Tata Institute of Fundamental Research
Survey No. 36/P, Gopanpally Village, Serilingampally, Ranga Reddy Dist., Hyderabad – 500 046

Seminar

Active Polymer Physics in Genetic Material Regulation

Rakesh Das

MPI-PKS, Dresden

The dense packing of chromatin and mesoscopic condensates in the eukaryotic nucleus presents a spatiotemporal challenge for genome regulation. We explored the role of active (non-equilibrium) perturbations in addressing this challenge by developing an active copolymer model for chromatin, incorporating non-localised active mechanisms mimicking Topoisomerase-II enzymes. Our results show that active perturbations induce phase separation and an emergent anisotropic phase, which equilibrium theories cannot capture. Additionally, we identified three distinct modes of tracer dynamics (modelling mesoscopic condensates) linked to different aspects of the embedding chromatin medium. These findings reveal new emergent physics in complex polymeric systems and provide insights into how global activity can influence cell state-specific genome regulation.

Friday, Sep 27th 2024

14:30 Hrs (Tea / Coffee 14:15 Hrs)

Auditorium, TIFR-H