



Seminar/Talk

Self-organization and symmetry breaking in intestinal organoid development

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Intestinal organoids are complex three-dimensional structures that mimic cell type composition and tissue organization of the intestine by recapitulating the self-organizing capacity of cell populations derived from a single stem cell. Crucial in this process is a first symmetry-breaking event, in which only a fraction of identical cells in a symmetrical sphere differentiate into Paneth cells, which in turn generates the stem cell niche and leads to asymmetric structures such as crypts and villi. We here combine a quantitative imaging approach with single-cell gene expression to characterize the development of intestinal organoids from a single cell. We show that intestinal organoid development follows a regeneration process driven by transient Yap1 activation. Cell-to-cell variability in Yap1, emerging in symmetrical spheres, initiates a Notch/Dll1 lateral inhibition event driving the symmetry-breaking event and the formation of the first Paneth cell. Our findings reveal how single cells exposed to a uniform growth-promoting environment have the intrinsic ability to generate emergent, self-organized behavior resulting in the formation of complex multicellular asymmetric structures.

Tuesday, February 19, 2019 11:00am - 12:15pm

Mondi Seminar Room 3, Central Building



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