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

Seminar

Imaging Across Scales – Catching Concurrent Organelle Dynamics in Living Cells and Tissues

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In animal development, timing matters. Phenomena operating within distinct levels—those of molecules, organelles, cells, or tissues, span the extremes of timescales and give rise to the clock work of development. Developmental programs are under genetic control; however, the physical basis of these processes lie within the components that drive it - molecules, organelles, cells, supracellular assemblies. Capturing these mechanisms requires imaging approaches that can span different scales, molecular to tissue level processes demand both high spatial and temporal resolutions simultaneously. In the first part, developments in microscopy, in particular light-sheet based modalities, I will describe an example of endosomal timekeeping of biochemical reactions at single cell levels using Lattice light-sheet microscopy along with tailored image analysis routines. Single cells on coverslip approaches are limited by the absence of physiological context as cells are investigated in isolation. In the second part, I will describe imaging approaches based on Airy beam-based light sheet microscopy of organelles in tens to hundreds of cells in a few hundred micrometre-wide tissue environments. We achieve a typical resolution of 320 nm over 266 × 266 × 100 μm^3 volumes at a temporal rate of 0.05 Hz that now allows tracking molecules and organelles in large living tissues. Finally, I will conclude by addressing data challenges and outlook on the future of biological problems that these approaches unravel.

Thursday, Jan 22nd 2026

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

Auditorium, TIFRH