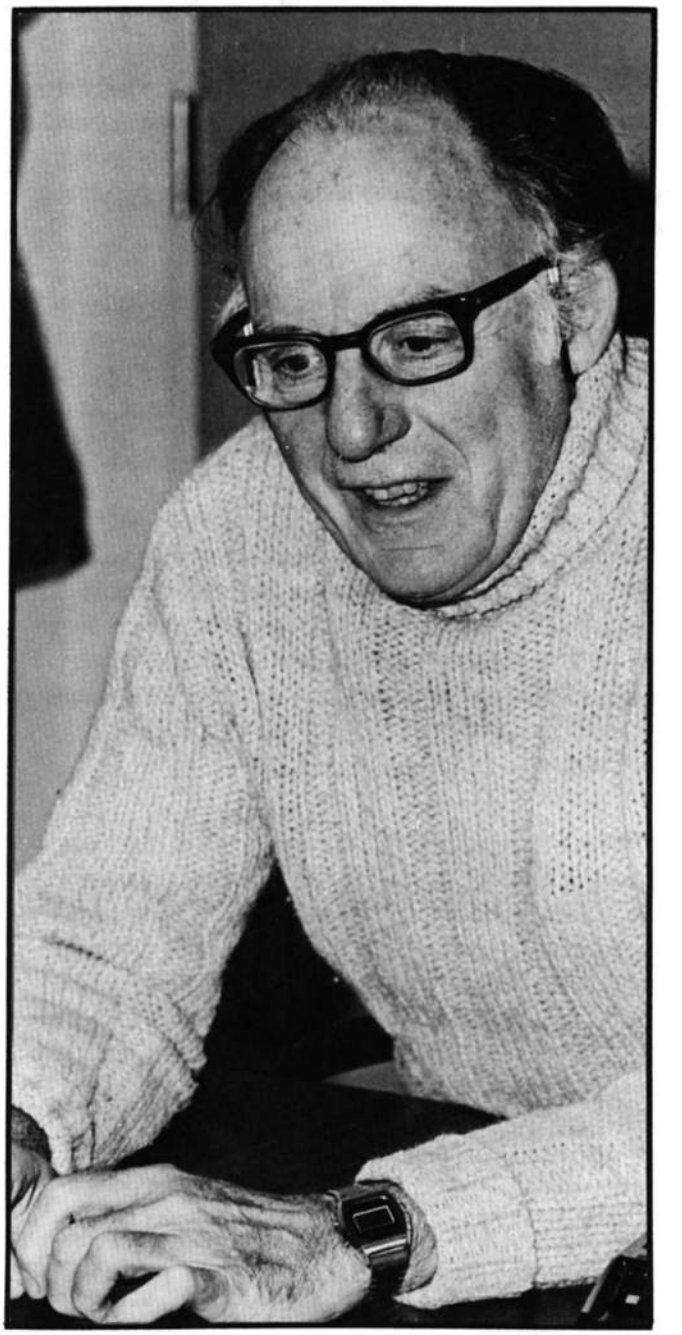
Since the first motor-generator has been completely installed, researchers will be able to operate the TFTR while repairs are performed on the second set. The second motor-generator will not be required for several years when break-even experiments will commence. Hence, Thursday's accident should not delay the TFTR program.

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.

ppl people

An Interview with:

M.B. GOTTLIEB



December 31 marks the end of the year, and the end of an era at PPL. Laboratory director Dr. Melvin B. Gottlieb will be retiring from the position he has held since succeeding Dr. Lyman Spitzer Jr. in 1961.

During his 26-year association with PPL, Dr. Gottlieb has seen the laboratory grow from a small contingent of investigators to a full-blown experimental facility on the leading edge of magnetic fusion research. The fusion concept itself has matured along with the laboratory: rather than the distant dream it once was, the TFTR, currently under construction here, is expected to achieve the breakeven point, Q=1.

Dr. Gottlieb recently took the time to reflect on the past and to offer some predictions for the future during an interview for the HOTLINE.

Q. How have you perceived the job of PPL Director?

A. The director organizes the lab to establish and then to achieve its objectives, gets the people who are needed, and works with the University and Washington in an effort to define PPL's role in the national fusion effort. The director deals with a thousand and one "people problems."

Public speaking is another aspect of the job that I have found particularly rewarding. I have felt for a long time that it is indeed possible to explain to the layperson what we're doing and why we're doing it, without using highly technical language. Since we are publicly supported, we have a duty to the public to make our ideas clear, our hopes clear, our dreams clear. Since I've been fairly

successful in doing this, I try to fit in requests to speak a couple of times a month. My position has always been that I can't really convince anybody else unless I'm convinced myself. I've always had the feeling that in this lab we can do what we set out to do.

Q. As laboratory director, how have your duties changed over the years?

A. I would say I've become more a scientific advocate than a scientist. I used to try to get into the laboratory once a week, but I don't even succeed in doing that anymore. Over the past decade, PPL has expanded rapidly from budgets of $7 million in the early 70's to $100 million today. When that rapid expansion started, my involvement as an experimentalist was doomed.

Q. When was the high point of your tenure at PPL?

A. One evening in July 1978, the PLT temperature was going up and up. I was in the control room watching the data come in. Finally, I was making people too nervous, and was chased out.

Q. What would you identify as your greatest personal achievement?

A. Putting together a superb, well motivated staff.

Q. Do you see a shortage of trained people as a future problem for the lab?

A. We train people here, but there is an overall shortage of physicists throughout the country and an even more extreme shortage of engineers. The nation must reach all the way into grammar school to make sure adequate training is provided, particularly in mathematics. Most of the students I've encountered who had serious problems in science, who feel its's beyond them, simply had difficulties with their early training in mathematics.

Q. What was the scientific significance of the 1978 milestone?

A. We have to get very high temperatures, up to 100 million degrees, which is hot even compared to the center of the sun. To get this temperature and to keep heat losses to a tolerable level, we have to provide excellent insulation. We can neither reach high temperature nor make use of that high temperature if the insulation is not adequate.

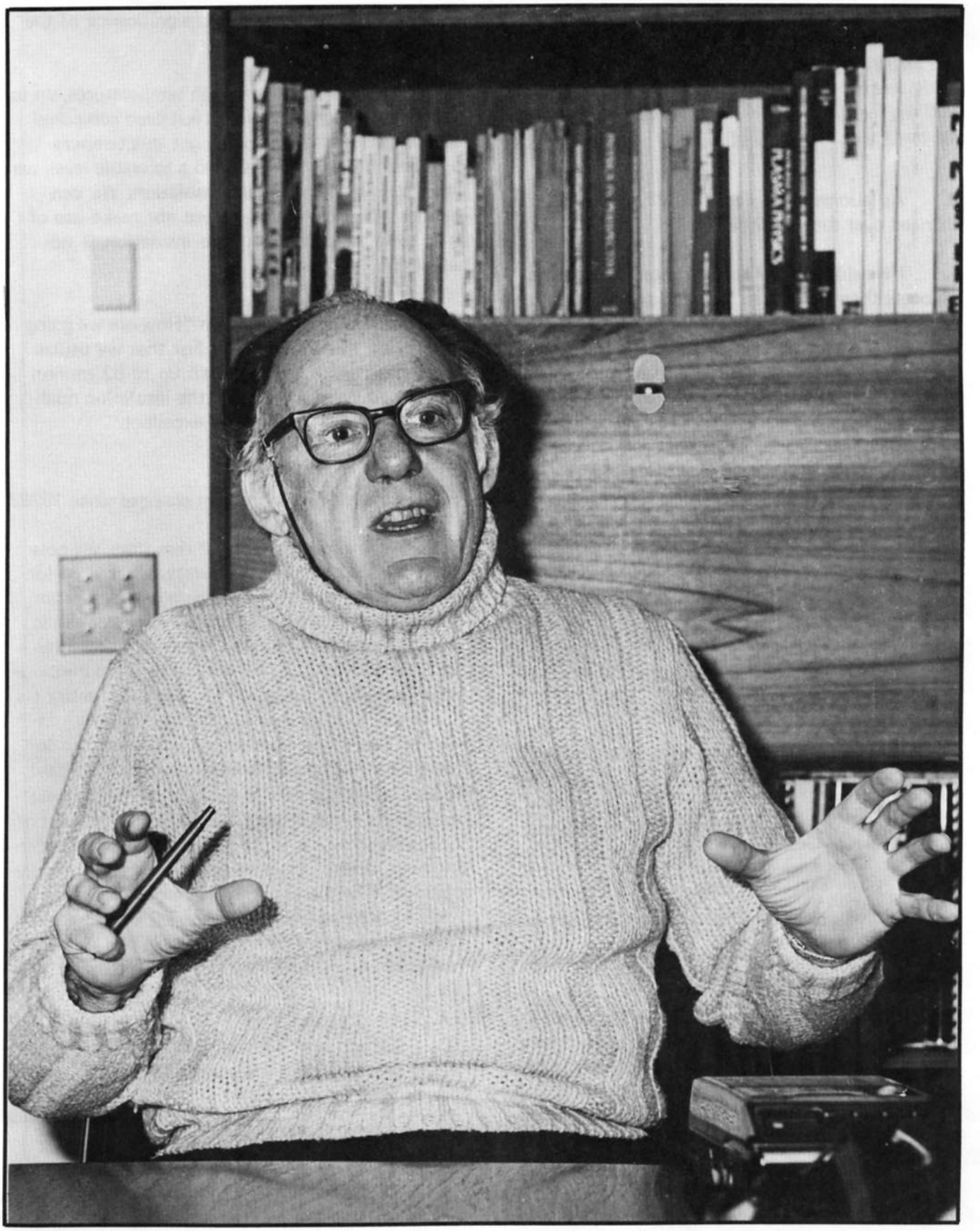
The question has always been "How are we going to provide this insulation?" For that we utilize a magnetic field. We've gotten up to 82 million degrees now and shown that the insulation qualities of the magnetic field are excellent.

Q. How has PPL's program changed since 1978?

A. We changed our path at that time. We now know we can reach the temperatures required for fusion using neutral beam heating. The question has shifted to one of "What's the most economic, or the simplest, method of heating the plasma?" We have one method that works, and that method is certainly quite adequate for laboratory purposes, but it has some disadvantages. Neutral beam injectors have to be located right up against the confinement device itself; this makes them very hard to maintain. In theory, we should be able to heat the plasma in other ways, particularly by means of radiofrequency waves. RF generators can be put in the next room or blocks away, with the RF energy piped in. There are a whole number of different ways of heating by radiofrequency waves. We've been trying some of the methods on PLT and the results are quite encouraging.

Q. Getting back to your personal involvement in the program, have there been things that have discouraged you?

A. The last few years have been quite encouraging. There are certainly questions that remain open. I wish we could pin down more exactly the nature of the energy loss processes.



Q. Are there any decisions you would alter in hindsight?

A. I can look back at individual choices which now appear not to have been the best, but we didn't know enough at the time to do better. The basic ideas had been exposed, but there were enormous gaps that had to be filled in.

Of course, you're never satisfied. You always say that if your intuition had been a little better, we might have gotten around many problems. Total satisfaction is not to be achieved.

Q. What do you see as your role in the fusion program after January 1?

A. I will stay on at PPL for a six-month transition period. Beyond that time, I hope to work with government officials and economists on matters of energy policy. . . . I would like to sort of taper off, but I would not like to vegetate!

Q. In talking to Congress, would you advocate an "Apollo program" for fusion energy development?

A. The Magnetic Fusion Energy Engineering Act of 1980 did not recommend an "Apollo program"; it calls for a gradual expansion. I envision an Apollo program as a big pot of money for you to spend without detailed justification.

I am opposed to that kind of "Apollo program". The way to proceed is to examine what it is you are waiting to do. Are you fund limited, or are you idea limited? It is clear to us that we are indeed fund limited. We've been waiting to do many things that are needed for our program, that we couldn't do because there wasn't enough money. A 50% increase in one year would be soaked up very quickly. That level of increase would not represent an Apollo program.

To put it another way, in an Apollo program you say "I have a problem and six ideas to solve it". Instead of choosing the best one, you do all of them just to make sure one of them works. There's no way that can happen within the recommendations of the new law.

Q. Is the tokamak approach the only way to commercialize fusion energy?

A. Certainly not! After 25 years we have found a way of doing it, but there are undoubtedly other ways. So how should the program proceed? We have to keep alternate approaches going in the hopes of finding something even better.

The tokamak program is further advanced than other forms of fusion. For that reason, it has been chosen as the means to get into questions of engineering feasibility.

Q. In addition to fusion, what are the nation's other significant energy options?

A. The long term solutions for energy are: fission, fusion, and solar. The question has always been: How much is it going to cost? If it costs 10 times existing levels, you're obviously going to have a great deal of trouble supporting present population levels at the present standard of living. If we don't solve that problem, we'll have a much bigger problem than just an energy shortage; namely, we'll have disorder, a breakdown in our socio-political system —— anarchy! I regard that as the critical matter now. Can we provide at least hope that there will be a reasonable standard of living in the future? The attainment of an economic, environmentally acceptable energy source is of enormous importance for the future of mankind.

Q. What about future involvement of industry in fusion?

A. In a certain sense, our task is over when industry takes over; then we'll begin working on improvements, and working to switch from D-T fuels which will last tens of thousands of years to a D-D system which would last till the end of our solar system . . . . There's a lot yet to be done.