



Institute Colloquium



S. N. Bose National Centre for Basic Sciences
(An Autonomous Research Institute established under DST, GOI)



11 JANUARY, 2024



4.00 PM



Fermion Hall

 YouTube Link



Webinar Link

Title: Collective motion of self-propelled ring polymers on circularly patterned substrates

Abstract:

We use a coarse grained model of disjoint semiflexible ring polymers to investigate collective behavior of Self-Propelled Particles confined to a substrate, using computer simulations. The rings are polarized with a motility force acting along a fixed set of diametrically opposite points on the polymer. The degree of collectivity, characterized by the average cluster size, the velocity field order parameter, and the polarity field nematic order parameter, are found to increase with increasing the amplitude of the motility force and area coverage of the cells.

Next, the combined effects of a circularly patterned substrate and circular confinement, on the collective motion of SPPs, is investigated over a wide range of values of the SPPs packing fraction ϕ^- , motility force, and area fraction of the region that is patterned. The confinement and the patterning of the substrate leads to circular motion of the particles. At high values of ϕ^- , the substrate pattern leads to reversals in the sign of the circulation, which become quasiperiodic with increasing ϕ^- . We also found that the substrate pattern is able to separate SPPs based on their motilities.



Speaker: Prof. P. B. Sunil Kumar

Department of Physics & Centre for Soft and Biological Matter, IIT Madras

Short Biography of the Speaker:

Professor P. B. Sunil Kumar is a chair professor at the Department of Physics, Indian Institute of Technology Madras. He has been working in the broad area of nonequilibrium statistical mechanics. In recent times, he has worked on the collective behavior of self-propelled particles (SPPs), colloidal transport of active filaments, the curvature sensitive localization of proteins on membranes, and thermoresponsive polymer solutions, etc. He also does some voluntary work for a children's science magazine called Jantar Mantar .