PHYSICAL MATHEMATICS SEMINAR

A Simple Model of Clonal Dominance

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ABSTRACT:

Tissues and organs arise from the proliferative expansion of a small number of founder cells. The disproportionately large contribution of one or a few such progenitor cells to the final structure is termed clonal dominance. While commonly observed, the mechanistic origin of this feature of organogenesis is poorly understood. We propose that clonal dominance can arise is through cell communication and positive feedback. A uniquely tractable system for reconstructing the collective growth dynamics of entire tissues with single cell resolution is the fruit fly follicle. Over the course of ~50 hours, the follicular epithelium expands from ~50 to ~1,000 cells through divisions that occur with incomplete abscission of the two daughter cells: clonal cells remain connected through stabilized intercellular bridges, allowing us to reconstruct complete lineage trees. We found that as the epithelium grows, large clones emerge that comprise ~50% of the entire tissue. Live imaging experiments reveal local coordination among interconnected cells in the form of mitotic waves. We interpret these findings within the framework of spatially distributed excitable dynamical systems, and use a modified Forest Fire model on growing networks to explain the observed dynamics.

TUESDAY, SEPTEMBER 18, 2018
2:30 pm
Building 2, Room 136

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

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