Seminar/Talk

Self-organizing principles in epithelial morphogenesis

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Host:

Branching morphogenesis has been a subject of abiding interest.
Although much is known about the underlying signaling pathways, it remains unclear how the macroscopic features of branched organs, including their size, network topology and spatial patterning, are encoded. Here we show that, in mouse mammary gland, kidney and human prostate, these features can be explained quantitatively within a single unifying framework of branching and annihilating random walks. Based on large-scale organ reconstructions and proliferation kinetics, we propose that morphogenesis follows from the proliferative activity of equipotent ductal tips that stochastically branch and randomly explore their environment, but compete neutrally for space, becoming proliferatively inactive when in proximity with neighboring ducts. These results show that complex branched epithelial structures in mammalian tissues develop as a self-organized process, reliant upon a strikingly simple, but generic, set of local rules, without recourse to a rigid and deterministic sequence of genetically programmed events.

Wednesday, April 5, 2017 09:45am - 10:45am

Mondi Seminar Room 2, Central Building

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