

GENERAL BOTANY Lecture 17 - Stems: Secondary Growth

- I. Secondary stem growth in angiosperms (introduction)
 - A. Requirements for secondary growth
 - 1. Secondary thickening meristems: found mostly in dicots - some monocots
 - a) Vascular cambium (like procambium) - between primary xylem & phloem
 - 1) Fascicular cambium - forms from within vascular bundles
 - 2) Interfascicular cambium - origin. fr. parenchyma between bundles
 - b) Cork cambium - forms from cells of cork cambium
 - 1) Cork (phellem) to the outside; phelloderm (parenchyma) to the inside
- II. Secondary growth of tissues (in detail)
 - A. Secondary phloem and secondary xylem (secondary vascular tissues)
 - 1. The bulk of tissues in woody stems of dicots are secondary vascular tissues
 - 2. How secondary vascular growth occurs
 - a) Begin at vascular cambium (fusiform and ray initials)
 - b) Primary phloem gets pushed out and primary xylem gets pushed in
 - 1) Cells orient up and down (vertically) the stem
 - c) New cells are located closest to the vascular cambium
 - d) Circumference increases because cells divide perpendicular to as well as parallel to the stem surface
 - 1) Ray cells - develop horizontally
 - 2) Function in growth and transport of minerals
 - 3. Where are secondary phloem and secondary xylem found?
 - a) New external cells mature into secondary phloem
 - 1) Primary phloem gets crushed
 - b) New internal cells mature into secondary xylem
 - c) Xylem can be seen as "rings" on a tree
 - B. Cork cambium
 - 1. Forms in the cortex (or sometimes from the epidermis)
 - 2. Produces cork cells (phellem) to the outside and parenchyma (phelloderm) to the inside
 - 3. Cork cambium, cork (phellem), and phelloderm make up the PERIDERM (bark)
 - 4. Lenticles - specialized regions of periderm functioning in gas exchange
 - 5. Inner bark - phloem that has been pushed outward - peeled away, it exposes the most recently formed secondary phloem (where sap can be found)
 - 6. Knots - come from wounds and broken branches
- III. Wood - secondary xylem - THE GROWTH RINGS
 - A. Heartwood and sapwood
 - 1. Heartwood - central darkened core (cross section)
 - a) Cells are dead and often pigmented
 - b) Composed of tracheids and vessel members
 - 1) Tracheids - simple and primitive
 - 2) Vessels - efficient and advanced
 - c) Contains tyloses - ingrowths of adjacent parenchyma into vessels
 - 1) Good wood for storage containers (whiskey & pickles)
 - 2. Sapwood - periphery of the wood
 - a) Includes living xylem and parenchyma
 - b) Functions in water and nutrient transport
 - B. Wood of conifers (gymnosperms)
 - 1. Softwood - composed mostly of tracheids and has smaller and fewer rays
 - 2. Vascular cambium
 - a) Fusiform initials - produce tracheids to the inside
 - b) Ray initials - produce ray cells
 - C. Cuts of wood
 - 1. Tangential (section) - longitudinal, but does not pass through pith
 - 2. Radial (section) - longitudinal and does pass through pith (radius)
 - 3. Transverse cut or cross (section) - at a right angle to longitudinal section