

# Properties of specialised plant cells and simple tissue types.

**Parenchyma:** "para" is Greek for "beside"

- ground tissue
  - alive at maturity
  - can divide
  - primary cell wall, although can have a secondary wall.
  - generally polyhedral shape, but can be elongated or other shapes
  - sometimes tightly packed, sometimes large air spaces (aerenchyma)
- Functions include: photosynthesis (chlorenchyma, "green tissue") storage (tubers and seeds) secretion (nectaries) water and food movement wound healing initiation of adventitious roots transfer cells meristematic activity

**Collenchyma:** "kolla" is Greek for "glue"

- alive at maturity
- unevenly thickened non-lignified primary walls (thicker walls at the corners)
- generally elongated shape
- present beneath the epidermis in stems and petioles. Border veins in dicot leaves and are the "strings" on celery stalks (petioles).
- support of growing tissues

**Sclerenchyma:** "skleros" is Greek for "hard"

- often dead at maturity
- thick, often lignified secondary walls
- strength
- fibers and sclerids:
- fibers - are usually very long, and are present in cortex of stems, often associated with xylem and phloem. Also in leaves of monocotyledons. Involved in support.
- sclerids - shorter, variable shape. Present throughout the plant. Involved in support and protection.

**Xylem:** a complex tissue; "xylon" is Greek for "wood"

- water and mineral conducting
  - support
  - forms vascular system along with phloem
  - primary and secondary xylem
  - conducting cells are tracheary elements:
  - two types of tracheary elements: tracheids and vessel members
  - vessel members:
  - dead at maturity, lignified wall
  - angiosperms only
  - pits and perforations in the walls, perforation plate is at end walls.
- Vessel members are joined at perforation plates to form long continuous tubes called vessels.
- tracheids:
  - dead at maturity, lignified wall
  - more primitive than vessel members
  - only water conducting cell in seedless vascular plants and gymnosperms
  - present in angiosperms as well
  - pits in wall, but no perforation plates
  - "safer", but less efficient

-parenchyma cells, fibers and sclereids are also present in xylem.

**Phloem:** a complex tissue; "phloos" is Greek for "bark"

- food conducting
- primary and secondary phloem
- conducting cells are called sieve elements. "Sieve" refers to the clusters or pores through which protoplasts are connected. Sieve elements are living at maturity but lack nuclei, ribosomes, Golgi, and microtubules. There is also a loss of a distinct vacuole. Sieve elements do have some smooth endoplasmic reticulum, plastids and mitochondria. The walls are primary, and there is not lignification as seen in tracheary elements.
- two types of sieve elements: sieve cells and sieve tube members
- sieve cells are the only sieve element in seedless vascular plants and gymnosperms. The pores are narrow and uniform in size on all walls of the cell.
- sieve tube members are only in angiosperms. Larger pores are present on some wall than on others. These areas are usually at the ends of the cell and are referred to as sieve plates. The sieve tube members are connected end-to-end to form sieve tubes. Sieve tube members in some plants have P-protein (slime).
- Companion cells - a specialized form of parenchyma that is densely cytoplasmic with lots of mitochondria and ribosomes. Also have nuclei. Associated with sieve tube member. Companion cells are a special kind of parenchyma involved in loading and unloading sieve tubes and in providing the sieve tube member with proteins and energy (ATP). A companion cell and sieve tube member are derived from the same mother cell. There are lots of plasmodesmata between these two cells.
- Albuminous cells- a specialized form of parenchyma that is associated with sieve cells in gymnosperms and that perform the same kinds of roles as companion cells. The albuminous cell and sieve cell are not derived from the same mother cell.
- When a sieve element dies, so does the associated companion cell or albuminous cell.
- other cell types in phloem include parenchyma cells involved in storage, as well as fibers and sclerids.

**Epidermis:**

- outermost layer, until there is considerable secondary growth.
- mechanical protection, aeration, protection from invasion, protection from water loss
- vacuolated cells
- alive at maturity
- typically one cell thick, but there are exceptions
- thick cell wall, tightly packed cells
- ground cells, stomata with guard cells, trichomes, root hairs, secretory cells
- cuticle = cutin and waxes