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

Seminar

Condensate Cascades: A Unifying Framework for Cellular Adaptation

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Organisms across the tree of life dynamically regulate growth to adapt to environmental changes, yet the mechanisms governing this process remain elusive. We present the "condensate cascade model", a unified framework for cellular adaptation, where phase-separated biomolecular condensates drive the reorganisation of cellular compartments to enhance resilience. Under heat stress, nucleolar condensate reorganisation halts rRNA processing, causing orphan ribosomal protein (oRP) accumulation, which sequesters Hsp70 chaperones and releases Hsf1 to activate the heat shock response (HSR). Hsp70 functions as a "condensate stirrer," preserving condensate liquidity and facilitating recovery. This model enables cells to decode environmental cues—such as temperature, pH, and osmolarity fluctuations—through feedback-controlled core processes. Disruptions in condensate dynamics can have pathological effects: persistent condensates drive cancer progression and therapy resistance, while unresolved aggregates contribute to neurodegeneration.

Wednesday, Feb 5th 2025

16:00 Hrs (Tea / Coffee 15:45 Hrs)

Auditorium, TIFRH