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

Seminar

Cristae in Motion: Exploring the Metabolic Architecture of the Inner Mitochondrial Universe

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Mitochondria perform diverse classical and non-classical functions essential for cellular homeostasis, including ATP generation, reactive oxygen species production, calcium buffering, metabolic regulation, and immune signalling. Dysfunction of mitochondrial proteins contributes to numerous human diseases, including neurodegenerative disorders, cancer, and diabetes. A defining feature of mitochondria is the highly folded inner membrane, which forms cristae. For over six decades, cristae were considered static structures. Using technically demanding live-cell STED super-resolution nanoscopy, we demonstrated that cristae membranes are remarkably dynamic, undergoing rapid remodelling within seconds, a discovery that has been independently confirmed by other groups. This paradigm shift establishes cristae membrane dynamics as a previously unrecognised regulator of mitochondrial function and highlights the need to understand their roles in physiology and disease. My research aims to uncover the molecular mechanisms that govern cristae membrane dynamics and determine how these dynamics influence mitochondrial function and cellular homeostasis. To address these questions, my laboratory integrates advanced live-cell super-resolution imaging with cell biology, biochemistry, genetics, APEX2-based proximity proteomics, and metabolic profiling to define how mitochondrial architecture regulates cellular function in health and disease.

Thursday, Aug 13th 2026

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

Seminar Hall, TIFRH