

Hotline

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

Three PPPL Physicists Named APS Fellows

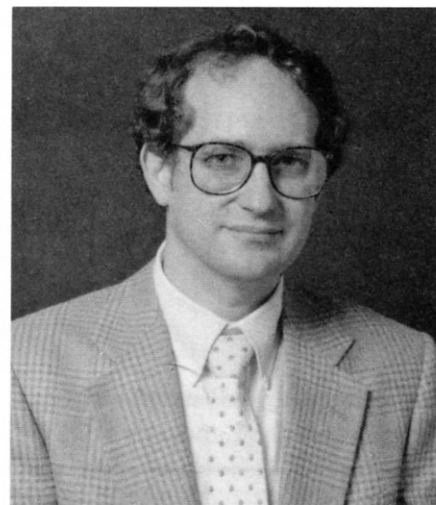
In recognition of their contributions to the field of plasma physics, three physicists from PPPL were recently named Fellows by the American Physical Society (APS).

The three elected to the rank of Fellow by the APS's Division of Plasma Physics (DPP) are Taik Soo Hahm, Janardhan Manickam, and Ned Sauthoff. Hahm, Manickam, and Sauthoff received the lifetime appointments at the November APS meeting held in Louisville, Kentucky. The APS rules limit the maximum number of Fellows selected each year to be half of one percent of the Division membership.

Hahm, a Research Physicist at the Laboratory, was cited in his Fellow-

ship Certificate "For outstanding contributions to progress in understanding anomalous transport and enhanced confinement regimes in toroidal plasmas through nonlinear analysis of microinstabilities and the development of the toroidal gyrokinetic formalism." He received a Ph.D. in plasma physics from Princeton University in 1984 and a Bachelor's in physics from Seoul National University in South Korea in 1980 and has been at PPPL since 1986. Hahm is internationally recognized as a leading theoretical physicist addressing the most challenging advanced confinement scientific issues.

Manickam, a Principal Research Physicist at the Laboratory, was cited "For his extensive contributions to the understanding of magnetohydrodynamic (MHD) plasma processes, discovery of the 'infernal mode,' and stewardship of the PEST code — a uni-



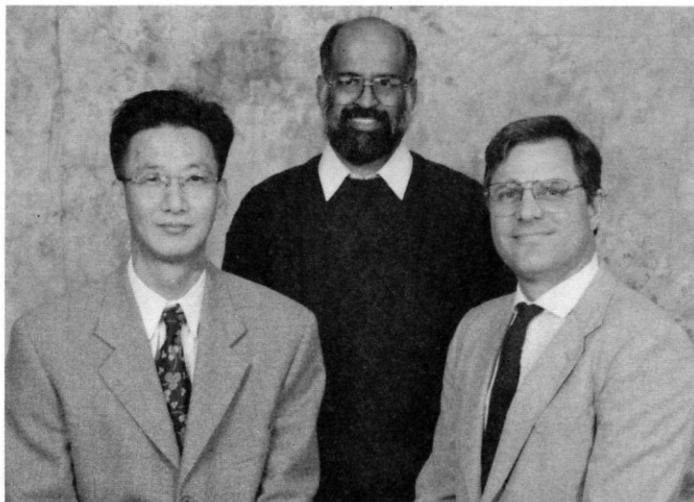
Nathaniel Fisch

Fisch Elected APS Vice-Chair

Nathaniel Fisch, a Professor of Astrophysical Sciences and Director of the Program in Plasma Physics at Princeton University, was recently elected Vice-Chair of the American Physical Society's (APS's) Division of Plasma Physics (DPP). The term begins this month. Fisch will become Chair of the DPP in 1998. He presently serves as Associate Director for Academic Affairs at PPPL.

Strong Personal Commitment

Laboratory Director Ronald C. Davidson said, "Professor Fisch has a very strong personal commitment to excellence in plasma physics research and education. I am delighted



The APS Fellows are, from left, Taik Soo Hahm, Janardhan Manickam, and Ned Sauthoff.

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APS Fellows

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versal tool for assessing tokamak stability properties." Manickam, who has been at PPPL since 1975, received a Ph.D. in plasma physics from the Stevens Institute of Technology in 1975, a Master's in nuclear physics from Andhra University in Waltair, India, in 1968, and a Bachelor's in physics from Osmania University in Hyderabad, India, in 1966. His present work centers on the simulation and interpretation of key MHD phenomena in tokamaks, and includes a lead role in investigating the physics properties of the new enhanced reverse shear modes in the Tokamak Fusion Test Reactor at PPPL.

Sauthoff, a Principal Research Physicist at the Laboratory, was rec-

ognized "For seminal contributions to the application of X-ray diagnostics to the study of sawteeth and disruptions in tokamaks, and for distinction in the leadership and management of important research projects."

Sauthoff came to PPPL in 1975 after receiving a Ph.D. in astrophysics from Princeton University. He received a Master's in nuclear engineering in 1972 and a Bachelor's in physics in 1971, both from the Massachusetts Institute of Technology. Sauthoff is Head of the Plasma Science and Technology Department at PPPL and is the Physics Manager of the U.S. International Thermonuclear Experimental Reactor (ITER) Home Team, coordinating the U.S. physics design participation in the ITER program.

Commenting on Sauthoff, PPPL Director Ronald C. Davidson said,

"Dr. Sauthoff's pioneering contributions to experimental fusion science, particularly to the study of disruptions and sawteeth oscillations in tokamak plasmas, can only be described in superlative terms. Also outstanding is the superb leadership he provides as Physics Head of the U.S. ITER Home Team and as Head of the Laboratory's Plasma Science and Technology Department."

Bill Tang, PPPL's Theory Division Head, said of Hahm and Manickam, "Dr. Hahm's exceptional productivity is characterized by depth and breadth. He is highly respected by the fusion research community. Dr. Manickam has played a valuable leading role in MHD theoretical analysis with key applications to PPPL projects, as well as to prominent national and international experiments." ●

Fisch

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with his selection as Vice-Chair of the DPP, and wish him every success in championing the course of plasma physics in this important role."

Fisch came to PPPL in 1978 after receiving a Bachelor's, a Master's and a Ph.D., as well as postdoctoral experience, at the Massachusetts Institute of Technology. Best known for his research on ways to create electric currents in plasma, Fisch specializes in theoretical plasma physics with applications to controlled nuclear

fusion, plasma devices, lasers, and astrophysics. He is the author or co-author of about 80 research papers, has edited one book, and has been granted seven U.S. patents, including one on separation methods for petroleum refining. His current research focuses on improving the tokamak concept by using waves to extract power directly from energetic fusion byproducts.

APS Award for Excellence

Fisch, an APS Fellow, is the 1992 recipient of the APS's Award for Excellence in Plasma Physics Re-

search and is a 1985 Guggenheim Fellow.

During a recent interview, Fisch said he looks forward to working with the current Chair and Chair-elect of the DPP.

"These are difficult, unprecedented, and rapidly changing times for American science, in general, and for the Division of Plasma Physics, in particular. My immediate predecessors are already responding vigorously and wisely to the challenges faced by the Division. I look forward to joining their efforts," said the newly elected Vice-Chair. ●

HOTLINE

Editor: Carol Phillips
Writer: Patti Wieser
Photography: Dietmar Krause

Graphic Artist: Greg Czechowicz
Layout: Patti Wieser

The **HOTLINE** is issued by the Princeton Plasma Physics Laboratory, a research facility supported by the United States Department of Energy. It is primarily an internal publication. Correspondence and requests to reprint material should be directed to the Editor, PPPL **HOTLINE**, P.O. Box 451, Princeton, NJ 08543; Interoffice correspondence should be addressed to Room B366, LOB Bldg., C-Site; fax 609-243-2751; telephone 609-243-2754; e-mail caphilli@pppl.gov

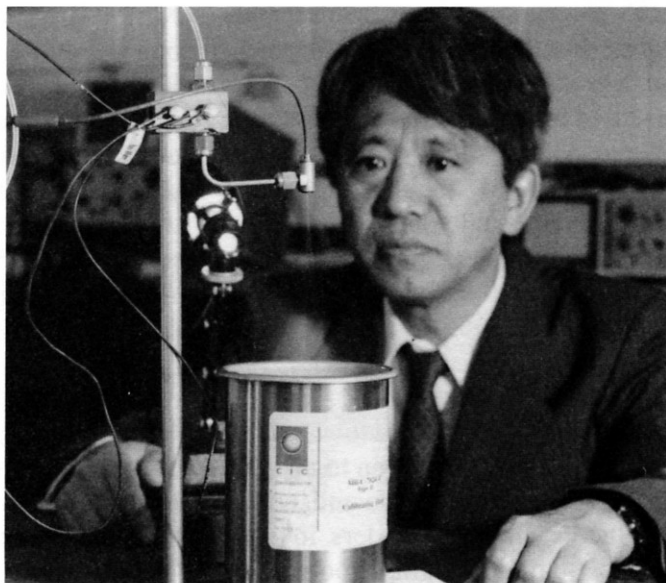
PPPL Scientists Begin Research Programs in Electrostatic Atomization

Scientists at PPPL are applying skills in theoretical and experimental plasma physics gained from fusion energy research to solve problems in the field of Electrostatic Atomization (EA). Attempts to understand the behavior of electrostatically-charged liquid and powder droplets date back to Lord Rayleigh. The famous nineteenth century physicist was intrigued by the pure science. Today there are good, practical reasons for the interest as well. A multitude of applications exist, including the design of novel fire sprinklers, fuel injection systems, and fine powder paint sprays.

If fire sprinklers could be designed to discharge an electrically charged water mist, the amount of water required to control a fire could be reduced dramatically. Because flames are good conductors of electricity, the charged mist would be attracted to the fire, thereby eliminating the need to deluge an entire area and preventing unnecessary water damage to valuable materials not directly involved in the fire. It is estimated that one electrostatic sprayer could replace three or four conventional sprinklers.

Self-repelling Uniform Droplets

Using electrostatic atomization, gasoline, aviation, and diesel fuels can be atomized into self-repelling



Hideo Okuda adjusts the spray triode voltage to find the optimum spreading of the charged droplets.

uniform droplets, which are much smaller than the packets of fuel typically fed into engine cylinders. The droplets are burned more efficiently, increasing fuel efficiency and lowering pollutants.

Unlimited Atomization

For painting applications, fine powder particles can be charged using an electron gun. The particles are then attracted to grounded surfaces, electrostatically coating front, back and corners, thereby avoiding the need for cumbersome multiple spraying from all the directions. By directly injecting electrons into powder particles, unlimited atomization can be achieved.

Both experimental and theoretical research programs in EA are now underway at PPPL. The work is carried out in a Cooperative Research and Development Agreement between PPPL and a local area firm, Charged Injection Corporation (CIC). Work is also being supported as part of PPPL's Laboratory Development Program Activities. The goal of these programs is to set up a comprehensive EA research and development program at the Laboratory. ●

More detailed information on electrostatic atomization research at PPPL is available in a soon-to-be published PPPL Digest. Copies will be available in Information Services, C-Site, LOB, B-378.



Hideo Okuda measures the pressure of the vacuum tank using a discharge vacuum gauge.

Science on Saturday Kicks Off on January 13

Want to hear a Nobel Prize winning biologist discuss his work in rearranging the development of legs and eyes in fruit flies? Interested in finding out how a New York Times science writer puts together articles? Or how about a concert that includes unusual sounds created by digital techniques? These are among the topics and features of the 1996 Science on Saturday series beginning January 13 at PPPL.

Science on Saturday is a series of nine free lectures geared toward high school students, but open to all. The lectures are given by scientists and engineers who are leaders in their fields. Started as a grass-roots effort 12 years ago by PPPL scientists, it now attracts more than 300 people each Saturday, with attendees ranging in age from 8 to 80. This year's

series is being organized at PPPL by Norton Bretz and Paul LaMarche.

Well-known Scientists

"The Science on Saturday lecture series features some of the most well known scientists in the country this year, including 1995 Nobel Prize winner Eric Wieschaus, a professor at Princeton University's Department of Molecular Biology. Scheduled are presentations on anthropology, biology, molecular biology, psychology, physics, geology, medicine, science writing, and music," said Bretz, noting the speakers are all volunteering their own time to give the lectures. "The eagerness of the scientists from the area to come here makes it work."

The series kicks off with a lecture by Penn State University Professor and anthropologist Alan Walker, re-

cently spotlighted in the news. "Professor Walker has collaborated with Dr. Meave Leakey from the National Museum of Kenya to discover the remains of mankind's oldest ancestors who walked upright in Africa about four million years ago. He will be able to give a firsthand account of the discovery and its implications," said Bretz.

Variety of Topics

The series spans a variety of topics, including music, which Bretz conceded is not usually considered "science." "But science touches almost everything these days and music is no exception," said the series organizer. "Professor Paul Lansky, Chairman of the Princeton University Department of Music, has been a

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PPPL to Host Regional Science Bowl; Volunteers from the Lab Needed

PPPPL is planning to host the New Jersey Regional Competition of the National Science Bowl® on Saturday, February 24. High school teams from New Jersey and Pennsylvania are expected to compete in the day-long bowl. The 1996 top winner of the regional competition will receive an all-expense paid trip to Epcot Center in Florida, to participate in the Fifth Annual National Science Bowl®, scheduled to begin May 3, 1996.

Seeking Volunteers

The organizers are seeking volunteers who would like to serve as judges, timekeepers, or scorekeepers, or to help out with refreshments. Anyone from the Laboratory wish-

ing to lend a hand can call PPPL's Pamela Lucas at ext. 3049.

The competition is a double-elimination tournament. Each team is made up of four students, a student alternate, and a teacher who serves as an advisor and coach. The students answer multiple choice or short answer questions in biology, chemistry, physics, astronomy, mathematics, and general, earth and computer sciences. The questions are being made up by scientists from the U.S. Department of Energy's (DOE) Oak Ridge National Laboratory in Tennessee. All the participating teams in the competition will receive certificates, while the top three will receive trophies and plaques.

The regional competition is sponsored by the DOE and hosted by PPPL. The National Science Bowl® is sponsored by the DOE and the Cray Research Foundation. Winners and finalists of the National Science Bowl® receive national recognition and are awarded prizes such as science trips at home and abroad, school link-ups to the National High School Supercomputer at the Lawrence Livermore National Laboratory in Livermore, California, computer hardware and software, and teacher scholarships. ●

[Don't forget! Call Pamela Lucas at ext. 3049 if you would like to volunteer during the bowl.]

Science

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pioneer in electronic and computer-assisted music and has used digital techniques to alter and create a wonderful set of sounds and compositions. He has collaborated with the Electrical Engineering and Computer Science departments at Princeton to create many of these unusual sounds,

and he will play and describe some of his compositions for Science on Saturday."

Unique Opportunity

"This is one of the very few spots in the world where a program of this quality and breadth can be put together. I hope area students and anyone else who is interested will be able

to take advantage of this unique opportunity," he said.

The lectures begin at 9:30 a.m. and usually last about two hours. Seating is on a first come, first-served basis. An AT&T grant provides buses for transporting students from Trenton, as well as refreshments. ●

[The 1996 Science on Saturday Schedule is below.]



Science on Saturday

Princeton University Plasma Physics Laboratory Lecture Series
sponsored in part by AT&T

January 13	NEW DISCOVERIES RELATING TO HUMAN ORIGINS by Prof. Alan Walker of Penn State University, Department of Anthropology
January 20	FLIGHT STRATEGIES OF MIGRATING BIRDS by Dr. Paul Kerlinger, Author and Environmental Consultant
January 27	SAT - NO PROGRAM
February 3	MAKING MUSIC WITH MACHINES by Prof. Paul Lansky of the Princeton University, Department of Music
February 10	THE HIGHS AND LOWS OF SCIENCE WRITING by Ms. Gina Kolata, Science and Medicine Reporter for the New York Times
February 17	SIGN-TRACKING, A MODEL OF DRUG ADDICTION by Prof. Arthur Tomie of Rutgers University, Department of Psychology
February 24	SCIENCE BOWL - NO PROGRAM
March 2	HOW GENES CONTROL THE WAY FLY EMBRYOS DEVELOP by 1995 Nobel Prize winner Prof. Eric Wieschaus, Princeton University, Department of Molecular Biology
March 9	COMETS AND THE ORIGINS OF LIFE by Dr. Chris Chyba, Princeton University, Department of Geological and Geophysical Sciences
March 16	MALARIA, MOSQUITOES, AND MAN by Prof. Photini Sinnis, New York University, Department of Medicine and Parasitology
March 23	BUILDING A STRONGER MAGNETIC BOTTLE TO CONTROL THE FUSION ENERGY GENIE by Dr. Michael Bell, Princeton University, Plasma Physics Laboratory

The Year in Review...

PPPL Makes Strides in Research, Faces Budget Battle, Rings in 1996 with New TFTR Schedule

For PPPL, 1995 was a year filled with excitement and recognition, a time of loss and transition, a period of renewed hope and ambition.

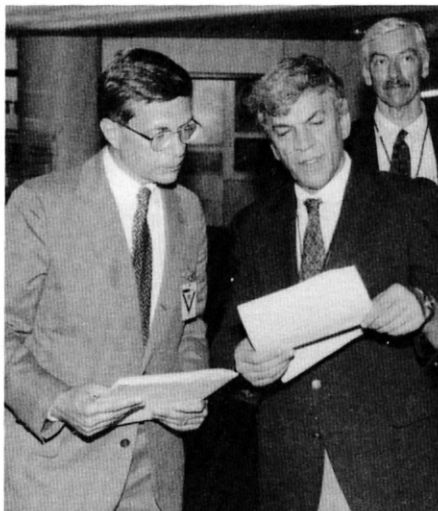
Visits from dignitaries abounded, from Department of Energy (DOE) officials and New Jersey politicians to Korean and Japanese representatives. New Jersey Governor Christine Todd Whitman pledged her support during a February visit to the Laboratory by saying of fusion, "You're seeing a whole new source of energy ... [a source] that doesn't hurt our environment and doesn't pollute."



PPPL Director Ronald C. Davidson presents Governor Whitman with a framed photograph of TFTR during a February visit.

Further support was voiced by the fusion panel of the President's Committee of Advisors on Science and Technology (PCAST). Robert Conn, Vice Chairman of the fusion panel, and Princeton University Professor Robert Socolow, another fusion panel member, said members viewed TFTR as the "flagship" device of the nation's domestic fusion program during a July presentation to employees.

Also backing the Laboratory during a summertime visit was Repre-



Representative Dick Zimmer talks with PPPL Director Ronald Davidson. In the background is PPPL Deputy Director Dale Meade.

sentative Dick Zimmer, who said, "Fusion will free us from our dependency on fossil fuels,...diffuse the situation in the Middle East, and reduce the cost of power. It promises an immense benefit not just for this country but for humanity."

PPPL and Princeton University officials continued their efforts to gain support for fusion from Congress throughout the year. Ultimately, the Department of Energy received just \$244 million from Congress for fusion for Fiscal Year 1996, down from the previous year's allotment of \$365 million. And in September, the Laboratory faced a reduction-in-force as a result of the cut.

Said PPPL Director Ronald C. Davidson, "The loss of so many valued colleagues in the recent reduction-in-force is a very traumatic experience for all of us."

But 1995 was also a year of firsts, and a time of acknowledgment for the staff's achievements.

Tokamak Fusion Test Reactor physicists discovered a new, fundamental mode of plasma confinement which could reduce substantially the size and cost of commercial fusion powerplants. The "enhanced reversed shear" technique involves a magnetic-field configuration which dramatically reduces plasma turbulence and could possibly double TFTR's record fusion power output.

In addition, the Magnetic Reconnection Experiment produced its first plasma in October and around the same time, the magnetic field for TFTR was pushed to 6 Tesla.

Staff Awarded

PPPL scientists and other staff were recognized for their achievements and generosity. Richard Hawryluk, the Tokamak Confinement Systems Department Head, received the U.S. Department of Energy Distinguished Associate Award for his "important contributions to fusion research" and former PPPL Director Harold Furth received the 1995 Dis-



From left are PPPL Director Ronald C. Davidson with 1995 PPPL Distinguished Research Fellows Masayuki Ono and Michael Zarnstorff.

tinguished Career Award from the Fusion Power Associates.

In November, three PPPL physicists — Taik Soo Hahm, Janardhan Manickam, and Ned Sauthoff — were named American Physical Society Fellows. Earlier in the year, PPPL physicists Masayuki Ono and Michael Zarnstorff received PPPL Distinguished Research Fellowships in honor of their “excellence in theoretical and experimental plasma physics research.”

The PPPL/Trenton Partnership was cited for its “significant innovations and achievements” by the National Center for Public Productivity, which gave the Laboratory the New Jersey Exemplary State and Local Award. In addition, PPPL employee Jerry Levine received the 1995 Energy Research NCO Quality Award and Bobbie Forcier, Suzanne Homer, Phyllis Schwarz, and Lynne Yager received the Princeton University Women’s Organization Awards.



Jim Kamperschroer gives a demonstration to a group of girls visiting the Laboratory for “Take Our Daughters to Work Day.”

In recognition of the generosity of PPPL’ers, the Laboratory garnered the United Way Silver Award for its contributions to the Greater Mercer United Way 1994/95.

New Beginnings

The year was also marked by farewells and new beginnings, with

Paul Rutherford retiring as Associate Director for Research, passing the baton to Robert Goldston.

Earlier in 1995, PPPL took an important step toward collaborating with Korea on fusion science and technology when Laboratory Director Ronald C. Davidson and Korea Basic Science Institute President Duk-In Choi co-signed a Letter of Intent for research cooperation in June.

“The agreement signals an opportunity for the Laboratory to collaborate with a major Korean institute committed to becoming a world-class research facility in fusion over the next decade,” said Davidson.

From 1995’s start to its finish, the spirit of the Laboratory was invigorated when PPPL opened its doors to special events and welcomed scores of visitors. In the winter months, PPPL hosted the Science on Saturday series, the New Jersey Regional Competition of the National Science Bowl®, and a procurement breakfast for small disadvantaged and women-owned businesses. Later in the year, the Laboratory hosted the International Symposium on Heavy Ion Inertial Fusion and took Japanese industrial labor union representatives on a tour of TFTR.

Special guests during the spring and summer included dozens of girls who came for “Take Our Daughters to Work Day” and nearly 30 middle school teachers from across the state who participated in the Teacher Leadership Workshops.

And PPPL managers went off for lessons in improving their skills by



Volunteer chefs dished up a free lunch for employees during the summer. From left are Lew Meixler, Margaret Young, Angelo Candelori, John Bavlish, and Steve Iverson.

participating in a seminar, “Maintaining a Positive Employee Relations Climate in a Dynamic Environment.”

The Laboratory was a hit outside its own doors as well, drawing a crowd at its exhibit at CommUniversity, an annual springtime celebration that joins Princeton University with the community of Princeton. Throughout the day, volunteers from PPPL handed out brochures and fusion buttons while answering questions.

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Stewart Zweben (middle) discusses a small experimental electric arc furnace with N. Anne Davies (left) and Martha Krebs.

Year

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Among the hosting and scientific endeavors, there was also time for respite. Employees took in the sunshine and a little revelry at the PPPL Picnic, gathered for a summertime free lunch, and concluded the year with a free holiday feast of turkey and ham.

DOE Officials Visit

In November, the Laboratory welcomed DOE Office of Energy Research Director Martha Krebs and N. Anne Davies, the Associate Director for Fusion Energy at the DOE's Office of Energy Research, for a tour. Davies, during an earlier visit, had lauded the successes of the Laboratory and of TFTR. "From a scientific endeavor, it's been a superb accomplishment."

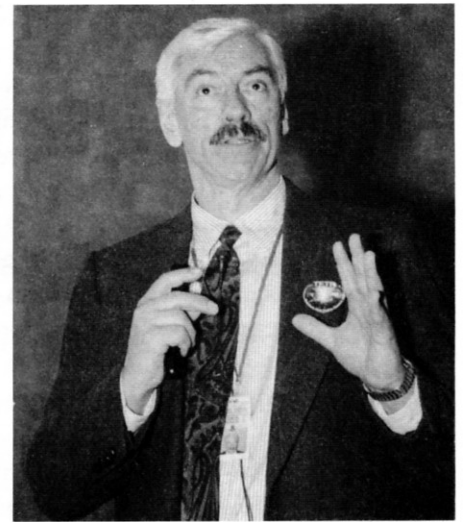
Krebs further complimented the Laboratory, saying the science at PPPL has had a "tremendous impact" on both the scientific achievement and understanding of high tempera-

**"The success of
TFTR reflects on
the entire Lab."**

— Dale Meade

ture fusion plasmas while making it much more possible to achieve the ultimate energy goal. She also conveyed to the staff how "personally frustrated" she is by what is happening as a result of a lack of Congressional support.

In December, PPPL Deputy Director Dale Meade addressed employees to unfold the Laboratory's ideas on what to do next, discussing its mission, progress and challenges,



Deputy Director Dale Meade discusses the Laboratory's plans with staff.

while outlining plans for an aggressive series of TFTR runs this winter. The Deputy Director expressed his appreciation of the staff's hard work.

"The success of TFTR reflects on the entire Lab," said Meade. ●



Best Wishes for 1996!

