BDR SEMINAR (Kobe & online hybrid)

Mechanobiology Seminar Series presents

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Tuesday, December 9, 2025

11:00-12:00

1F Auditorium, DB Building C, Kobe / Broadcast online via Zoom

Zoom meeting URL will be announced on the event day by e-mail.

※This seminar is open only to BDR members.

Imaging actomyosin contractility during rapid development in the ascidian

Summary

Dynamic spatiotemporal control of actomyosin contractility is essential for cell and tissue morphogenesis, regulating cell shape, polarity, and coordinated tissue dynamics. With its rapid and stereotyped development, the ascidian embryo offers a powerful context in which to examine how dynamic control of the same contractile machinery within differently fated cells drives different modes of morphogenesis. Here, I describe distinct roles for actomyosin contractility during notochord tubulogenesis and blastopore closure. During notochord tubulogenesis, we show that actomyosin contractility orchestrates distinct modes of cortical and cytoplasmic transport to promote lumen formation: lateral actomyosin contractility centralizes apical determinants along cell–cell contacts to position nascent apical lumens, while cyclic detachment and inward contraction of basal actomyosin drives internalization and transport of basal membranes through the cytoplasm and toward the apical lumen surface to support lumen growth. These results highlight surprising new roles for actomyosin in redistributing molecules and membranes across the cortex and through the cytoplasm, with potential relevance to many other morphogenetic processes. I will also describe our ongoing efforts to understand blastopore closure. We find that blastopore closure involves the coordinated assembly and rapid contraction of a multicellular purse string which is organized by interactions across the boundaries of differently fated cells. Our results suggest that local purse string assembly and contraction is triggered by mitotic rounding of boundary-facing cells, which transiently elongates the boundary, followed by rapid junction shrinkage. Junction shrinkage is associated with the progressive removal of adherens and tight junction components from the boundary. I will discuss how cell division generates mechanical responses and how adhesion–contractility feedback drives robust junction shrinkage. In parallel with these studies, I have also developed a napari plugin that enables interactive visualization and quantification of morphometrics, which I will briefly introduce for those studying multicellular and tissue-level dynamics.

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