

Developmental Biology
3090-01
Week 7, Thursday
10/09/14

Lecture 13) Plant Development II

This is lecture 13, not 14, as it says on the notes. Material for the exam (a week from today) covers this lecture up until the morphogenesis slides (lectures 8-13). It is important to know that there are concepts previous to the first exam that will be covered on this lecture, including left and right asymmetry. Chapters in the book are 3-6 for the third edition and 4-7 for the fourth edition. Lecture slides should be the primary tool for studying, with personal notes and the text used for follow up. Good luck!

Slide 1: (Adult Structures are Derived From Meristems)

(incomplete) Meristem: A group of undifferentiated dividing cells that give rise to the adult structures of the plant.

An example of the lateral meristem would be the rings of growth we see in trees. Looking at the picture, if we cut off the apical meristem (responsible for primary growth in this example), the axillary bud will take over growth. This is apical dominance, and is controlled by auxin. Auxin's two functions that we know right now are apical dominance and apical/basal polarity.

Slide 2:

(incomplete) Growth due to cell elongation and enlargement.

The red-orange area shows the central zone. The central zone has the initials (the name for stem cells in plants). The yellow rib zone gives rise to the stem and the green gives rise to the epidermis and flower structures. If we cut the meristem here, we would get 2 developing meristems (this tells us there is regulation and that the initials (stem cells) are undifferentiated).

Slide 3:

(incomplete) Contains a small number of founder cells that produce the new structure by: cell division, enlargement, and differentiation.

The blank is: anticlinal.

Cells on the upper layer stay on the upper layer. There are anticlinal divisions between the L1 and L2 layers. The growing bump on the left and right sides are the leaf primordium, the first stage of the future leaf.

Slide 4:

(missing) Position appears to determine cell fate. → this hints that there is cell-cell signaling.

In this picture, L1 forms the epidermis, the L2 has the polyploid cells and form the flowers and leaves, the rest (L3) forms the stem.

Slide 5: Phyllotaxis is the arrangement of leaves around the stem. Cells with high levels of auxin develop leaf primordia (Auxin's third function!) Have identified 1-2 genes involved with the bottom leaf structures.

Slide 5:

(incomplete) Conversion to the inflorescence meristem is under environmental control → temperature, sunlight

Plants can't move around like animals, meaning that they really have to adapt to their environment. Pay attention to the bottom picture showing structure. This pattern is called a whorl. This is the common structure of Arabidopsis plant.

Slide 6:

(incomplete) Mutations in homeotic genes cause transformations of one type of structure to another.

Plant homeotic genes are NOT Hox genes!!! However, they are similar in their function. Apetala = no petals; agamous = asexual (mutant has petals only, no reproductive organs).

Slide 7:

(missing) Particular combinations of A,B,C give each whorl specific identity.

Overlapping expression defines identity of flower structures.

Clicker Question!

Why do we see similar mechanisms for determining tissue/structure identity in animals and plants?

- a) animals once had leaves
- b) their cells are the same size

- c) they have homologous transcription factors
- d) they have homologous Hox genes
- e) gene expression is regulated the same way in animals and plants

Answer is E! We are told that plants have transcription factors that behave similarly to Hox genes, but that they are NOT Hox genes. We are never told the transcription factors are homologous. So the answer is E.

Slide 8:

(incomplete) Photoperiodism: a change in amount of flowering in relation to amount of daylight

When leafy is expressed, during the long day meristem is converted to flowers. That is why we don't see as many flowers as in the short day like we might expect. IF there is a defect in leafy, we get more leaves than flowers forming (remember genes are usually named for their mutant phenotype).

Slide 9:

(missing) flowers form only on plant with covered leaf.

Slide 10:

(missing) Signal to flower travels from one plant to another.

Slide 11: Plants have a circadian clock, and so do we! (located in the hippocampus).

(missing) Regulates the timing of metabolism and gene expression over the day.

Slide 12:

(missing) Promotes the transcription of flowering genes in meristem.

Clicker Question!

Loss of function mutations in the leafy gene results in the formation of more

- a) flowers
- b) leaves
- c) stems
- d) roots

Answer is B! Leafy affects leaf and flower formation. When it is expressed, we expect to see more flowers. When it is mutated, we get more leaves (named for the mutation!!!).