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

Seminar

Mechanics of Epithelial Tissues: Structure, Rigidity and Fluidity

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Cells must move through tissues in many important biological processes, including embryonic development, cancer metastasis, and wound healing. Often these tissues are dense and a cell's motion is strongly constrained by its neighbors, leading to glassy dynamics. Although there is a density-driven glass transition in particle-based models for active matter, these cannot explain liquid-to-solid transitions in confluent tissues, where there are no gaps between cells and the packing fraction remains fixed and equal to unity. I will demonstrate the existence of a new type of rigidity transition that occurs in confluent tissue monolayers at constant density. The onset of rigidity is governed by a model parameter that encodes single-cell properties such as cell-cell adhesion and cortical tension. I will also introduce a new model that simultaneously captures polarized cell motility and multicellular interactions in a confluent tissue and identify a glassy transition line that originates at the critical point of the rigidity transition. This work suggests an experimentally accessible structural order parameter that specifies the entire transition surface separating fluid tissues and solid tissues. Finally, I will discuss recent work using a culture of human lung epithelial tissue to compare a newly discovered mode of fluidization of jammed cells – the unjamming transition (UJT) – with the canonical epithelial-to-mesenchymal transition (EMT).

Friday, Dec 28th 2018

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

Auditorium, TIFR-H