

Cell Structure and Contents

1. STRUCTURAL RELATIONSHIPS:

A. Observe transmission electron micrographs of plant cells and be able to identify the organelles (nucleus, chloroplasts, Golgi bodies, mitochondria and vacuoles). Locate the cell wall and observe plasmodesmata.

B. *Allium* (onion) scale - fresh material - carefully peel off a portion of the epidermis of a scale and make a wet mount. Draw a group of adjacent cells, show clearly the spacial and structural relationships of cell walls, cytoplasm, nucleus, vacuoles (if visible), etc. Label appropriately. Note the occurrence of prismatic crystals in some cells.

2. PLASTIDS:

C. *Elodea* leaf- fresh material - mount a whole leaf on a slide in a drop of water and cover with a coverslip. Observe the chloroplasts in these cells. Draw and label a group of cells that illustrate the spacial and structural relationships of cell walls, cytoplasm, chloroplasts and nucleus (if visible).

D. *Capsicum* (red pepper) or *Lycopersicon* (tomato) - fresh fruit - spread a small portion of fresh fruit (pulp) or make a thin slice of pigmented tissue and place on a slide. Squash gently under coverslip. Draw a population (about five) of chromoplasts. Is there any difference in morphology or size of these plastids? What color are they? Why?

E. *Daucus* (carrot) taproot - fresh material - prepare a thin section of a carrot. Observe and draw a population of chromoplasts. Any variations within the population?

F. Avocado fruit - fresh material - prepare a hand section of the soft tissue of avocado fruit. Observe and draw the abundant elaioplasts (oil droplets) in these cells. Stain for a few minutes with Sudan IV and observe again.

G. *Phaseolus* (bean) seed (cotyledon) - fresh material - place a thin section of material on half of a slide and several drops of cell sap on the other. Draw a population of starch grains (amyloplasts). Label the concentric rings and hilum (if visible). Stain with iodine (I₂KI) and observe the positive stain.

H. *Musa* (bananas) fruit - fresh material - proceed as in F. Compare these starch grains with those of Phaseolus and draw a group of them.

I. *Solanum* (potato) tuber - fresh material - prepare a thin section that includes the epidermis. Express several drops of cell sap on a separate portion of the slide. Draw starch grains as in G and H. In the parenchyma cells just below the epidermis (corky layers), you may find small prismatic crystals. These are crystalline protein bodies called crystalloids. After having observed starch grains from three species (one monocot, two dicots) could you distinguish unlabelled specimens of these species on the basis of their starch grains? What features of the grains would you use to tell them apart?

ERGASTIC SUBSTANCES:**3. CRYSTALS:**

J. *Pelargonium* (geranium) stem - xs - prepared slide - locate and draw a few cells with their included druse crystals. Do the crystals seem to be concentrated in any one region of this stem?

K. *Zebrina* (wandering Jew) leaf or *Dieffenbachia*- fresh material - excise a small portion of the leaf, mount on a slide, and press the coverslip gently. Observe the edges of the specimen. You will see an abundance of delicate, colorless, needle-shaped crystals that have been released from the ruptured cells. These crystals are called raphides. Draw a group of crystals. Why is *Dieffenbachia* called "dumb cane?"

L. *Yucca* leaf - xs - prepared slide - locate, observe and draw raphides in the larger central cells of the leaf mesophyll tissue.

M. *Ficus* leaf - fresh leaves - make a thin section (transection) of the fig leaf. Observe the large crystals of calcium carbonate (cystoliths) in enlarged specialized cells (lithocysts).

4. TANNINS:

N. *Ficus* (fig) leaf - xs - prepared slide - locate and observe the dark-staining cells in the ground tissue of this leaf. These cells are filled with tannin, a phenol derivative. Also note the large lithocysts which in these sections are lacking their corresponding cystolith.

O. Observe electron micrographs of cells filled with tannin.

5. OTHER ERGASTIC SUBSTANCES

P. *Gynura* (velvet leaf) trichomes (hairs) - fresh material. Strip away a small portion of leaf or stem epidermis with purple hairs and make a wet mount. Note that the pigment is diffused throughout the vacuole and not contained within a plastid as in carrot or tomato. This pigment is an anthocyanin, is water soluble and is referred to as a vacuolar pigment. Also note the presence of chloroplasts whose color is masked by the vacuolar pigments. Draw a trichome indicating the diffuse color and include chloroplasts.

Q. *Zingiber* (ginger) rhizome - fresh material. Place a thin section of tissue on one side of a slide and express cell sap on the other side. Note the golden droplets of ginger oil. Unlike some storage lipids, ginger oil is not formed in elaioplasts, but it is synthesized directly in the cytoplasm.