

Journal Club



LOOKING DEEPER INTO TISSUE ELONGATION

Epithelia are the primary tissues that, through stretching, bulging, folding and layering, give animals their forms. Much of the study of morphogenesis has focused on the versatile shape-change toolkit epithelia use to accomplish these rearrangements. These studies are dominated by the use of advanced microscopy techniques. However, epithelial cells are not the near-2D pancakes that microscopists prefer, and the problem of light scattering deep in tissues is a tough one. Consequently, we often take the 3D problem of cell rearrangements and see how much of it we can account for with the events happening just under the coverslip.

One model in which to study epithelial tissue rearrangements is the embryonic ectoderm of *Drosophila melanogaster*. This epithelium rapidly becomes narrower and longer to extend the body axis through a process called convergent extension, which occurs during the development of many animals. To do this, cells move between their neighbours preferentially along the shortening axis (Irvine & Wieschaus, 1994). In the early fly embryo, the apical surface of the ectoderm is most accessible for imaging. Because of this, most studies to date have focused on investigating molecular drivers of convergent extension in this plane, revealing that neighbour exchanges are driven by myosin-dependent contraction of adherens junctions along the shortening axis and formation of new junctions along the elongating axis (Bertet et al., 2004; Zallen & Wieschaus, 2004).

An exciting paper from Sun et al. (2017) shows that there is more to this story. Using two-photon microscopy to image whole cell volumes over time, they found that neighbour exchange often initiates at the basal surface, and apical junction exchange lags behind. At the basal surface, neighbour exchange is driven by polarized localization of phosphorylated Src42A kinase, which acts upstream of the Rho GTPase Rac1 to generate basal protrusions that cells extend between their neighbours in the direction of ultimate neighbour exchange. After these protrusions make contact, the junction zippers upwards, assisted at the apical surface by contraction of cell–cell junctions as described above. Notably, both the formation of basal protrusions and apical junction contraction are required for full convergent extension. These findings extend work from vertebrate systems (see especially Williams et al., 2014) and provide the strongest case yet for the contribution of both apical and basal cell behaviours to convergent extension. This paper is a nod to the under-appreciated dynamicity of the epithelial basal surface. It is also a nice reminder to look at the processes we study from new perspectives — there is a lot going on beneath the surface.

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ORIGINAL ARTICLE Sun, Z. et al. Basolateral protrusion and apical contraction cooperatively drive *Drosophila* germ-band extension. *Nat. Cell Biol.* **19**, 375–383 (2017)

RELATED ARTICLES Bertet, C., Sulak, L. & Lecuit, T. Myosin-dependent junction remodelling controls planar cell intercalation and axis elongation. *Nature* **429**, 667–671 (2004) | Irvine, K. D. et al. Cell intercalation during *Drosophila* germband extension and its regulation by pair-rule segmentation genes. *Development* **120**, 827–841 (1994) | Williams, M. et al. Distinct apical and basolateral mechanisms drive PCP-dependent convergent extension of the mouse neural plate. *Dev. Cell* **29**, 34–46 (2014) | Zallen, J. A. & Wieschaus, E. Patterned gene expression directs bipolar planar polarity in *Drosophila*. *Dev. Cell* **6**, 343–355 (2004)