A K SUNDARAM MEMORIAL LECTURE

BY

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PROF A K SUNDARAM

Professor A. K. Sundaram, former Dean and a past distinguished faculty member of IPR, was an internationally known plasma physicist who had played a major role in the establishment and early development of the Institute. He belonged to the original team of seven scientists who had been handpicked by Dr. Vikram Sarabhai in 1971 to initiate a fusion program at the Physical Research Laboratory (PRL), Ahmedabad. His active contributions in the research program planning and in the training of young `would be plasma scientists' at PRL were of considerable help in the formation of a core group for the fusion program that was launched in 1982. Subsequently as the first Dean of IPR he set up the administrative structure of the Institute and successfully oversaw its operation for a number of years. An accomplished theoretical physicist with a strong background in Applied Mathematics his research interests encompassed a wide range of topics spanning space plasma physics, fusion physics and fundamental aspects of fluid dynamics. Known for his detailed and rigorous calculations – all carried out in neat long hand- he tackled frontline problems related to magnetic reconnection in the magnetosphere, tearing and ballooning mode instabilities in tokamaks and fundamental aspects of basic fluid instabilities. His scientific accomplishments attracted international attention and led to invitations for collaborations and visits to a number of leading research centers in the world. After taking retirement from IPR in 1993, Dr. Sundaram immigrated to the USA and worked for several years at the Goddard Space Flight Center, Greenbelt, Maryland where he continued to actively research magnetospheric and ionospheric phenomena. However, his heart always remained at IPR – as he was fond of saying – the organization that he had known from its infancy and had helped to grow and in which he had invested so much of his love and care. To honour his memory his family has contributed funds to establish this annual memorial lecture to be organized by PSSI. The lecture is to be delivered by an eminent scientist preferably on a topic of research interest of Dr.Sundaram.

ABOUT THE SPEAKER

Professor Ramit Bhattacharyya is a renowned plasma physicist working at the Physical Research Laboratory, Ahmedabad, India. Professor Bhattacharyya has obtained his PhD in Physics from Jadavpur University, Kolkata on his work carried out at the Saha Institute of Nuclear Physics, Kolkata, India. He was awarded the prestigious Advanced Study Program scholarship to work at the High Altitude Observatory at the Boulder, Colorado USA, Over the years, Professor Bhattacharyya has contributed immensely in the field of magnetohydrodynamics of solar corona through state-of-the- art numerical simulations. His research interests include understanding the solar coronal heating problem and the underlying physics of various solar eruptions using computational means. He has extensively worked on the process of coronal heating occurring through the Ohmic dissipation of spontaneously developed current sheets: two dimensional ribbons of intense current.

He has established the role of plasma relaxation towards understanding the fundamental physical processes involved in solar eruptive events using computer simulations. He has contributed significantly in constructing the coronal magnetic field from photospheric observations and developed theory behind one of the Non Force-Free extrapolation models. Such models are important for understanding for constructing three-dimensional coronal magnetic as no reliable direct measurements of this field are available. Professor Bhattacharyya has authored more than 50 publications in International journals and has guided several PhD students.

Talk Title: ***Alfvén's theorem, magnetic reconnection, and Solar Transients: A tale of two scales***

OFFLINE

Date: 16 April 2026 (Thursday)
Time: 3:30 PM
Venue: IPR Seminar Hall

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ABSTRACT OF THE TALK

Alfvén's theorem implies that in high magnetic Reynolds number plasmas, magnetic field lines remain frozen into the fluid. However, when magnetic field gradients steepen locally, the effective Reynolds number decreases, enabling diffusion and the onset of magnetic reconnection. In these localized regions, magnetic energy is rapidly converted into thermal and kinetic energy, accompanied by a rearrangement of the magnetic field lines.

The dynamic interplay between large-scale frozen-in behavior and small-scale diffusive processes drives a variety of solar transients, including flares, coronal mass ejections, and jets. Moreover, ubiquitous small-scale reconnection events are thought to contribute significantly to coronal heating.

In this talk, I will present results from three-dimensional magnetohydrodynamic (MHD) simulations that investigate how multi-scale interactions lead to magnetic reconnection in solar environments. Both two-dimensional and fully three-dimensional reconnection scenarios will be explored to provide insights into the fundamental mechanisms underlying these energetic phenomena.