**Tata Institute of Fundamental Research**
Survey No. 36/P, Gopanpally Village, Serilingampally, Ranga Reddy Dist., Hyderabad - 500107

# Seminar

## Physical Principles of Cell Centre Finding by Cytoskeletal Systems

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In eukaryotic cells, microtubules (MTs) generate a system of polarised tracks along which plus-(kinesins) and minus-ended (dyneins) molecular motors transport vesicles and maintain and modulate cell polarity. Here we proceed to investigate the centripetal motility of radial MT arrays or asters towards chromosome patches in Xenopus egg extracts in vitro using micro patterned substrates. Our model simulations predict that the collective properties of the motor-MT interactions minimally require dynein localised uniformly on the surface, and a gradient of MT regulators, to reproduce experimental data. We proceed to examine the in vivo role of such centripetal forces in multiple aster congression to the cell centre during spindle assembly in mouse meiotic maturation. We find the gradient model does not explain experimental data. Instead a force-gradient due to dynein localization around chromosomes, combined with self-organized clustering of asters by tetrameric dyneins, is required to reproduce the experimental data. This illustrates general properties and constraints in cellular centre finding. We will discuss some recent, unpublished results relating to the phase space of such a system. These calculations in simulations present a picture of the available mechanisms that evolution could explore. We will attempt to compare the phase space predictions with equational and asymmetric cell division during in C. elegans and Drosophila embryogenesis.

***Monday, May 14th 2018***

***11:30 AM (Tea/Coffee at 11:00 AM)***

***Auditorium, TIFR-H***