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

Seminar

Unusual Glassy Dynamics and Morphometric Properties of a Confluent Epithelial Cell Monolayer

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Collectively migrating epithelial cells exhibit several hallmarks of glassy dynamics, which are crucial for embryonic development, wound healing, and cancer progression, etc. Unlike conventional glasses, in which the structure changes very little, epithelial tissues exhibit a strong coupling between structure and dynamics. In this talk, I will first show that a structure-dynamics feedback mechanism based on Mode-Coupling Theory predicts well the relaxation dynamics of MDCK monolayers and confluent tissue models. I will then discuss the origin of the sub-Arrhenius relaxation, an unusual feature of confluent tissues, and demonstrate that a glass point governs it. Next, I will show how the softness formalism, originally developed for particulate glasses, can be extended to epithelial tissues to predict local processes such as cell divisions and T1 rearrangements, and provide an indirect estimate of the target shape index, a key theoretical parameter. I will also discuss how persistent cellular motion gives rise to the compressed exponential relaxation observed in experiments and reproduced by Self-Propelled Voronoi simulations. I will then show how cell division and apoptosis fluidize confluent tissues and generate distinct stress-redistribution patterns. Finally, I will briefly discuss how geometric morphometrics quantifies symmetric and asymmetric shape changes during zebrafish palate development, thereby linking Hedgehog signaling to tissue-scale morphogenesis.

Tuesday, Aug 4th 2026

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

Auditorium, TIFRH