



University
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Department
Biozentrum



Swiss Institute of
Bioinformatics

BIOZENTRUM

The Center for
Molecular Life Sciences

Basel Computational Biology Seminar

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Self-organization of active epithelial mechanics

Shape changes of epithelia during animal development, such as convergent extension, are achieved through the concerted mechanical activity of individual cells. While much is known about the corresponding large-scale tissue flow and its genetic drivers, fundamental questions regarding local control of contractile activity on the cellular scale and its embryo-scale coordination remain open. To address these questions, we develop a quantitative, model-based analysis framework to relate cell geometry to local tension in recently obtained time-lapse imaging data of gastrulating *Drosophila* embryos. This analysis systematically decomposes cell shape changes and T1 rearrangements into internally driven, active, and externally driven, passive, contributions. Our analysis provides evidence that germ band extension is driven by active T1 processes that self-organize through positive feedback acting on junctional tensions. This mechanical self-organization allows the tissue to remodel internally, to change shape like a fluid, while resisting external forces, like a solid. Together our findings explain how controlled tissue shape change emerges from the interplay of bottom-up local self-organization with the top-down, embryo-scale regulation by gene expression.

Date: **Monday, 08 December 2025**

Time: **16:15 h – 17:15h**

Location: **Biozentrum, 2.073**

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