Plant anatomy

We will not cover diversity or reproduction, since that was covered in 103.

Basic plant structure and function:

Basic plant anatomy **[OVERHEAD, fig. 31.3, p. 624]**:

Roots - usually the parts of the plant below ground. They function in:

1) anchoring the plant.
2) absorbing minerals & water from the soil.
3) storing food.

Roots also have root hairs that increase the surface area and allow water & mineral absorption.

Shoots - usually the parts of the plant above ground.

Composed of *stems*, *leaves*, and *reproductive* parts.

Also the main site of photosynthesis

Some structures associated with shoots include:

1) *nodes* - the location where leaves are attached to stem
2) *internodes* - simply, the area between nodes.
3) *Buds* - divided into:

a) *terminal buds* - at the tips of stems (where growth of stems takes place)

b) *axillary buds* - between leaves and stem; usually dormant, but can start to grow if influence of terminal bud wears off.

(The terminal bud releases a hormone that prevents the axillary buds from growing).

Roots & shoots can be highly modified by different plants **[Fig. 31.4 p. 625]**. Some examples:

Carrots & sugar beets have an enormous root that stores energy.

Strawberries have horizontal stems that run along the ground.

Potatoes have tubers, which are enlarged areas at the ends of roots where food is stored.

Leaves can be highly modified as well (see fig. 31.4C).

Wide variety of shapes.

Can be modified into different structures (e.g., tendrils, spines, etc.)

Plant tissue systems **[Fig. 31.5A, p. 627]**:

Three tissue types:

1) *Epidermis* - the outside covering of the plant, it protects the plant and acts as a barrier.

2) *Vascular tissue* - made up of xylem and phloem:

Xylem - transports water upwards

Phloem - transports nutrients and other substances throughout all parts of the plant.

Phloem is more complex than xylem since it needs to transport stuff in different directions.

4) *Ground tissue* - everything else.

Includes cells for photosynthesis, storage, support, etc.

Plant growth:

In general, plants grow throughout their lives (don't stop growing).

Plants are either annuals, biennials, or perennials:

Annuals - live one year (wheat, corn, some wildflowers)
Biennial - live two years (beets & carrots)
Perennials - live more than two years (e.g. trees, etc.)

Plants can get old. Some giant sequoias are over 3000 years old.

Some Bristlecone pines over 4000 years **[Fig., not in text]**.

Many plants do get old, but the above examples are sort of exceptional.

Meristem is made up of unspecialized cells that cause growth.

When meristem makes new branches, roots, or makes existing branches or roots longer, this is "primary growth" **[Fig. 31.7A, p. 630]**.

Apical meristem is usually found at the tips of branches & roots, or at the axillary buds.

Secondary growth - this is the widening of woody plants (e.g., how you get a trunk from a twig) **[Fig. 31.8A, p. 632]**.

Two layers of meristem (called *cambium* here):

Vascular cambium - makes secondary xylem (more xylem) on the inside, and secondary phloem on the outside.

Xylem is not just vascular tissue, it also provides a lot of support.

This secondary xylem is composed of fibers, tracheids & vessels (cells with lots of structural support), and is quite strong (woody).

Over the years, it's the secondary xylem that makes the *wood* in a tree.

In contrast, the secondary phloem never gets much thicker

It stays on the outside, and excess cells are lost.

Cork cambium - makes cork.

Cork is a thick outside layer that protects the tree (*bark* is the outer part of the cork).

As the tree grows, older cork is sloughed off and lost.

Tree trunks **[Fig. 31.8B, p. 633]**

Dark center is the *heartwood*. This is composed of non functioning xylem.

This is often filled with nasty chemicals to prevent rotting.

Lighter circular area is the *sapwood*. This is made up of functioning xylem

Then, surrounding this are the layers discussed above:

Vascular cambium

Bark (secondary phloem, cork cambium, cork)

Secondary xylem cells are much larger in the spring;

This gives trees in temperate climates rings (the cells put down during the rest of the year are much smaller).

Also works in tropical areas with rainy seasons.

Some concluding comments:

Plants are incredibly important for many different reasons:

They feed the world (not just humans)

They provide oxygen

They provide other important things like clothes, shelter, medicines, and other things.

Note that our agriculture (for food) is based almost entirely on Angiosperms (= flowering plants).

(All grasses, fruit trees, “vegetables”, etc. are angiosperms.)

We'll get back to some of these ideas when we do Conservation Biology.