PHYSICAL MATHEMATICS SEMINAR

Solid-fluid transition in tissues with nonlinear stochastic junctional dynamics

MATEJ KRAJNC

Princeton University

ABSTRACT:

In epithelial tissues, which typically appear close to 100% confluency, cells need to rely on active processes to be able to rearrange and move across tissue-scale distances. Previous theoretical studies proposed cell motility and geometric incompatibility between the actual and the preferred cell shape as drivers of density-independent glass and jamming transitions. We take a complementary approach by studying a solid-fluid transition in tissues with stochastic junctional dynamics, driven by myosin turnover. Using a simple toy model, we first study local properties of the energy landscape and relate them with the time scale of fluctuations-driven cell rearrangements. Our model tissues use these fluctuations to explore the energy landscape, which leads to a solid-fluid transition. We propose order- and control parameters to describe this transition and to construct a phase diagram of disordered fluid and ordered/disordered solid states. On the fluid side of the phase diagram, we study the relation between tissue fluidity and cell shape, whereas on the solid side, we focus on the structure of cell packing and how it is established in time.

TUESDAY, APRIL 23, 2019
2:30 PM – 3:30 PM
Building 2, Room 139

Reception following in Building 2, Room 290
(Math Dept. Common Room)

http://math.mit.edu/seminars/pms/

Massachusetts Institute of Technology