Tissues and Stems and Roots LAB

In this Lab you will be
1) recognizing **primary and secondary growth** and associated tissues. You will also be differentiating between eudicots, monocots and in some cases gymnosperms.
2) You’ll be looking at **roots**, and differentiating between different **kinds of roots**, and **growth regions** of roots.

Specifically:
1. **Know the general difference in stem vascular bundle arrangement in monocots and Eudicots**
2. **How can you differentially a pine from a woody angiosperm?** Hint: look at the xylem
3. **Know the difference between primary (apical meristem) and secondary (lateral meristems) growth in plants.**
4. **Know the structure of a woody stem including the two lateral meristems, and what they do**
5. **Know how to age a piece of wood**
6. **Know root types, which are typical of monocots and of eudicots, and recognize parts of a root**
7. **Name the external features of roots.**
8. **Recognize and name the merisematic tissues in roots’ sections.**
9. **Recognize and name the mature primary tissues in the cross section of a root.**
10. **Recognize and name the secondary tissues in the cross section of a root**

Terms and Concepts

**Primary Meristematic Tissue** (new growth). Occurs at roots and shoots
- Apical meristem
- Early primary tissues:
  - Protoderm = will become dermal tissue
  - Procambium = will become vascular tissue
  - Ground meristem = will become ground tissue

**Epidermal Tissue**
- Epidermal cells
- Guard cells
- Cuticle
- Compare roots, shoots and leaves – different epidermal tissue?

**Cork (phellem)**
- What is it? From where is it derived?
Herbaceous stems (primary growth)
- Look at the slides carefully and be able to pick out the structures bolded in the lab handout (Topic 11)
- Be able to recognize monocots and eudicots and their differences

Woody stems (secondary growth via lateral meristems)
- Be able to recognize the ‘parts’ of a woody twig
- Find these and know what they do:
  - Cork
  - Cork cambium (lateral meristem)
  - Primary and secondary phloem and phloem rays
  - Primary and secondary xylem
  - The Vascular cambium (lateral meristem)
  - Xylem rays
  - Phloem rays
  - Summer wood
  - Spring wood
- Be able to age a cross section of wood

Modified stems
- Look at modified underground and aerial stems. Be able to recognize them and their primary functions

**Roots.** Identify and distinguish the following, as well as know the function
- Root types:
  - Fibrous (monocot)
  - Taproots (eudicots)
- Radicle
- Taproot
- Branch/lateral roots
- Root cap
- Root hairs
- Zone of maturation, elongation and apical (root) meristem
- Protoderm, procambium, ground meristem
- Pericycle
- Stele
- Primary phloem, xylem
- Woody roots: phloem and xylem rays, primary and secondary xylem, secondary phloem, vascular cambium, pericycle, cork
- What is a branch root?
- Types of specialized roots

**for monocots and eudicots**
GROWTH
The bodies of plants have three kinds of organs: roots, stems, and leaves. All three are composed of the tissue types and cell types studied earlier. The stem and leaves make up the shoot system and the roots make up the root system. Some plants have only primary growth in the stems and roots and are said to be "herbaceous", others have secondary growth and are said to be "woody".

Primary growth:

Herbaceous plants have only primary growth and therefore grow only in length. Secondary growth which develops in woody plants after primary growth, includes the following:

Secondary Growth:

Woody plants have both primary and secondary growth and therefore grow both in length (primary tissues) and in diameter (secondary tissues).
Procedure: Draw and label!!

I. Meristematic Tissue. This is growth tissue: Mitosis!

1. Study the longitudinal sections of the stem tips of Coleus or Elodea and note terminal (or apical) meristematic tissue near the tip of the stem composed of small, isodiamic cells with large nuclei. The meristematic tissue is protected by young leaves which grow up around it. (Do not confuse these with the meristematic tissue.)

2. Examine the terminal meristematic tissue near the tip of a longitudinal section through an onion root. Note that this is not right at the tip but is back behind a mass of tissue called the root cap. (To be studied later). In the onion tip, not that you can see the cells in various stages of mitosis. See if you can ID some of the stages (ie. anaphase, telophase etc.)

II. Epidermal Tissue. Protective outer tissue

1. Peel a piece of the epidermis (the outer "skin") from the leaf of a succulent plant and make a wet mount for observation under the microscope. The epidermis is one cell layer thick and has two kinds of cells: the epidermal cells and the guard cells. The epidermal cells fit together in species specific patterns. They have no chloroplasts but you should see a nucleus in some cells if you manipulate the light. The guard cells come in pairs around a pore, the stoma, and they have chloroplasts and nuclei which should be visible under good light conditions. The outer surface of all these cells is very waxy; therefore you may trap bubbles of air in your wet mount, particularly in the stomata (plural of stoma) so if they look very black you probably are not seeing the stomata clearly.

2. Make a similar preparation from an onion bulb which is composed of the swollen bases of many leaves and examine the preparation under the microscope. Are the epidermal cells the same shape as the succulent cells? Are they guard cells and stomata?

3. Study a prepared slide of a cross section of a lilac leaf, observing the epidermis, both upper and lower and note the heavy, continuous waxy layer or cuticle particularly well developed on the upper epidermis. Locate a cross section through guard cells and note how they relate to the neighboring epidermal cells.

III. Herbaceous Stems – primary growth

1. Examine the external features of the shoot system of an herbaceous plant. Note that the stem is branched and that it bears leaves in arrangements that are typical of specific species (opposite, alternate, whorled). The node is the part of a stem where one or more leaves are attached. The internode is the region between two successive nodes. The
branches always originate in the axiles of the leaves (between the leaf and the stem, although that may not be obvious if the leaf has fallen.

2. Examine the slide of a longitudinal section through the growing tip of a Coleus stem. Note the apical meristem which is well protected by the overlapping young leaves which surround it. These young leaves look like flaps that grow upward from behind the tip (note nodes and internodes). Small lumps of tissue in the axils of these young leaves are branch buds (lateral buds). Below the apical meristem find the primary meristems: the protoderm (pre epidermal tissue) which is a single layer of cells on the outside of the young plant; the procambium (pre-vascular tissue) which can be seen as two slightly darker staining strands developing back from the tip; and the ground meristem (pre-ground tissue) which is all the rest of the tissue. If the section goes far enough down the stem, note the mature primary tissues: The single layer of epidermis which developed from the protoderm, the primary xylem, which often stains red and shows thickenings in the vessel elements and tracheids, the primary phloem which is just external to the primary xylem and often stains greenish and is composed of elongate living cells. The rest of the tissue is cortex (parenchyma) if it lies between the epidermis and vascular tissue, and pith (parenchyma), if it is to the inside.

3. Obtain a prepared slide of a cross section of a Buttercup stem showing mature primary tissues. The Buttercup or Ranunculus is an example of an herbaceous dicotyledon (EUDICOT) which has no secondary growth. Under the microscope note the epidermis which is covered on the outside by a layer of waxy cutin. Note any guard cells. Internal to the epidermis is the cortex composed of parenchyma tissue which has chloroplasts, particularly in the regions of the stem nearest the light. The xylem and phloem are arranged in primary vascular bundles arranged in a ring around the pith. Each vascular bundle has primary xylem on the pith side and primary phloem on the outside. Locate the seive tubes and companion cells. Note that the pith is composed of parenchyma and is continuous with the cortex by way of pith rays that run between the vascular bundles.

4. Obtain a prepared slide of a cross section through a corn stem (Zea mays). This is an example of an herbaceous monocotyledonous (MONOCOT) stem. Under the microscope note that the vascular bundles are distributed throughout the ground tissue (parenchyma), which is more difficult to divide into 'pith' and 'cortex'. Under a higher power study a single vascular bundle and note that each is surrounded by sclerenchyma tissue called the bundle sheath. Within the bundle find the primary phloem of seive tubes and companion cells and the primary xylem of large vessels which may be organized as a "mouth" and "two eyes". The bundle is often torn around the "mouth" as a result of stem elongation.

IV. Woody Stems – secondary growth

1. Select a dormant twig and note the terminal bud which is enclosed in protective bud scales which last over winter. Along the length of the twig, note the leaf scars which are
Thank you for evaluating Wondershare PDF Converter.

You can only convert 5 pages of each file with the trial version.

To get all the pages converted, you need to purchase the software from:

http://cbs.wondershare.com/go.php?pid=756&vid=2.1.0&m=db