भौतिक अनुसंधान प्रयोगशाला, अहमदाबाद

Physical Research Laboratory, Ahmedabad

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61_PRL Ka Amrut Vyakhyaan

Wednesday, 28 September 2022

@ 04:00 PM (IST)

"Space: the less explored dimension of light"

Prof. Siddharth Ramachandran

Distinguished Professor, Electrical Engineering,
Physics & Materials Science,
Boston University, Boston, MA, USA.

https://youtu.be/4Uragx_Ae-w

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Title: "Space: the less explored dimension of light"

Speaker: Prof. Siddharth Ramachandran

Distinguished Professor, Electrical Engineering,

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Abstract

This talk will describe the propagation, control and manipulation of light that manifests spatial complexity. In free space and bulk media, such higher order eigenstates of light possess intriguing characteristics such as the ability to carry spin and orbital angular momentum and the ability to self-heal. Upon confinement, either by focusing them, or by guiding them in fibers, even more exotic behaviour, akin to spin-orbit interactions of confined electrons in atomic and molecular systems, is observed – light's polarisation as well as phase and group velocities become dependent on the intrinsic as well as extrinsic geometric path that the light beam takes. Such attributes have spawned applications as diverse as super-resolution microscopy, deep-tissue imaging, DNA sorting, classical and quantum communications, remote sensing and directed-energy defence strategies. This talk will describe recent applications, after elucidating the fundamental phenomena that make singular light beams behave dramatically differently from commonly encountered, conventional, Gaussian-shaped beams of light.

The Speaker

Prof. Siddharth Ramachandran did his B.Tech. in Materials and Metallurgical Engineering from IIT Kanpur in 1991, MS in 1993 from the University of Wisconsin, Madison and earned his doctorate in Electrical Engineering from the University of Illinois, Urbana-Campaign in 1998. He started his career at Bell Labs, and after a decade in industrial research labs, returned to academia as a member of the faculty at Boston University. He is currently a Distinguished Professor of Engineering at BU. His contributions to the understanding and development of lightwave devices comprising spatial, vectorial and topological complexity have been applied in the fields of quantum computing, optical networks, brain imaging, as well as laser based defense systems. For his contributions, he has been named a Distinguished Member of Technical Staff at OFS (2003), a fellow of Optica, formerly OSA (2010), IEEE (2019) and SPIE (2019), an IEEE Distinguished Lecturer (2013-2015), a Distinguished Visiting Fellow of the UK Royal Society of Engineering (2016), and a Vannevar Bush Faculty Fellow (2019). He serves the optics and photonics community in several capacities, including, currently, as a deputy editor for Optica.

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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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