# Introduction to Flowering Plant Tissues

This laboratory is designed to introduce you to the tissues found in flowering plants. You will have the opportunity to observe many of the tissues and organs of flowering plants and relate these structures to how plants function. As you do this laboratory think about the ways plants deal with the problems of being alive, such as support, nutrition and internal transport. We will look closely at these structures in the next few weeks.

Before looking at the details of the leaves, stems and roots of plants, it is helpful to identify the tissue types which are found in plants. All plant organs contain the same kinds of tissues, which arise from the three primary meristems of the embryo: the **surface tissue system**; the **ground tissue system**; and the **vascular tissue system**. Identifying the specific tissues in this exercise will be most beneficial when you observe the tissue systems and their arrangements in the different plant organs when we study roots, stems and leaves more closely in the coming weeks.

## A. Surface Tissues

### Epidermis

Obtain a prepared slide of alfalfa stem (*Medicago,* xs) or sunflower stem (*Helianthus,* xs). Examine the outer layer of cells, the **epidermis**. Note the thin layer of cutin, or cuticle, which forms the protective layer on the outer surface. You may find some guard cells, which form stomates for gas exchange.

## B. Ground Tissues

There are three different types of ground tissue in plants: **Parenchyma**, **Collenchyma**, and **Sclerenchyma**. They can be differentiated visually by their wall thicknesses, and often by their locations in the plant organs.

### 1. Parenchyma

Parenchyma cells are the general purpose cells of plants. They are uniformly thin-walled cells found in many parts of plants. The photosynthetic cells of the leaf are parenchyma cells, as are the starch storage cells of potato and most fruits. The pith region and the cortex of primary stems and roots consists of parenchyma cells. Look at cells of the pith region (the central area) in your prepared slide of alfalfa or sunflower stem to observe the general nature of a parenchyma cell.

### 2. Collenchyma

Collenchyma tissue provides the principal structural support for the primary (herbaceous) plant body. Collenchyma can be found in the "ribs" of the alfalfa stem cross sections. Find one of the "ribs" of the stem and note the cells with the unevenly thickened walls; these are collenchyma cells.

Living collenchyma cells are very different in appearance from those in prepared slides. Make a wet mount of a **very thin** cross section of a piece of celery and find the collenchyma cells in the ribs. Note the shiny appearance of the collenchyma cell walls.

### 3. Sclerenchyma

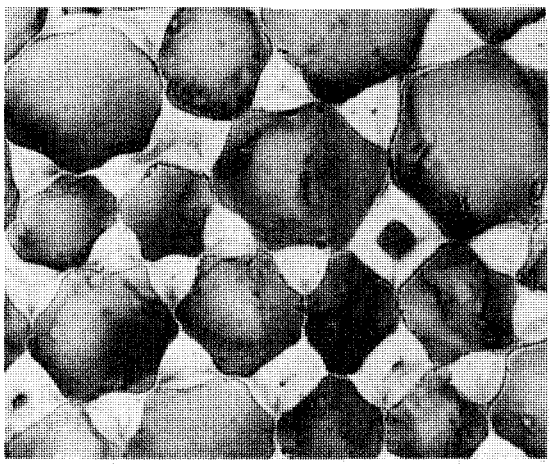
There are two different types of sclerenchyma cells, a tissue which provides strength and support for plants. Woody plants have lots of sclerenchyma tissue.

### Sclereids

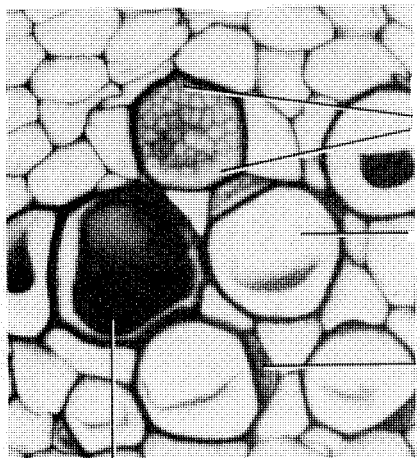
The gritty texture of pears results from clusters of sclerids, which are relatively short, often isodiametric sclerenchyma cells. Make a wet mount of a small amount of pear tissue. Look for clusters of sclereids using low power. When a cluster is found, switch to high power to observe the sclerids in detail. All sclerenchyma cells have thick secondary walls for strength.

### Fibers

The second type of sclerenchyma cell is the fiber. Fibers are elongated cells used for support. The narrow diameter and thick secondary walls of the cells make fibers conspicuous. Fibers are common in veins of leaves, and throughout the xylem tissue of stems.



Collenchyma cells



Phloem cells with Sieve Plate

## C. Vascular Tissues

There are two types of vascular tissue: **xylem**, which conducts water throughout the plant, and **phloem**, which conducts solutes. Vascular tissue is called a complex tissue because it consists of a variety of cell types unique to xylem and phloem, as well as parenchyma and sclerenchyma. The veins of leaves are vascular tissue. In stems, vascular tissue is often found in discreet bundles.

Obtain a cross section (xs) of *Cucurbita* stem. Note that the vascular bundles are in a ring. The vascular bundles in the *Cucurbita* stem are atypical because phloem is located on both sides (inner and outer) of each vascular bundle. The majority of plants have phloem only on the outer region of the vascular bundle.

### 1. Phloem

Locate a section of phloem in your cross section. Phloem consists of three cell types: **sieve-tubes**, **companion cells**, and **phloem parenchyma cells**. The sieve-tube cells are relatively large cells and will be either clear in appearance or will contain a dark substance, which is known as slime (although some biologists call it p-protein). A sieve tube cell can be identified by finding its perforated cross wall, called the **sieve plate**. Companion cells are small with dense cytoplasm and hard to distinguish. The thin-walled phloem parenchyma cells are intermediate in size, and look like thin-walled cells.

## 2. Xylem

The xylem in *Cucurbita* consists of **vessels** and parenchyma cells. Examine the xylem region of a vascular bundle and note the distribution and diameter of the vessels.

Now examine the xylem in a longitudinal section (ls) of *Cucurbita.* stem. Look for rings or spiral thickenings on the vessel walls as well as for pitted walls. Vessels and fibers provide the structural support for the stem.