

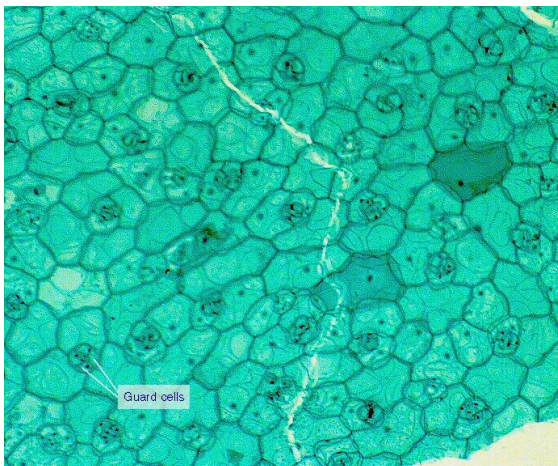
Plant Anatomy Lab 3 - Tissues

In this exercise, you will be able to observe examples of three main tissue types common to most plants. We will revisit some of these same plant organs in future labs which will focus more on the organ and how its tissues are arranged. For now, focus more on the kinds of cells that make up these tissues.

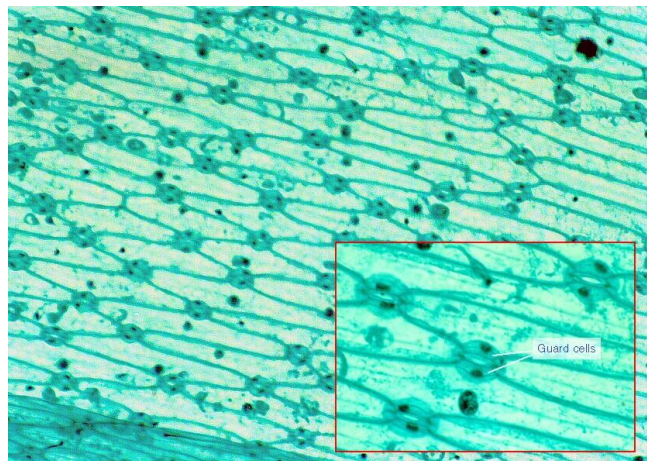
Epidermis

You should examine the epidermal tissues for leaves from each of the following plants. Pay attention to:

- Cell shapes
- Arrangement of stomata, shapes of guard cells
- Any other epidermal cells like trichomes or glands



Typical dicot epidermis



Typical monocot epidermis

Dicot epidermis

Select a spinach leaf from the front of the lab. Peel off the abaxial epidermis (typically, the lower epidermis) and mount a small piece in water on a microscope slide.

- Observe the shapes of epidermal cells
- Note how tightly they are connected (Why would this be important?)
- Find the stomata and look at the guard cells under 400x. Do they contain chloroplasts? Generally, epidermal cells do not have chloroplasts.

Monocot epidermis

Select a leaf of the grass plant from the front of the lab. Try to obtain a peeled section of epidermis and observe the shapes of epidermal cells along with the arrangement and shapes of guard cells.

Onion bulb epidermis

Onion bulbs contain a series of modified leaves compressed together. If you separate the sections of the bulb of this purple onion, you will find a thin epidermis that is purple colored. Carefully extract this layer and mount a piece on a microscope slide. If you are not careful in peeling off the epidermis, the cells will be damaged and the purple pigment will leak out of the broken cells.

Does this epidermis have stomata? Why or why not?

Pine needle epidermis

Selected a single pine needle from the shoot in front of the lab. Make a cross-section. We will be looking at the organization of leaf tissues later, for now just located the epidermis.

Notice that the epidermis appears to have two layers - the innermost layer is sometimes called a hypodermis. Notice how the guard cells are not right up on the outer surface of the epidermis, but sunken below the epidermis. This feature might reduce water loss. You should also be able to see the thick, waxy cuticle layer on the surface of the epidermis.

Xylem

Tissue location: *Helianthus* & *Sambucus*

Obtain a prepared slide from a *Sambucus* stem. Locate the xylem tissues and identify the vessels and the xylem parenchyma.

Similarly, obtain a prepared slide from a *Helianthus* stem. Locate the xylem tissues and identify the vessels and the xylem parenchyma.

Secondary wall thickenings

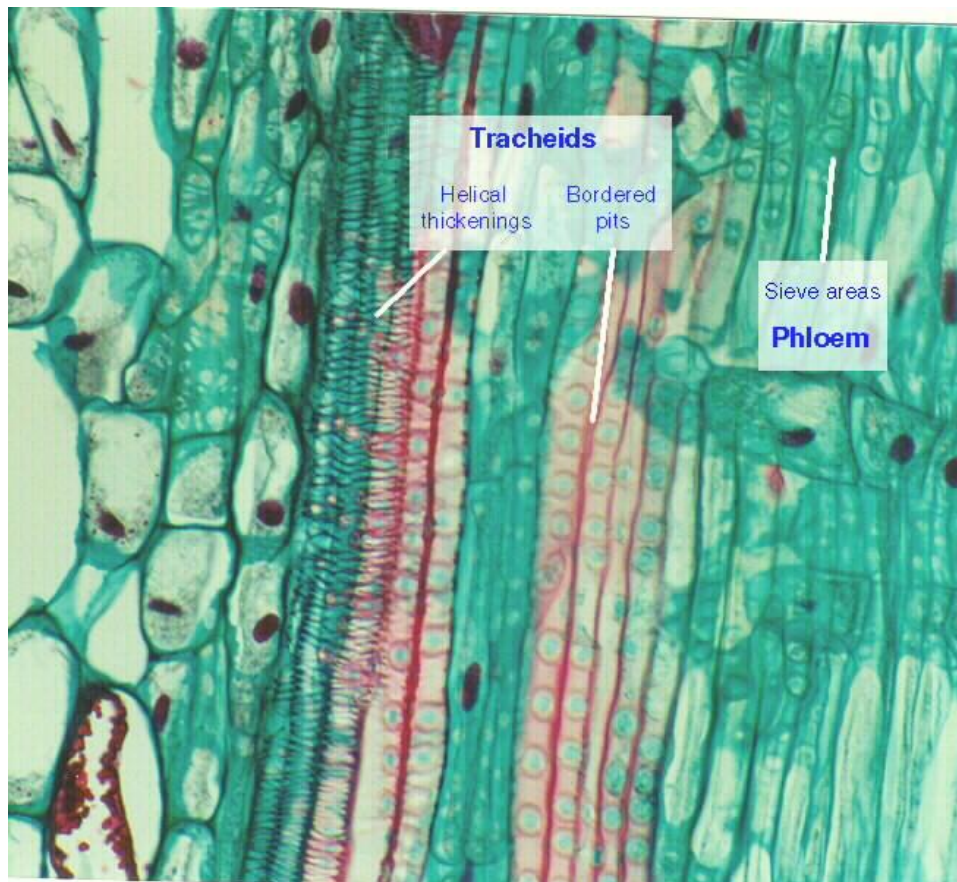
Obtain a short piece of the celery stalk (this is actually a leaf petiole, part of the leaf). Strip a section of one of the vascular bundles (sometimes termed “fibers”) from the petiole. Use two microscope slides to “squash” the bundle and separate the cells enough for viewing. You will probably want to stain the cells first with toluidine blue. Observe the tissues for the various types of secondary wall thickenings, like:

- Annular
- Helical
- Scalariform (ladder-like) or reticulate (net-like) pits
- Circular or bordered pits.

Pine tracheids

Obtain a short section of pine stem. You want to make a longitudinal section through the stem that is parallel to the axis of the stem instead of a cross-section. After staining, look for the same types of secondary wall thickenings as noted above (see prepared slide and image below for what to look for).

Obtain a prepared slide of a pine stem and again look for the various tracheid types.



Longitudinal section through a young pine stem

Oak xylem

Obtain a prepared slide of macerated oak (*Quercus*) xylem. Locate the following xylem cell types:

- vessel elements (with simple perforation plates)
- vascular tracheids (lots of pits)
- libriform fibers (very few and tiny pits)
- xylem parenchyma (short cells containing cytoplasm)

Phloem

Pine sieve cells

Using the same prepared slide from a pine stem (longitudinal section), locate the phloem tissue and see if you can find sieve areas on some of the sieve cells. See the pine stem image above: Note the pith is on the left and the epidermis would be off to the right; so the xylem would be to the right of the pith and then the phloem would be further to the right of the xylem. Make sure all of this makes sense to you!

Helianthus phloem

Go back to one of the prepared slides of a *Helianthus* stem and locate the phloem associated with the vascular bundles. You should be able to identify:

- sieve tube members
- companion cells

If you are lucky, you may even find a sieve plate across one of the large sieve tube cells.

