AAAS 2013 Symposium on Worldwide Progress toward Fusion Energy

February 16, 2013, 8:30-11:30 am, Room 207, Hynes Convention Center

Abstracts

***ITER: A Magnetically-Confined Burning Plasma*, Dr. Richard Hawryluk (Deputy Director General of ITER)**

Deuterium-tritium plasma on the TFTR and JET produced 10-16 MW fusion power. ITER is projected to generate 500 MW fusion power with 50 MW external heating power. This talk gives a review of key scientific issues and highlights experimental results, which affect the design. In addition, it will describe how ITER addresses key technology issues ranging from fabrication of large superconducting coils to construction of vacuum vessel to design of heating and current drive systems.

***NIF Program and Ignition Campaign*, Dr. Debbie Callahan (Group Leader for ICF Target Design, National Ignition Campaign, LLNL)**

Inertial confinement fusion (ICF) is one of two major approaches to achieving controlled fusion in the lab. In the ICF approach, a ~ 1 mm radius sphere containing deuterium-tritium fuel is compressed using either laser light or x-rays to reach the density and temperatures needed for fusion to occur. We are conducting experiments toward achieving ICF ignition on the National Ignition Facility (NIF) laser. In this talk, I will discuss experimental techniques and results on the path to ignition.

***Advances in burning plasma-related physics and technology in Magnetic Fusion*, Dr. Amanda Hubbard (Principal Research Scientist, Plasma Science & Fusion Center, MIT)**

This talk will survey advances in the US and world fusion burning plasma research programs. These are aimed at ensuring the success of ITER, now under construction, and preparing for its exploitation as well as supporting fusion nuclear science beyond ITER. Current tokamaks are able to demonstrate, at smaller scale, expected scenarios as well as key technologies, and validate our increasingly comprehensive simulations. Dr. Hubbard is Deputy Director of the US Burning Plasma Organization.

***Alternate Approaches/Direct Drive in Inertial-Confinement Fusion*, Professor Robert McCrory (Vice President, University of Rochester and Director and CEO of the Laboratory for Laser Energetics)**

Direct-drive inertial confinement fusion provides a true alternative to the indirect-drive concept. It couples an order of magnitude more energy to the compressed core allowing higher margins and gain for the same laser energy. A new variant, Shock Ignition, shows promise for increasing the gains even further. Significant progress has been made in direct-drive research over the past decades, suggesting it provides a viable path towards inertial fusion energy.

***Issues and Paths to Magnetic-Confinement Fusion Energy*, Dr. G. H. Neilson (Head, Advanced Projects Department, Princeton Plasma Physics Laboratory)**

The path to magnetic fusion, beyond ITER, will include fusion nuclear facilities and accompanying programs to develop the technologies for reactor control, energy extraction, and closing the fuel cycle. A 2011 international workshop organized by Dr. Neilson found that scientists in all nations studying fusion have plans to develop a demonstration power reactor, and led to an IAEA initiative to foster international collaboration in Demo development.

***Issues and Paths to Inertial-Confinement Fusion Energy*, Professor Michael Dunne (Director for Laser Fusion Energy, LLNL)**

This talk will discuss the pathway to inertial fusion energy. Anticipating ignition on the recently completed NIF facility, plans have been developed for transition to commercial delivery of a demonstration power plant, known as LIFE. The US leads the world in this field, with intense interest internationally in the proposed solution. Because of its near-term potential, recent work has been driven by the requirements of likely end-users, including economic, social and policy considerations.

Special Tour

***The MIT Plasma Science and Fusion Center Laboratories in Cambridge*, Hosted by Professor Miklos Porkolab (AAAS Fellow)**

Tour includes:

- Alcator C-Mod Tokamak
- Levitated Dipole Experiment (LDX)
- VTF Magnetic Reconnection Plasma Experiment
- Superconducting Magnet R&D Program
- Inertial Fusion Confinement Diagnostic Lab

Senior staff will be available to explain details of the different projects. Pizza and soft drinks will be served upon arrival.

Departure time: 12:00 pm, Hynes Auditorium, by bus, limit 50 people, first come first serve by sign up.

Return time: 3:30 pm, from Nabisco Laboratory, arrive back at Hynes Convention Center at 3.45 pm.