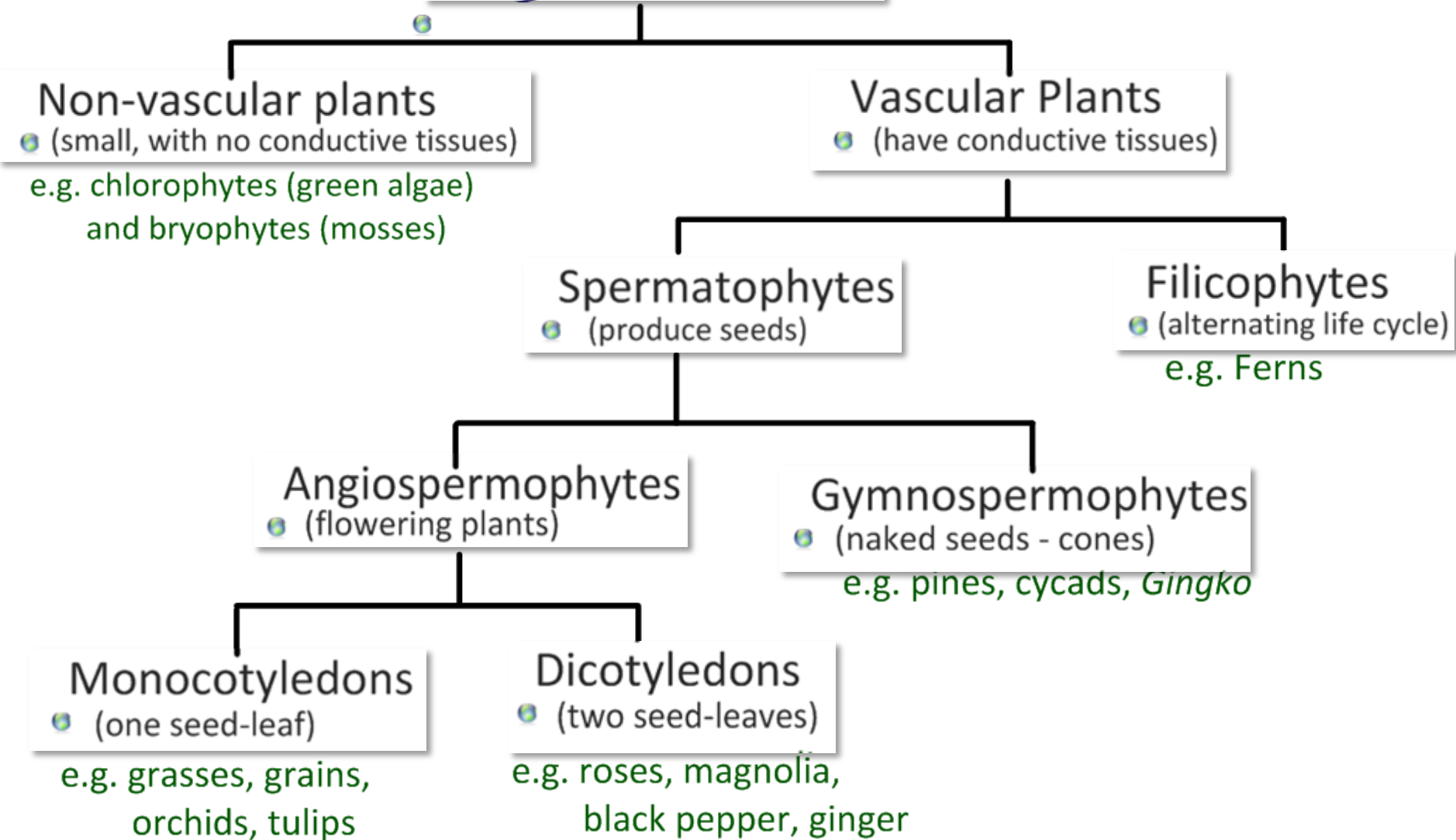


Plant Structure & Growth

Stephen Taylor

Bandung International School

Kingdom Plantae



This phylogeny is very simplified

Monocots

vs

Dicots



<http://www.dkimages.com/discover/Home/Plants/Anatomy-and-Reproduction/Angiosperms/Index.html>

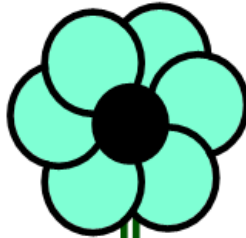


Monocots

vs

Dicots

Floral organs in multiples of 3



Floral organs in multiples of 4 or 5



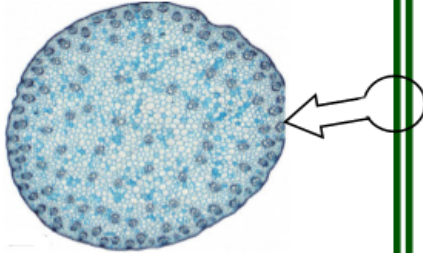
Parallel veins in leaves



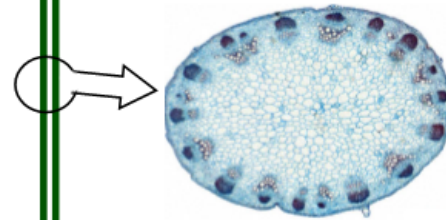
Branched veins in leaves



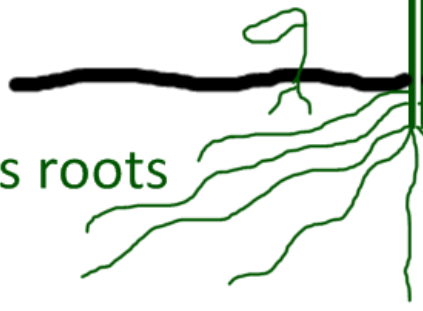
Random distribution of vascular tissues in the stem.



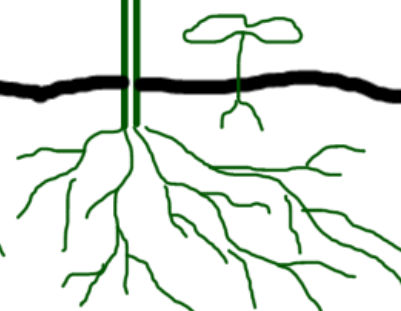
Vascular bundles arranged in rings in the stem.



One cotyledon (first leaf) after germination.



Two cotyledons after germination.

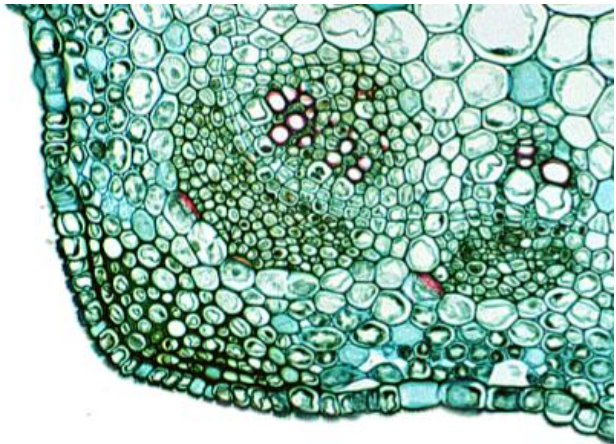


Adventitious roots

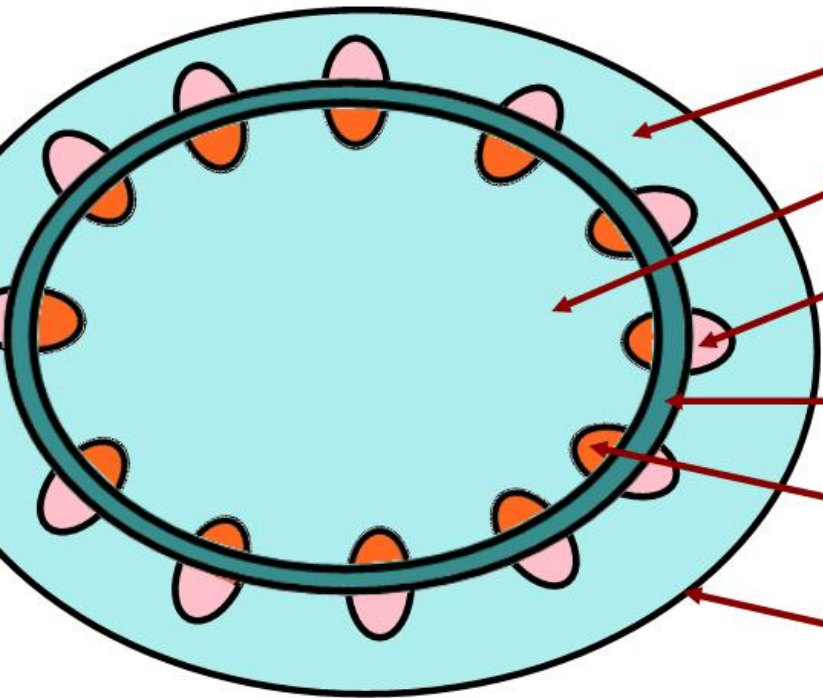
Branching roots

Tissue Plan Diagram: Dicotyledon Stem

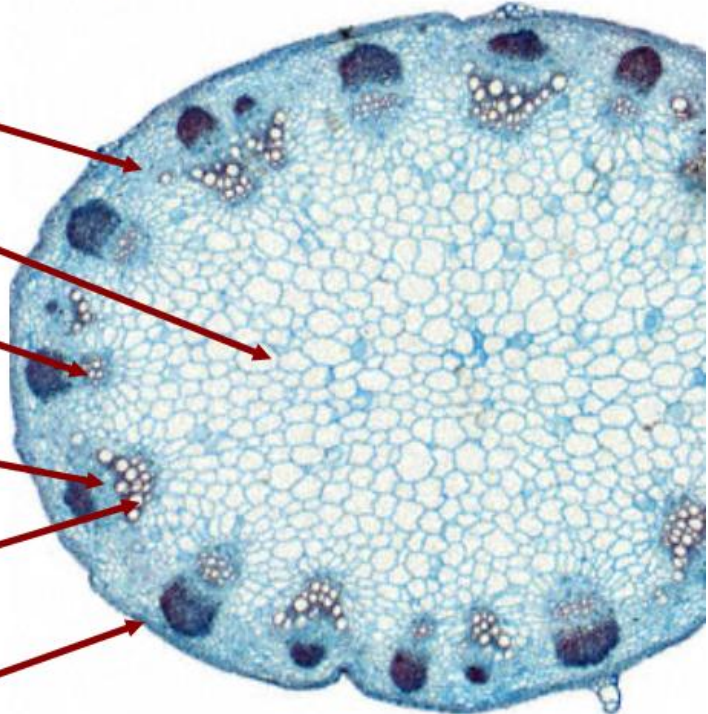
A tissue plan diagram is simply a map of where the different types of tissue can be found. You don't need to draw each cell!



http://www.uri.edu/cels/bio/plant_anatomy/33.html

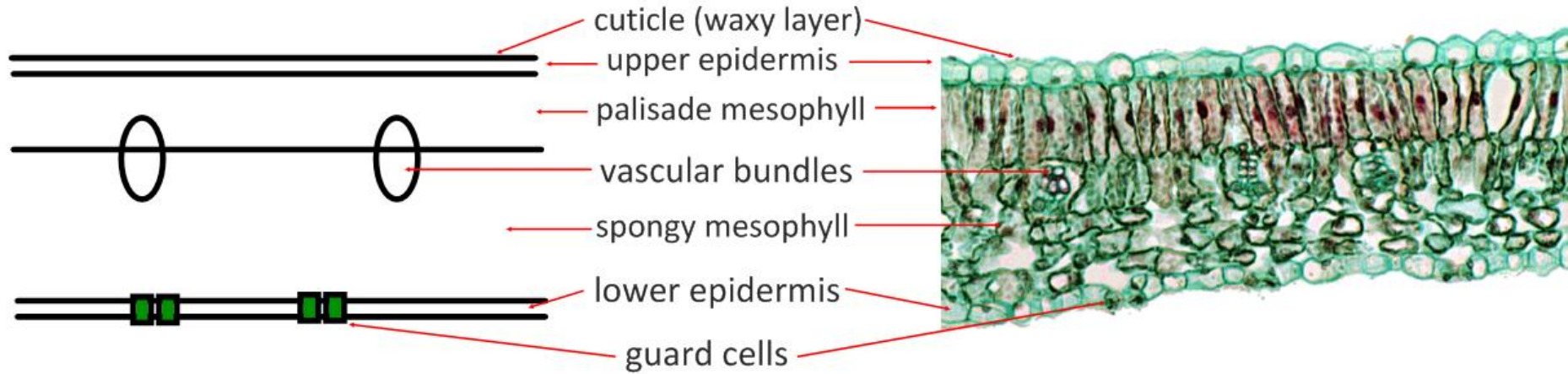


- cortex
- pith
- phloem
- cambium
- xylem
- epidermis



http://biology.unm.edu/ccouncil/Biology_203/Summaries/FloweringPlants.htm

Tissue Plan Diagram: Dicotyledon Leaf



cuticle (waxy layer)
upper epidermis

prevents water loss

palisade mesophyll

cells contain lots of chloroplasts: absorption of light for photosynthesis

vascular bundles

transport water to the leaf (xylem) and starch away (phloem)

spongy mesophyll

loosely packed, surfaces for gas exchange

lower epidermis
guard cells

guard cells open and close, controlling water loss by transpiration and allowing for gas exchange

Modified Roots, Stems and Leaves*

The basic purposes of **roots**, **stems** and **leaves** are well known: **anchorage and water uptake**; **support and transport**; and **gas exchange and photosynthesis**, respectively. Some plant adaptations make use of these structures in interesting ways.



Tendrils grow outward from leaves and spiral around until they make contact with a solid surface. They then attach themselves and the plant uses the solid surface to climb upwards, like this *Bignonia* plant.

If plants were to hunt humans, this is how they'd catch us!

Bignonia tendril

<http://www.hiltonpond.org/images/CrossvineTendril02.jpg>

Bulbs are collections of thick leaf bases that store food. They don't look like leaves because we cannot see the stem clearly - it is so short!



fleshy leaves

stem

Onion bulb

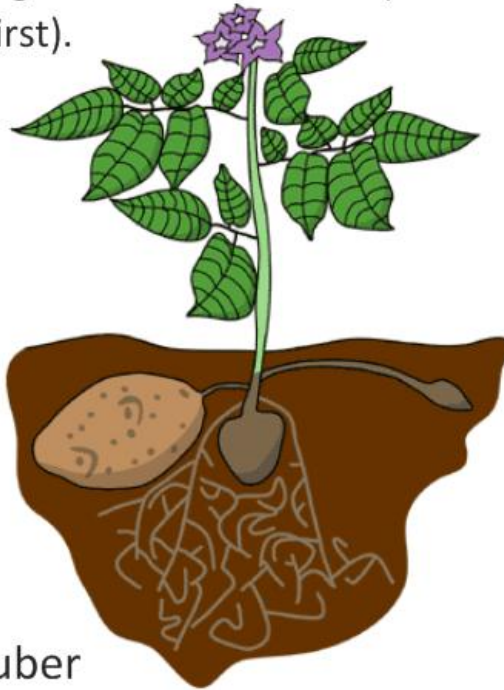
*nothing to do with the panda joke

<http://www.dkimages.com/discover/Home/Plants/index.html>

Modified Roots, Stems and Leaves: Tubers

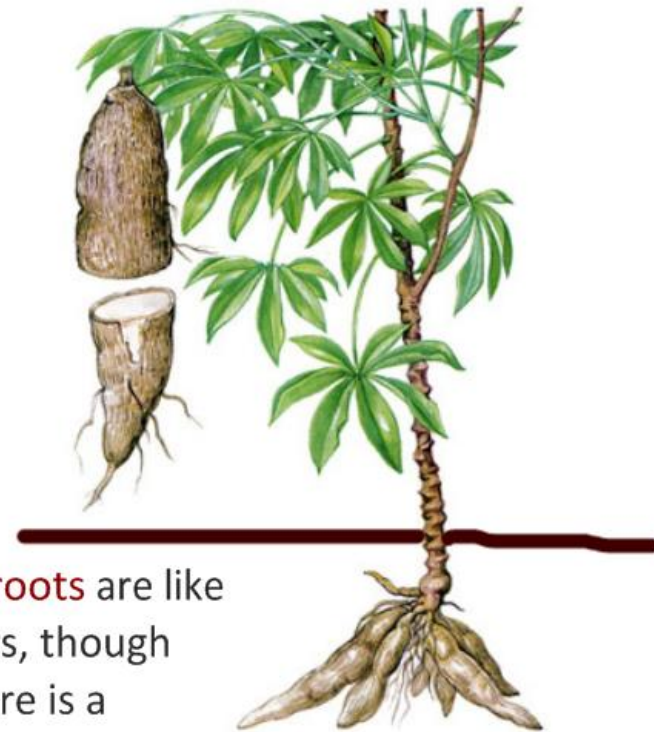
Tubers are enlarged sections of the roots or stems that store large amounts of nutrients.

Stem tubers, like potatoes, are swollen offshoots from the stem that allow the plant to grow every year - it becomes perennial. The plant dies in the winter but the following spring a new set of stems and roots grow from the tuber (if we don't dig it up and eat it first).



potato tuber

<http://www.bbc.co.uk/schools/gcsebitesize/img/bipotato.gif>



Tuberous roots are like stem tubers, though the structure is a swollen root rather than a stem.

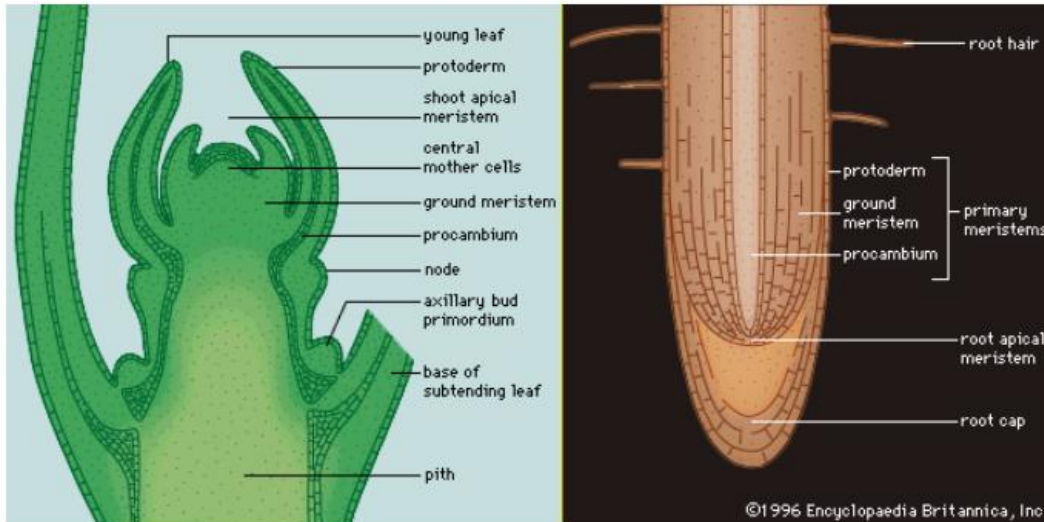
cassava tuber

http://i76.photobucket.com/albums/j14/biopact/biopact_cassava_biofuels.jpg

Plant Growth: Meristems

Plants only grow at the **meristems**: regions of undifferentiated cells - like *stem cells* in animals.

These can be **apical** (at the **root or stem tip**), or **lateral** (thickening layers of cambium).

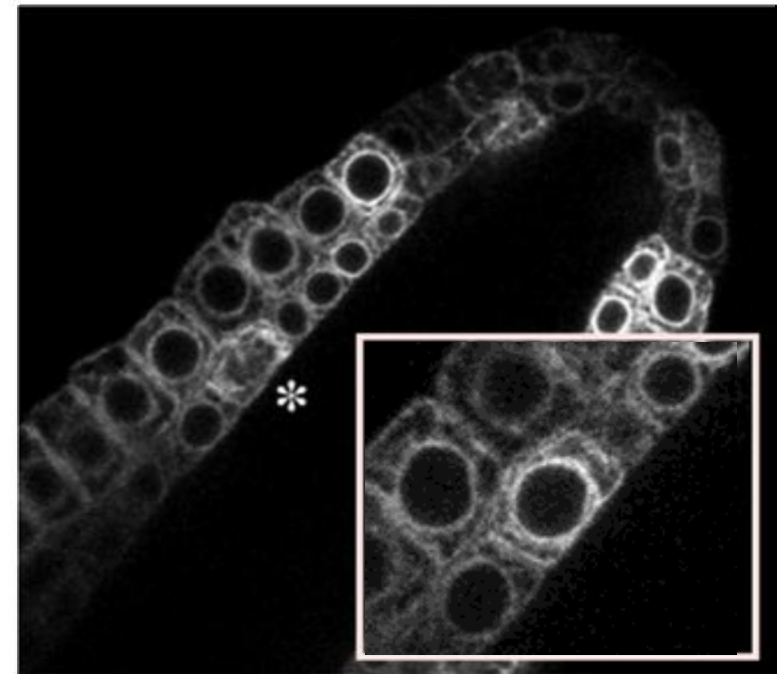


<http://media-2.web.britannica.com/eb-media/99/5599-004-D6C19960.gif>

Try out this plant anatomy lab activity:



http://www.uri.edu/cels/bio/plant_anatomy/images.html#lab_4



<http://www.plantsci.cam.ac.uk/Haseloff/imaging/confocal/division.html>

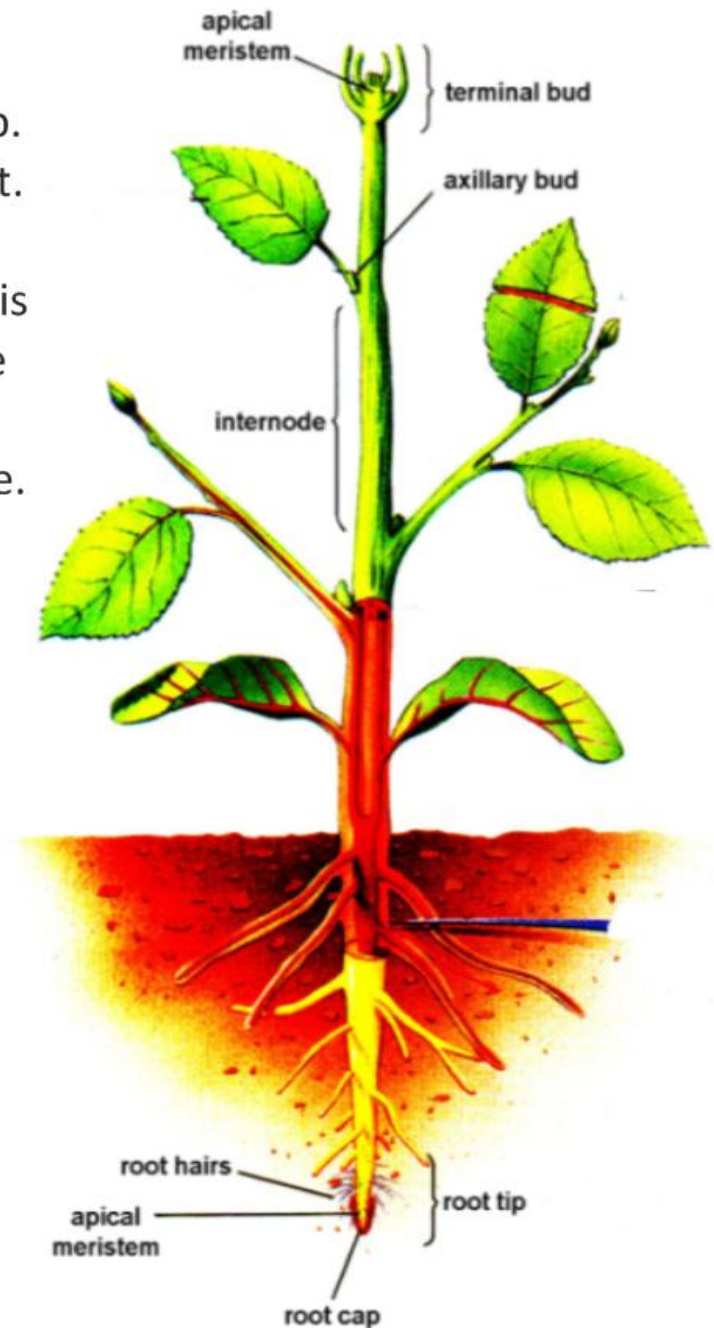


http://www.sli.unimelb.edu.au/envis/Ervin_book/html/animations/plant-growth.htm

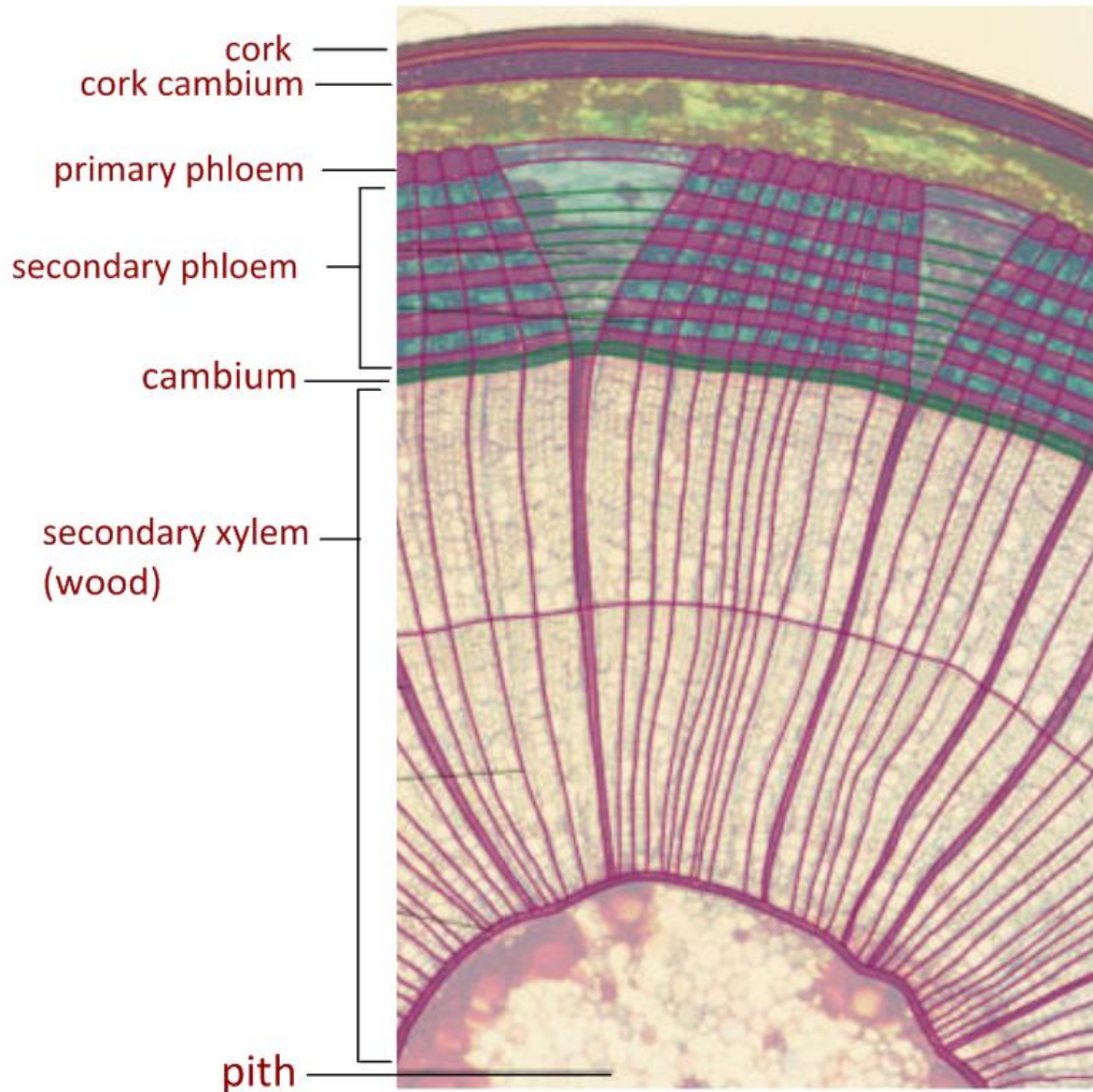
Plant Growth: Apical Meristems

Found at the terminal bud of the stem and the root tip.
Indiscriminate growth: adding length/ size to the plant.

At each section of growth (internode), an axillary bud is left behind. This is inactive meristem tissue - when the plant flowers or produces a new shoot, the hormonal inhibitor is removed and the meristem becomes active.



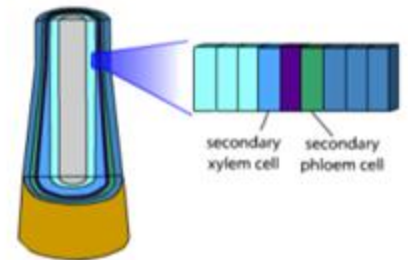
Plant Growth: Lateral Meristems



As plants grow taller, they need to support the extra mass. Lateral meristem growth results in extra (secondary) xylem growth in a ring inside the cambium. Secondary phloem also grows. These are the tree rings we observe in a cut log. Tree bark is also the result of lateral meristem growth: cork cambium produces cork - which we know as bark.

annual growth ring

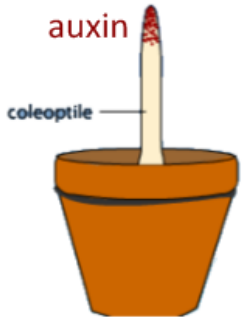
Animation: Secondary Growth



Tropisms: plant responses to directional external stimuli.

Plant responses to stimuli can be either positive (towards stimulus) or negative (away from stimulus). **Phototropism** is an example of a **positive tropism** - the plant will grow towards the light.

Plant growth is regulated by hormones called auxins.



Auxins promote growth by lengthening cells.

Auxins are produced in the **coleoptile**, a protective sheath around the emerging root or shoot.

Under normal conditions, auxin is distributed evenly along the shoot, causing even (vertical) growth.

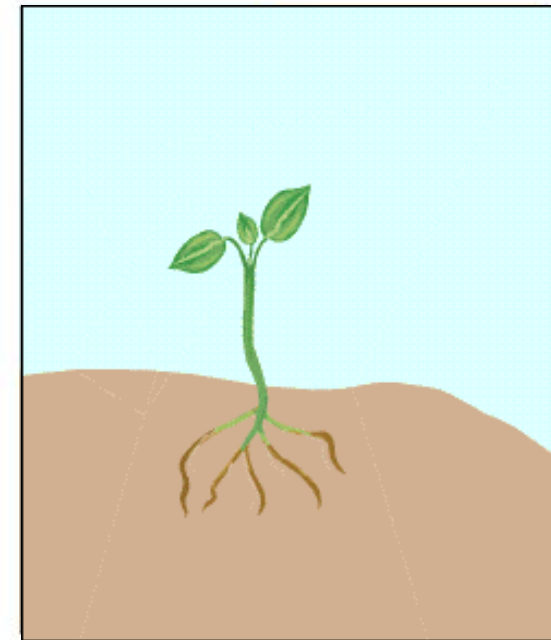


If **photoreceptors** in the coleoptile detect a light stimulus from one direction, auxin is moved to the opposite side of the growing shoot.



The uneven distribution of auxin causes increased growth on one side - and the plant grows towards the direction of the light.

<http://bcs.whfreeman.com/thelifewire/content/chp38/3802001.html>



Phototropism

<http://leavingbio.net/Plant%20Responses.htm>

This young shoot is growing in a different environment.

It is on a windowsill with most light coming from the right.

How is its growth affected by the environment?

How does this response help the plant?



Play

Back

Next

<http://www.kscience.co.uk/animations/auxin.htm>



copyright 2009 andypanda.co.uk

For more IB Biology resources:

<http://sciencevideos.wordpress.com>

Panda joke:

<http://www.funnyandjokes.com/eats-shots-and-leaves.html>