Soft Living Active and Adaptive Matter

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Making connections: how epithelial tissues guarantee folding

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Abstract:

Tissue folding is a ubiquitous shape change event during development whereby a cell sheet bends into a curved 3D structure. This mechanical process is remarkably robust, and the correct final form is almost always achieved despite internal fluctuations and external perturbations inherent in living systems. While many genetic and molecular strategies that lead to robust development have been established, much less is known about how mechanical patterns and movements are ensured at the population level. I will describe how quantitative imaging, physical modeling and concepts from network science can uncover collective interactions that govern tissue patterning and shape change.

Actin and myosin are two important cytoskeletal proteins involved in the force generation and movement of cells. Both parts of this talk will be about the spontaneous organization of actomyosin networks and their role in collective tissue dynamics. First, I will present how out-of-plane curvature can trigger the global alignment of actin fibers and a novel transition from collective to individual cell migration in culture. I will then describe how tissue-scale cytoskeletal patterns can guide tissue folding in the early fruit fly embryo. I will show that actin and myosin organize into a network that spans a domain of the embryo that will fold. Redundancy in this supracellular network encodes the tissue's intrinsic robustness to mechanical and molecular perturbations during folding.

Date:
10/25/2021

Time:
9:00 AM-10:15 AM (PT)

About the speaker:

Dr. Hannah Yevick is a NIH K99/R00 postdoctoral investigator at MIT working with Dr. Adam Martin. She will transition to an Assistant Professor at Brandeis University in the department of Physics beginning Summer 2022. Her research focuses on interpreting the mechanics of developmental robustness in early embryos using quantitative approaches.

Dr. Yevick completed her PhD at the Curie Institute in Paris where she studied collective cell migration in living tissues by employing engineered microenvironments.

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