

PIN2-mediated self-organizing transient auxin flow contributes to the auxin maxima at the tip of the *Arabidopsis* cotyledons

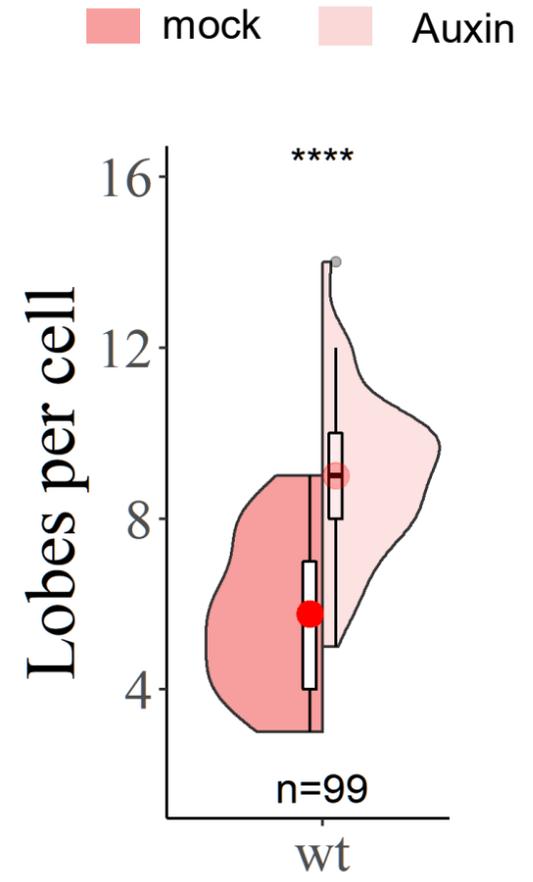
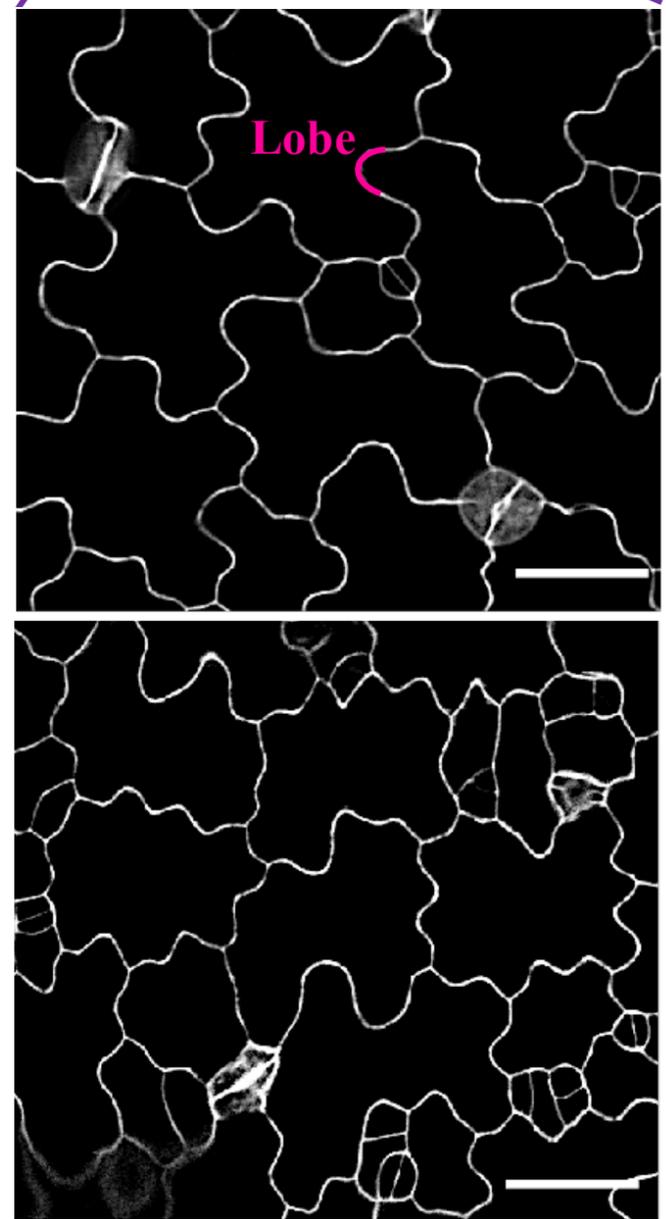
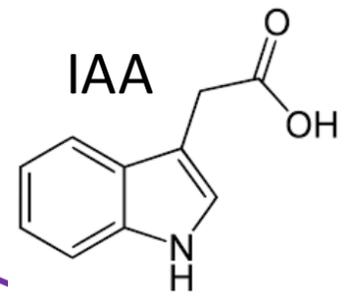
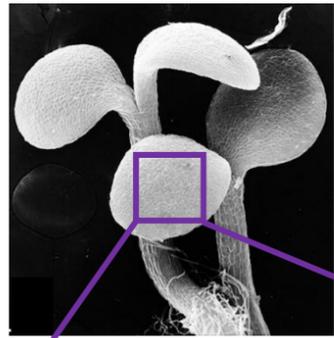
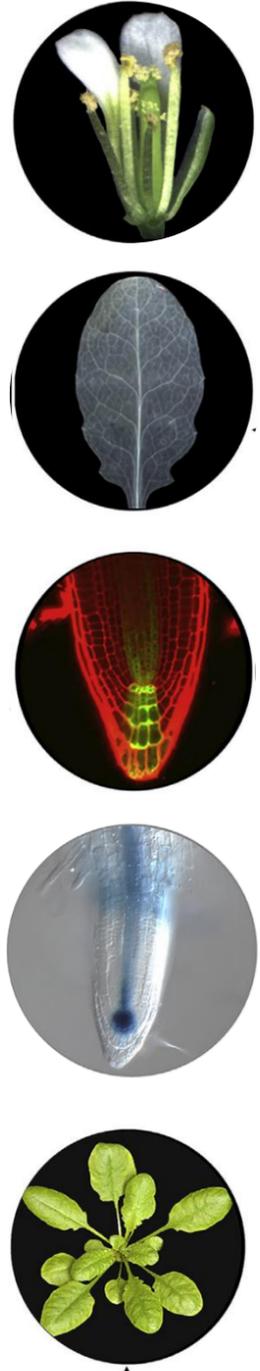
Patricio Pérez-Henríquez

Assistant Project Scientist
University of California, Riverside

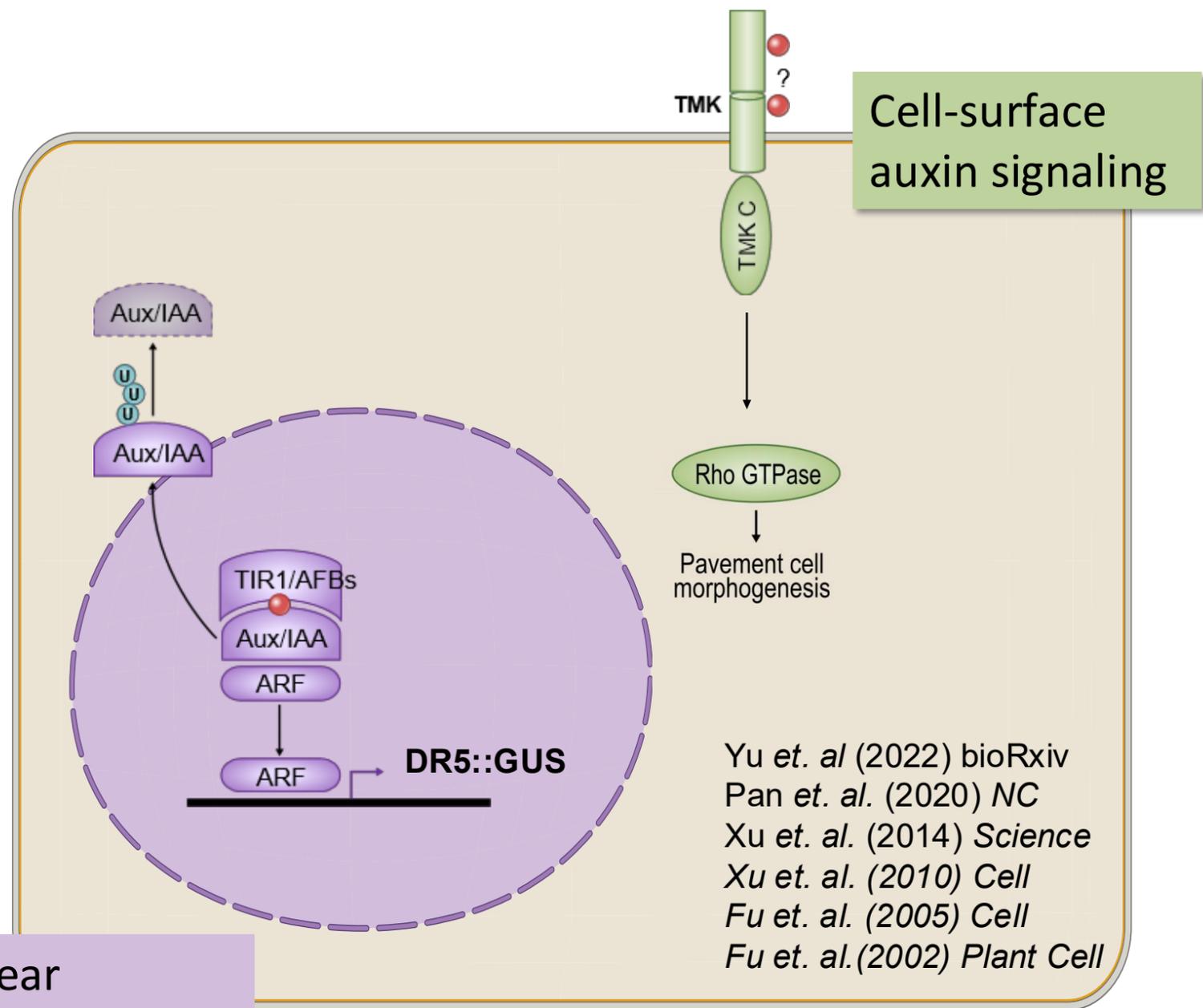
Zhenbiao Yang Lab
Jaimie Van Norman Lab

Development presents 2023

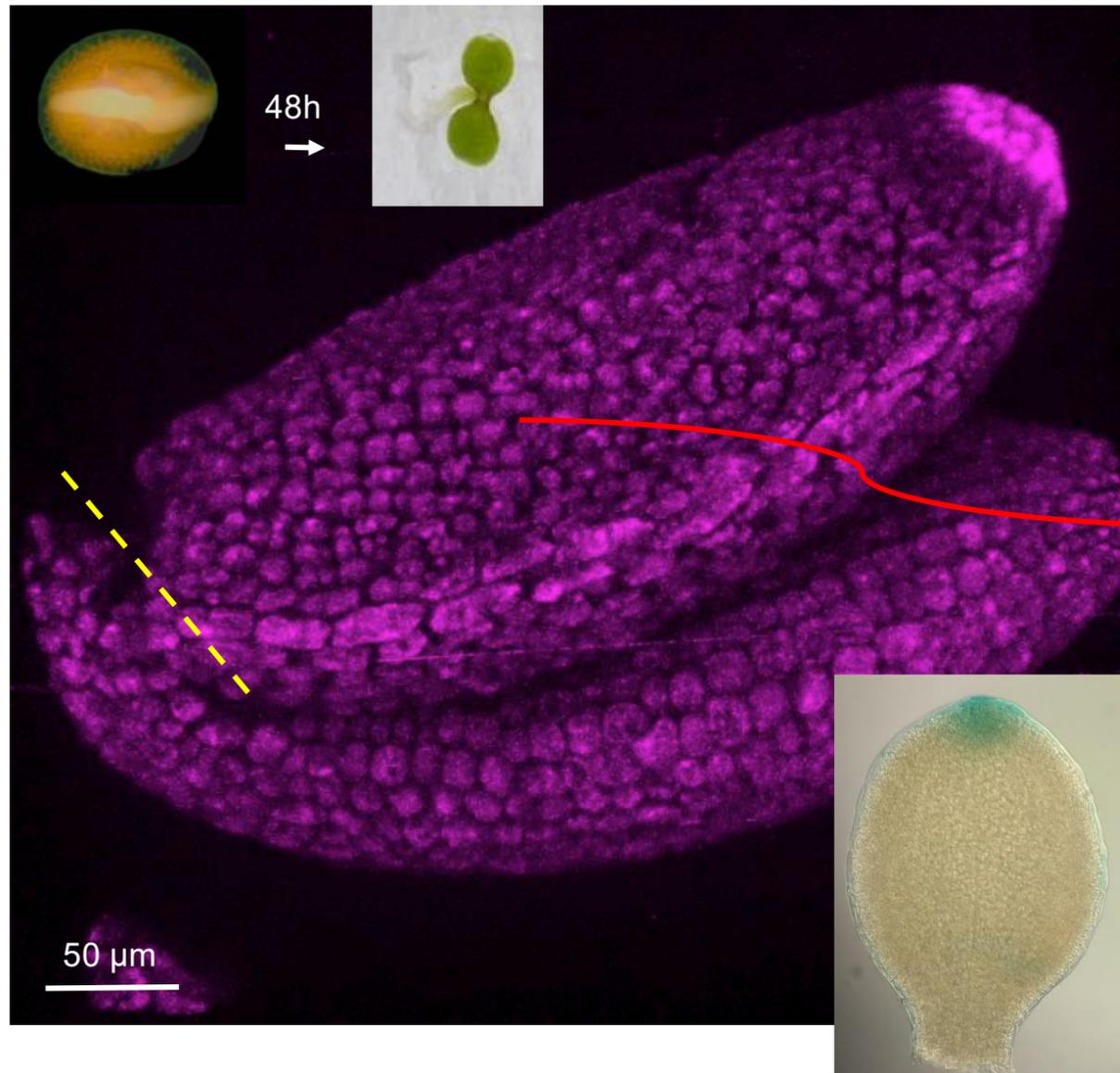
Auxin signaling and pavement cell morphogenesis



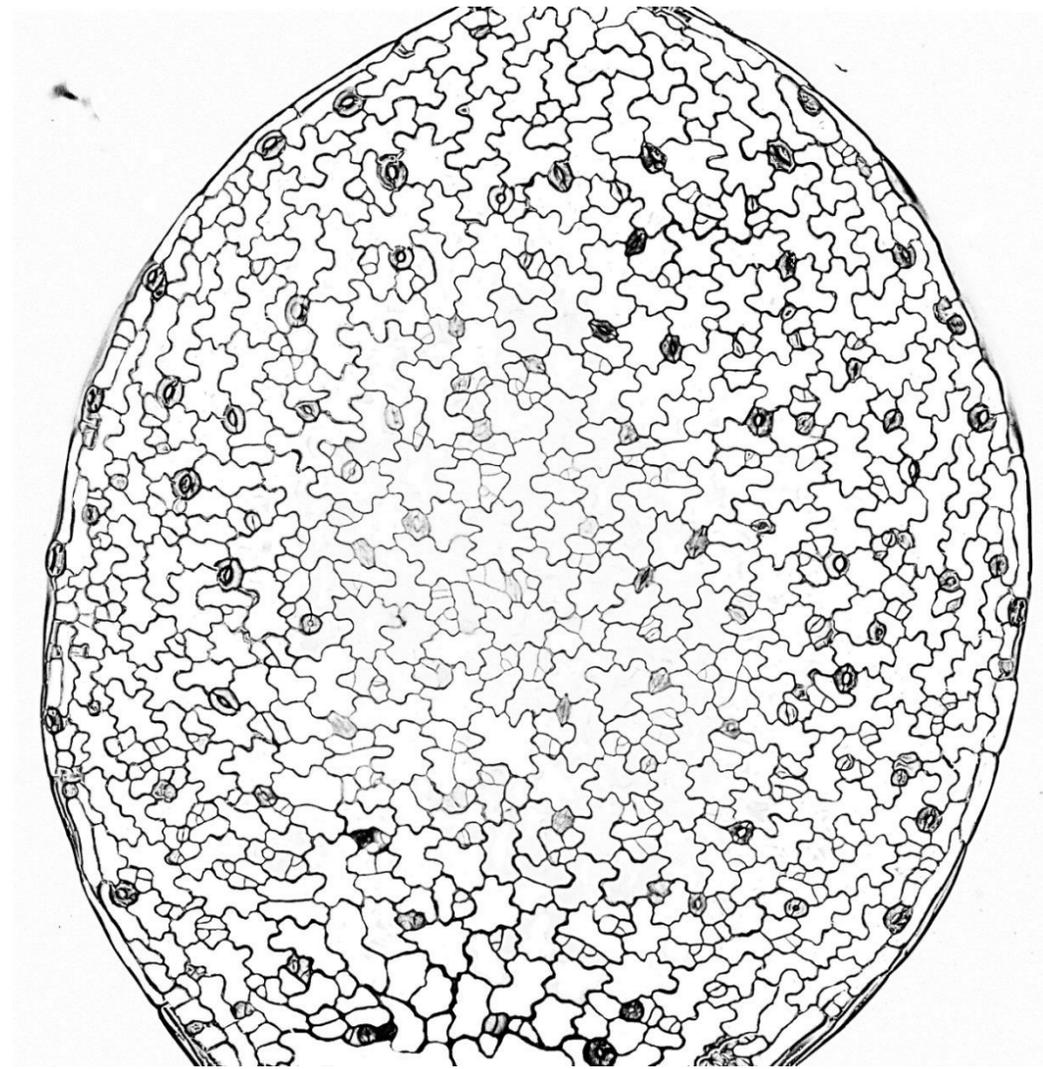
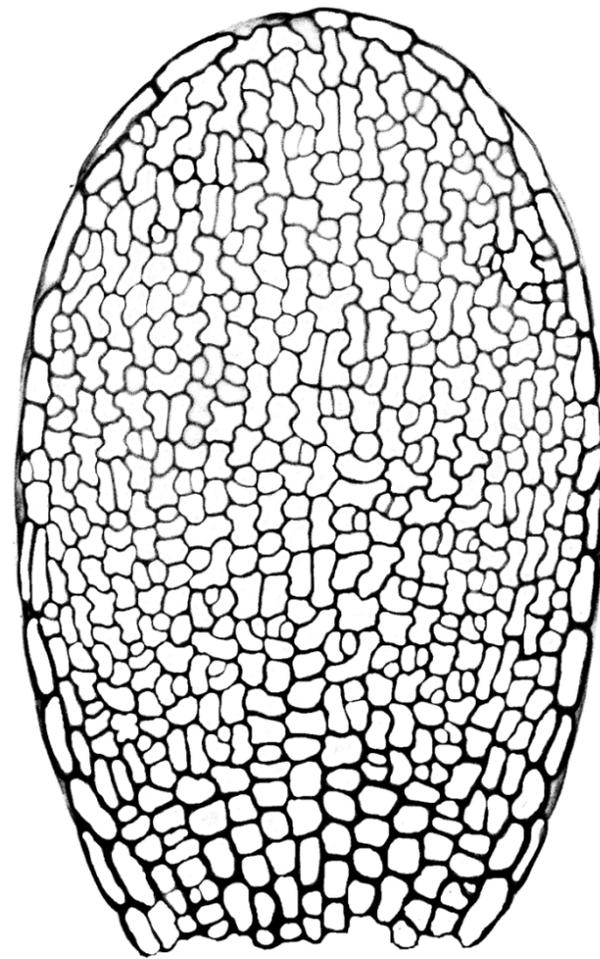
Nuclear auxin signaling



Auxin maxima at the tip coordinates early cotyledon expansion



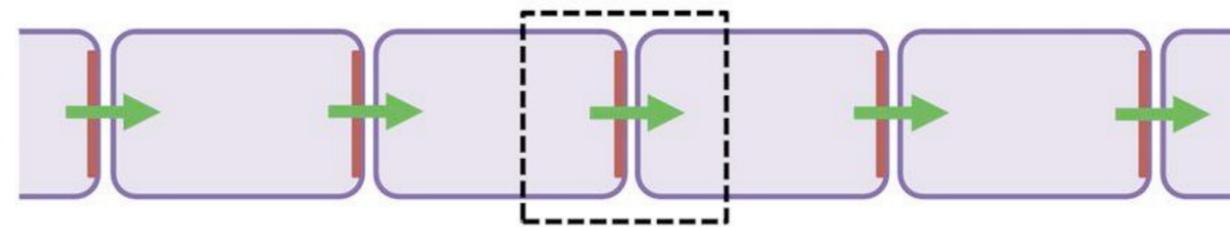
DR5::GUS



How is the auxin maxima at the tip formed?

PIN-based auxin transport

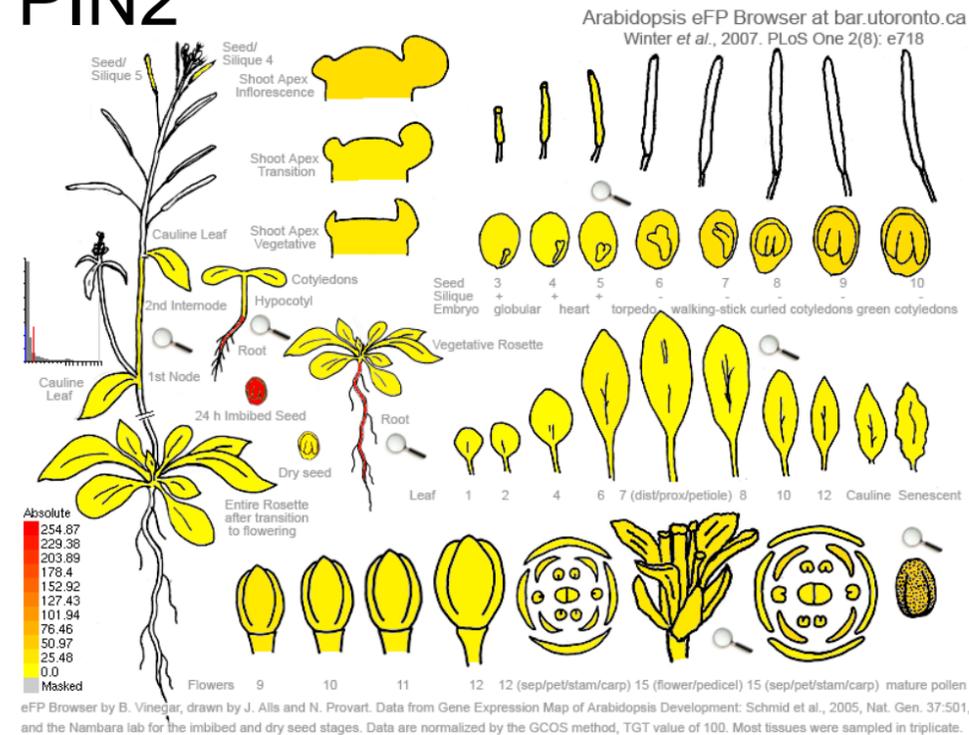
Source
Synthesis



Sink
Signaling

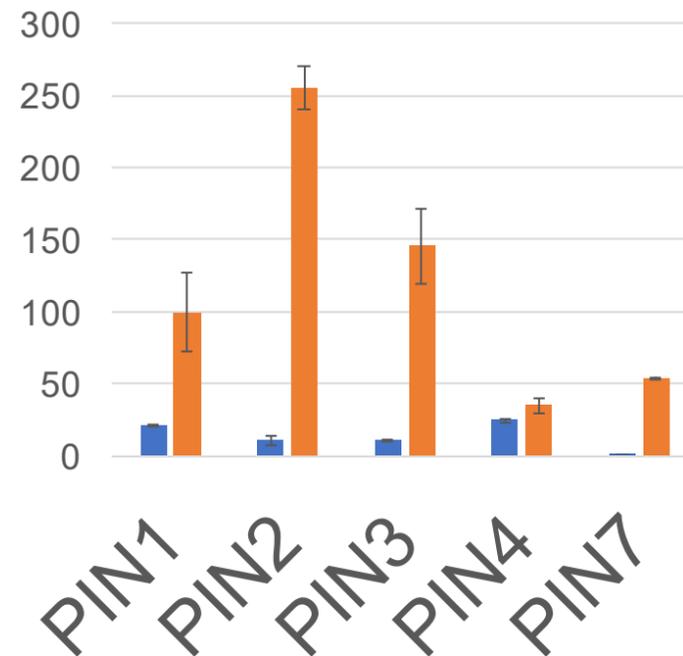
Friml and Jones. 2010. Plant Phys
Adamowski and Friml 2015. The Plant Cell

PIN2



Expression levels
eFP browser

■ DRY SEED ■ IMBIBED SEED



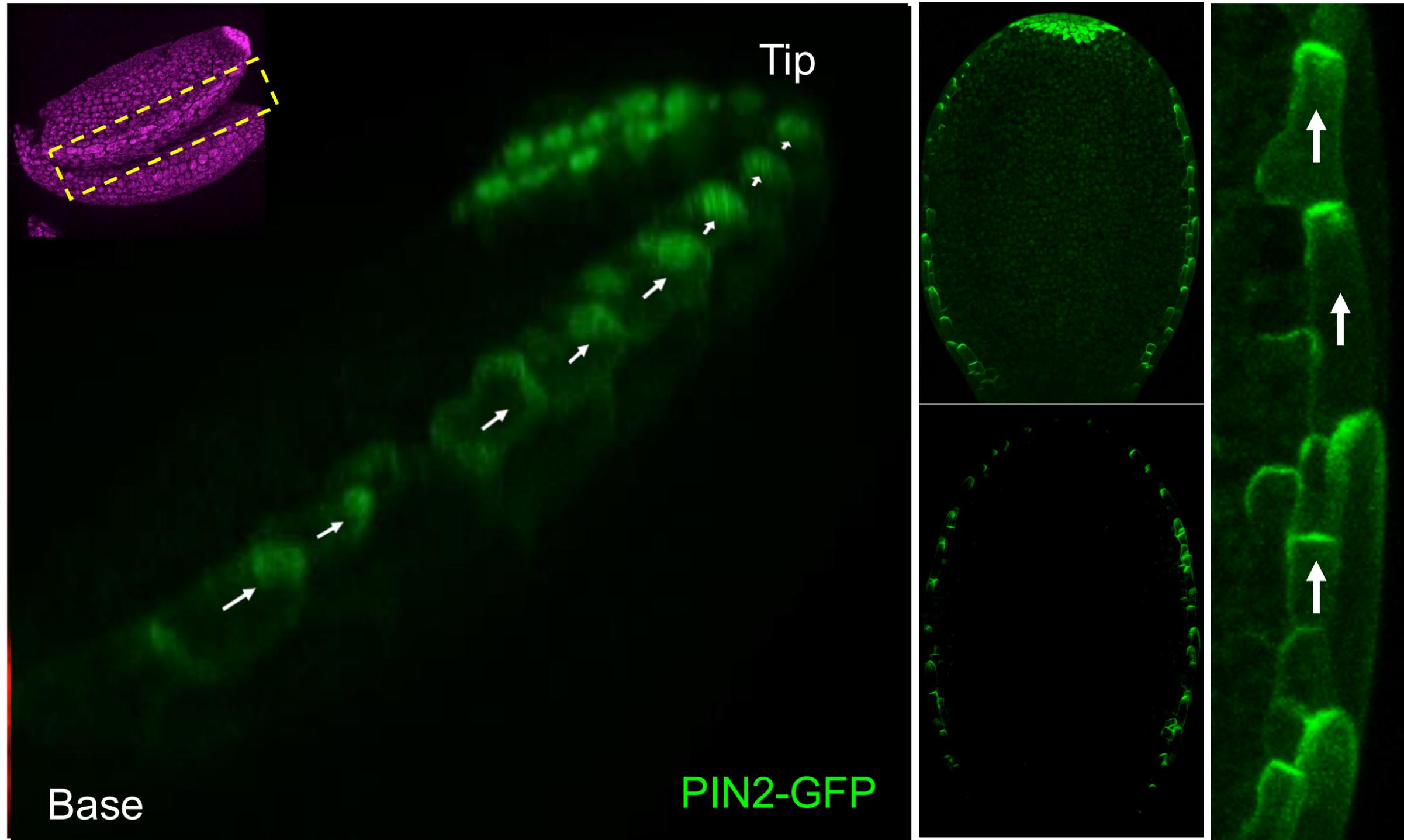
DR5::GUS



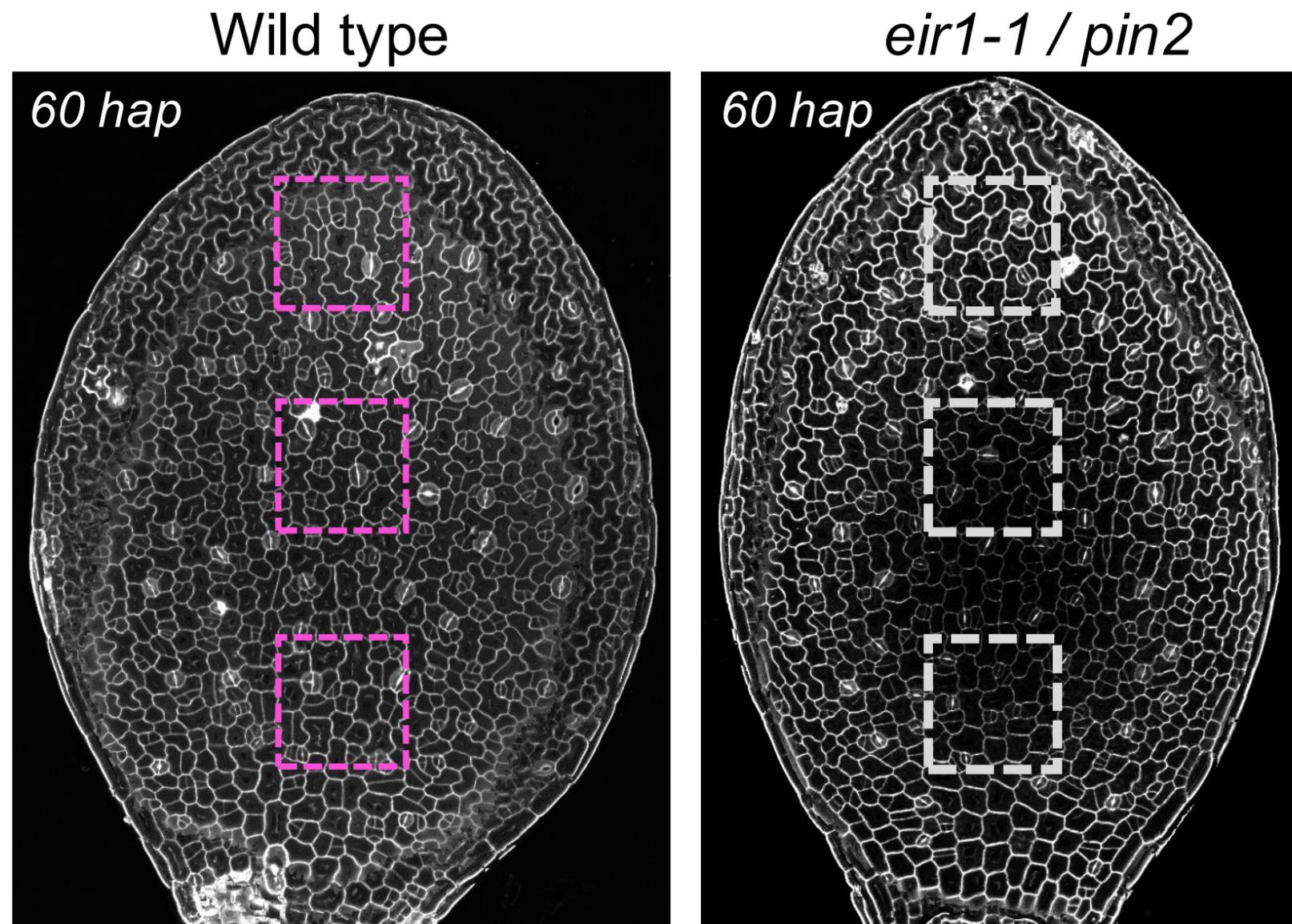
eir1-1/pin2
DR5::GUS



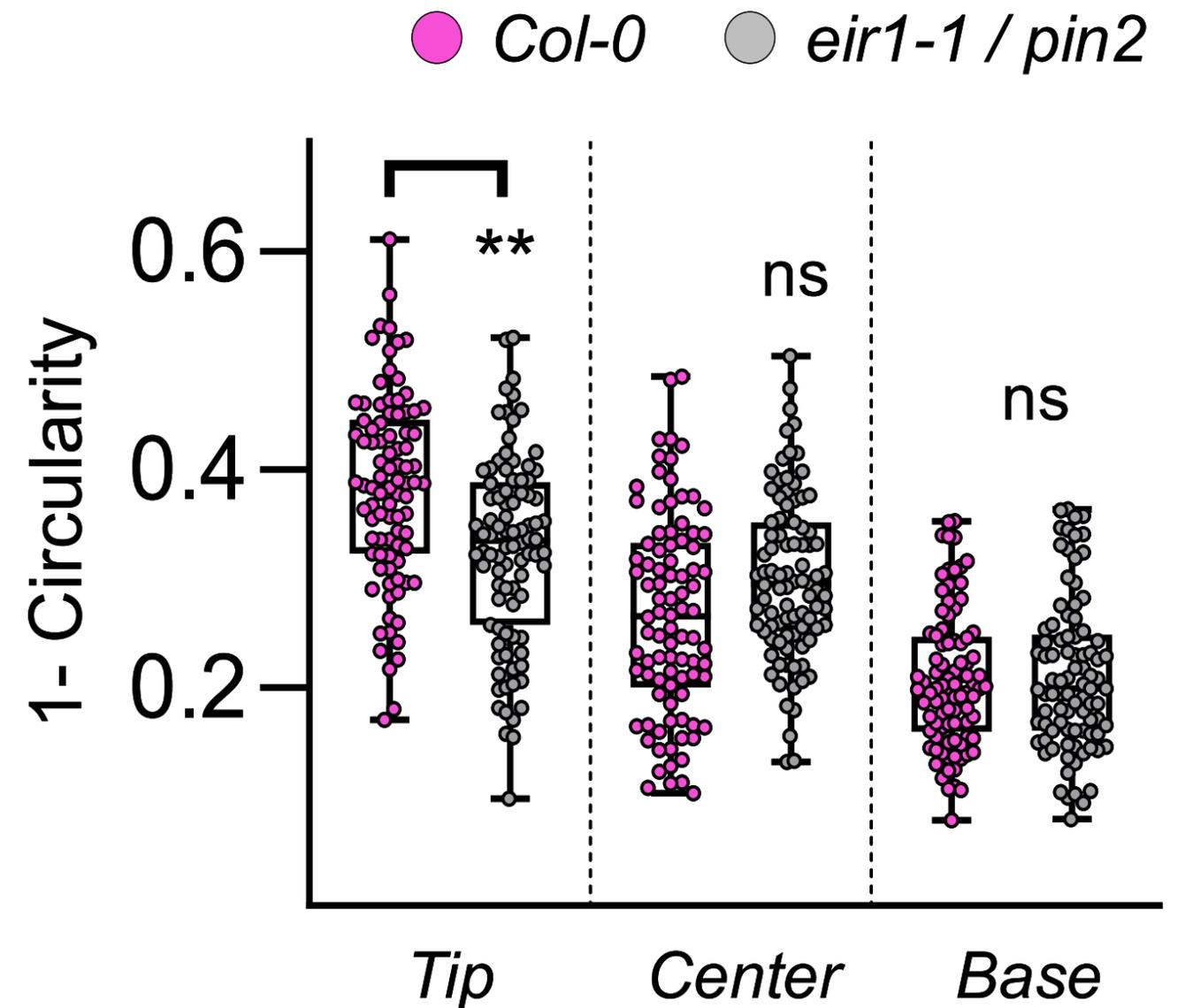
PIN2 is expressed in margin cells (MCs)



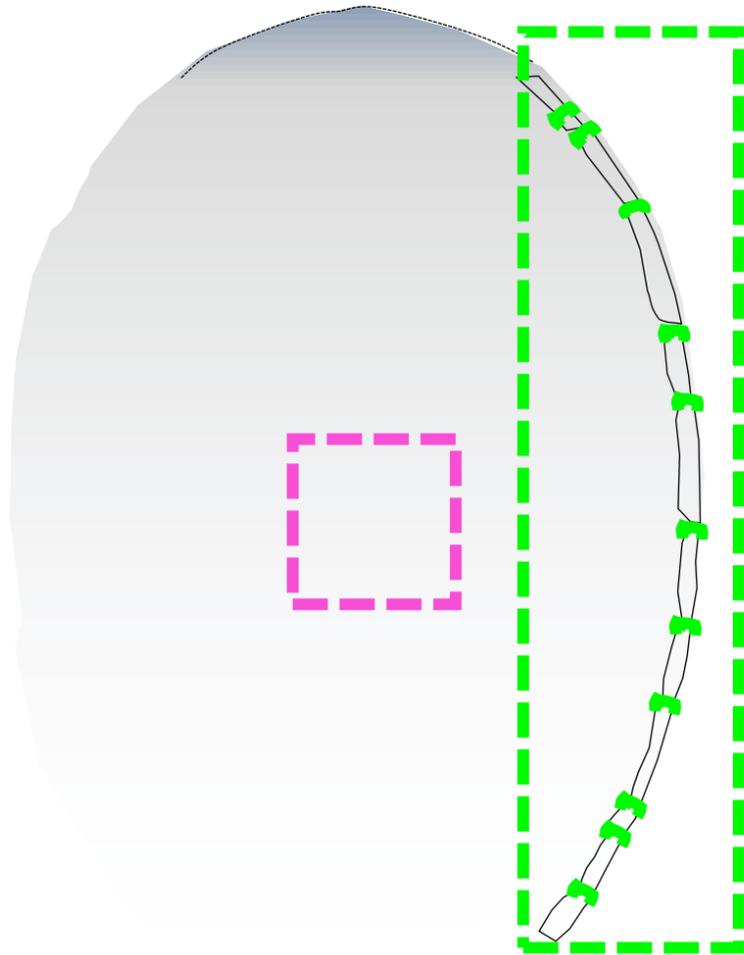
Interdigitation phenotype of *eir1-1 / pin2* mutant



$$\text{Circularity} = \frac{4 \cdot \pi \cdot [\text{Area}]}{[\text{Perimeter}]^2}$$

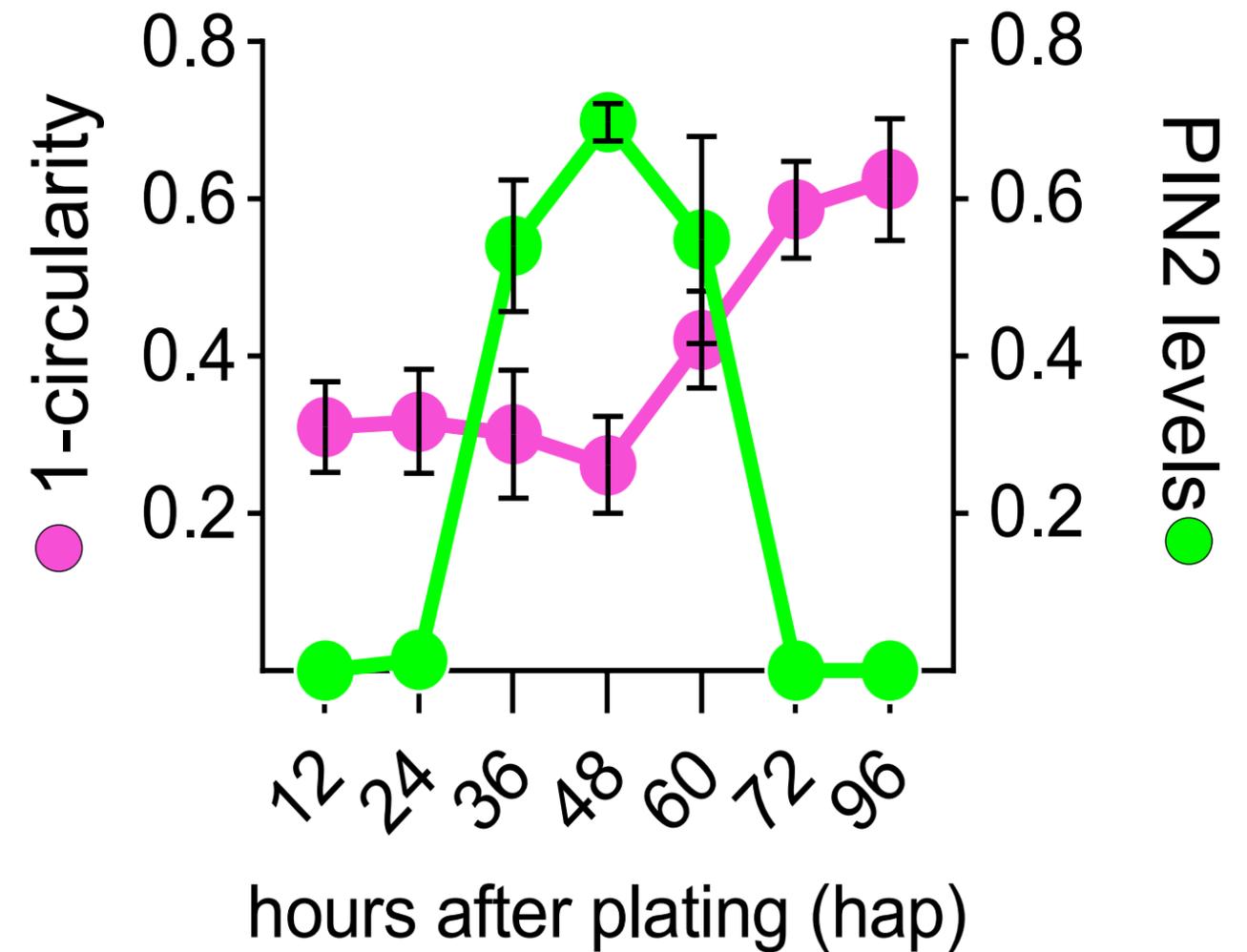


PIN2 precedes the start of interdigitation



$$\text{PIN2-GFP levels} = \frac{\text{MCs PIN2+}}{\text{Total MCs}}$$

$$\text{Circularity} = \frac{4 \cdot \pi \cdot [\text{Area}]}{[\text{Perimeter}]^2}$$

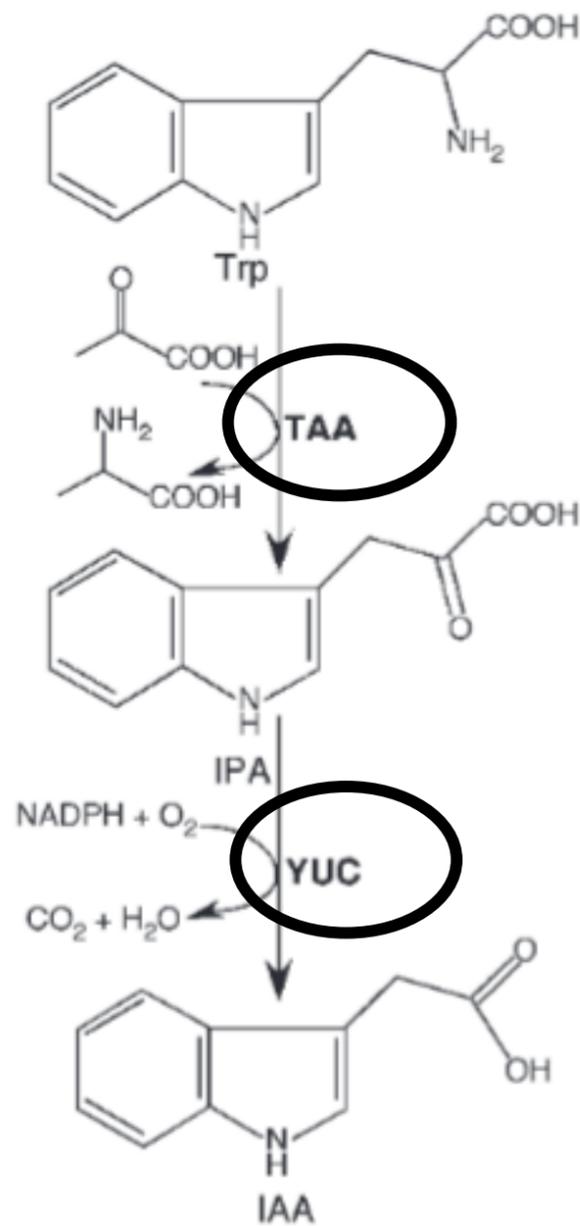


This system is transient BUT how?

What are the initiating and terminating signals for the transient PIN2-based auxin transport system?

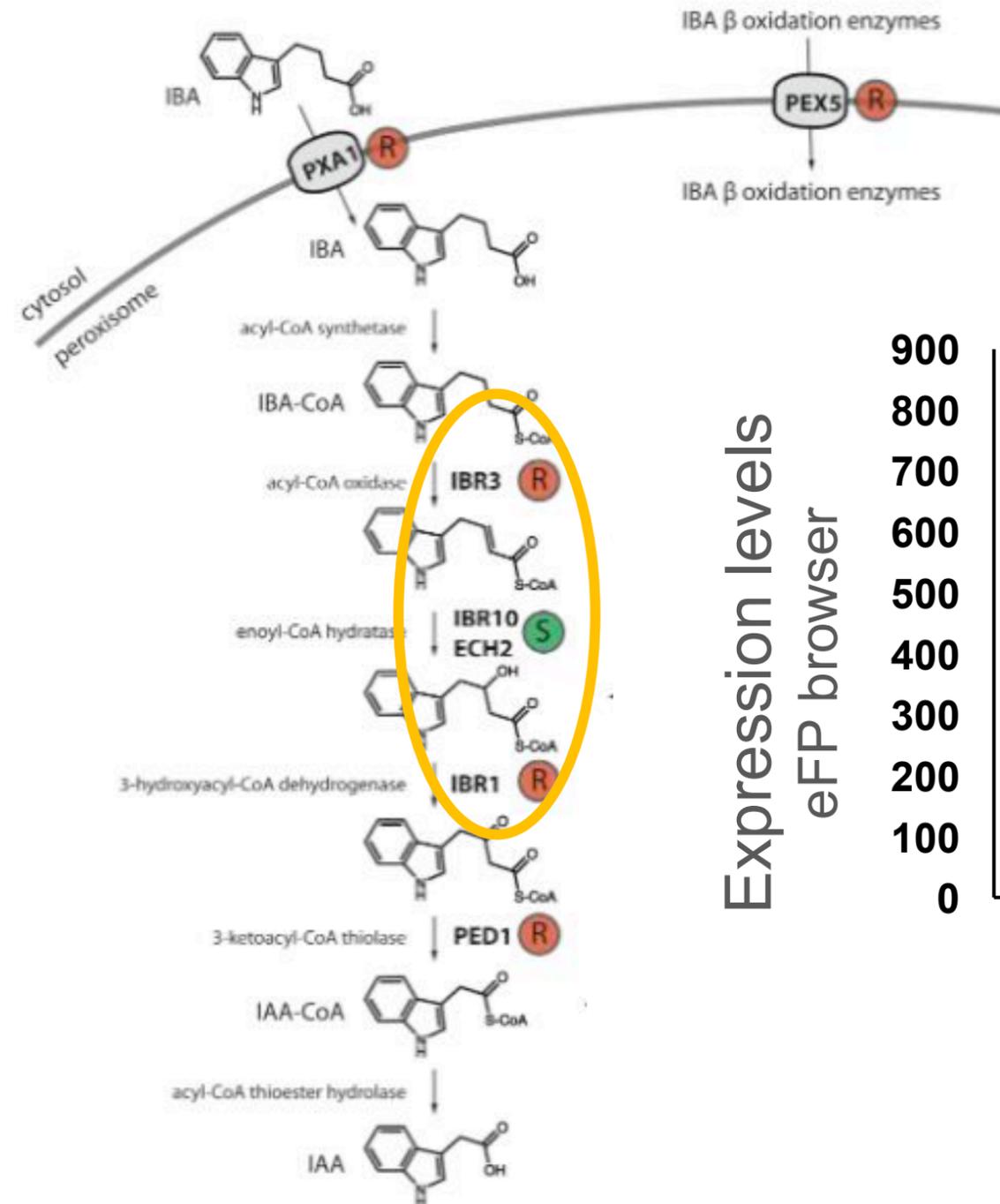
What is the initiating signal?

IPA pathway

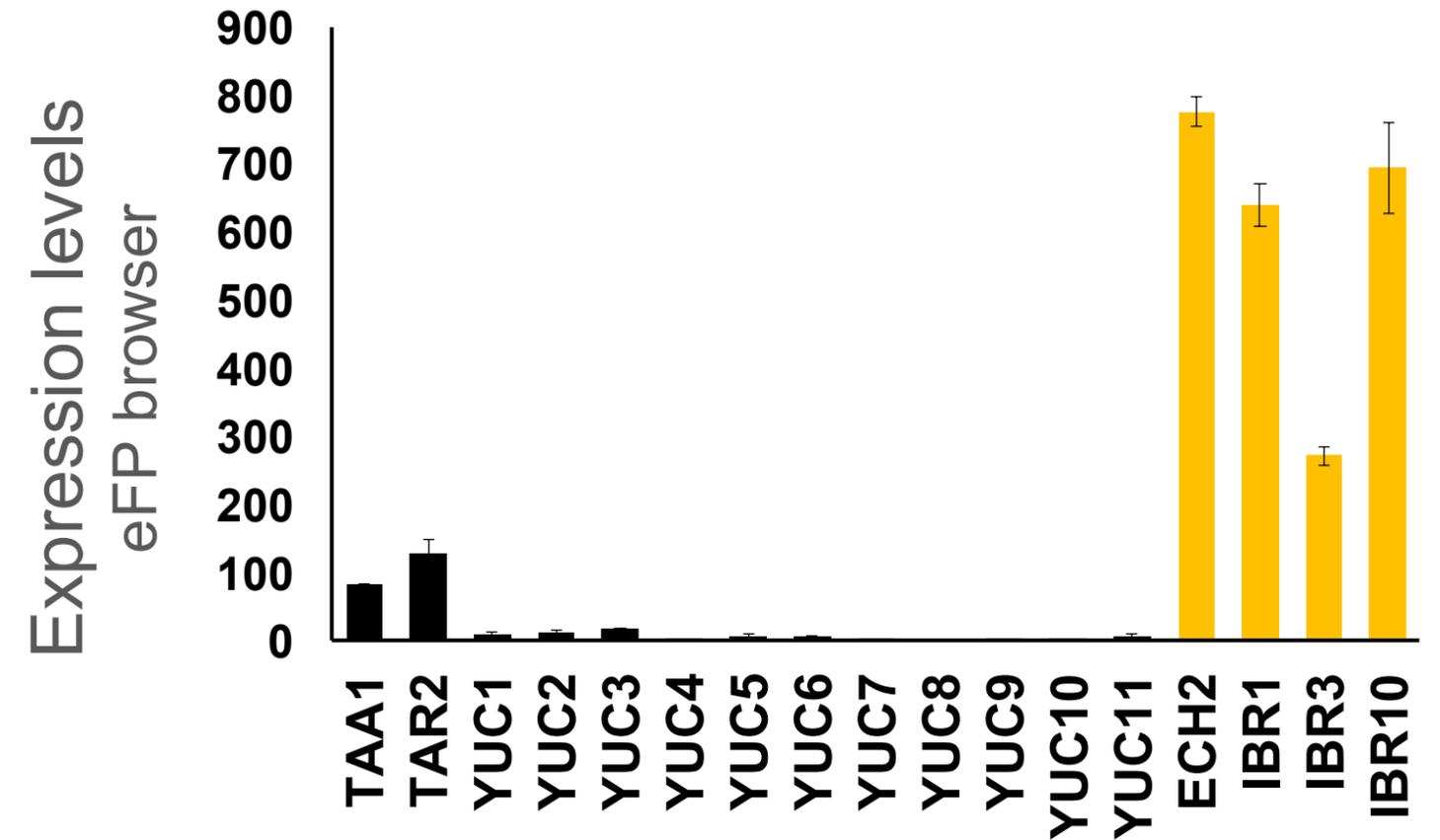


Zhao et al 2012, Molecular Plant

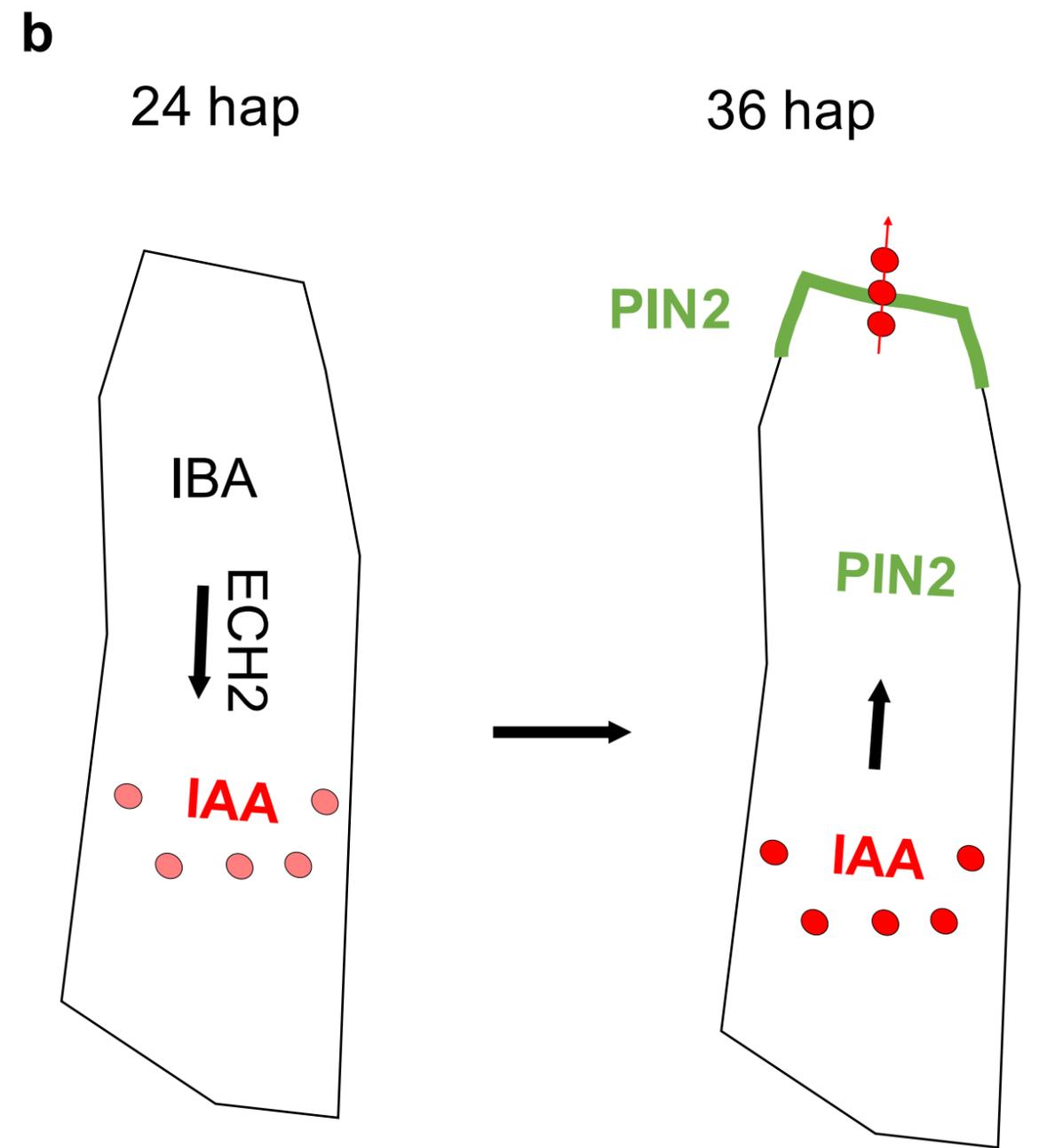
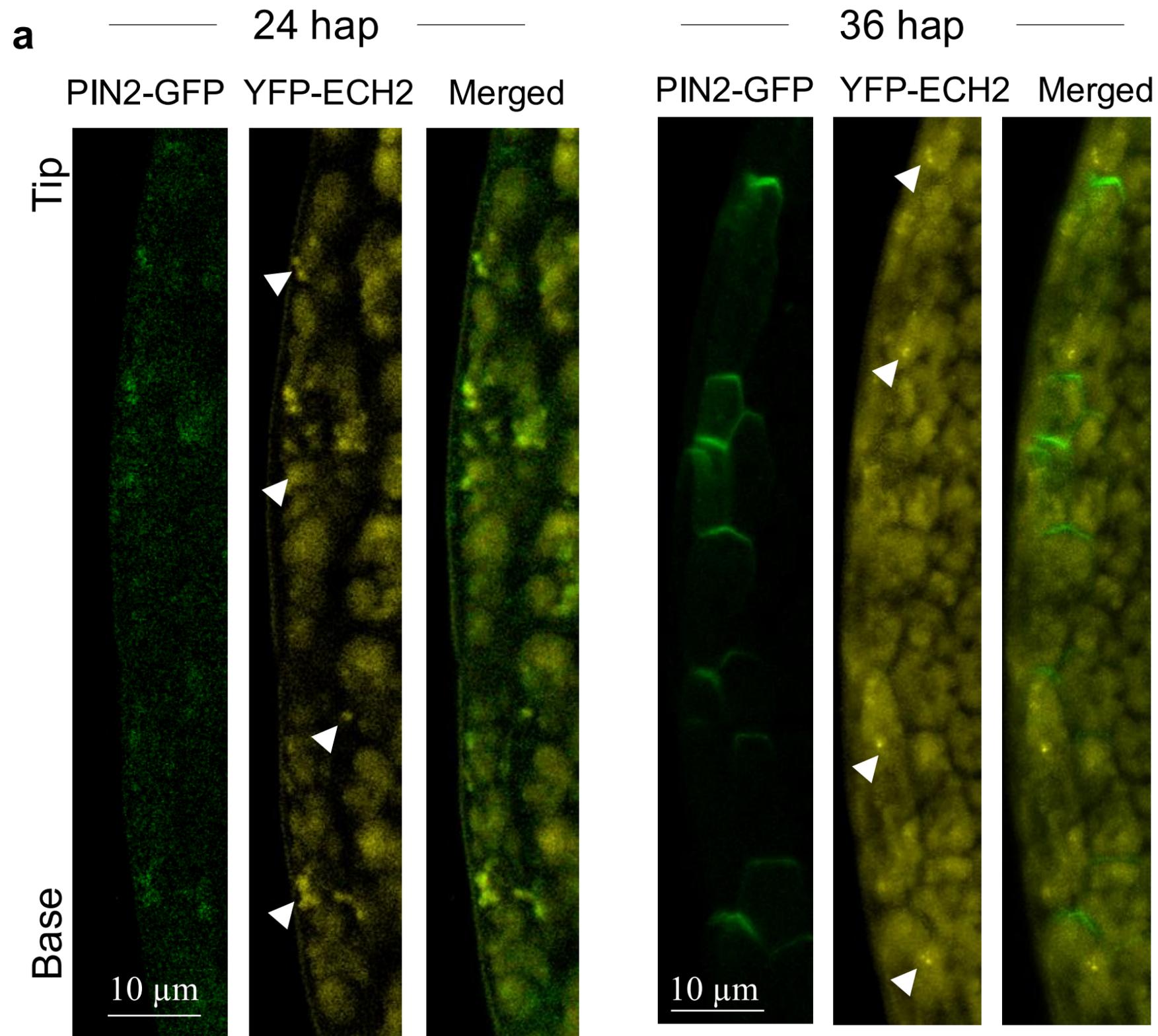
IBA-to-IAA conversion



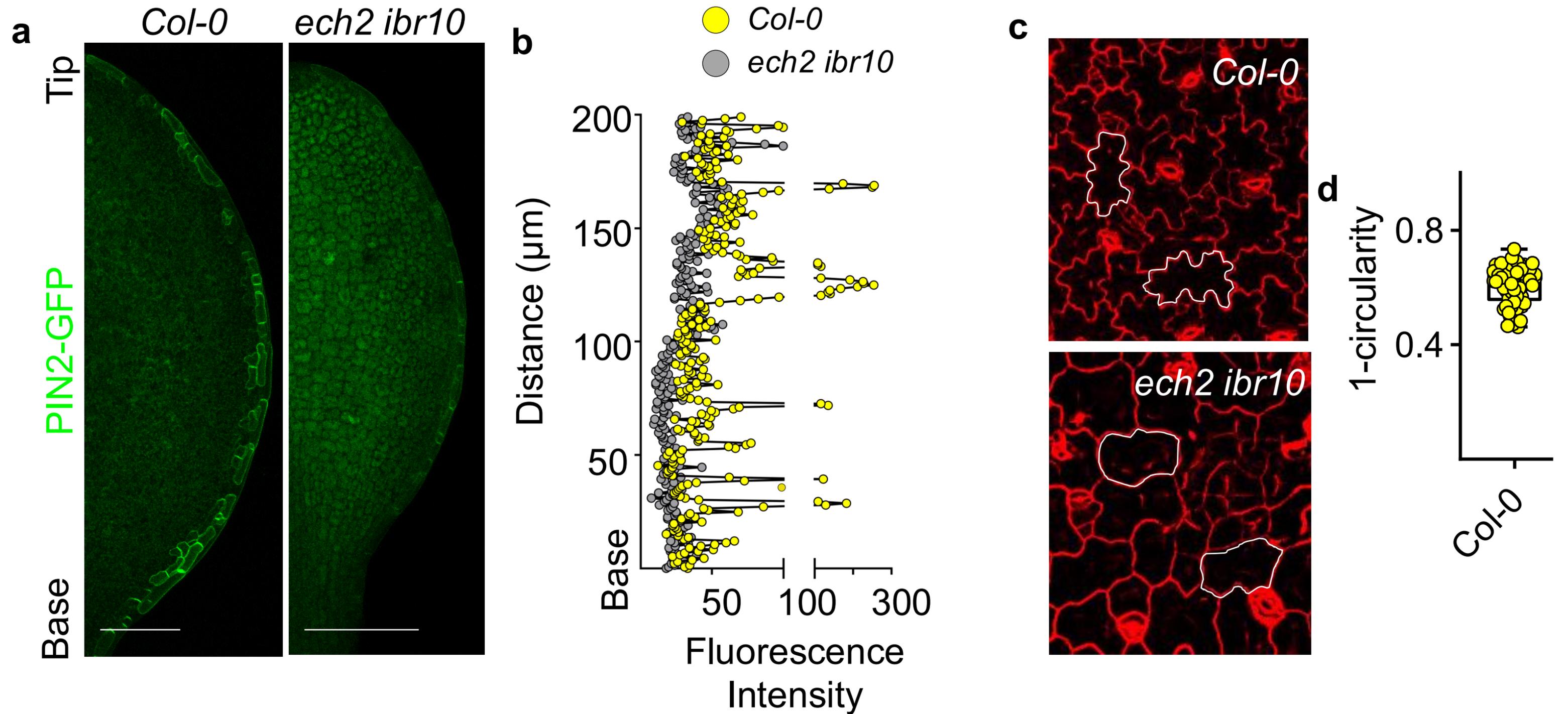
De Rybel et al 2011, Nature Chem Biol



IBA-derived auxin precedes PIN2 levels

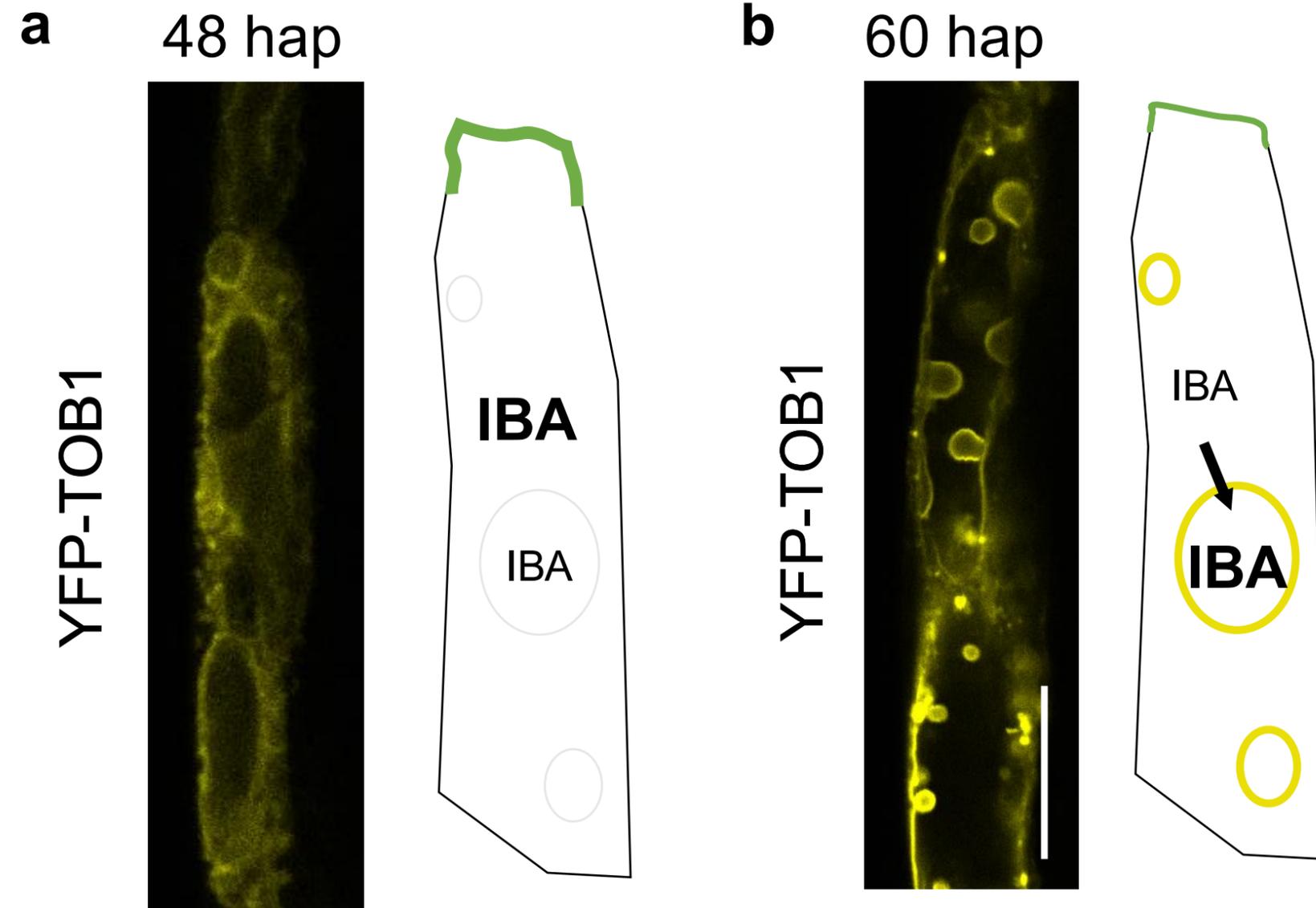


IBA-derived auxin regulates PIN2 levels at MCs



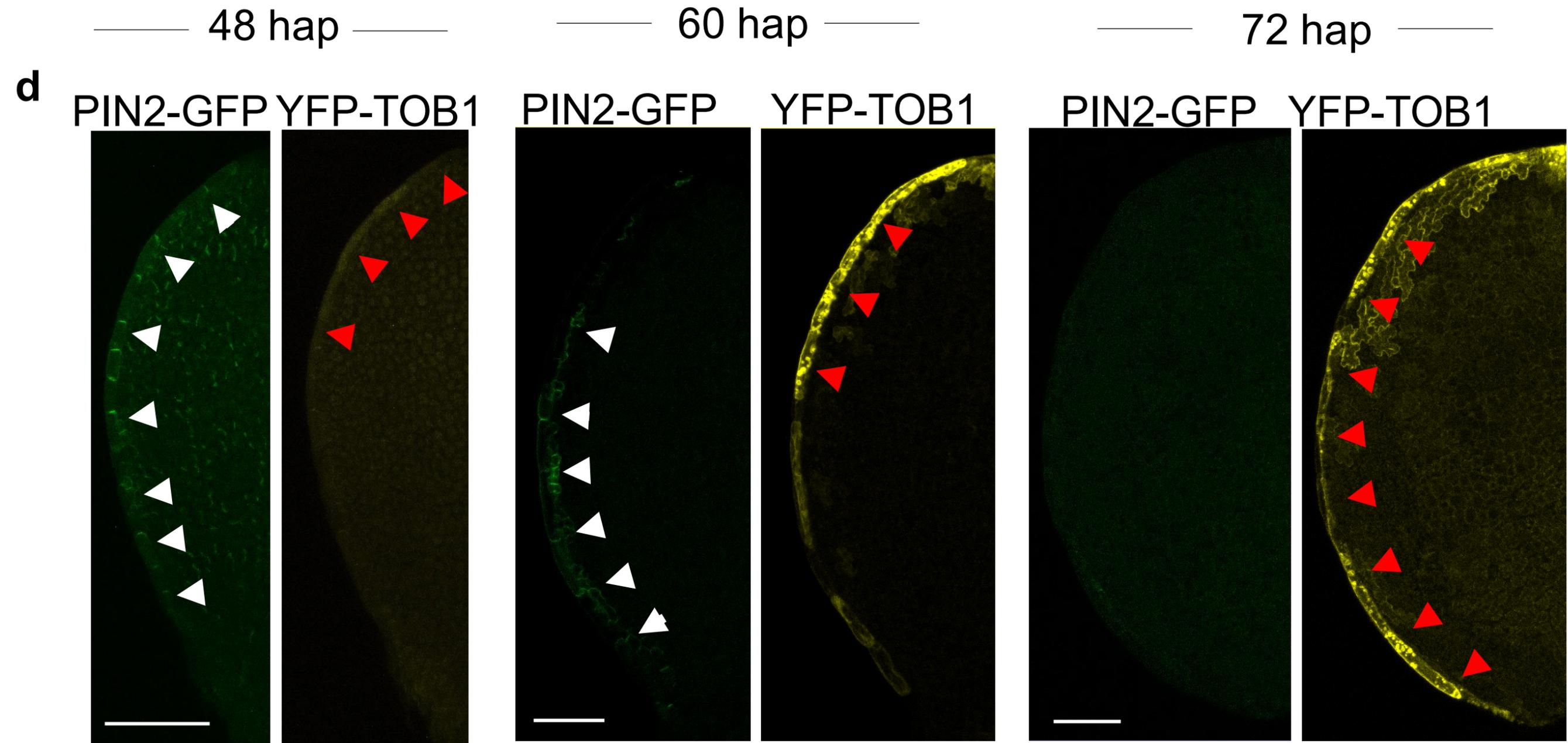
The initiating signal is IBA-derived auxin BUT what is the terminating signal?

Vacuole-localized TOB1 correlates with reduced PIN2 levels

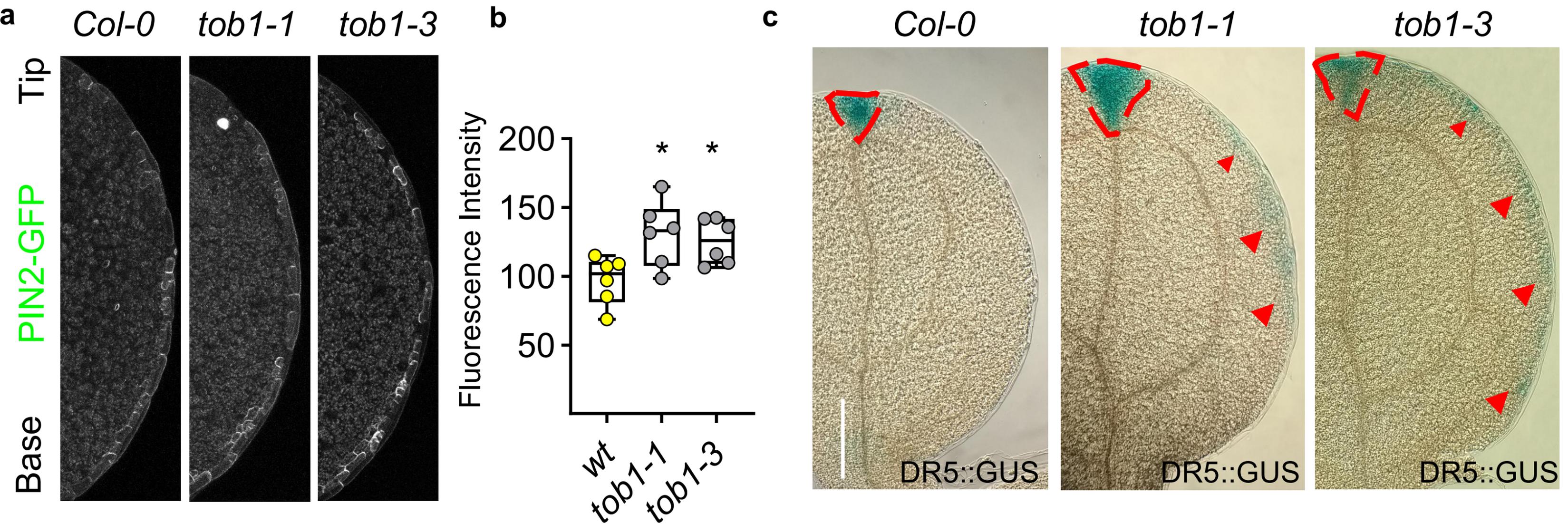


The hypothesis might be correct ...

Vacuole-localized TOB1 correlates with reduced PIN2 levels

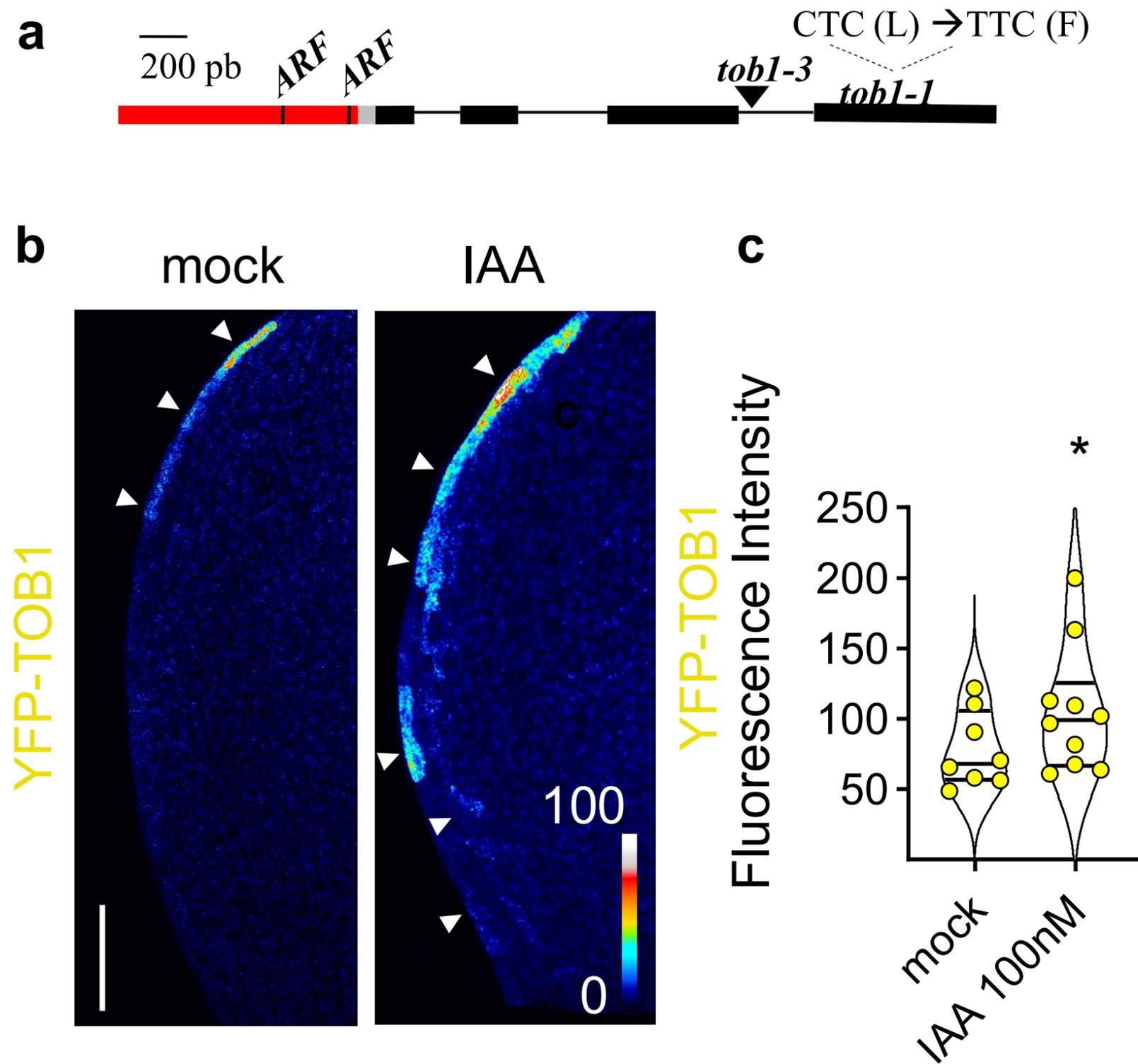


TOB1 regulates PIN2 levels in margin cells

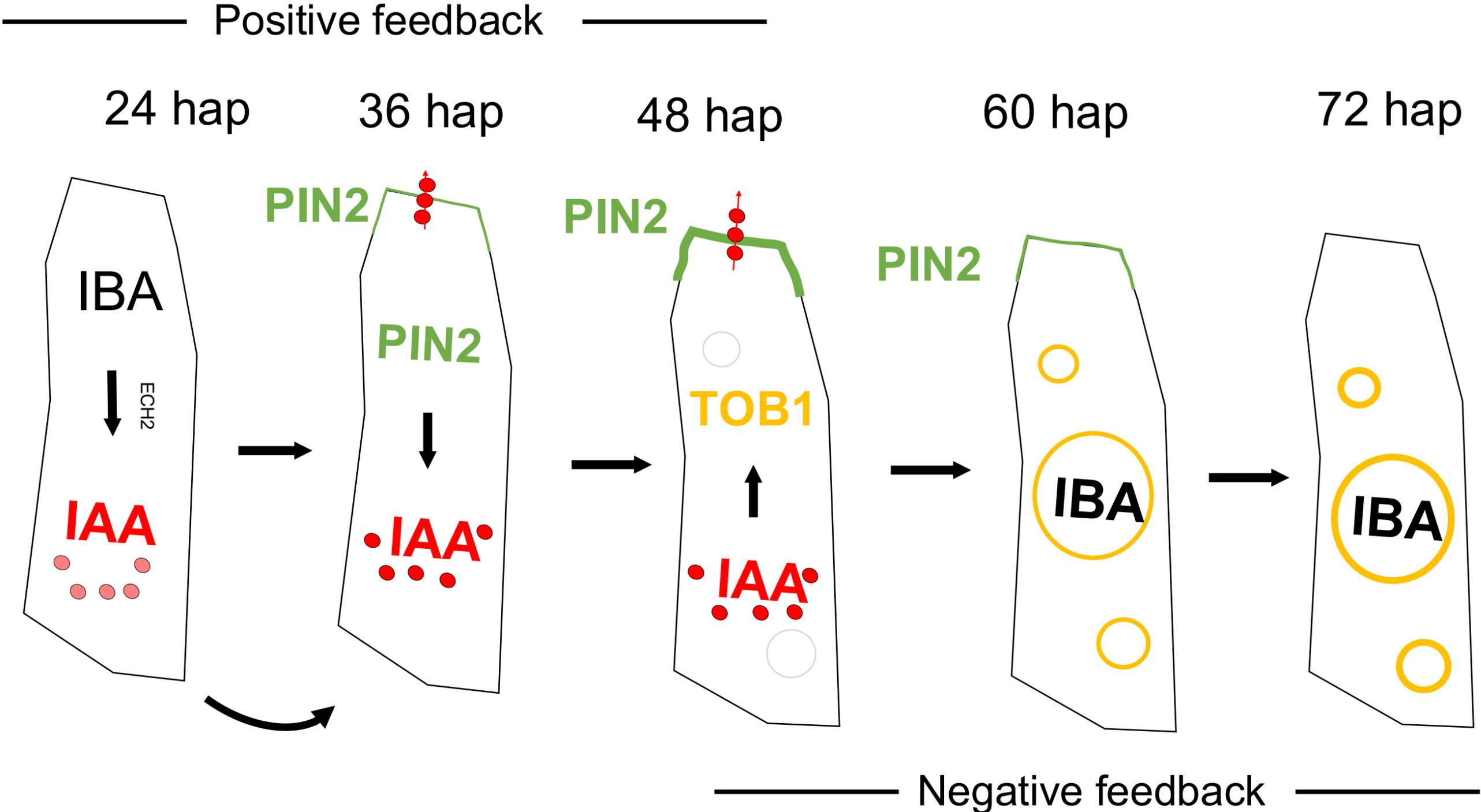


TOB1-mediated IBA internalization into vacuoles is the terminating signal

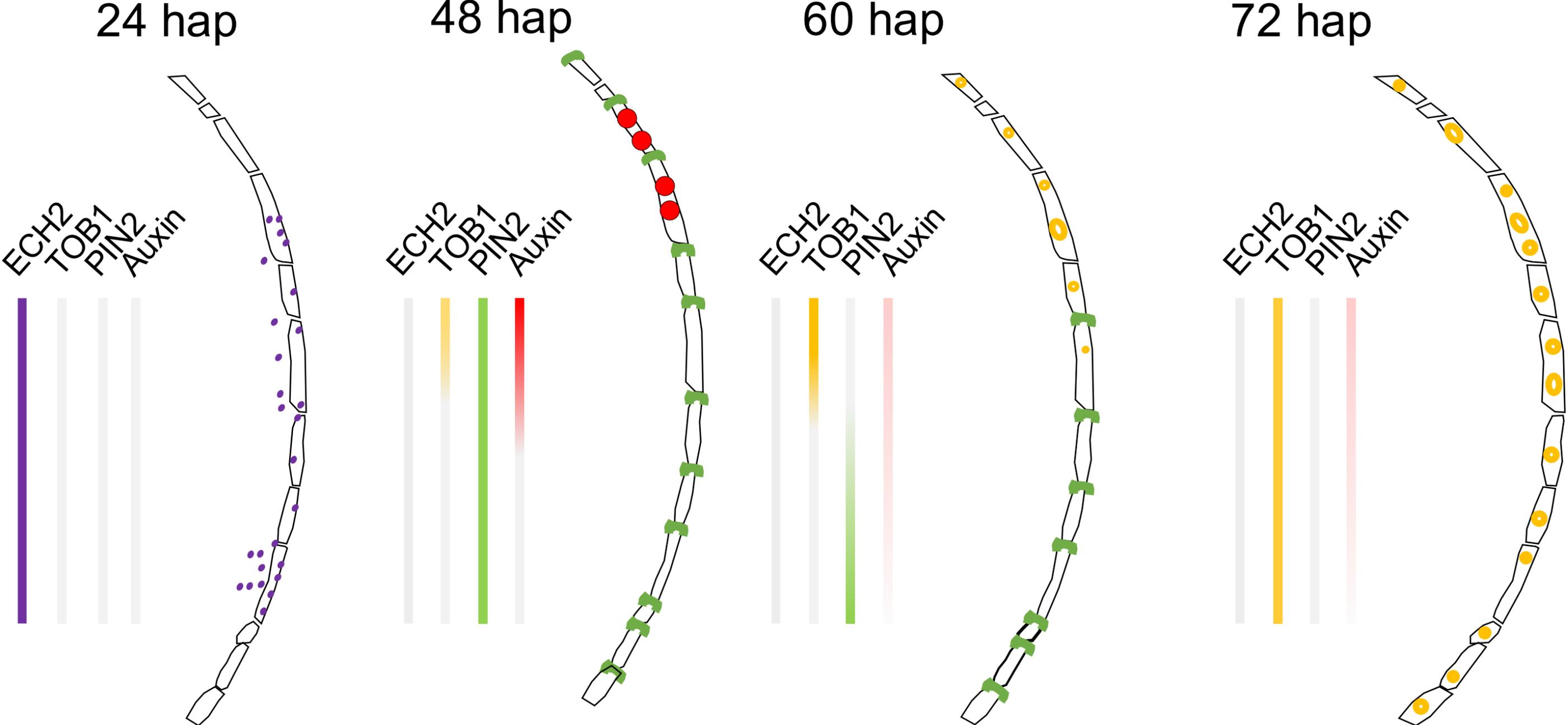
Auxin regulates TOB1 levels



Working model for self-organizing transient auxin flow at MCs



Working model for self-organizing transient auxin flow at MCs



Acknowledgments

Zhenbiao Yang, UCR

Xue Pan

Xiang Zhou

Wenwei Lin

Christian Craddock

Wenxin Tang

Jingzhe Guo

Jaimie Van Norman, UCR

Lucia Strader, Duke U

Ken-Ichiro Hayashi, Okayama U



FAFU-
UCR
HBMC

