

Chapters 35: Plant Structure, Growth and Development

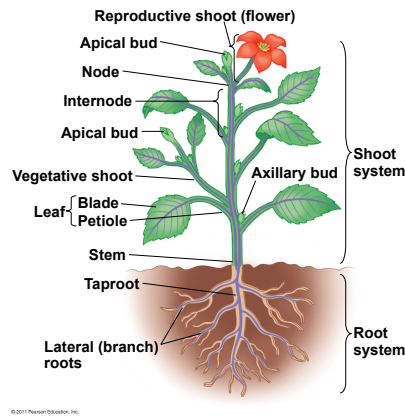
AP Biology 2013

1

Plant Body

Fig. 35.2

- Has a hierarchy of organs, tissues, and cells
- Basic morphology of vascular plants reflects evolutionary history as terrestrial organisms that draw nutrients from below and above ground
- Three basic types of organs: roots, stems, and leaves
- Organized into two organ systems: a root system and a shoot system

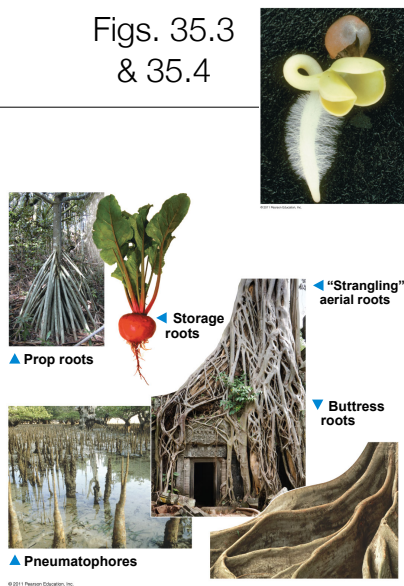


2

Roots

Figs. 35.3 & 35.4

- Organ that anchors the vascular plant
- Absorbs minerals and water
 - Occurs near the root tips where tiny root hairs increase the surface area of the root
- Often stores organic nutrients/carbohydrates
- Taproot - main vertical root
- Lateral roots - arise from taproot
- Root hairs - increase surface area



3

Stems

- Organ consisting of an alternating system of nodes (points at which the leaves are attached) and internodes (stem segments between nodes)
- Axillary bud - structure that has the potential to form a lateral shoot or branch
- Apical bud (terminal bud) - located near the shoot tip and causes elongation of a young shoot
- Apical dominance - maintains dormancy in most axillary buds

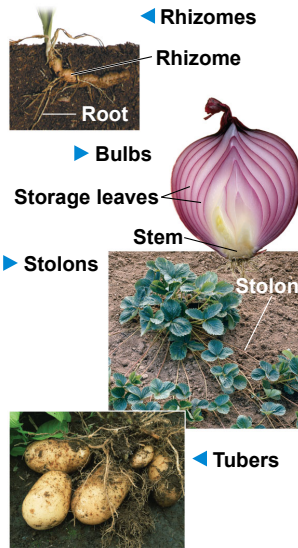
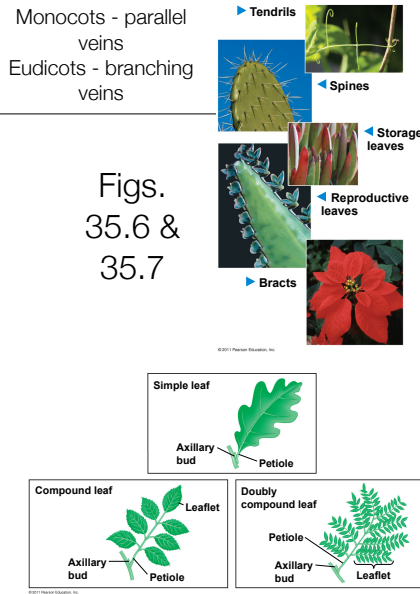


Fig. 35.5

4

Leaves

- Main photosynthetic organ of most vascular plants
- Consist of a flattened blade and a stalk
- Petiole - joins the leave to a node of the stem
- Classification of angiosperms is often related to leaf morphology
- Modified leaves: tendrils (lassoes neighboring plant and forms a coil for support), spines, storage (ex. storage of water), bracts (brightly colored leaves that surround a group of flowers), reproductive

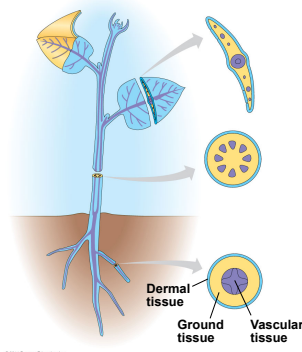


5

Tissues

Fig. 35.8

- Dermal - consists of epidermis and periderm
 - cuticle waxy coating that helps prevent water loss (replaced by periderm in woody plants)
- Vascular - carries out long-distance transport of materials between roots and shoots
 - Xylem - carries water and dissolved minerals upward (roots to shoots)
 - Phloem - transports organic nutrients from where they are made to where they are needed
- Ground - cells specialized for storage, photosynthesis, and support



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Major Cell Types

- Parenchyma - thin walled cells that make up most of the non-woody structure
- Collenchyma - thick walled
- Sclerenchyma - lignified cell walls that lose their protoplasm at maturity
- Water conducting (xylem)
- Sugar conducting (phloem)

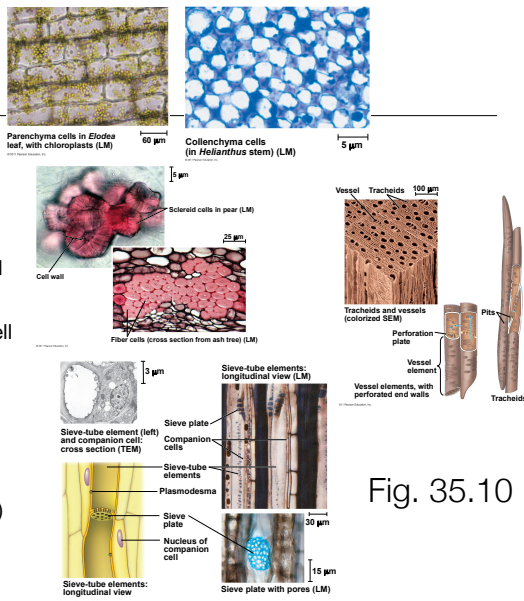
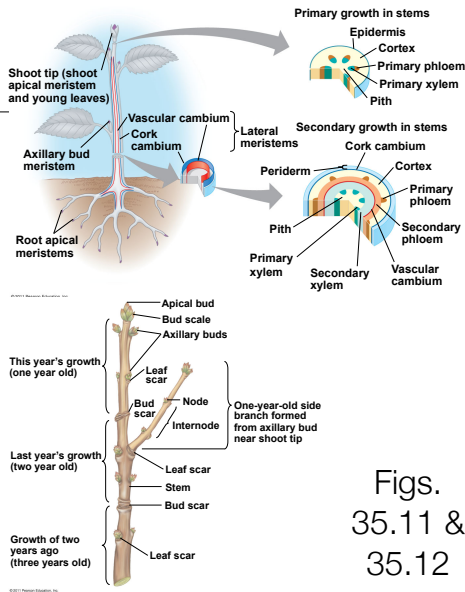


Fig. 35.10

Meristems

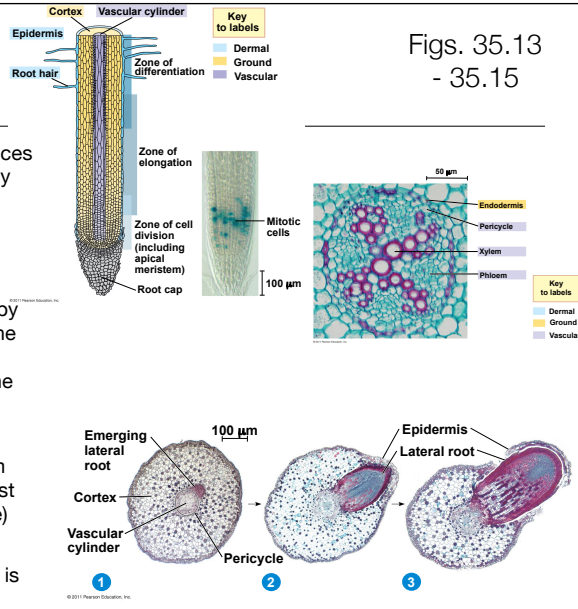
- Meristems - perpetually embryonic tissue that generates cells for new organs
- Apical meristems - located at the tips of roots and buds of shoots, elongate roots and shoots through primary growth
- Lateral meristems - add thickness to woody plants through secondary growth
- Primary and secondary growth occurs simultaneously but in different locations in woody plants



Figs. 35.11 & 35.12

Primary Growth

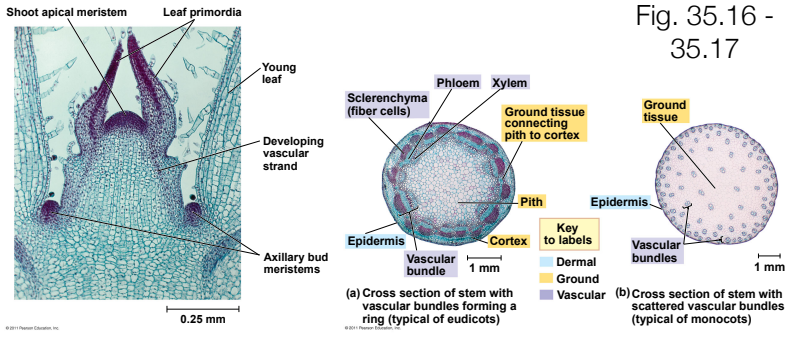
- Apical meristem produces the primary plants body (produces epidermis, ground tissue, and vascular tissue)
- Root tips are covered by a root cap to protect the apical meristem as the root pushes through the soil
- Lateral roots arise from the pericycle (outermost layer of vascular tissue)
- Shoot apical meristem is dome shaped



Figs. 35.13 - 35.15

Organization of Shoots

- In gymnosperms and most eudicots the vascular tissue consists of vascular bundles arranged in a ring
- In most monocot stems the vascular bundles are scattered throughout the ground tissue



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Organization of Leaves

- Epidermal barrier is interrupted by stomata
- Each stomatal pore is flanked by two guard cells which regulate opening and closing
- Mesophyll - ground tissue is between the upper and lower epidermis
- Vascular tissue in a leaf is continuous with vascular tissue of the stem

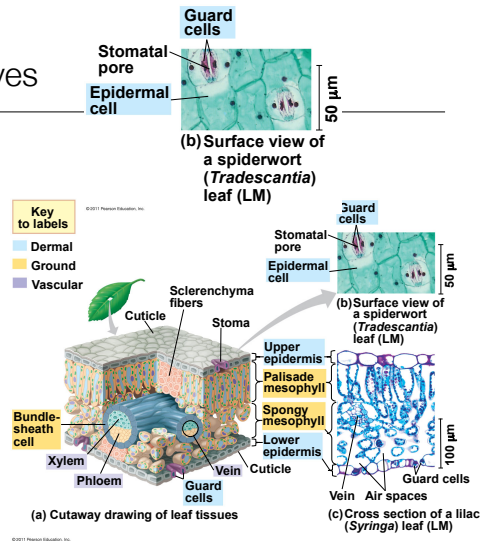
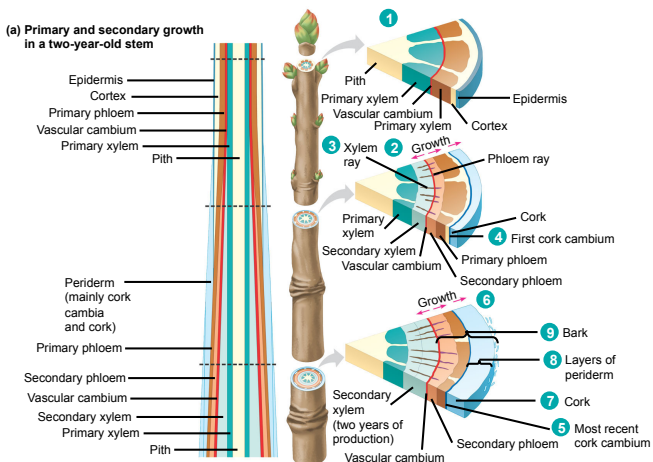


Fig 35.18

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Primary and Secondary Growth

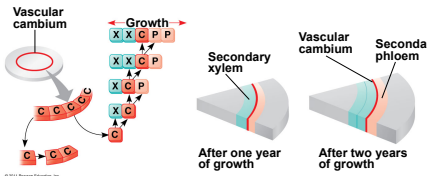
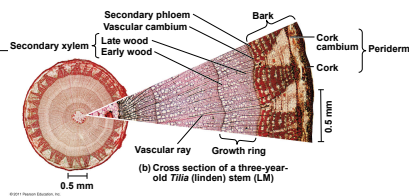
Fig. 35.19



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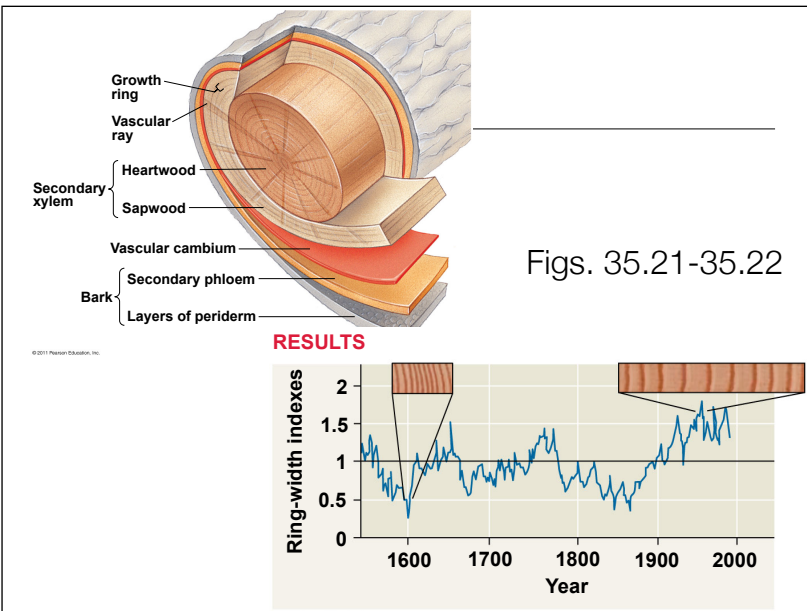
Secondary Growth

- Adds girth to stems and roots (rarely occurs in leaves)
- Secondary tissue consists of tissues produced by vascular cambium and cork cambium



Figs.
35.19 -
35.20

13



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Secondary Growth

- Cork cambium - gives rise to the secondary plant body's protective covering (periderm)
 - Periderm - consists of the cork cambium and layers of cork cells it produces
- Bark - all tissues external to the vascular cambium including secondary phloem and periderm

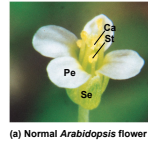
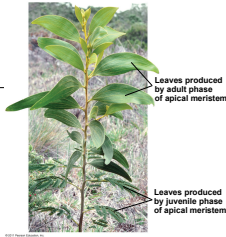
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Morphogenesis and Pattern Formation

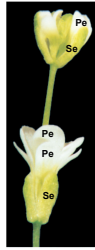
- Development of specific structures in specific locations
- Determined by positional information from signals that indicate to each cell its location
 - Polarity - knowing which end the cell is located
- Morphogenesis is controlled by homeotic genes
 - Most obvious morphological changes happen with leaf size and shape
- Flower growth is caused by a change from vegetative growth to reproductive growth because of environmental and internal signals.
 - Floral meristem identity genes



Figs. 35.28, 35.32, & 35.33

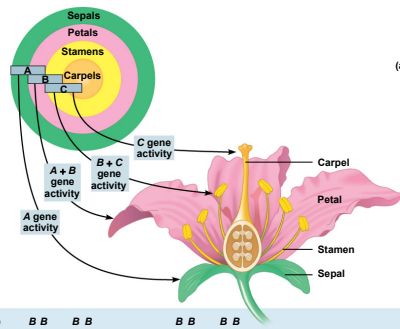


(a) Normal Arabidopsis flower



(b) Abnormal Arabidopsis flower

ABC Hypothesis for Flower Formation



(a) A schematic diagram of the ABC hypothesis

Fig. 35.34

