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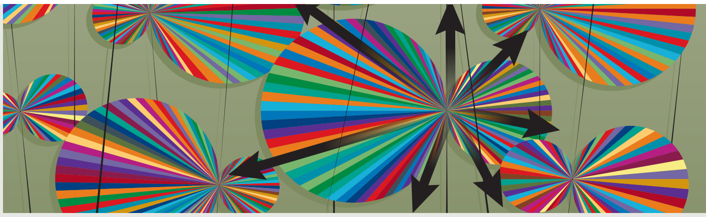
PLANT CELL DEVELOPMENT

Forcing cell polarity



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Eighty percent of epidermal cells in plant leaves, including stomata, derive from asymmetric stem cell-like divisions of meristemoid mother cells (MMCs). The asymmetry of these divisions is dependent on the polarized localization of membrane-associated proteins, including BREAKING OF ASYMMETRY IN THE STOMATAL LINEAGE (BASL) and BREVIS RADIX-LIKE 2 (BRXL2). The orientation of protein and division asymmetries may be guided by the peptide signal EPIDERMAL PATTERNING FACTOR 1 (EPF1) that is secreted by stomatal guard cells and their precursors, and is sensed by receptor-like kinases. Bringmann and Bergmann now reveal that mechanical tension generated by polarized cell growth is an additional cue contributing to specifying the axis of polarity in MMCs.

To understand the global alignment of polarity in the developing epidermis, the authors imaged early leaves of *Arabidopsis thaliana*, and analysed the localization of fluorescently tagged BRXL2 in individual cells with respect to the organ midline. They found that, globally, the polar distribution of BRXL2 was approximately aligned with the long axis of the leaf. Notably, this alignment was evident for the MMCs at the base of the leaf, but was gradually lost in more distal regions.

Analysis of global leaf growth revealed that it is driven in large part by longitudinal (parallel to the long axis) expansion of cells at the midline, particularly at the organ base, indicating that, at least at the base of the leaf, MMC polarity is aligned with the main axis of organ growth. This raised the possibility that MMCs are able to polarize in response to mechanical tension generated by expanding neighbouring cells. Indeed, inducing tension by cell ablation or by applying external stretch was sufficient to polarize cells with respect to the direction of tension. However, MMCs at the distal end of the leaf were consistently polarized towards EPF1-secreting cells (the abundance of which increases in the distal regions of the leaf), irrespective of the axis of organ growth, suggesting that peptide signalling is able to override the mechanical tension cue.

> MMCs are able to polarize in response to mechanical tension

This study indicates that both chemical and mechanical signals provide important cues for tissue patterning in plant epidermis, underscoring the instructive role of mechanical cues during organism development.

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ORIGINAL ARTICLE Bringmann, M. & Bergmann, D. C. Tissue-wide mechanical forces influence the polarity of stomatal stem cell in *Arabidopsis*. *Curr. Biol.* http://dx.doi.org/10.1016/j.cub.2017.01.059 (2017)