MODELING EPITHELIAL SHEET FOLDING

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Abstract

Epithelial sheets consist of interconnected, polarized cells, serving as barriers to protect underlying tissues and regulate material exchange between inner and outer environments. During embryonic development, simple epithelia fold into complex structures, leading to the formation of neural tubes, guts, optic cups, branches of lungs, etc. Questions remain as to whether epithelia can fold without external forces and what intrinsic mechanisms can induce it. By using a simple physical model, I will show that an autonomous folding can be induced by modulation of the intracellular mechanics along the basal-lateral as well as the apical cell surfaces. Those intrinsic mechanisms sculpt epithelia into distinct fold morphology. I will demonstrate that the different mechanical modulations can be identified from the cell and tissue shapes obtained experimentally.

Publications

[1] **F. L. Wen**, H. Y. Chen, and K. T. Leung, Statistics of actin-propelled trajectories in noisy environments, Phys. Rev. E **93**, 062405 (2016).
[2] **F. L. Wen**, K. T. Leung, and H. Y. Chen, Spontaneous symmetry breaking for geometrical trajectories of actin-based motility in three dimensions, Phys. Rev. E **94**, 012401 (2016).
[3] **F. L. Wen**, Y. C. Wang, and T. Shibata, to be published.
[4] **F. L. Wen**, K. T. Leung, and H. Y. Chen, Curved trajectories of actin-based motility in two dimensions, Europhys. Lett. **98**, 38005 (2012).
[5] **F. L. Wen**, K. T. Leung, and H. Y. Chen, Trajectories of *Listeria*-type motility in two dimensions, Phys. Rev. E **86**, 061902 (2012).