

III. PRIMARY PLANT BODY

Bot 404—Fall 2004

A. Primary vs. secondary growth

1. Primary growth—axes grow longer
 - results from the actions of the root and shoot apical meristems (incl. buds)
 - protoderm → epidermis; procambium → vascular tissue; ground meristem → ground (or simple) tissues (parenchyma, collenchyma, sclerenchyma)
2. Secondary growth—axes grow in diameter
 - results from the action of lateral meristems
 - these typically initiate in the vascular tissue but can (and often do) develop in adjacent tissues as well (e.g., interfascicular regions)

B. Basic ground plan

1. Seedling
 - dicot seedling (DIAGRAM) (E p. 8)
 - root and shoot apices and meristems, procambium, rootcap, hypocotyl

2. Root/shoot axis (DIAGRAM)

C. Functions of shoots

- production and elevation of leaves and reproductive tissues
- long-distance transport of water and nutrients
- *-storage
- *-perennating organs (e.g., corms, bulbs, tubers, rhizomes)
- means of dispersal/asexual reproduction (e.g., rhizomes, stolons, bulbs, tubers)
- *-housing of symbiotic organisms (e.g., N-fixing bacteria)

D. Functions of roots

- anchorage (including contractile roots) either in subterranean substrate or for epiphytes aerial roots help anchor the plant to its support
- absorption and conduction of water and dissolved minerals
- *-storage (various products)
- *-perennating organs (survival through harsh conditions, e.g., root crown)
- source of hormones (e.g., cytokinin, gibberellins)
- specializations for: stem support (aerial or prop roots); aeration (e.g., bald cypress knees); defense (spines); asexual reproduction (root buds in dogbane); repositioning (contractile roots)
- haustoria in parasitic plants
- *-housing of symbiotic organisms (e.g., mycorrhizae, N-fixing bacteria)
- “communication” (signal transduction?) where roots of different individuals or different species might be in contact; allelopathy where harmful substances are produced that discourage other plants
- rhizomes, stolons, corms, bulbs, tubers are not root structures, rather they are modified stems

E. Introduction to meristems

- meristematic region includes a meristem and an area of relatively rapid cell division and growth
- meristem is a cell or group of cells whose principal function is to divide in an organized manner
- plants have an open or indeterminate pattern of growth
- functions of meristems:
 - 1) establish patterns
 - 2) source of mitotically young cells
- function of meristematic regions:
 - 1) cell division and growth
 - 2) differentiation of tissues
- meristematic cells are included in the concept of synthetic parenchyma; metabolically active and densely cytoplasmic, several small vacuoles instead of one large one; generally small in size and isodiametric in shape (major exception—fusiform initials of vascular cambium)
- types of meristems based on position (**M** pp. 84-85):
 - 1) apical meristems—at apex of organ they produce
 - 2) basal meristems—at base of organ they produce
 - 3) intercalary meristems—occur between their derivatives

- 4) lateral meristems—located at periphery of an organ (vascular cambium is also intercalary)
- 5) axillary meristems—apical meristems of buds in leaf axils

-types of meristems based on derivatives (**M** p. 85):

- 1) protoderm—gives rise to epidermal cells
- 2) procambium—produces primary vascular tissues
- 3) ground meristem—produces pith, cortex (large amounts of homogenous tissue)
- 4) promeristem—gives rise to other meristems or other parts of the same meristem