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

Webinar

Decoding the mechanisms of fluidization in solid-like biological tissues

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Fluidization is a crucial emergent feature of apparently solid-like epithelial cell layers, e.g., our skin that allows these tissues to orchestrate fundamental biological processes, like embryonic development, wound healing, inflammation, and cancer metastasis. I will describe a general theoretical framework[1] to understand the different mechanisms of fluidization observed in a solid-like epithelial cell monolayer via the conventional epithelial-mesenchymal transition and an unconventional unjamming transition[1], observed first in an asthmatic human lung epithelium. This model[1, 2] predicts the physical mechanisms and distinct features of these different processes based on the abilities of single cells to change shapes, cooperate with neighbours and generate forces for movement. I will also show how the model leads to a rich phase diagram of active glassy behaviours of tissues[2] in general and discuss the broad implications of our results in the context of development and diseases.

References:

1. J.A. Mitchel*, A. Das*, M. O'Sullivan, I. Stancil, S. DeCamp, S. Koehler, J. J. Fredberg, J. Drazen, J. P Butler, A. Nieto, D. Bi & J.-A Park, Nature Communications, 11, 5053 (2020). In primary airway epithelial cells, the unjamming transition is distinct from the epithelial-to-mesenchymal transition. https://www.nature.com/articles/s41467-020-18841-7 *Equal contribution.
2. A. Das, S. Sastry, D. Bi, Controlled neighbor exchanges drive glassy behavior, intermittency and cell streaming in epithelial tissues. arXiv:2003.01042.

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4:00 PM