THE UNIVERSITY OF TOKYO

ゆらぎと構造の協奏
Synergy of Fluctuation and Structure

Seminar Series on Bio-Soft Matter Out-of-Equilibrium (2)

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東京大学小柴ホール [本郷キャンパス理学部１号館２階]

Speaker

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Title

"Directed Actin Self Assembly, Contractility and Motilitynce"

Abstract

The organization of actin filaments into higher-ordered structures governs eukaryotic cell shape and movement. Global actin network size and architecture is maintained in a dynamic steady-state through regulated assembly and disassembly. We have developed a micropatterning method that enables the spatial control of actin nucleation sites for in vitro assays (Reymann, Nat. Mat., 2010). These actin templates were used to evaluate the response of oriented actin structures to myosin-induced contractility. We determine that myosins selectively contract and disassemble anti-parallel actin structures while parallel actin bundles remain unaffected. In addition, the local distribution of nucleation sites and the resulting orientation of actin filaments regulate the scalability of the contraction process. This "orientation selection" mechanism for selective contraction and disassembly reveals how the dynamics of the cellular actin cytoskeleton is spatially controlled by actomyosin contractility (Reymann et al., Science, 2012). Further application of the micropatterning method will be presented in particular recent data on the reconstitution of a lamellipodium-type of actin organization and the fabrication of three-dimensional electrical connections by means of directed actin self-organization (Galland et al., Nat. Mat., 2013).

1. Reyman et al., "Nucleation geometry governs ordered actin networks structures", Nature Materials **9**, 827–832 (2010).
2. Reyman et al., "Actin Network Architecture Can Determine Myosin Motor Activity", Science **336**, 1310-1314 (2012).
3. Galland et al., "Fabrication of three-dimensional electrical connections by means of directed actin self-organization", Nature Materials **12**, 416–421 (2013).

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