



Seminar/Talk

Deciphering the evolution of developmental cell lineage maps using an agent-based model of cell-fate decisions

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Host: Filip Ruzicka (Vicoso group)

During biological development, cells constantly assimilate signals from other cells in the body in order to decide whether to divide, differentiate, migrate or die. While it is in general intractable to experimentally observe the cellular interactions and decisions for all the cells in a developing organism, high throughput single cell transcriptomics studies allow us to infer cellular differentiation trajectories in the form of cell-type lineage maps (CTLMs). Animal CTLMs display characteristic patterns, such as tree-like graph topologies, and a dearth of cyclic differentiation trajectories. In this work, I explore how and why these patterns in CTLMs might evolve using an agent-based model of cellular decisions. In this talk, I will describe my model and discuss some preliminary results relating to small multicellular systems composed of 3 cell-types. My model generates a rich variety of organisms with diverse developmental dynamics – some organisms display transient intermediate life stages which are reminiscent of juvenile stages of real organisms. A large fraction of the models' developmental dynamics ultimately produce organisms with stable cellular compositions, while others tend to be unstable and either decay through excessive cell-death or grow uncontrollably. I discuss how selection for organismal stability could steer the evolution of developmental CTLMs.

Wednesday, January 15, 2025 11:00am - 12:00pm

Sunstone Bldg / O1 / Big Office Meeting room (101) (I23.O1.101)



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