Getting in shape: the flexible nature of leaf development

האוניברסיטה העברית בירושלים
THE HEBREW UNIVERSITY OF JERUSALEM

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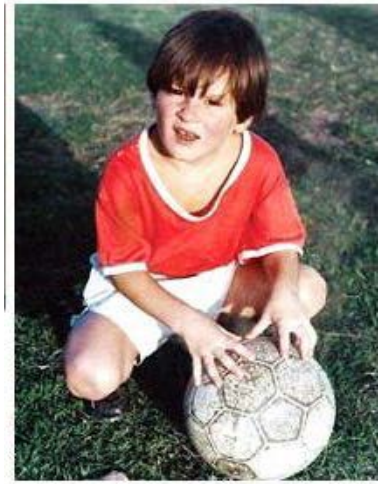
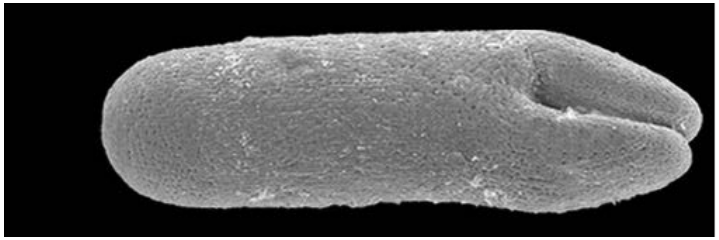
While we are born with all our “parts”



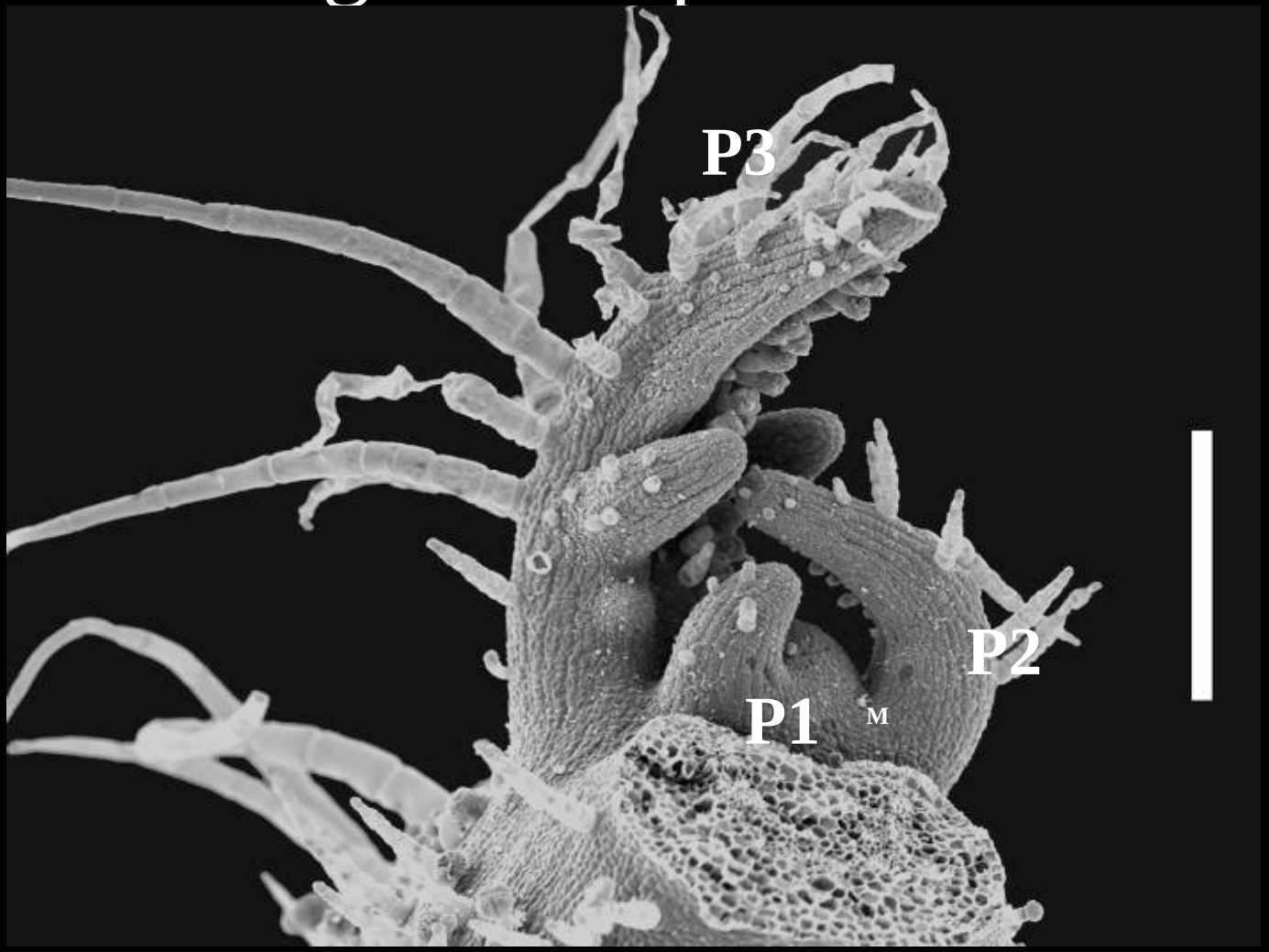
Plants produce organs throughout their lives



http://www.youtube.com/watch?v=JpgUbqXRoSE

http://www.youtube.com/watch?v=NUJtwBYGByI

Within the growing tip of the plant, new organs are produced



By a unique protected organ called meristem

Leaf diversity reflects flexible plant development

Leaves can be small and simple, as in pepper

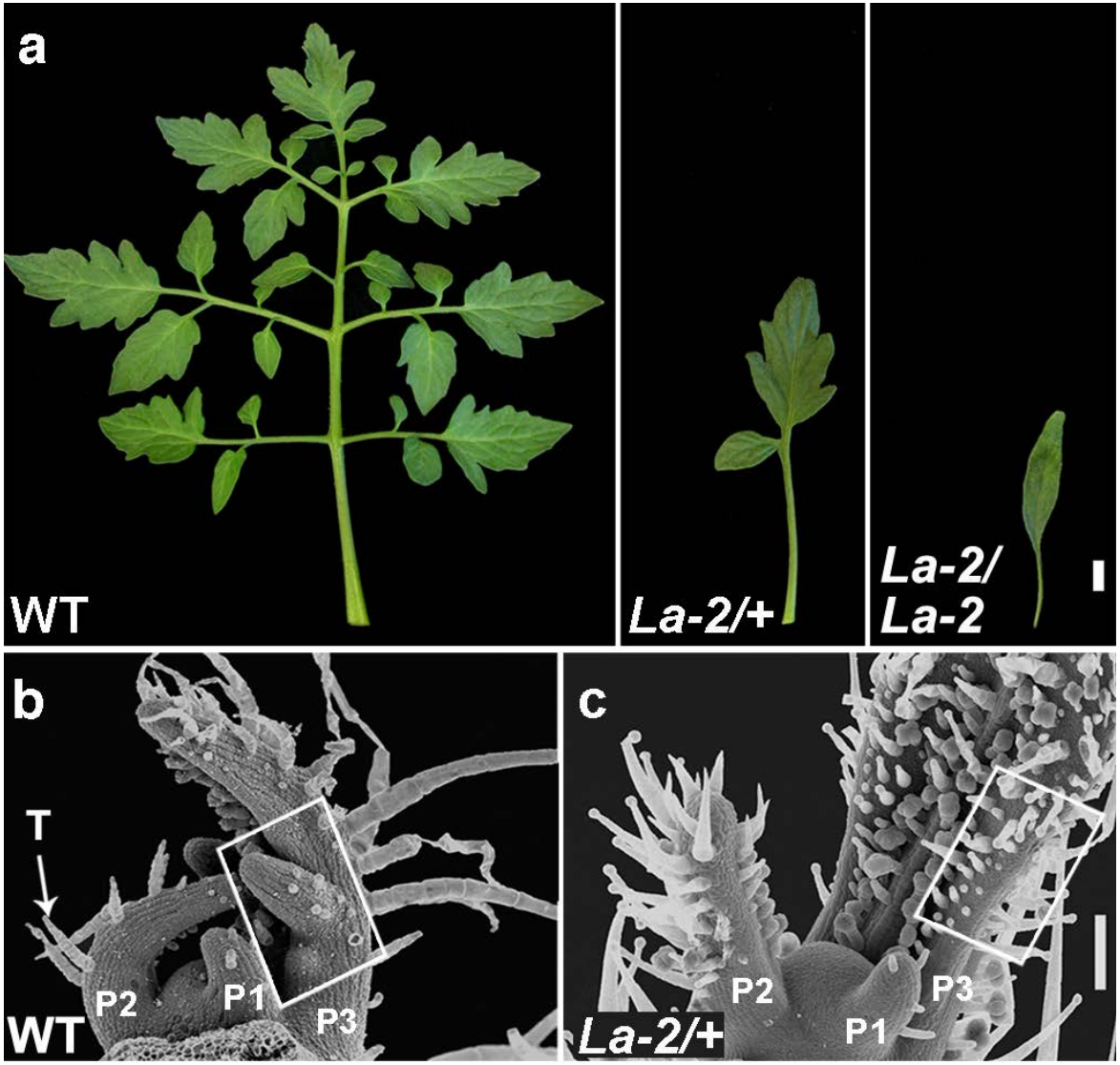
Or large and compound as in tomato

We use tomato leaves to understand developmental flexibility

How do tomatoes make all these leaf shapes?

We answer this using mutants

The *LANCEOLATE* gene terminates growth

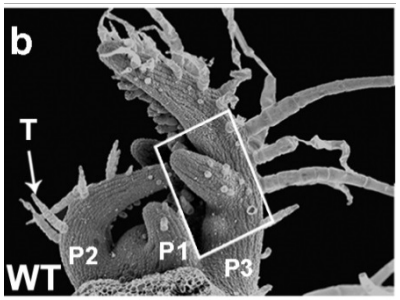


LANCEOLATE – a target of *microRNA319*

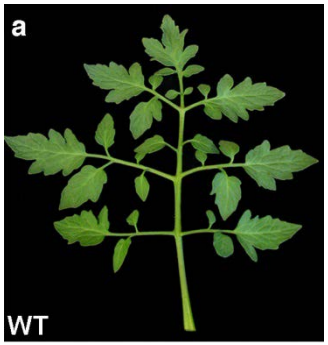
***LA/LA* (wt)**

miR 319

***LA* mRNA**



Normal leaf



LANCEOLATE – a target of *miR319*

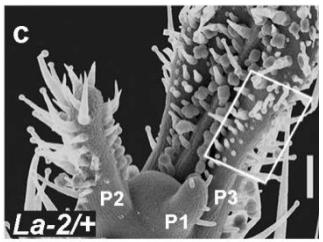
miR 319 ——

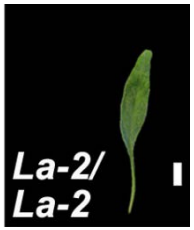
La^R/LA

miR resistant LA mRNA

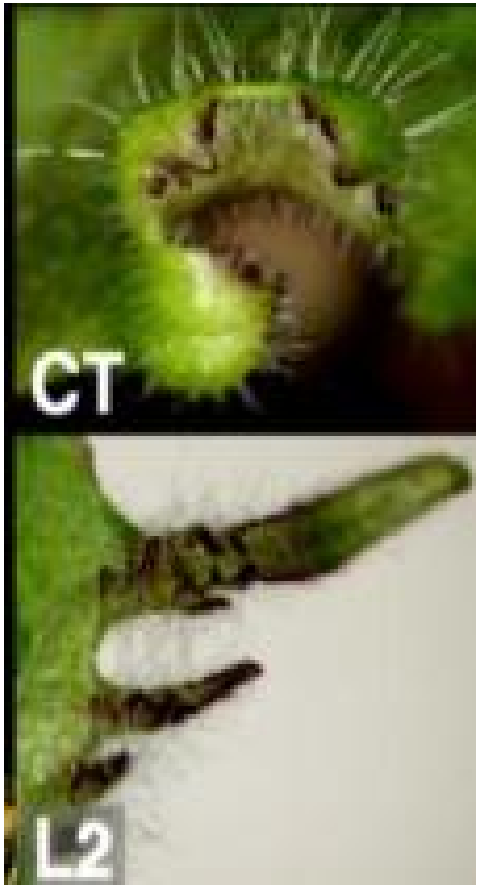
↓

Precocious maturation – simple leaf

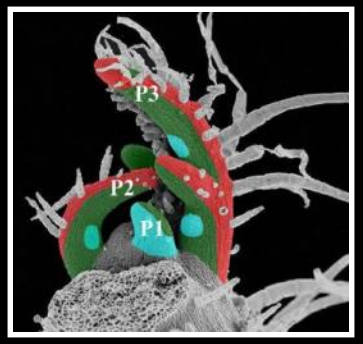




Without LANCEOLATE leaves keep growing!!



By adjusting LANCEOLATE activity the plant controls leaf size and shape



LA

WT

Initiation | Morphogenesis | Differentiation

La-2

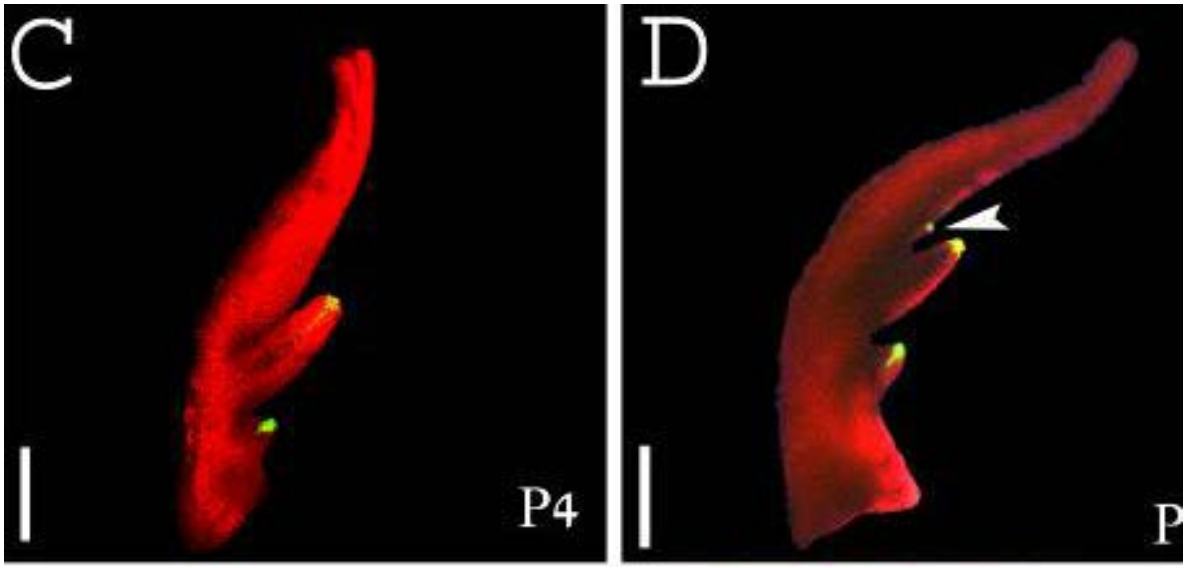
I | M | D

miR319

I | M | D

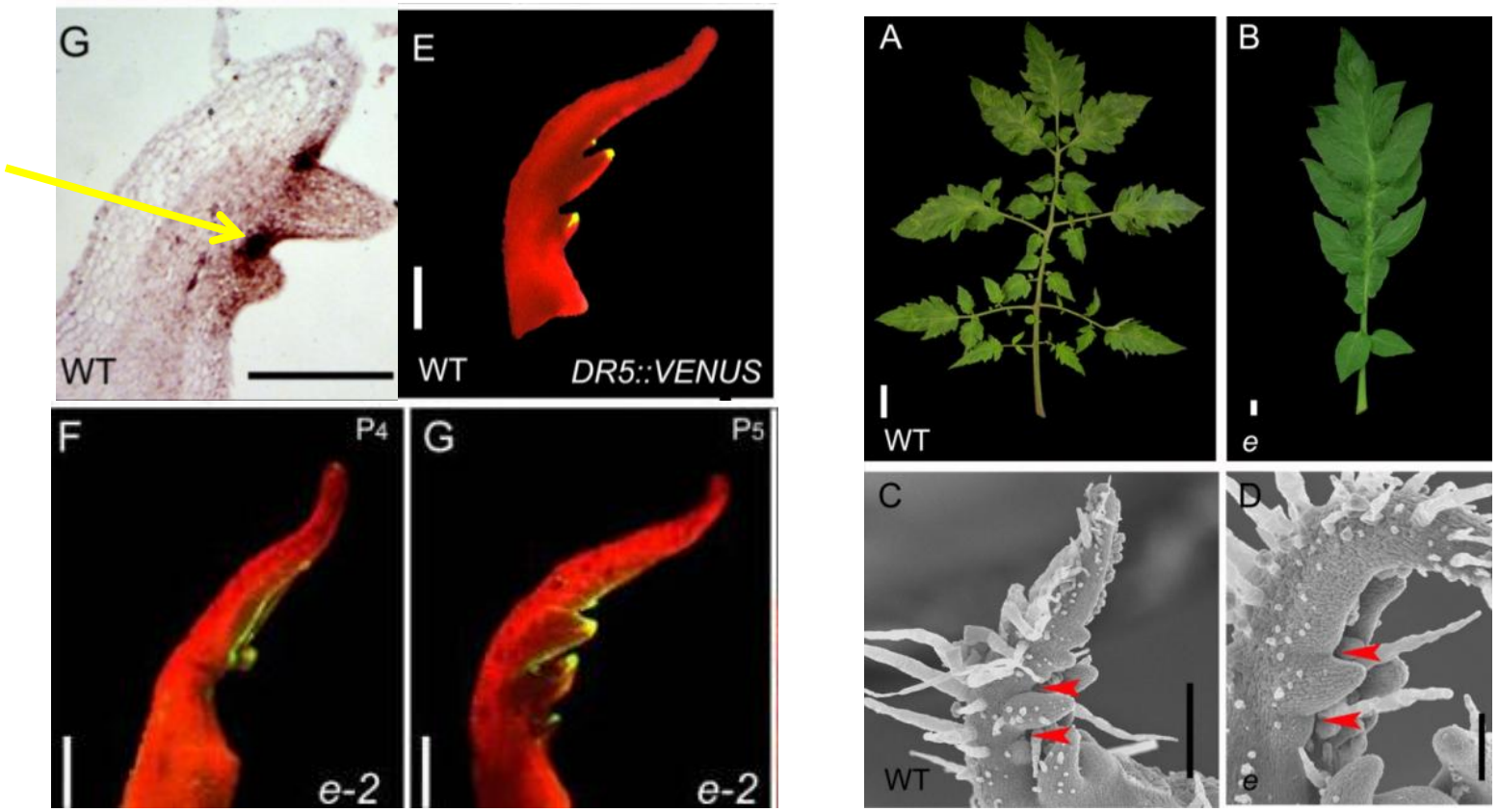
Leaf development

How does the leaf “decide” where to make leaflets?



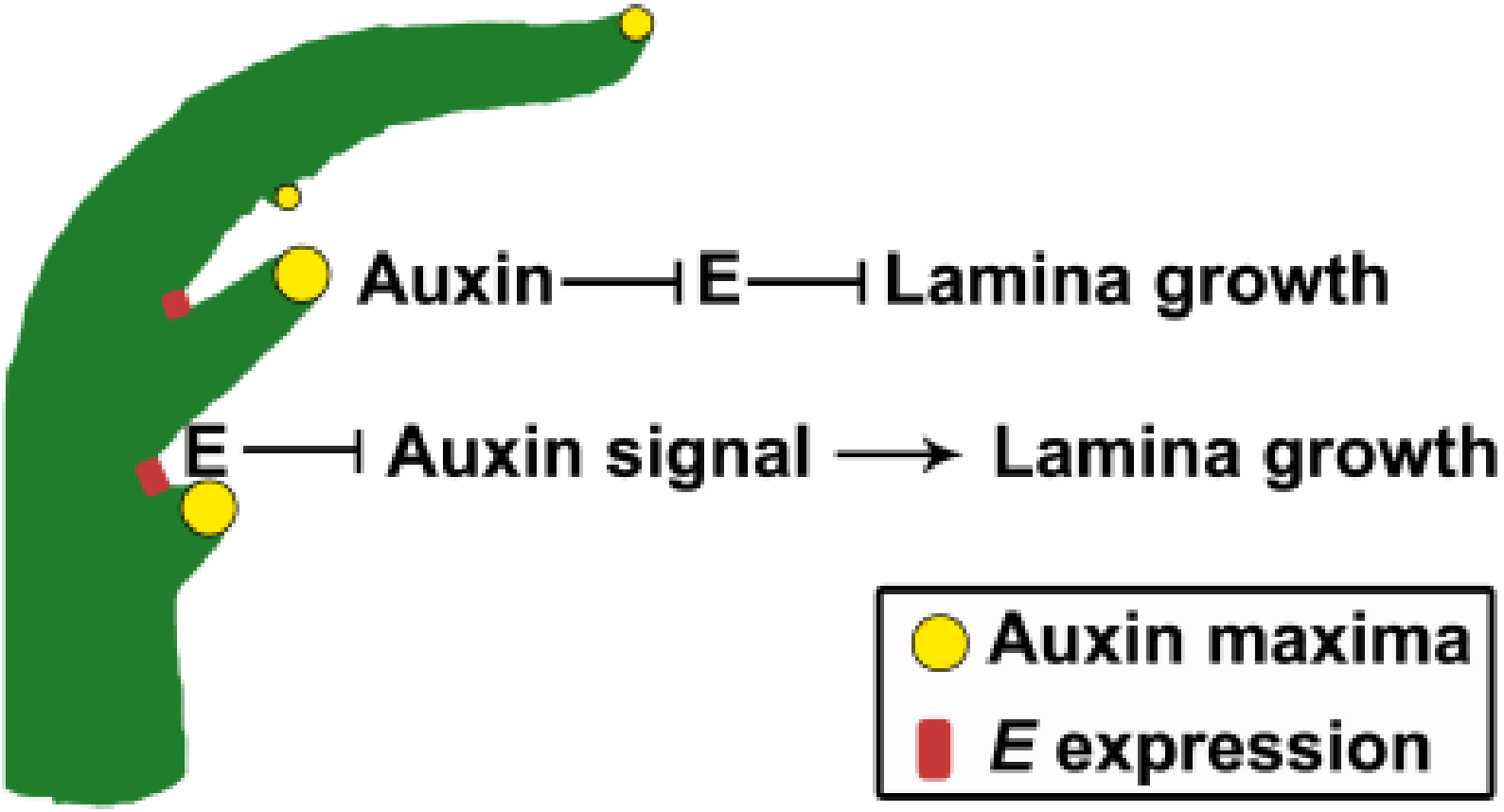
DR5 (green) – a sensor of the response to the plant hormone auxin

The *ENTIRE* gene is expressed between leaflets

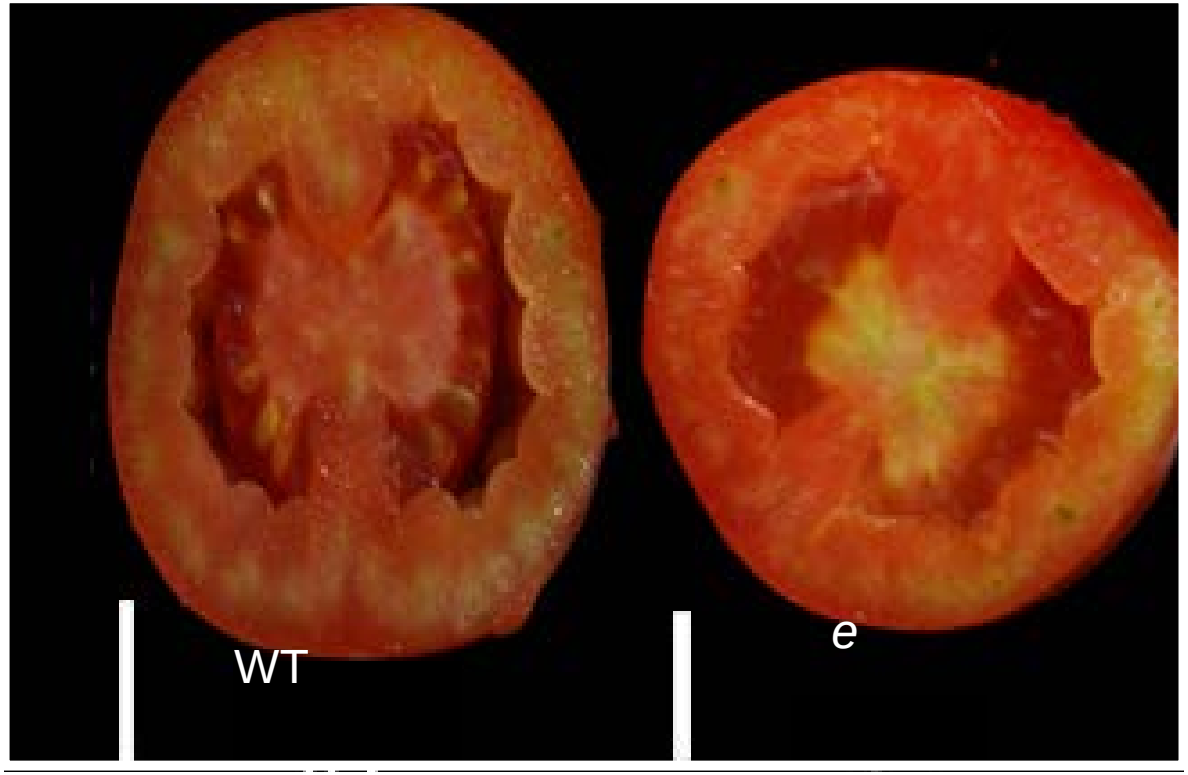


And when it is not active the auxin response expands to the entire leaf margin and the leaf is simple

E restricts auxin response and lamina growth between initiating leaflets.



Normally, fruit growth depends on fertilization



In *entire* mutants, fruits develop independently of fertilization

Can we use *entire* mutants to enhance yield stability under extreme temperatures?

Our conclusions:

- Plants develop flexibly.
- How??
- We ask this using genetics.
- We have discovered an important gene that tunes growth.
- Controlled activity of auxin affects leaf form and fruit development.

Thank you!

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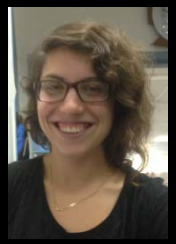

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