



IIT ROORKEE



NPTEL ONLINE
CERTIFICATION COURSE

Shoot Development: Leaf Development

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Leaf Morphology in Plants

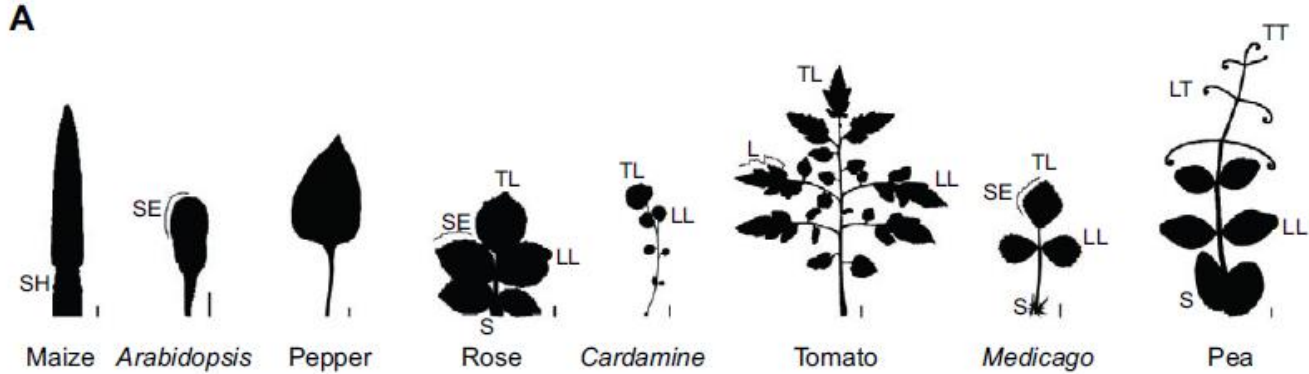
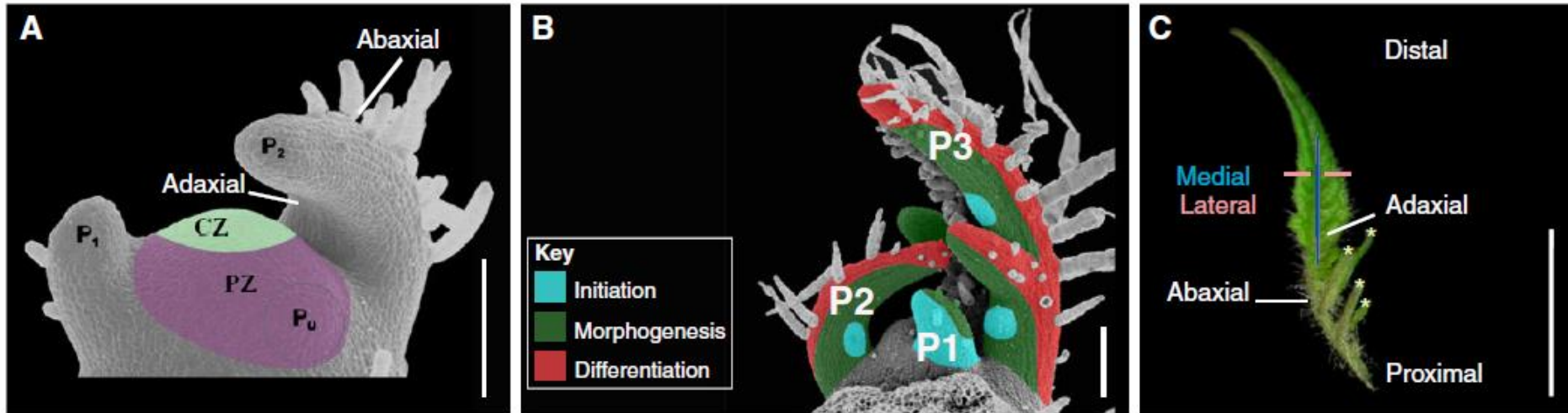


Image Source: Bar & Ori (2014), Development 141, 4219-30.

Leaf Morphogenesis in Plants



typical tomato shoot

Image Source: Bar & Ori (2014), Development 141, 4219-30.

Leaf Morphology in Arabidopsis

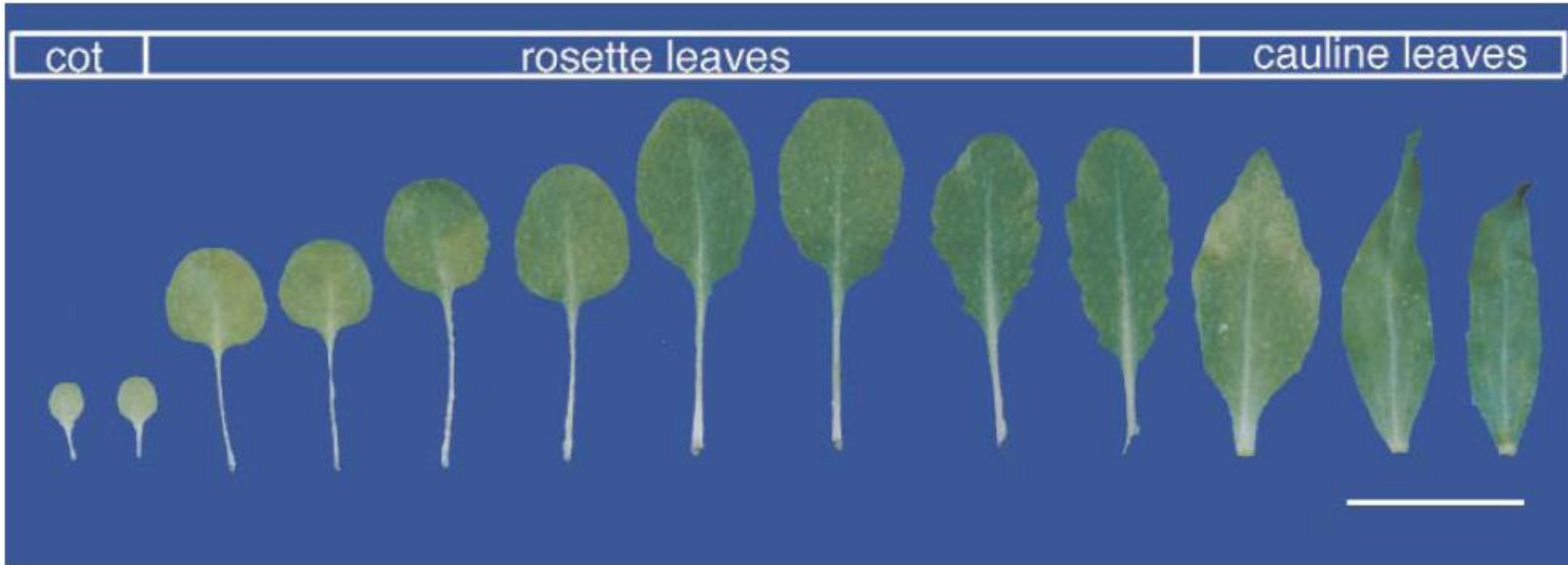


Image Source: Tsukaya H. (2002), Arabidopsis Book, 1, e0072.

Leaf Morphology in Arabidopsis

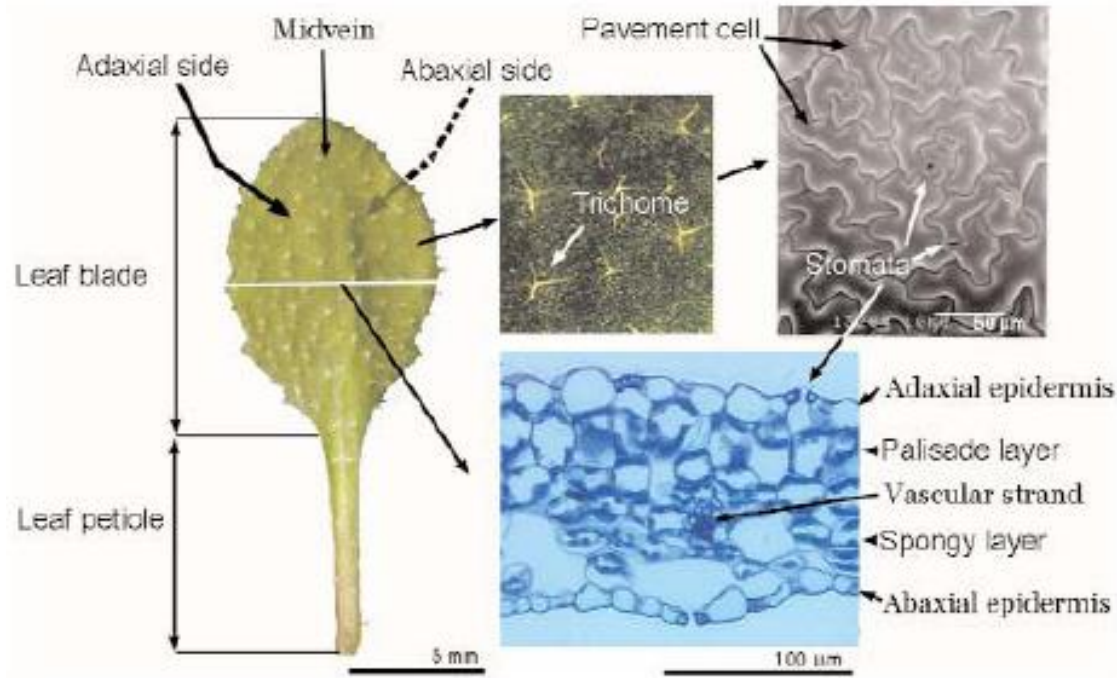


Image Source: Tsukaya H. (2002), Arabidopsis Book, 1, e0072.

Genes regulating leaf Development

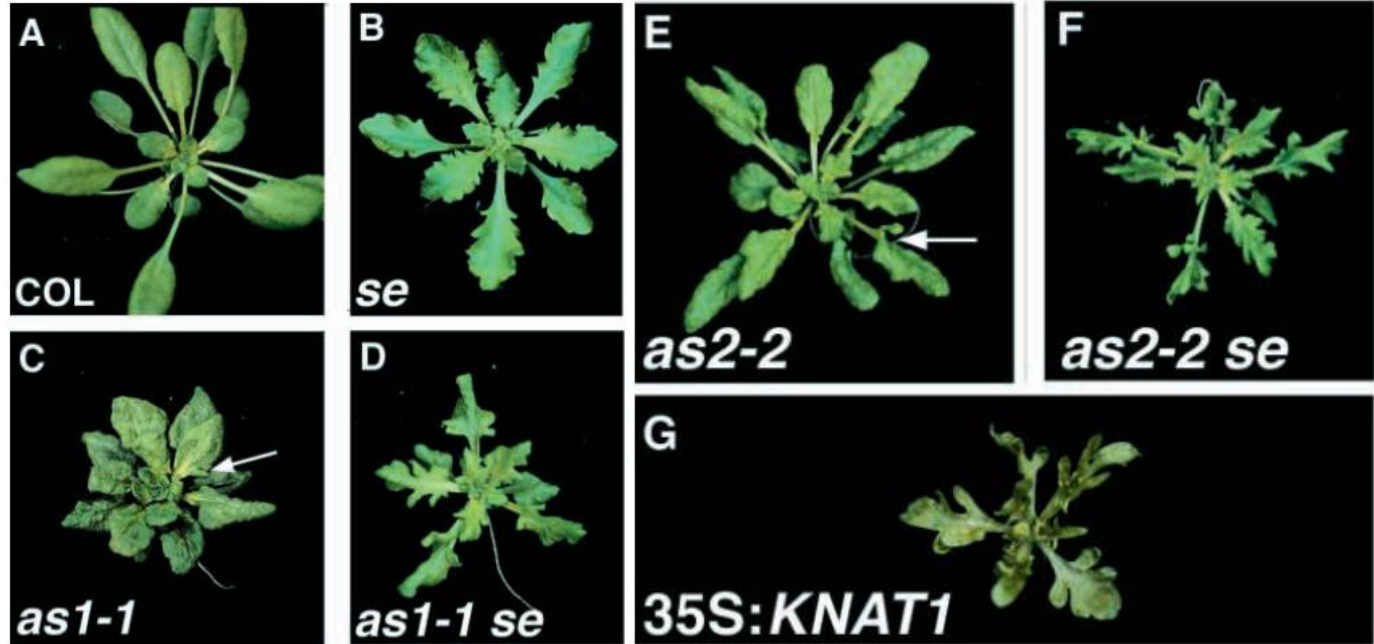
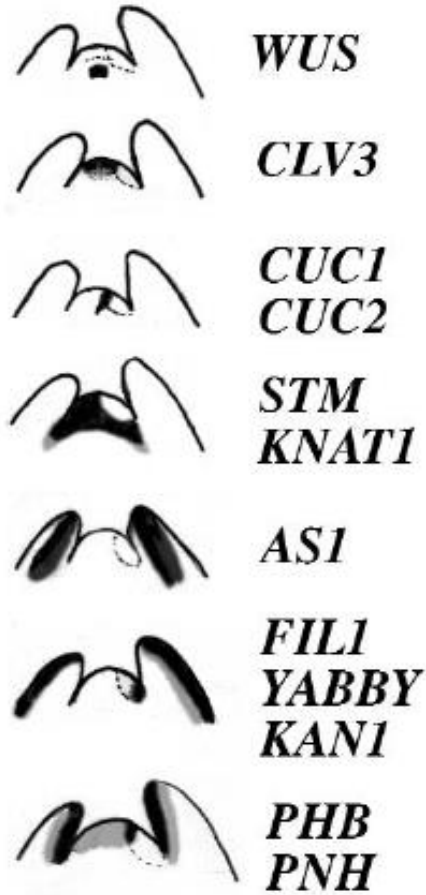
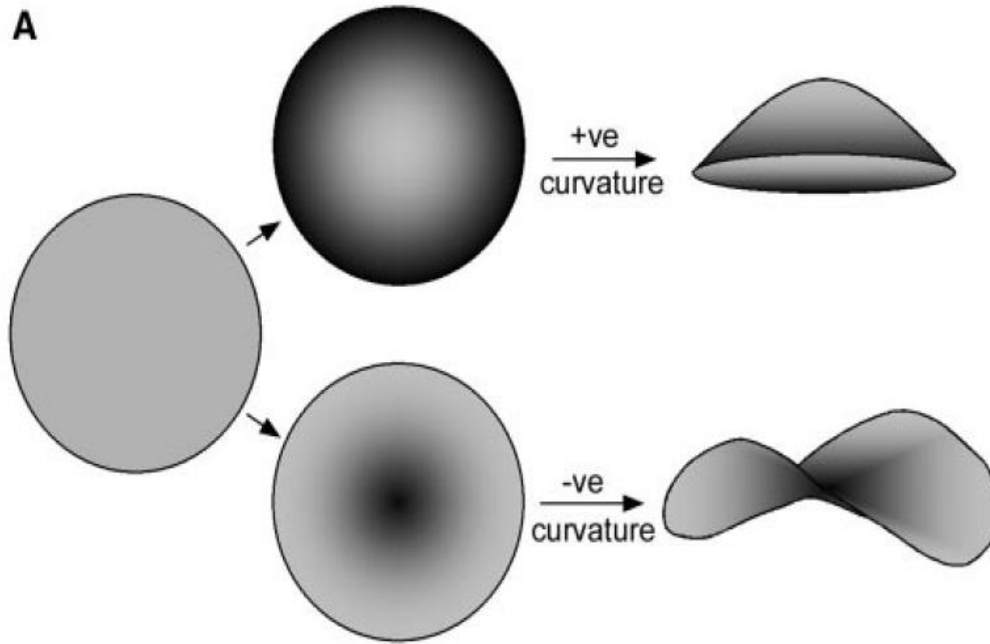


Image Source: Tsukaya H. (2002), Arabidopsis Book, 1, e0072.
Ori et al. (2000) Development 127, 5523-32.

Genes regulating leaf curvature



CIN encodes a TCP protein

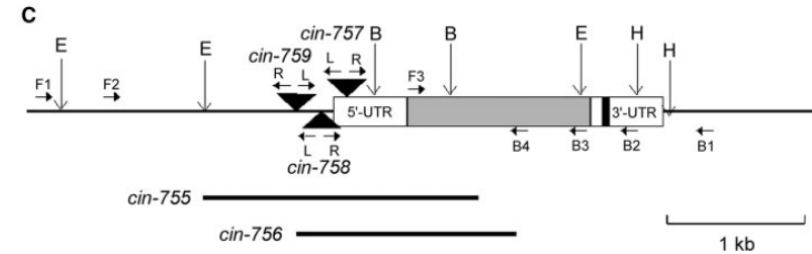


Image Source: Nath et al. (2003), Science, 299, 1404-407.

Genes regulating leaf morphology

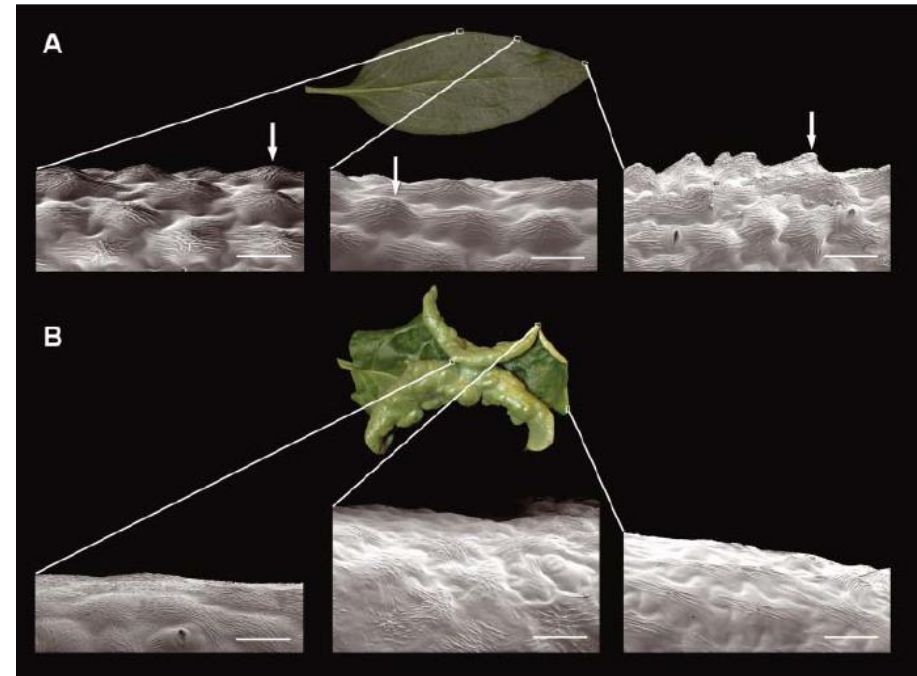
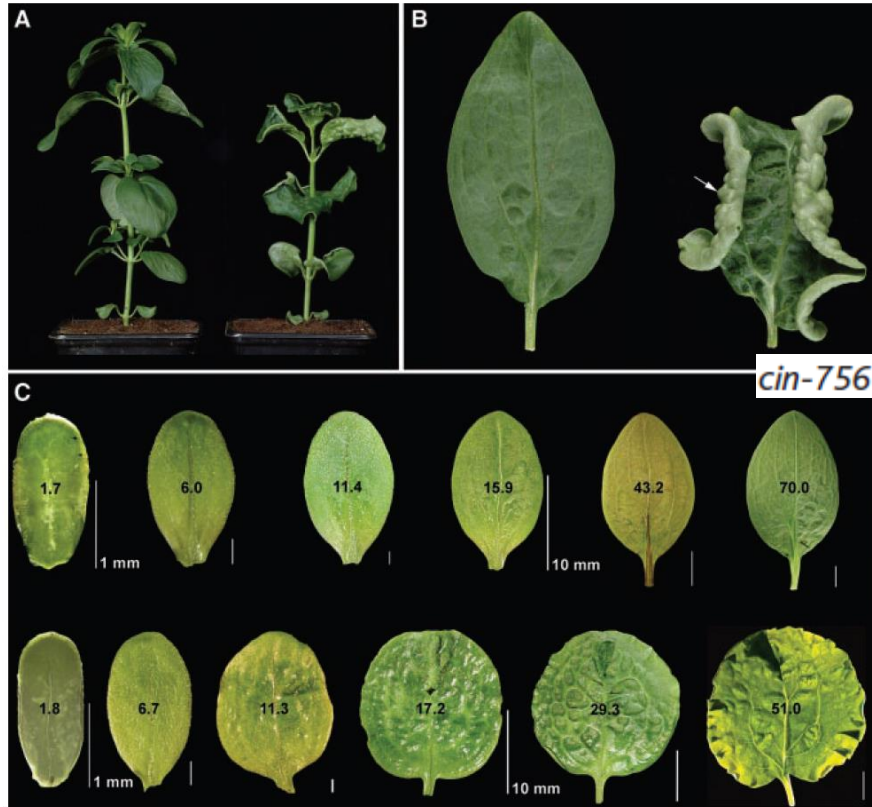


Image Source: Nath et al. (2003), *Science*, 299, 1404-407.
Brian et al. (2004), *Plant Physiol.*, 135, 244-53.

Regulation of leaf morphology

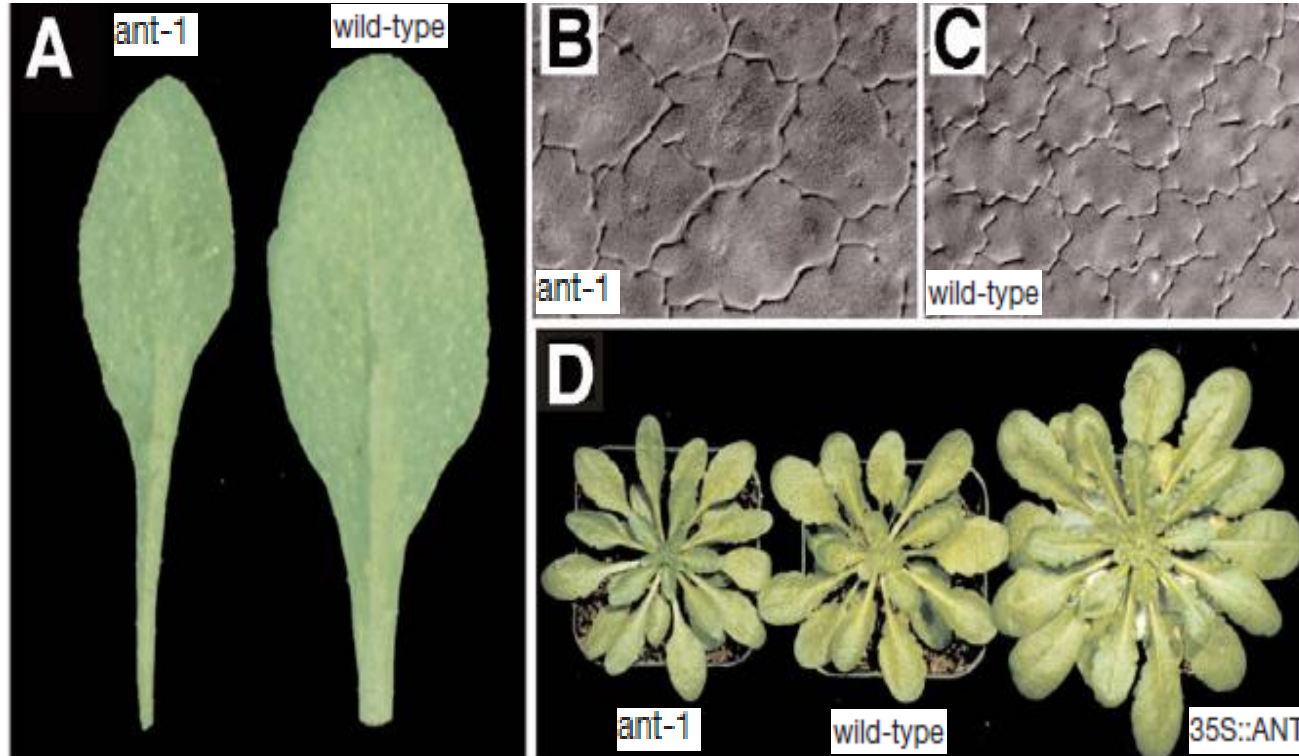


Image Source: Tsukaya H. (2002), Arabidopsis Book, 1, e0072.

Leaf Development

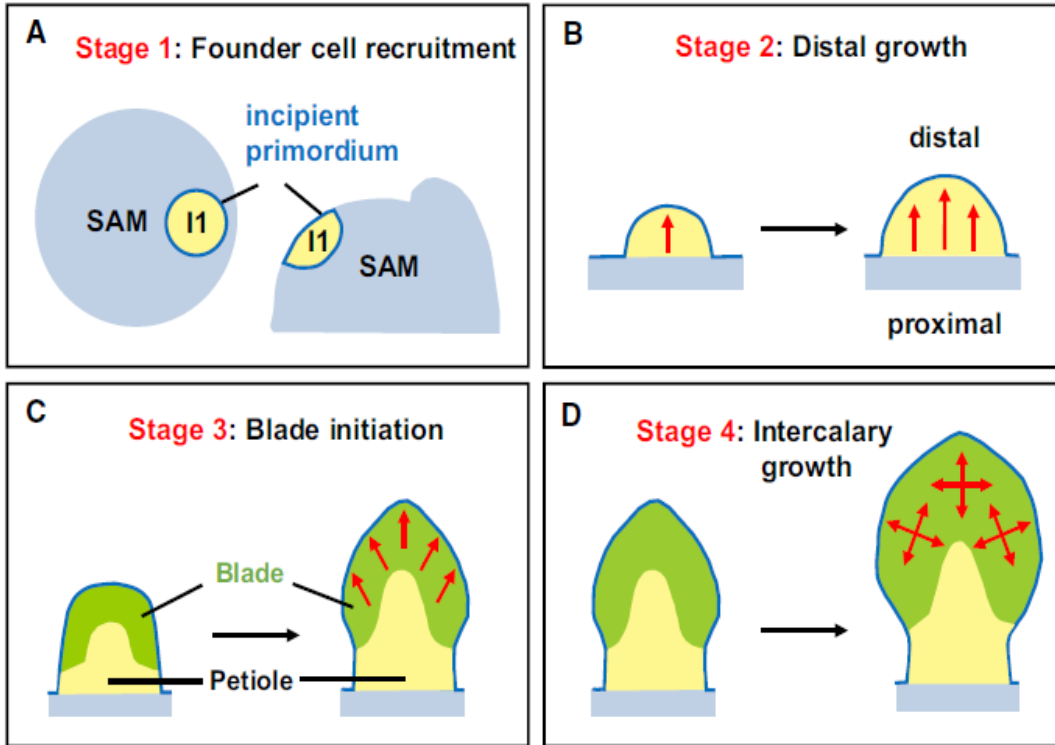
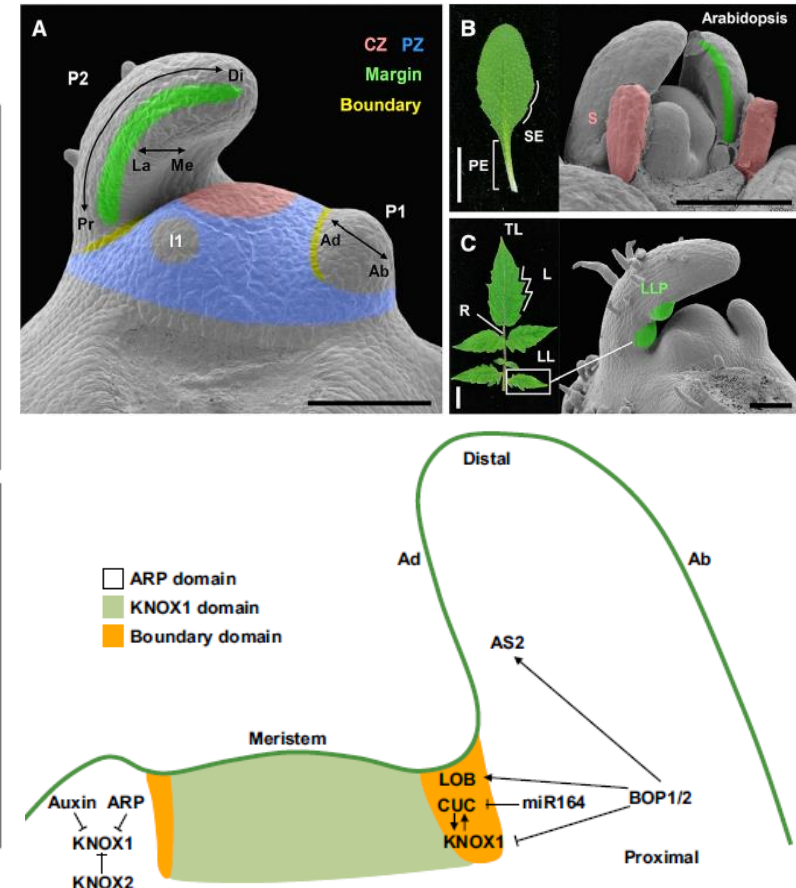
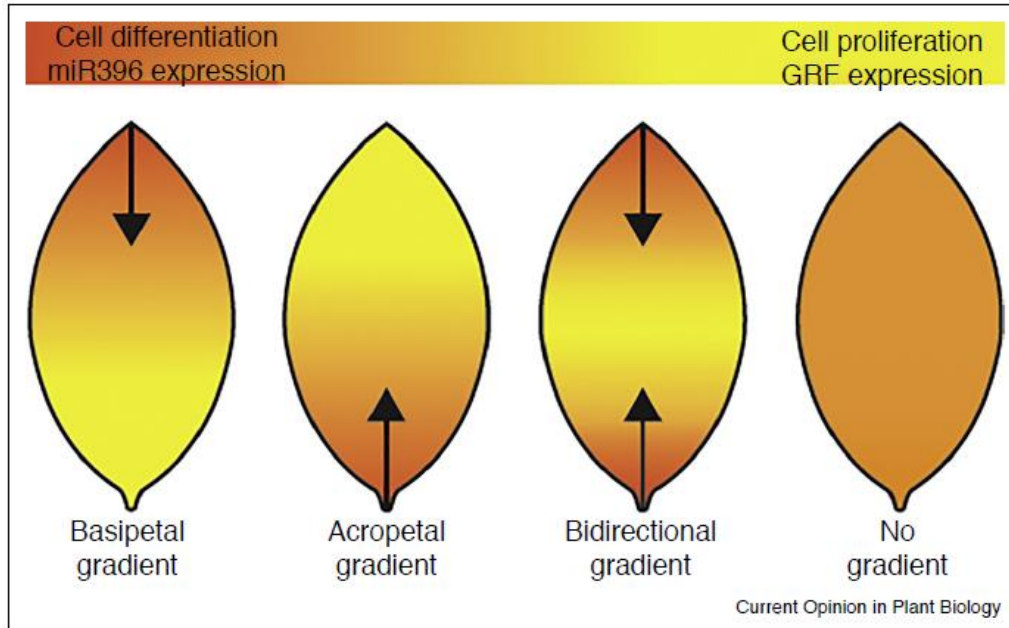


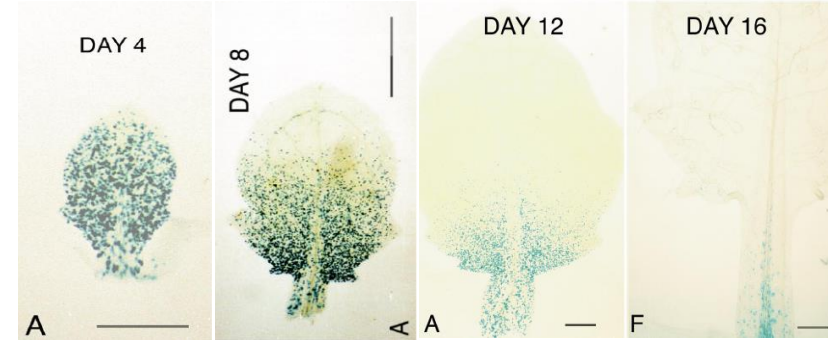
Image Source: Du et al. (2018), Mol Plant, 11, 1117-34.



Leaf Differentiation



Arabidopsis thaliana (Columbia)



cyclin:: β -glucuronidase reporter

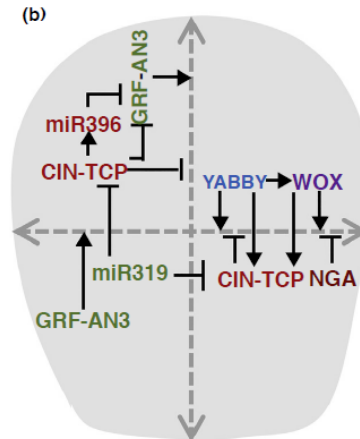


Image Source: Donnelly et al. (1999) Dev. Biol. 215, 407–19.
Sarvepalli et al. (2019), Current Opinion in Plant Biology, 47, 22–31.

Spatial Auxin Signaling Controls Leaf Flattening in *Arabidopsis*

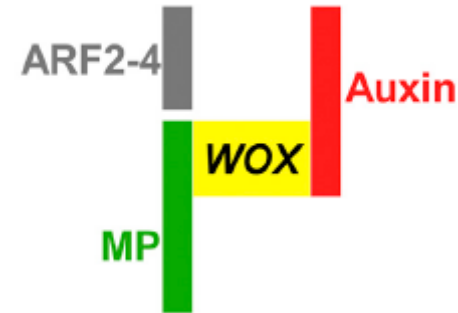
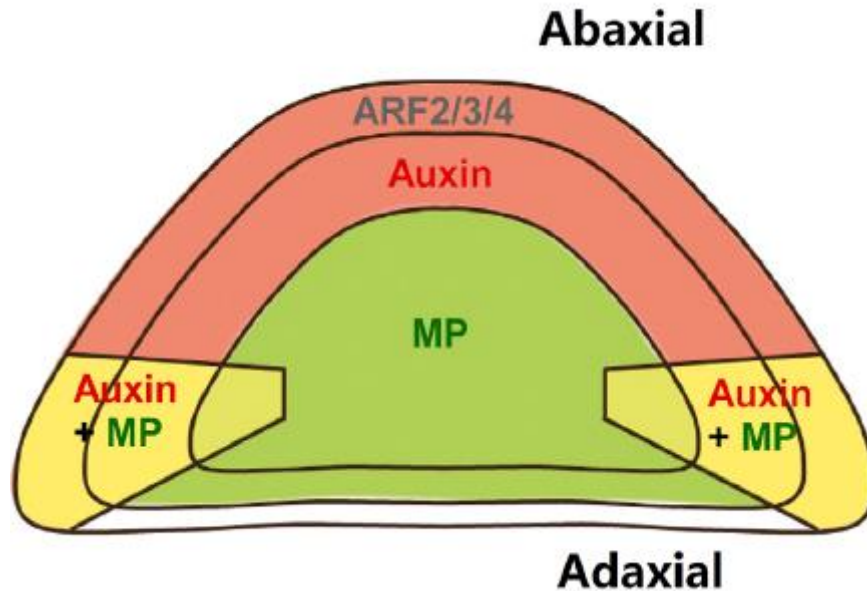


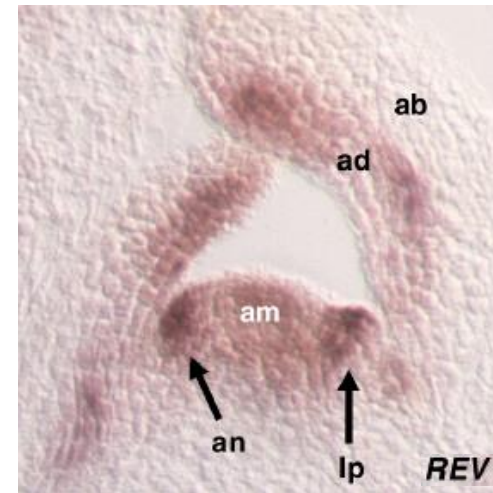
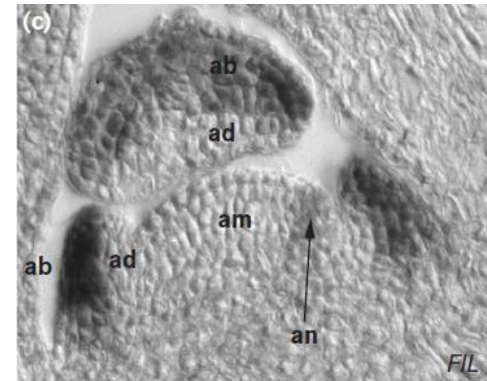
Image Source: Guan et al. (2017), Current Biology 27, 2940–50.

Establishing Organ Polarity

<i>Arabidopsis</i> gene	Family of protein	Expression in lateral organs	Loss-of-function phenotype ^a	Gain-of-function phenotype
<i>PHABULOSA</i>	Class III HD-ZIP	Adaxial	Unknown	Adaxialized
<i>PHAVOLUTA</i>	Class III HD-ZIP	Adaxial	Unknown	Adaxialized
<i>REVOLUTA</i>	Class III HD-ZIP	Adaxial	Abaxialized?	Unknown
<i>FILAMENTOUS FLOWER</i>	YABBY	Abaxial	Adaxialized?	Abaxialized
<i>YABBY2</i>	YABBY	Abaxial	Unknown	Unknown
<i>YABBY3</i>	YABBY	Abaxial	Adaxialized?	Abaxialized
<i>CRABS CLAW</i>	YABBY	Abaxial	Adaxialized	Abaxialized
<i>INNER NO OUTER</i>	YABBY	Abaxial	Adaxialized	Unknown
<i>KANADI1</i>	GARP	Abaxial	Adaxialized	Abaxialized

Image Source: Bowman et al. (2002), Trends Genet., 18, 134-41.

Bowman, J. L. (2000) Curr Opin Genet Dev., 10, 399-404.



Establishing Leaf Polarity

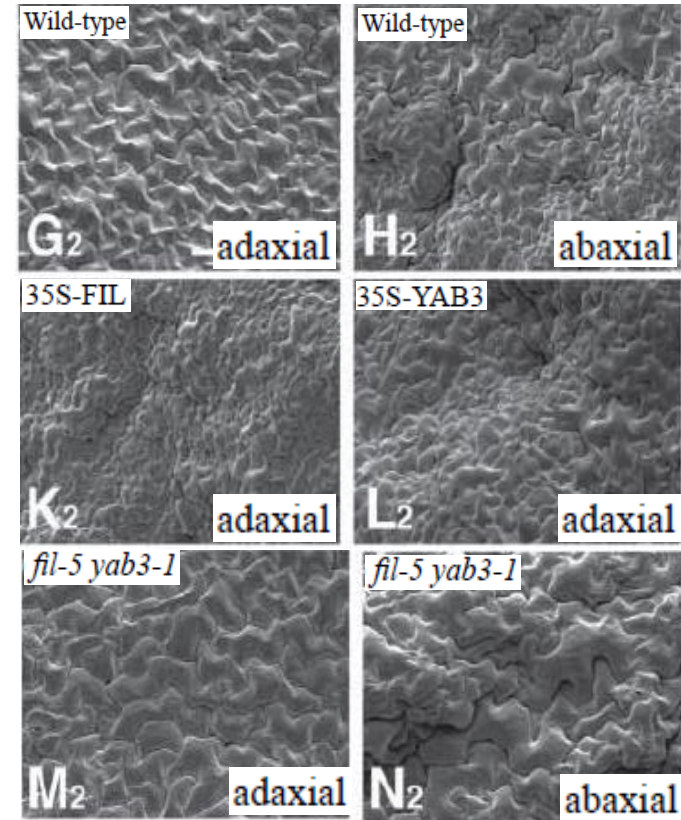
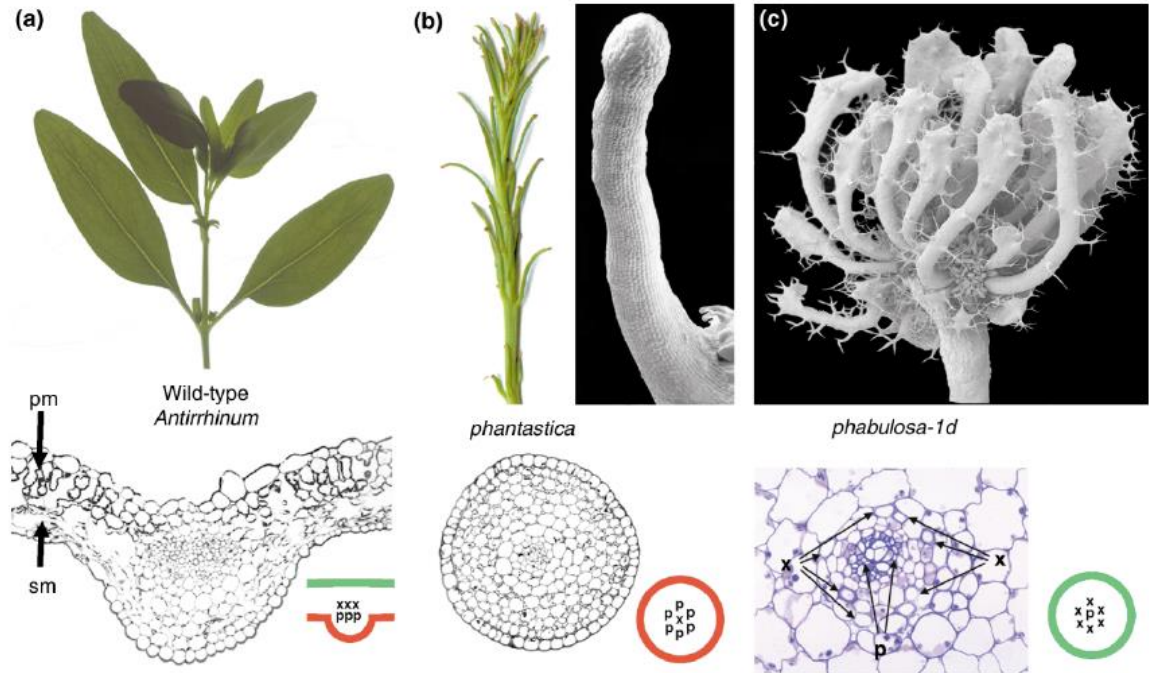


Image Source: Bowman et al. (2002), Trends Genet., 18, 134-41.
Siegfried et al. (1999), Development 126, 4117-28.

Establishing Leaf Polarity

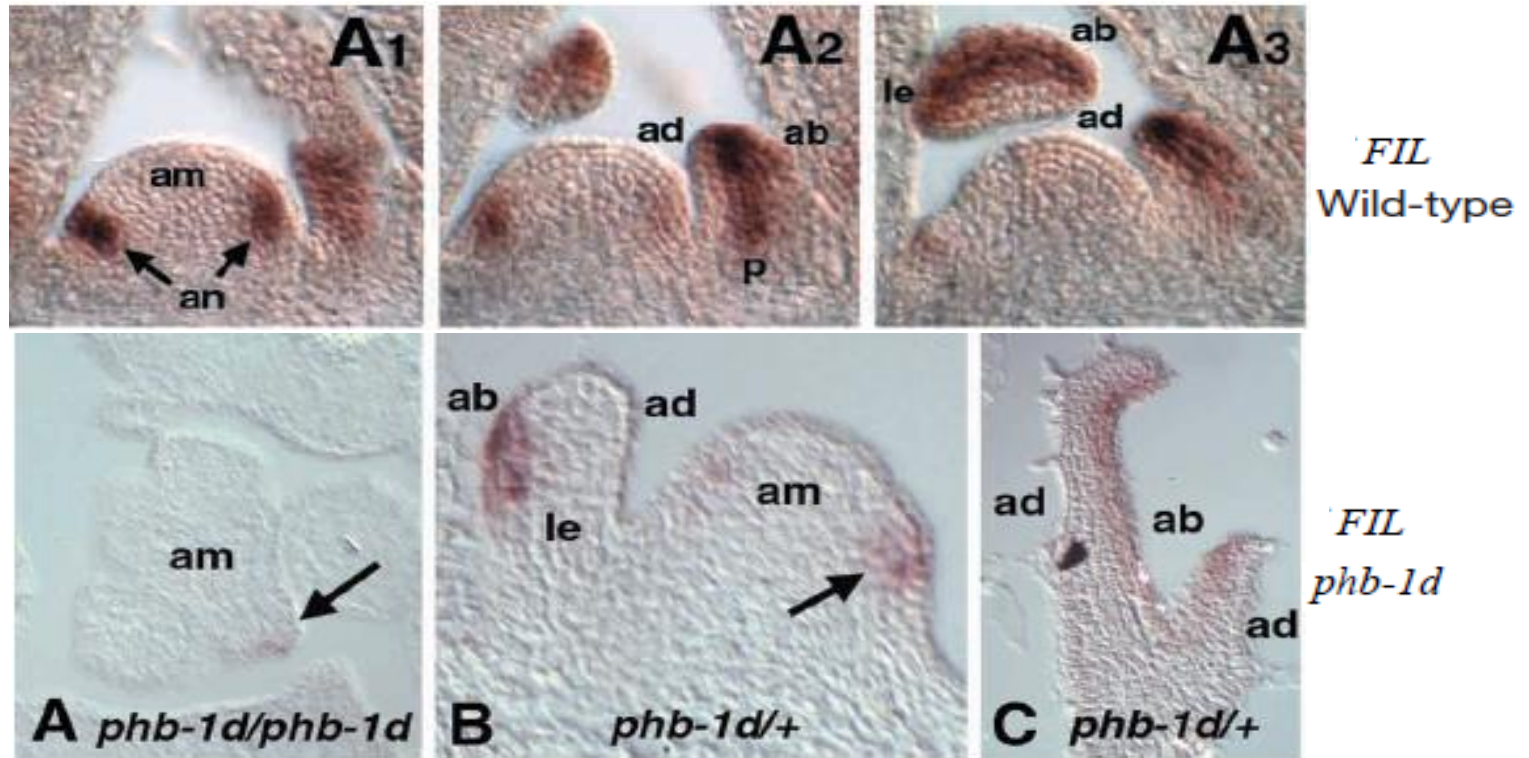


Image Source: Siegfried et al. (1999), Development 126, 4117-28.

Establishing Leaf Polarity

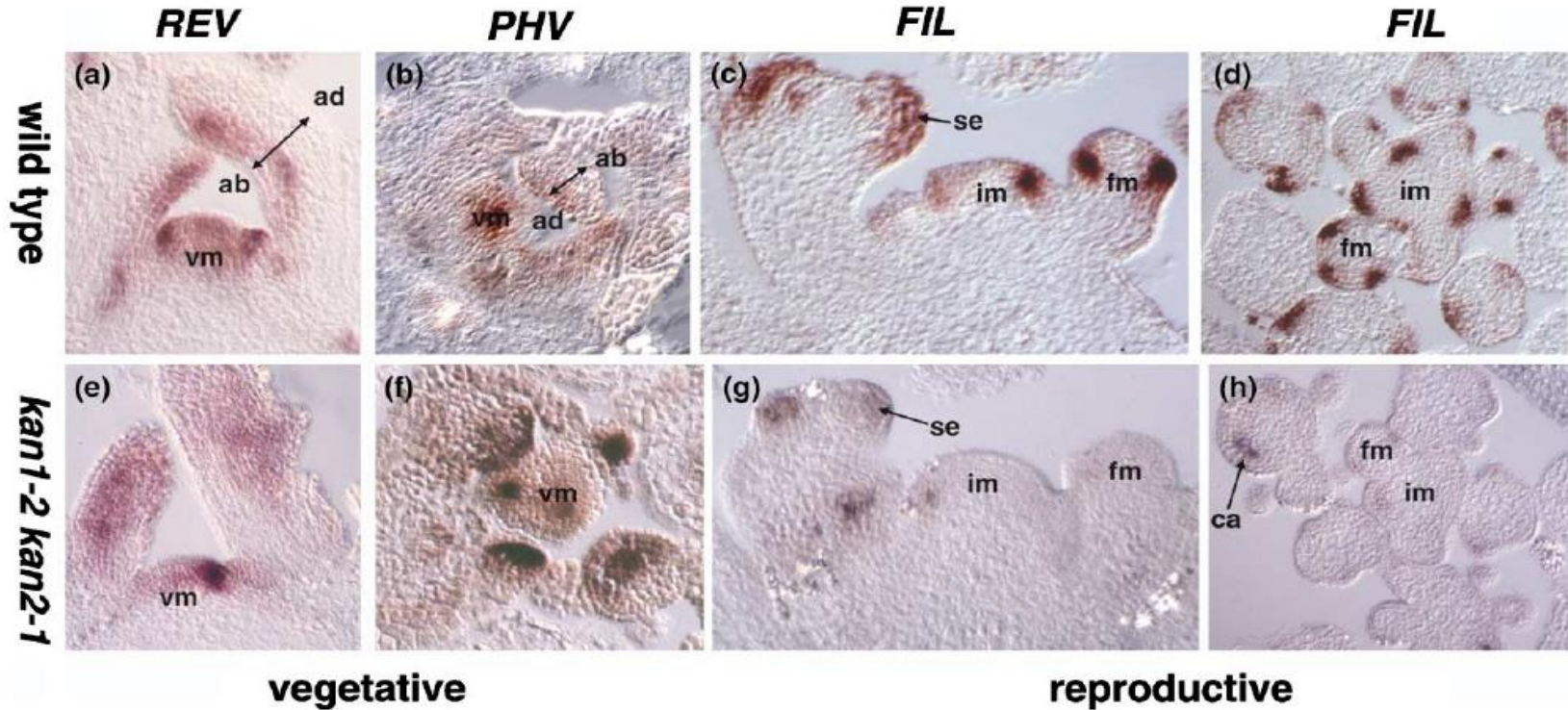


Image Source: Eshed et al. (2001), Current Biology, 11, 1251–60.

Establishing Organ Polarity

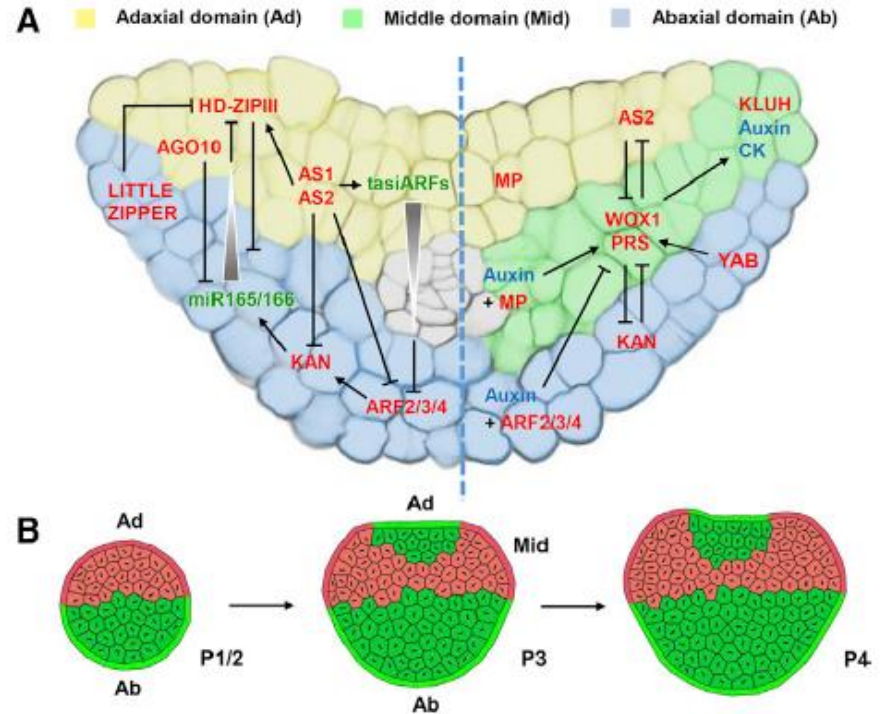
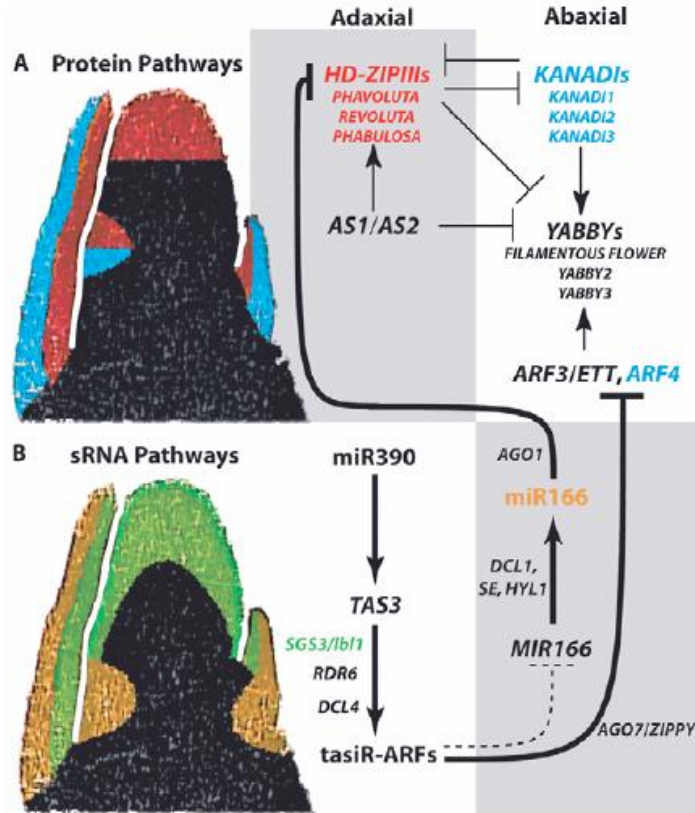


Image Source: Chitwood et al. (2007), *Development*, 134, 813-23.
Du et al. (2018), *Mol Plant*, 11, 1117-34.