



TIFR Alumni Association

TAA – JRD TATA PUBLIC LECTURE

Fun Science with Inanimate and Living Bacteria:

Flocking and Nano Heat Engine

Prof Ajay Sood, Indian Institute of Science, Bengaluru

Thursday, August 3, 2017 at 5 p.m.

Lecture Theatre AG 66, Tata Institute of Fundamental Research

1 Homi Bhabha Road, Colaba, Mumbai 400005



This talk will bring out how nature inspires us to explore fascinating phenomena like flocking, a self-organized motion of vast numbers individuals of same species in a common direction is a common behavior in many animals like ants, locusts, birds, fishes etc. Flocks of birds flying every morning and evening or of ants crawling in one direction are a common sight. As physicists, we have tried to understand this beautiful phenomenon in the laboratory by working with inanimate polar granular objects made active by placing them on a rapidly vibrating surface amongst spherical beads. We discover that a small number of motile particles can coherently transport a large passive cargo which we suspect is potentially relevant to the understanding of flocking and other biological phenomena.

The conventional macroscopic heat engine, a device to convert thermal energy to mechanical energy, is a triumph of our understanding of classical thermodynamics over the last three centuries. In recent years, taking the heat engine concepts to microscopic scale, necessarily dominated by fluctuations, has led to the development of stochastic thermodynamics. In the second example, we show that a micrometer-sized active Stirling engine can be realized by periodically cycling a colloidal particle in a time-varying harmonic optical potential across bacterial baths at different activities Our experiments bring out a message towards the fundamental insights into the functioning of engines operating out of equilibrium.



Prof. Ajay Sood, FRS, is an Honorary Professor at Indian Institute of Science (IISc) and Jawaharlal Nehru Centre for Advanced Scientific Research (JNCASR), Bengaluru. He is a member of several science academies and has been bestowed with several honours and awards, some of which are - Fellow of the Royal Society, London (2015); Secretary General, The World Academy of Sciences (2013-2018); Shanti Swarup Bhatnagar Award in Physical Sciences (1990); TWAS Prize in Physics (2000).

talk open to all