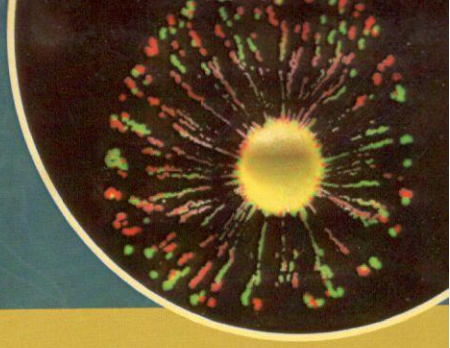
SIR C V RAMAN MEMORIAL LECTURE

भारतीय विज्ञान संस्थान
INDIAN INSTITUTE OF SCIENCE



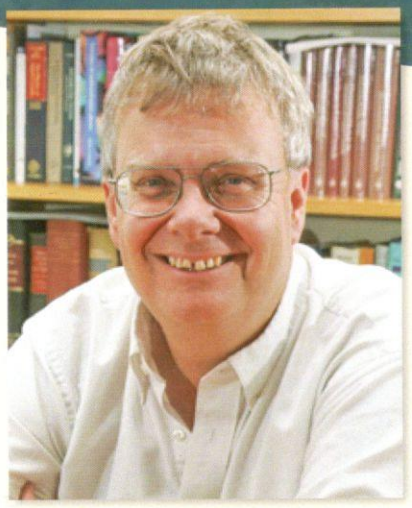
14 AUG 2023
MONDAY
2.30 p.m.

Venue
Faculty Hall
Main Building, IISc

Prof. Govindan Rangarajan
Director, IISc will preside

ACTIVE ANTAGONISM: REPRODUCING MICROORGANISMS AND FLUID FLOWS

The growth and evolution of microbial populations is often subject to advection by fluid flows in spatially extended environments, with immediate consequences for spatial population genetics in marine ecology, plank tonic diversity and fixation times. We review recent progress made in understanding this rich problem in the simplified setting of two competing genetic microbial strains subjected to fluid flows. We first review microbial range expansion experiments on liquid substrates and then move on to discuss antagonism, i.e., two killer microorganism strains, each secreting toxins that impede the growth of their competitors (competitive exclusion), both with and without stationary fluid flows. Recent experiments that reveal the presence of a genetic line tension are described. Coupled reaction-diffusion equations that include advection by simple steady cellular flows composed of characteristic flow motifs in two dimensions reveal how local flow shear and compressibility effects can interact with selective advantage to have a dramatic influence on genetic competition and fixation in spatially distributed populations. We analyze a variety of 1d and 2d flow geometries including sources, sinks, vortices and saddles, and show how simple analytical models of the dynamics of the genetic interface can be used to shed light on the nucleation, coexistence and flow-driven instabilities of genetic drops.



DAVID R. NELSON
Departments of Physics & of Molecular & Cellular Biology
Harvard University

About the Speaker

David R. Nelson is Arthur K. Solomon Professor of Biophysics and Professor of Physics and Applied Physics at Harvard University. With his colleague, Bertrand I. Halperin, he is responsible for a theory of two-dimensional melting that predicts a fourth "hexatic" phase of matter, interposed between the usual solid and liquid phases. David Nelson is a member of the U.S. National Academy of Sciences and the American Academy of Arts and Sciences. Nelson is the recipient of a five-year MacArthur Prize Fellowship, the National Academy of Sciences Prize for Initiatives in Research, the Harvard Ledlie Prize, the Bardeen Prize (for research on superconductivity) and the Buckley Prize (for research on soft condensed matter physics). In 2019, he received the Niels Bohr Institute Medal of Honor.

ALL ARE WELCOME