Palaeontology

Practical 9

Kingdom Plants

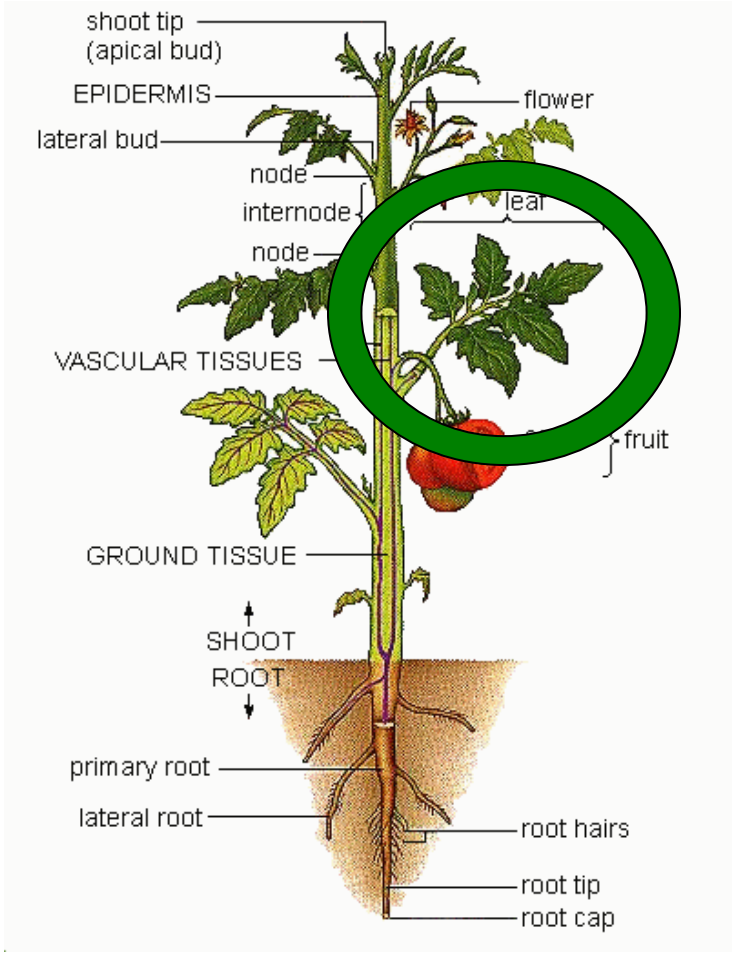
Leaf morphology

LEAVES: FORM & FUNCTION

- Function
- External Anatomy
- Internal Anatomy
- Specialized Leaves

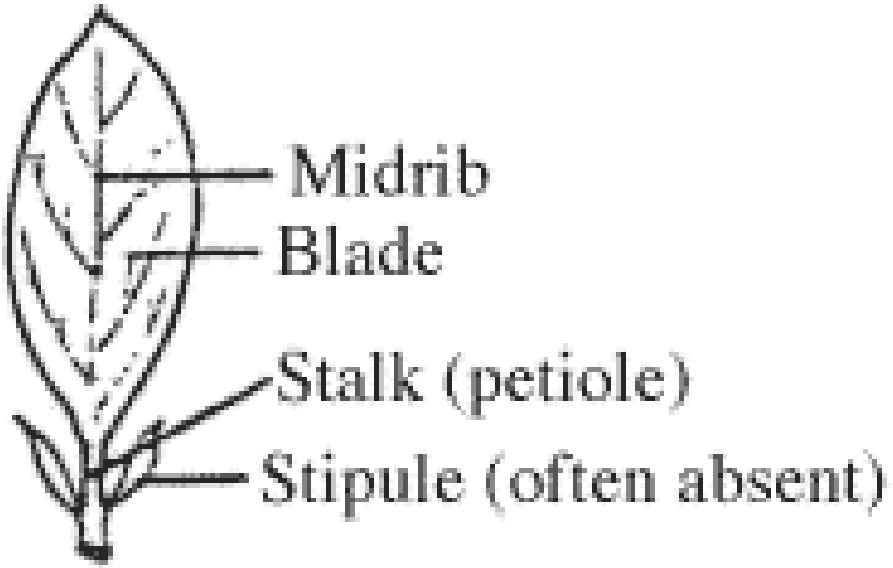
The Plant Body: Leaves

- FUNCTION OF LEAVES
  - Leaves are the solar energy and CO_2 collectors of plants.
  - In some plants, leaves have become adapted for specialized functions.

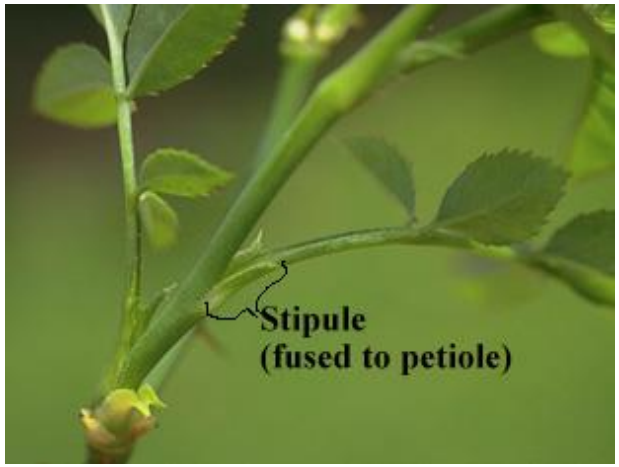


EXTERNAL ANATOMY

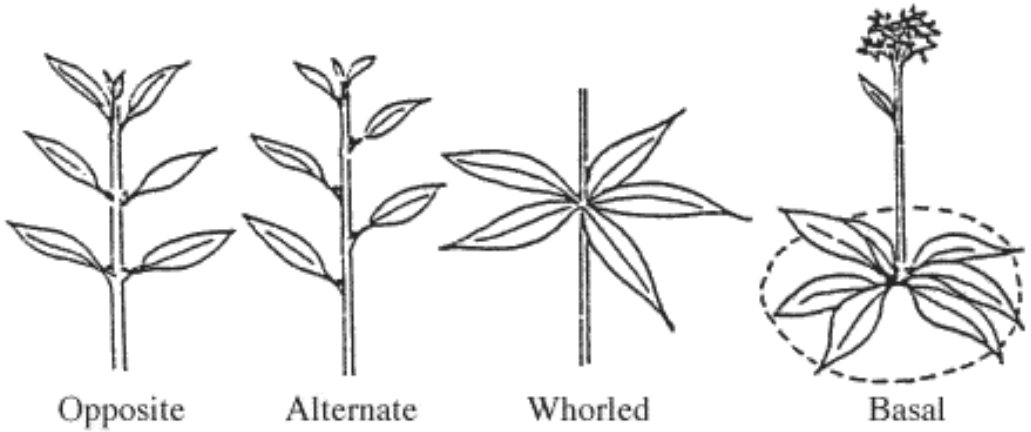
- Leaves possess a blade or lamina, an edge called the margin of the leaf, the veins (vascular bundles), a petiole, and two appendages at the base of the petiole called the stipules.



EXTERNAL ANATOMY

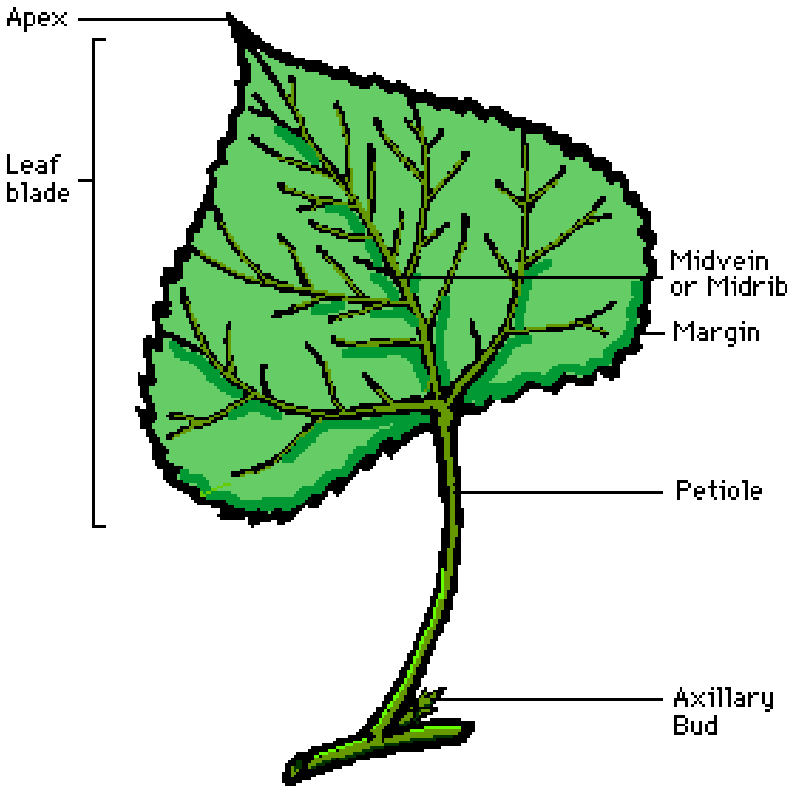


Phyllotaxy - Arrangement of leaves on a stem



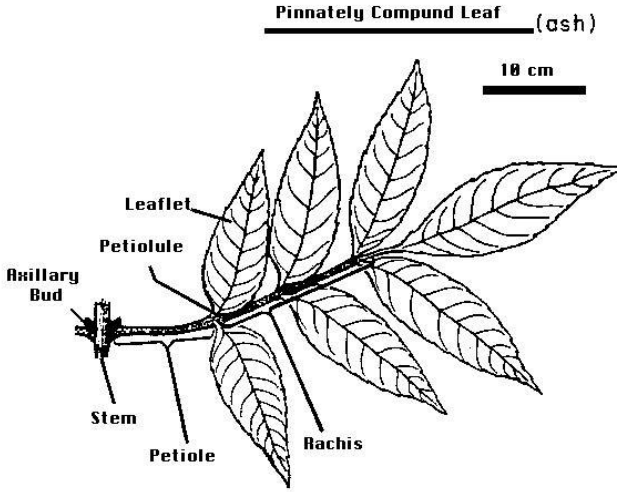
Leaf types - Simple, compound, peltate and perfoliate

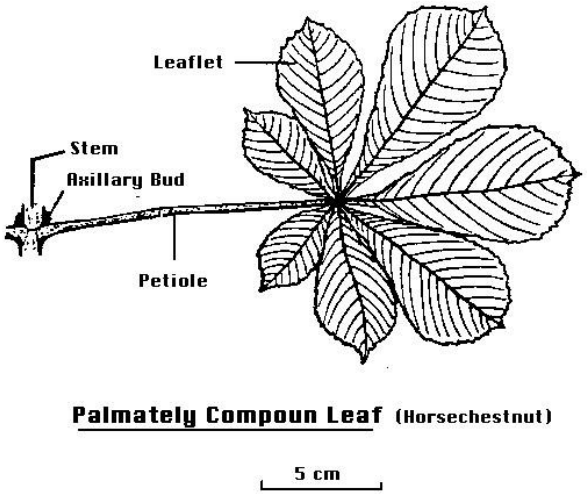
- Simple leaf = undivided blade with a single axillary bud at the base of its petiole.
- Compound leaf = blade divided into leaflets, leaflets lack an axillary bud but each compound leaf has a single bud at the base of its petiole
  - pinnately-compound leaves: leaflets in pairs and attached along a central rachis; examples include ash, walnut, pecan, and rose.
  - palmately-compound leaves: leaflets attached at the same point at the end of the petiole; examples of plants with this leaf type include buckeye, horse chestnut, hemp or marijuana, and shamrock.
- Peltate leaves = petioles that are attached to the middle of the blade; examples include mayapple
- Perfoliate leaves = sessile leaves that surround and are pierced by stems; examples include yellow-wort and thoroughwort



Simple Leaf: Poplar

Leaf types – Pinnately & Palmately Compound Leaves





Peltate & Perfoliate Leaves

Mayapple

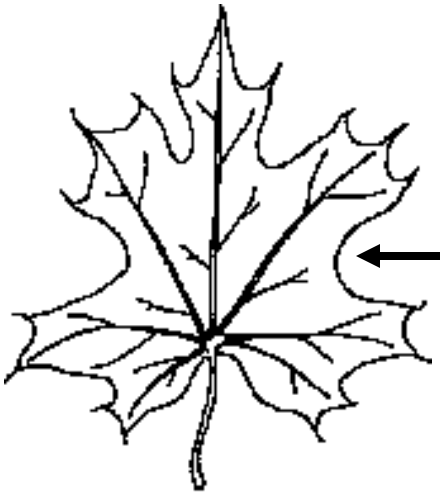
Yellow Wort

Venation = arrangement of veins in a leaf

- Netted-venation = one or a few prominent midveins from which smaller minor veins branch into a meshed network; common to dicots and some nonflowering plants.
  - Pinnately-veined leaves = main vein called midrib with secondary veins branching from it (e.g., elm).
  - Palmately-veined leaves = veins radiate out of base of blade (e.g., maple).
- Parallel venation = characteristics of many monocots (e.g., grasses, cereal grains); veins are parallel to one another.
- Dichotomous venation = no midrib or large veins; rather individual veins have a tendency to fork evenly from the base of the the blade to the opposite margin, creating a fan-shaped leaf (e.g., *Gingko*).

Venation Types

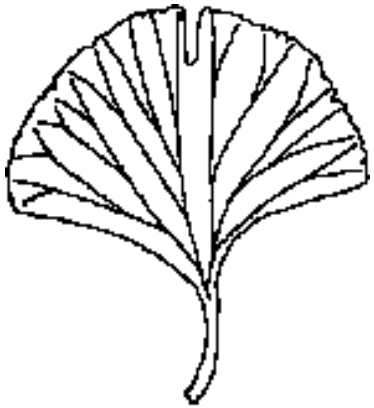
Pinnately Veined



Palmately Veined

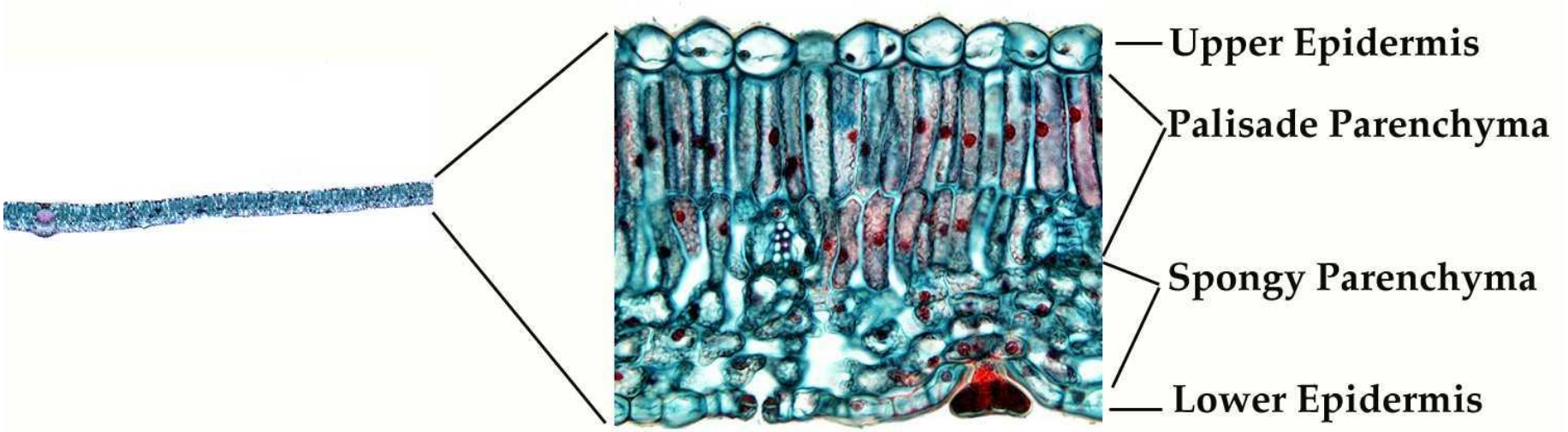
Netted or Reticulate Venation

Parallel

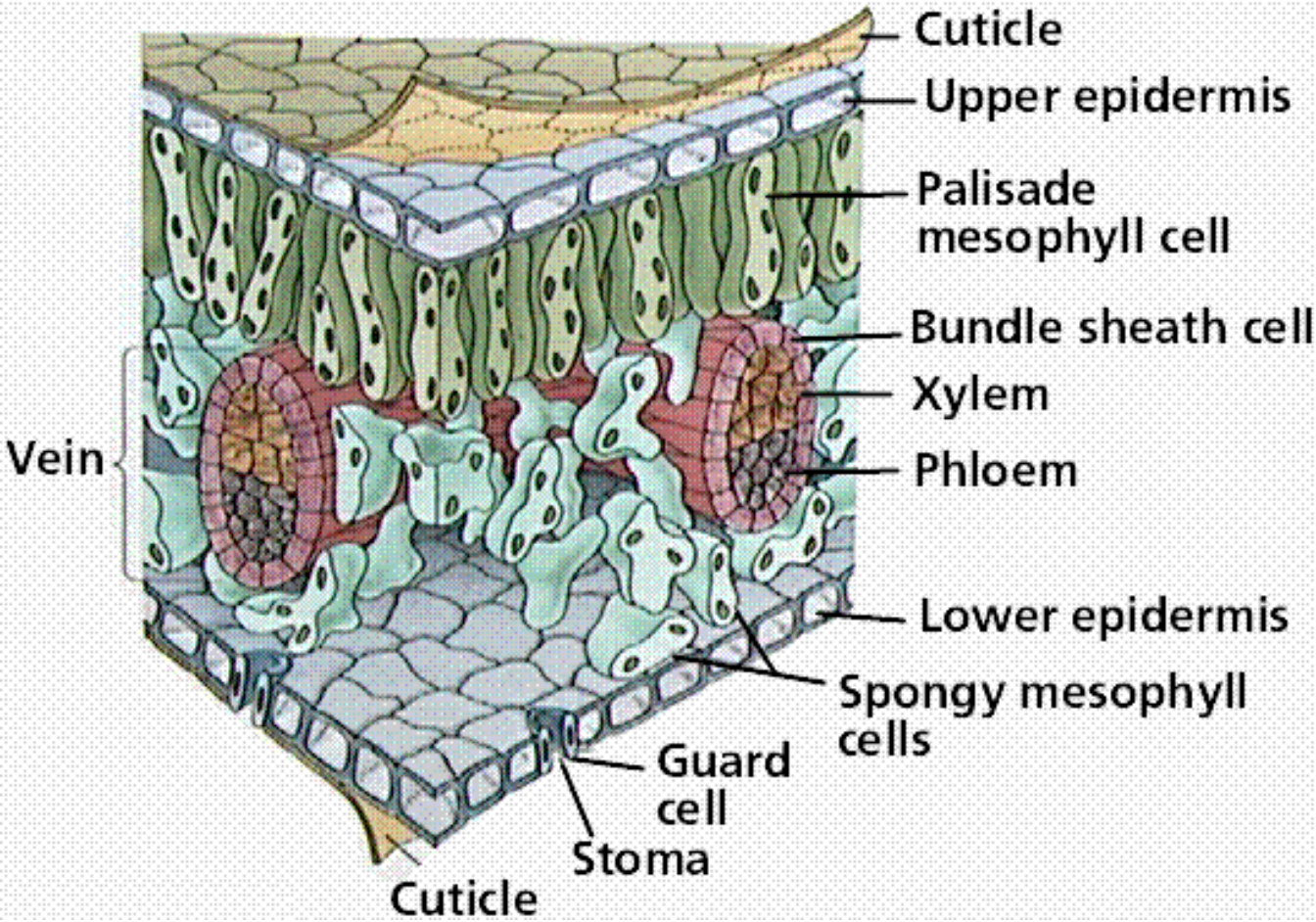


Dichotomous

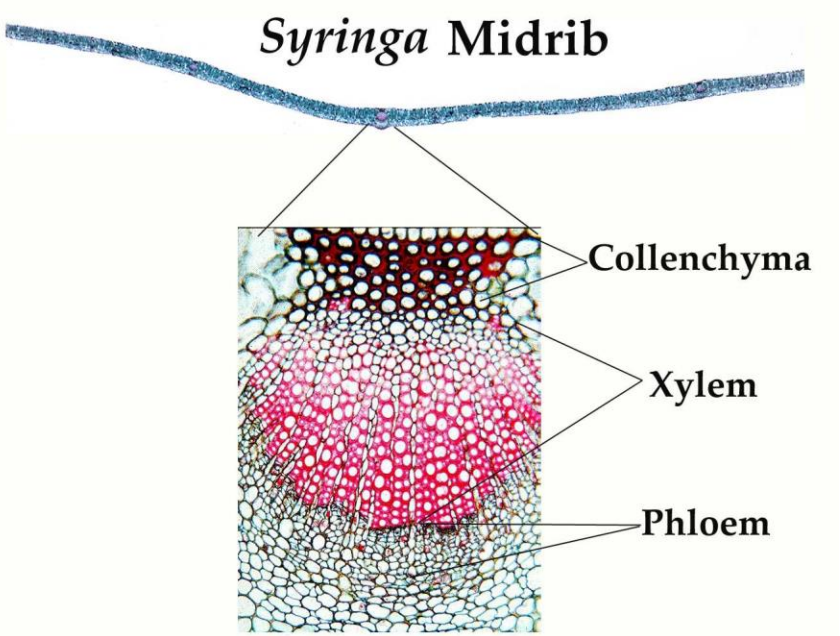
LEAF – Internal Anatomy

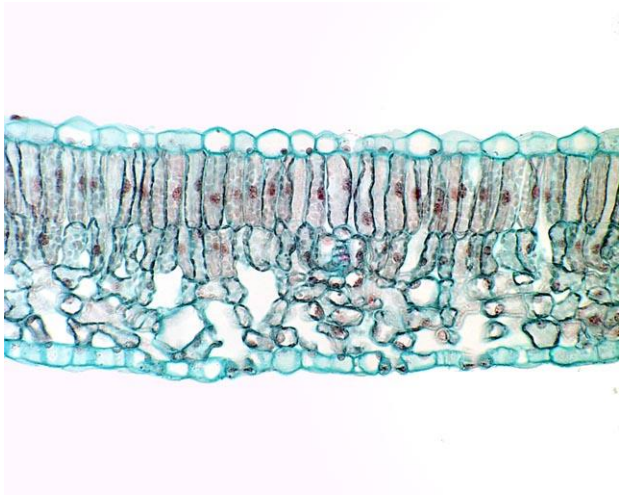


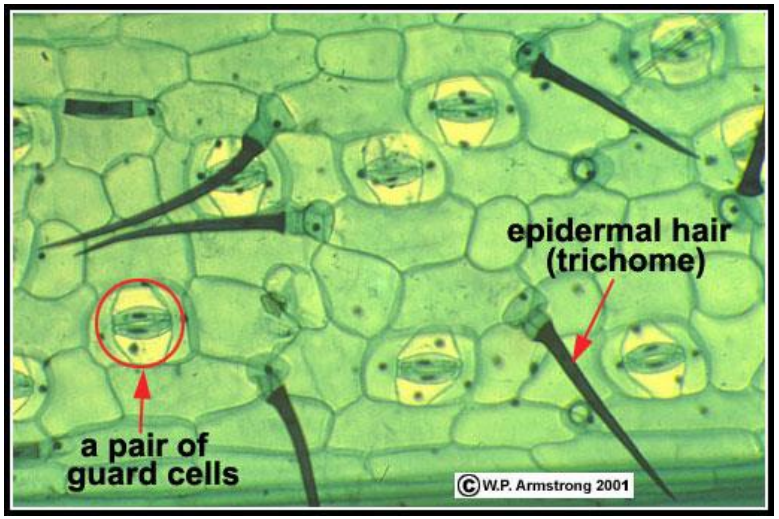
Leaf – Internal Anatomy



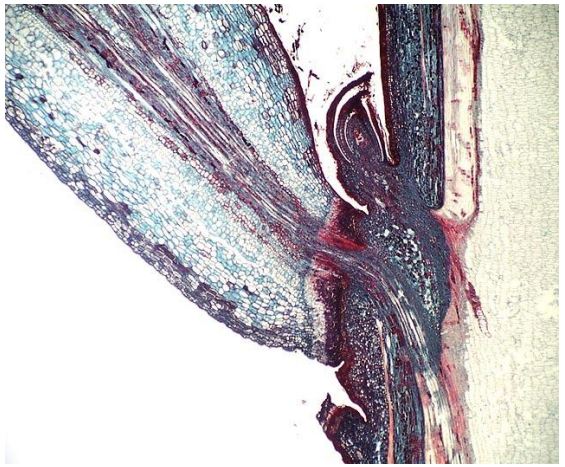
Internal and External Views







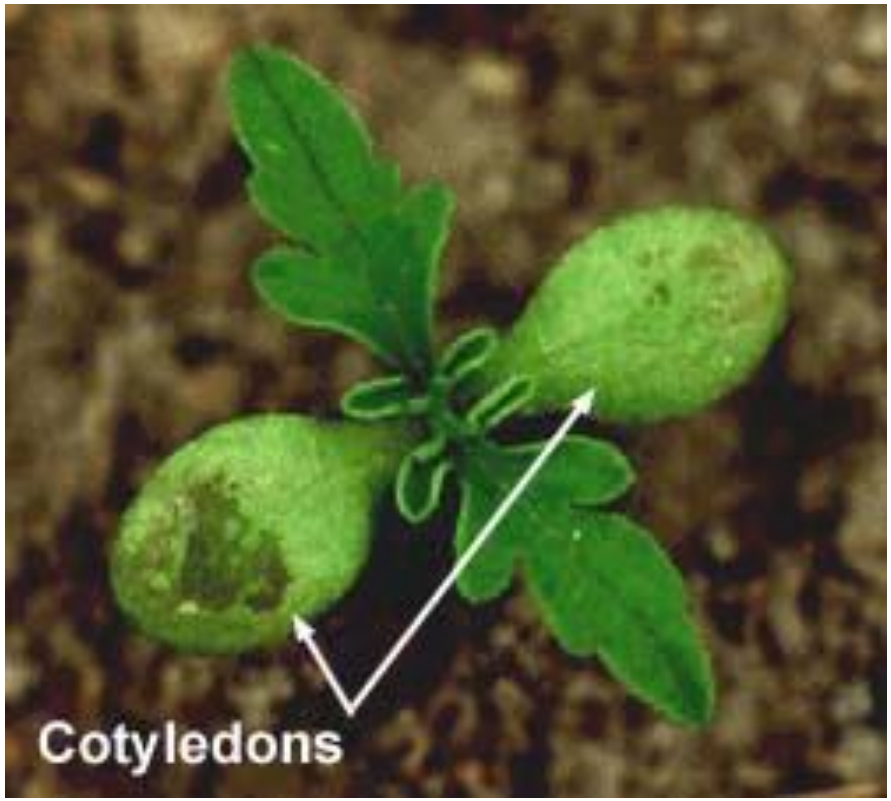
Deciduous Leaves & Leaf Abscission

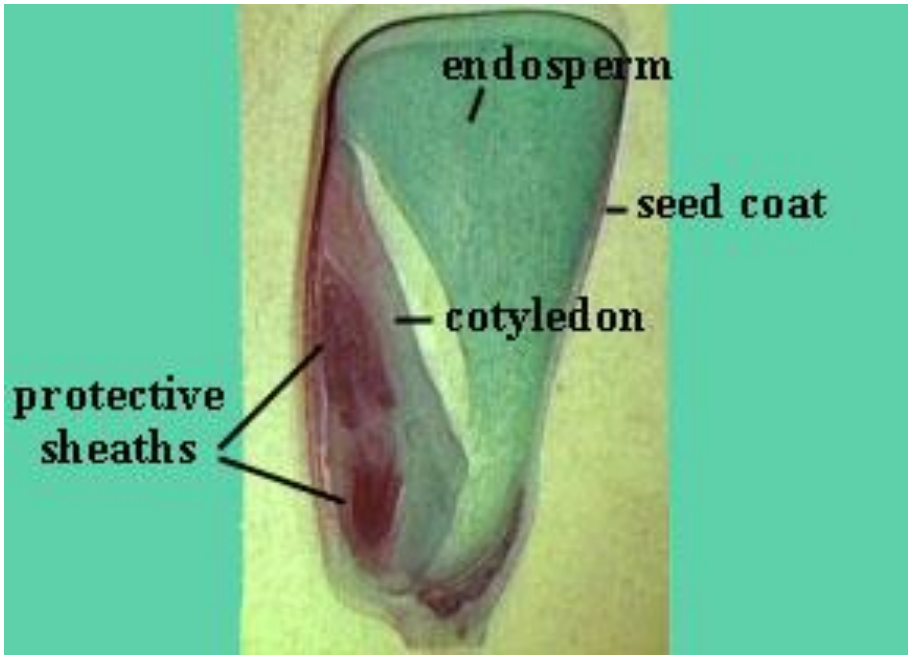


Specialized or Modified Leaves

- Cotyledons: embryonic or "seed" leaves. First leaves produced by a germinating seed, often contain a store of food (obtained from the endosperm) to help the seedling become established.
- Tendrils - blade of leaves or leaflets are reduced in size, allows plant to cling to other objects (e.g., sweet pea and garden peas.
- Shade leaves = thinner, fewer hairs, larger to compensate for less light; often found in plants living in shaded areas.
- Drought-resistant leaves = thick, sunken stomata, often reduced in size
  - In American cacti and African euphorbs, leaves are often reduced such that they serve as spine to discourage herbivory and reduce water loss; stems serve as the primary organ of photosynthesis.
  - In pine trees, the leaves are adapted to living in a dry environment too. Water is locked up as ice during significant portions of the year and therefore not available to the plant; pine leaves possess sunken stomata, thick cuticles, needle-like leaves, and a hypodermis, which is an extra cells just underneath the epidermis - **refer to Figure 9.18 on page 216 in the textbook**.
- Prickles and thorns: epidermal outgrowths on stems and leaves (e.g., holly, rose, and raspberries; Hypodermic trichomes on stinging nettles.
- Storage leaves succulent leaves retain water in large vacuoles.
- Reproductive leaves, (e.g., Kalanchöe plantlets arise on margins of leaves.
- Insect-trapping leaves: For example: pitcher plants, sundews venus flytraps, and bladderworts have modified leaves for capturing insects; All these plants live under nutrient-poor conditions and digest insect bodies to obtain nitrogen and other essential nutrients**.**
- Bracts: petal-like leaves**.**
- Window Leaves: plant is buried in soil with transparent part exposed to light. Being buried reduces loss of war in arid environments.
- Flower pot leaves: Structure to catch water and debris for nutrient collection - fairy-elephant's feet**.**

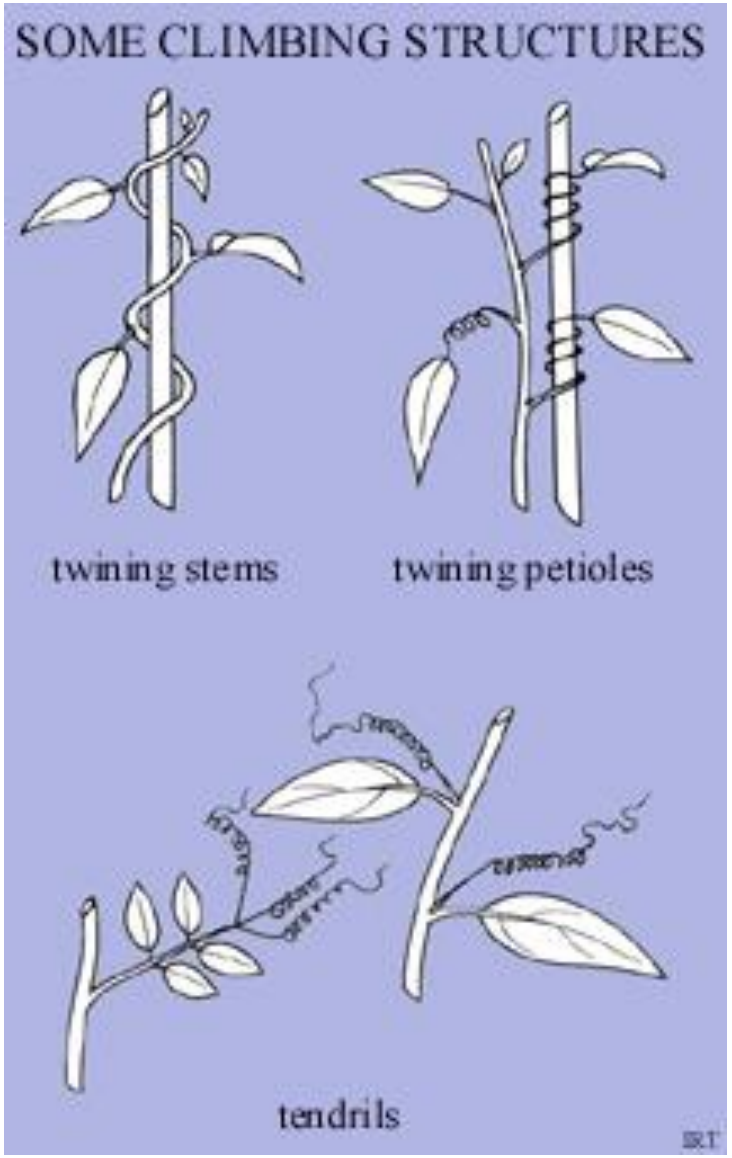
Cotyledons or “seed leaves”





Tendrils

Garden Pea



Leaves as Needles and Spines

Leaves as Colorful Bracts