भौतिक अनुसंधान प्रयोगशाला, अहमदाबाद

Physical Research Laboratory, Ahmedabad

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63_PRL Ka Amrut Vyakhyaan

Wednesday, 12 October 2022

@ 04:00 PM (IST)

"Nuclear Fusion: Indian Program, ITER Project & Beyond"

Prof. Shishir Deshpande

Sr. Professor and

Head, Fusion Interdisciplinary Science Division

Institute for Plasma Research, Gandhinagar.

https://youtu.be/Q26tQvHxnWs

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Abstract

A very significant research effort around the world is about finding and perfecting new sources of energy – sources that are clean, safe and with easy access for everyone. A number of spin-offs too occur in such effort, generating additional, unforeseen benefits. Nuclear fusion is known to be the cause of star-fire and past few decades have seen a series of breakthroughs which makes it possible to create an energy source from thermonuclear fusion.

Controlled thermonuclear fusion in the laboratory remains a powerful driver in basic and applied plasma research. It offers a potentially attractive solution to power generation due to abundance of fuel, inherent safety and especially since it is environmentally acceptable. Over many years of research, the toroidal plasmas have revealed many facets of stability, control, confinement and transport. The worldwide research has culminated in the dream project called International Thermonuclear Experimental Reactor (ITER). Here the ultimate test of burning plasmas will be carried out in a fusion reactor. ITER is being built in France with 'in-kind' commitments from its seven partners (China, EU, India, Japan, S. Korea, Russia and the US).

In this talk, an overview is presented on how this field has evolved and how it has shaped our grand-challenge perspective, what lies next and what might the key players in our long-term energy-future.

The Speaker

Prof. Shishir Deshpande did his Masters in Physics at Nagpur in 1984 and completed doctoral research in 1992 at the Institute for Plasma Research (IPR). After joining IPR as a faculty member in 1993, he has contributed to fusion research in various roles: leading a group for physics design of tokamak (1995-2007), for fusion blanket design (2006-08) and as the Project Director for ITER-India (2007-2019) a mega-science project for execution of in-kind deliveries from India to ITER-France. He has published around 40 scientific papers and is currently working at IPR as the head of Fusion Interdisciplinary Science Division.

About PRL

The Physical Research Laboratory (PRL), known as the “cradle of space science” in India, is one of the premier research institutes founded in 1947 by Prof. Vikram Sarabhai, a renowned Cosmic Ray Scientist, a great visionary and institution builder. PRL played a seminal role in producing a highly motivated cadre of space scientists and the technologists of highest international repute. The first scientific rocket launched from Thumba on 21st November-1963 and many other rockets launched thereafter contained payloads developed at PRL. Dr. Sarabhai initiated many of these scientific and technical activities at PRL which eventually led to the formation of the Indian Space Research Organization (ISRO). Therefore, PRL is known as the “cradle of space science” in India. Further, the research in the area of Plasma Physics expanded to the formation of the Institute of Plasma Research (IPR).

As an institution PRL is unique in that it conducts fundamental research in a wide range of research areas from the Earth to the cosmos, and comprising Astronomy and Astrophysics; Solar Physics; Space and Atmospheric Sciences; Theoretical Physics; Geosciences; Atomic, Molecular and Optical Physics, Astrochemistry; and Planetary Sciences and Space Exploration. PRL is one of the rare research institutes of international repute wherein research in such diverse fields of sciences is carried out using several state-of-the-art experimental facilities that exist under one umbrella.

Along with the ongoing research, several new initiatives have been taken up during the last few years. The Multi-Application Solar Telescope (MAST) at Udaipur Solar Observatory has been operationalized. PRL initiated scientific programmes in frontier areas of research, which include a search for exo-planets, laboratory studies of interstellar grains, laboratory synthesis of cold astromolecules and experimental studies in the field of quantum optics. PRL is also developing several scientific payloads as a part of ISRO’s larger vision and contributing to roadmap for competitive scientific exploration of the solar system and beyond. In particular, PRL has been contributing significantly not only in building instruments for space missions, such as Chandrayaan-1, Chandrayaan-2, AstroSat and upcoming Aditya-L1, Chandrayaan-3 and planetary and space missions, but also by bringing out new and insightful science results.

PRL contributes to several national and international research programmes and to human resource development through its Doctoral and Post-Doctoral Programmes, capacity building programmes, such as UN Course on Space Science, and science and engineering internship programmes. PRL contributes significantly to society through its Outreach Programmes by periodically organizing science exhibitions and Open Houses, planned visits of students of various school and college to PRL, and popular talks at various institutions to not only share the excitements of the advancements of contemporary scientific findings but also to encourage students to take up sciences as their research career.

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