ZBP Colloquium

Zentrum für Biophysik
Center for Biophysics

UNIVERSITÄT DES SAARLANDES

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ZBP Colloquium, Thursday, January 15, 2026

Programming Biological Shapes: Morphogenesis in an Active Solid

Understanding how epithelial sheets of cells robustly and reliably adopt complex shapes during animal development remains a key open problem of developmental biology and tissue mechanics. Classically, cortical contractility of the apical surface of these cells generating local bending moments in an effectively fluid tissue has been the go-to theoretical picture for such problems. However, many morphogenetic events are not well explained under this framework. We hypothesize that collective, in-plane active cell behaviours could instead generate effective spontaneous strains in a solid tissue and in so doing drive stable shape outcomes. We explore these ideas and their consequences in a series of lower dimensional and/or simplified arenas, from a quasi-1d spontaneous strain buckling instability model of the Drosophila cephalic furrow, to how actively driven neighbour rearrangements in vertex models can give rise both to entropic forces in the tissue and locally establish coarse-grained spontaneous strains at steady state. We then turn to a full-blown 3D problem where, together with experimental collaborators, we show that active, in-plane cellular behaviours create the spontaneous strains that ultimately shape the Drosophila wing disc pouch during the dramatic morphogenetic event known as eversion. Taken together, these findings establish active, in-plane, solid shape programming as a potentially general mechanism for animal tissue morphogenesis.

https://tinyurl.com/zbp-modes20260115

Talk: 14:15
Tea/Coffee at 14:00
Campus Saarbrücken
Building C6.4
Room 0.09 (Lecture Hall II)

Schedule with full abstract

Teams link