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The Mechanics of Cell Intercalation MADHAV MANI, BORIS SHRAIMAN, KITP and UCSB Physics, THOMAS LECUIT, IBDM CNRS & Aix-Marseille Université — Cell-intercalation involves the cytoskeleton-driven exchange of cellular neighbors. Developmental cues produce directional biases in the pattern of neighbor-exchanges, resulting in the alteration of tissue shape – morphogenesis. Focusing on cell-intercalation during early fly development, I will address both static and dynamical aspects. A quantitative correspondence is drawn between cytoskeletal levels, stresses and geometry. This construction of a constitutive law, relies on a novel image analysis tool that infers mechanical features of the cellular lattice from live imaging (from the Lecuit Lab, Marseilles). Building on our understanding of these static aspects, we construct a phenomenological, and physically-motivated, model for cytoskeletal remodeling based on temporal correlation analyses. This model predicts the qualitative phases of junctional states, insights into the T1 event that mediates intercalation, and several of the collective properties of cell-intercalation that have remained unaddressed so far – we go on to validate these predictions. We conclude with introducing the idea that tissue-wide anisotropies, central to morphogenesis and patterning in the embryo, can emerge as a consequences of the collective aspects of mechanical interactions.

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