Modeling the emergence of polarity patterns for the intercellular transport of auxin in plants

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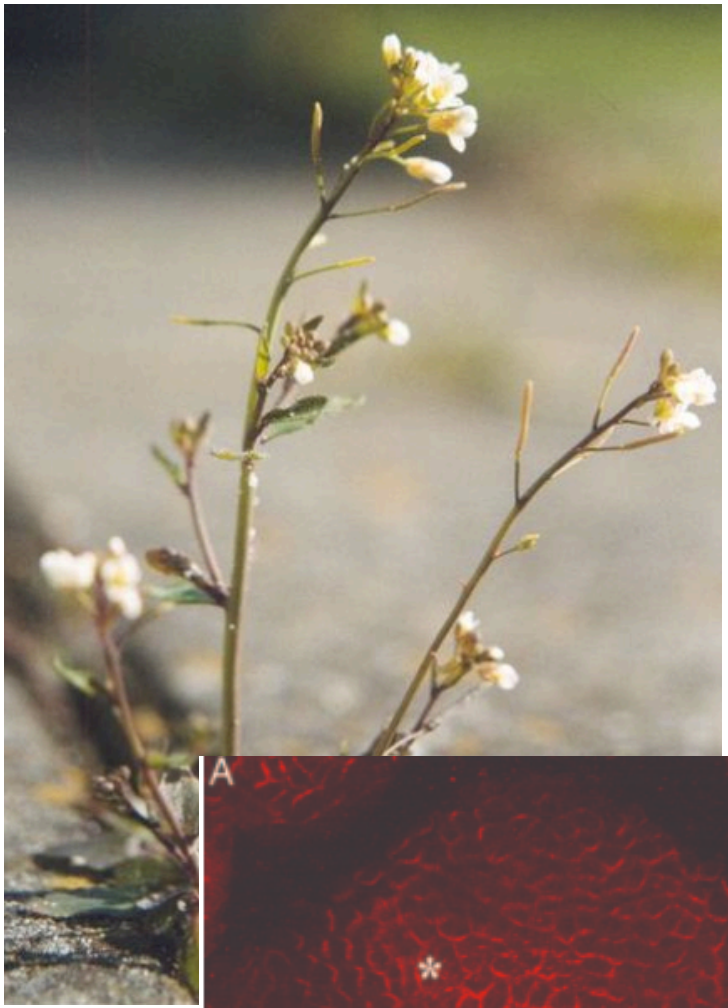
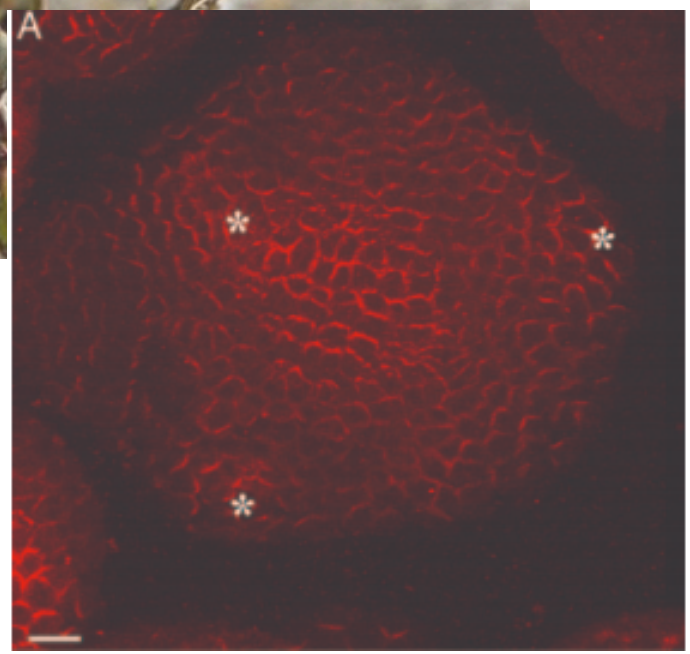
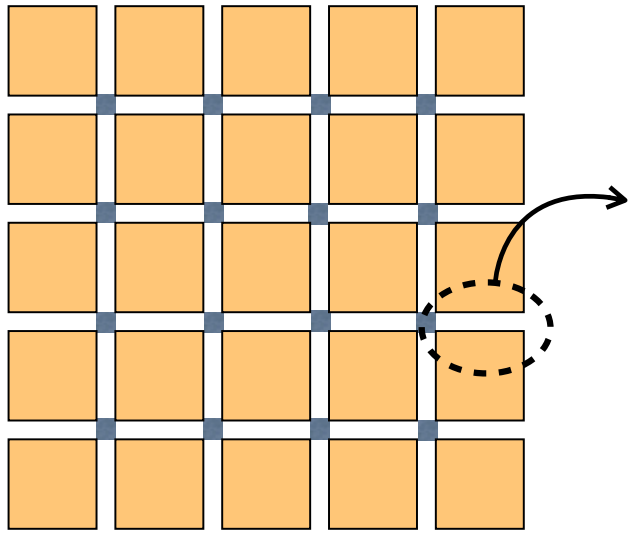
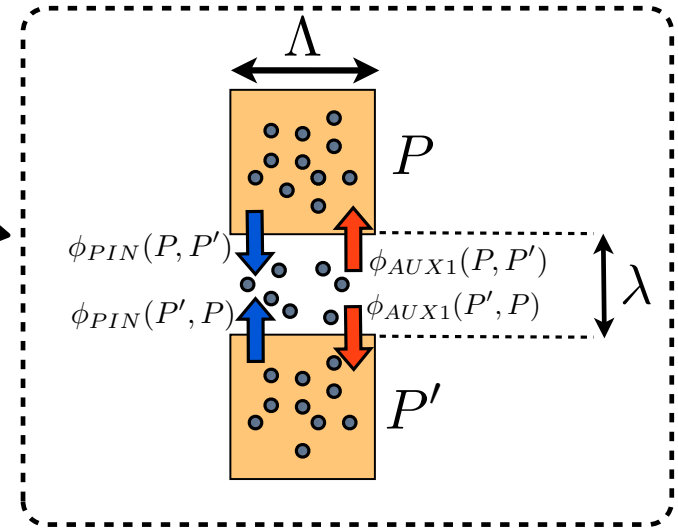
S.G., P. Sollich, O. C. Martin, *Modeling the emergence of polarity patterns for the intercellular transport of auxin in plants*, accepted for publication in J. R. Soc. Interface

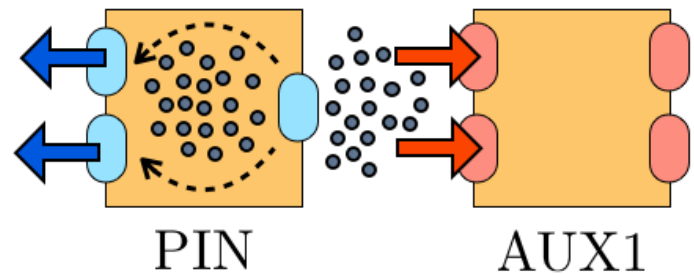
Modeling Plant Morphogenesis











D. Reinhardt et al., *The Plant Cell*, 2000

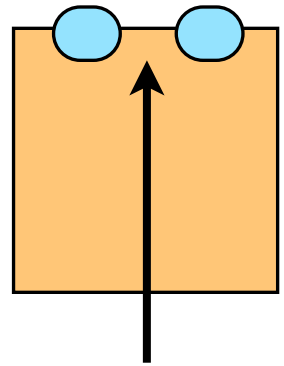
Spontaneous polarisation patterns

$$\vec{\delta} \equiv (\delta_1, \delta_2)$$

$$\delta_1 = \frac{N_R^{PIN} - N_L^{PIN}}{N^{TOT}}$$

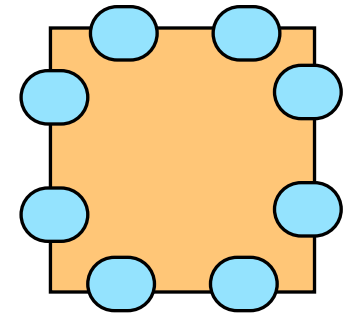
$$\delta_2 = \frac{N_U^{PIN} - N_D^{PIN}}{N^{TOT}}$$

Cases:



$$||\vec{\delta}|| = 1$$

$$\theta = \frac{\pi}{2}$$



$$||\vec{\delta}|| = 0$$

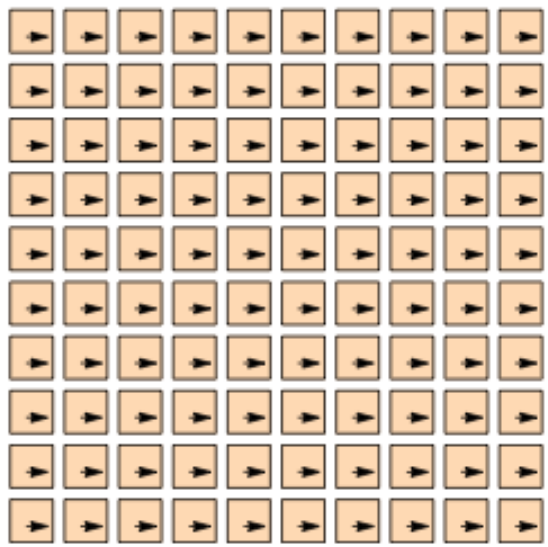
θ not defined

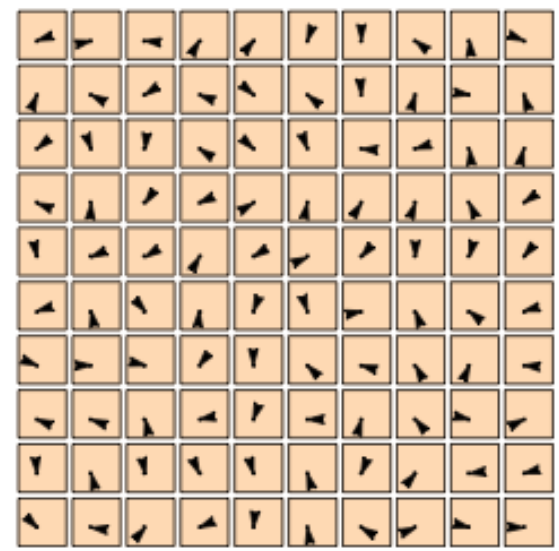
PIN dynamics:

$$\tau \frac{dN_f^{PIN}}{dt} = -\frac{3}{4} N_f^{PIN} \frac{1}{1 + (\frac{\phi_f^{OUT}}{\phi^*})^h} + \frac{1}{4} \sum_{f'} N_{f'}^{PIN} \frac{1}{1 + (\frac{\phi_{f'}^{OUT}}{\phi^*})^h}$$

for the f-th face

Low diffusion





High diffusion