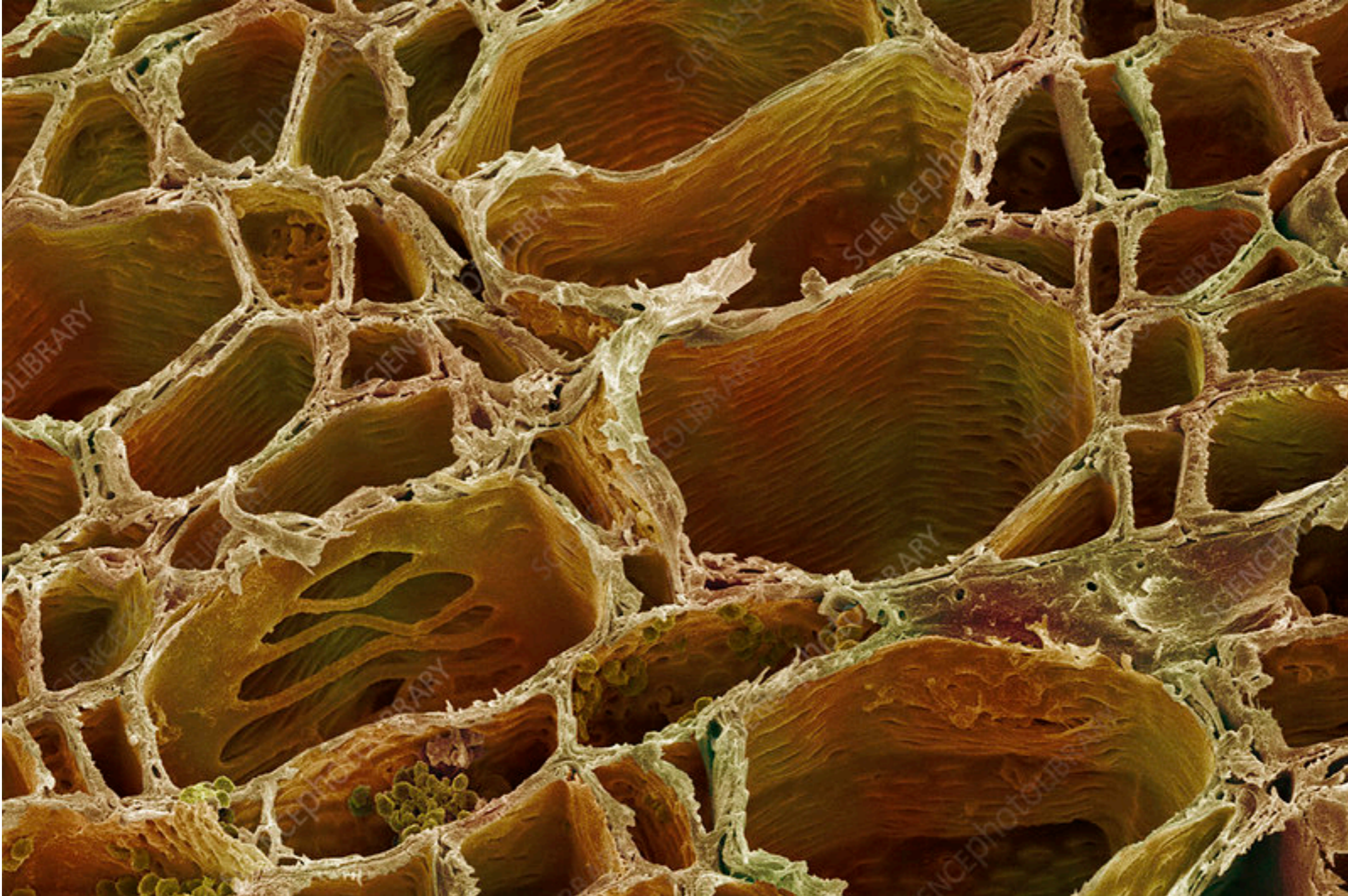
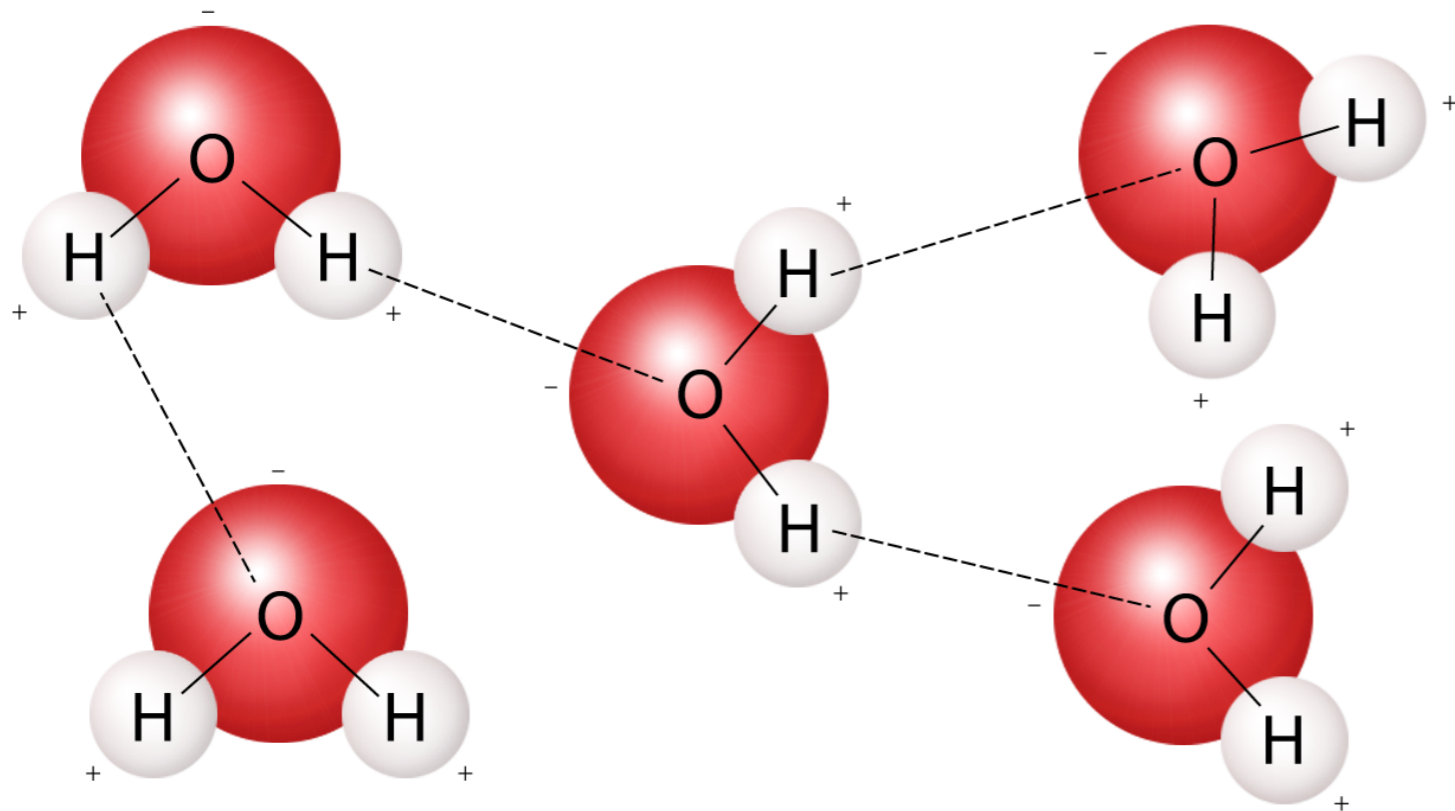
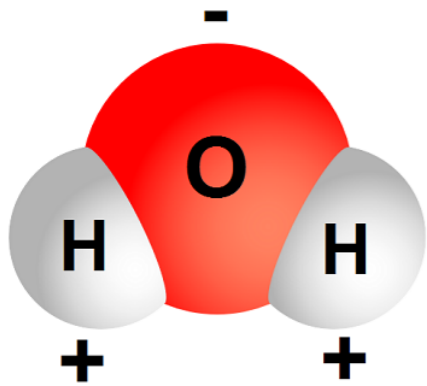


Plants 9.1

Transport in plants



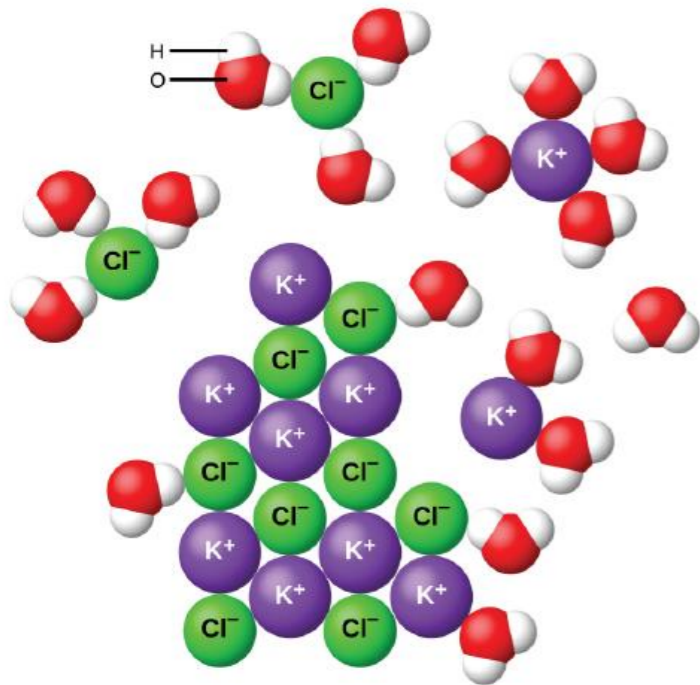
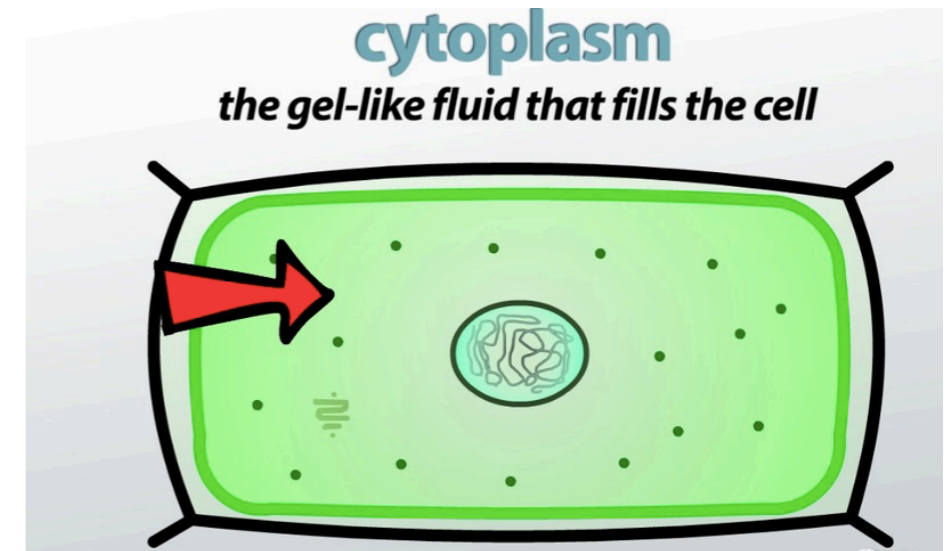
Properties of Water



- is formed by covalent bond between O and H
- covalent sharing is unequal (oxygen is stronger) creating + pole and - pole
- the poles results in hydrogen bonds (attraction of O⁻ and H⁺ between water molecules)
- a weaker intermolecular bond than ionic bonds but still significant in larger numbers

Properties of Water

- **Solvent properties-** many polar molecules are dissolved by water
 - water clumps and shells around polar substance (weaken polar bonds)
 - cytoplasm of plant cells consists of mostly water with dissolved polar substances

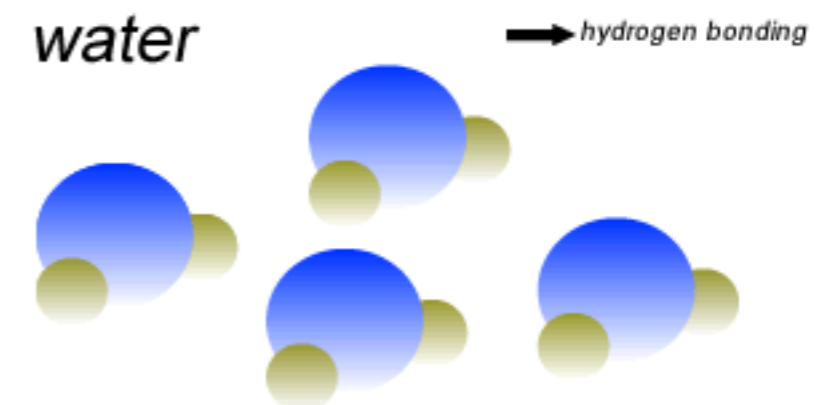
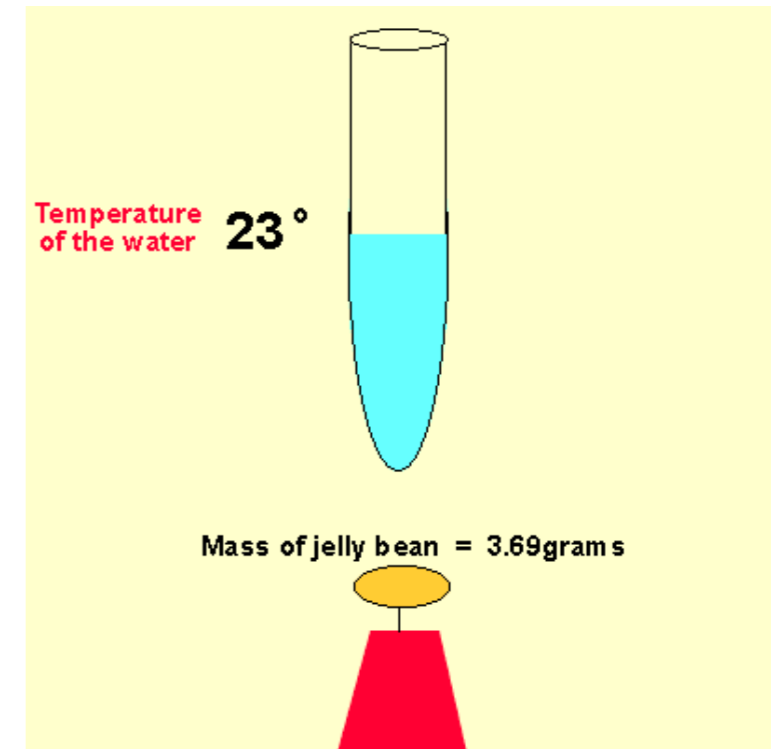


Na⁺ Cl⁻ C₆H₁₂O₆
K⁺ NO₃⁻
H⁺ HCO₃⁻
proteins
PO₄³⁻



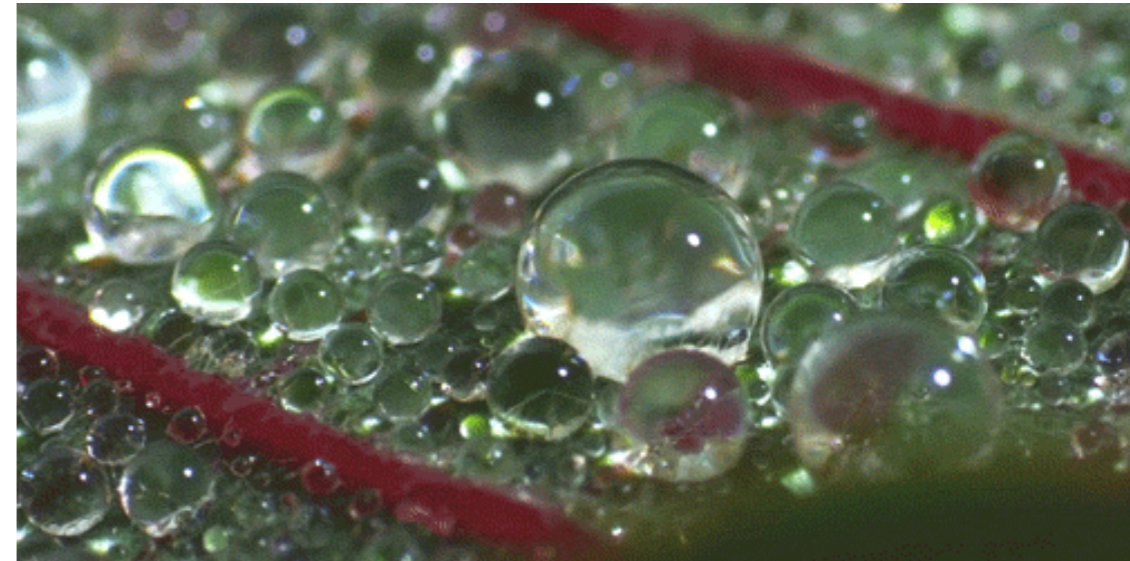
Properties of Water

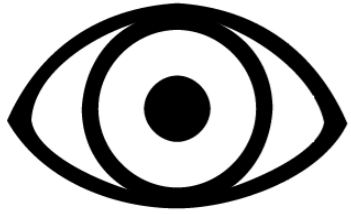
- **Thermal properties**
 - **High specific heat capacity**
 - hydrogen bonds restrict water motion... higher energy is needed to raise water temperature
 - this allows it to regulate temperature changes
 - **High latent heat of vaporization**
 - to evaporate, heat must be added to vaporize
 - causes a cooling effect on the surface
 - eg. transpiration in plants, sweating in animals



Properties of Water

- **cohesive property** - ability to stick together
- useful for water transport in plants,
 - water sucked through vessels at low pressure
 - molecules stick together with suction forces
 - water can be pulled up through the tallest trees



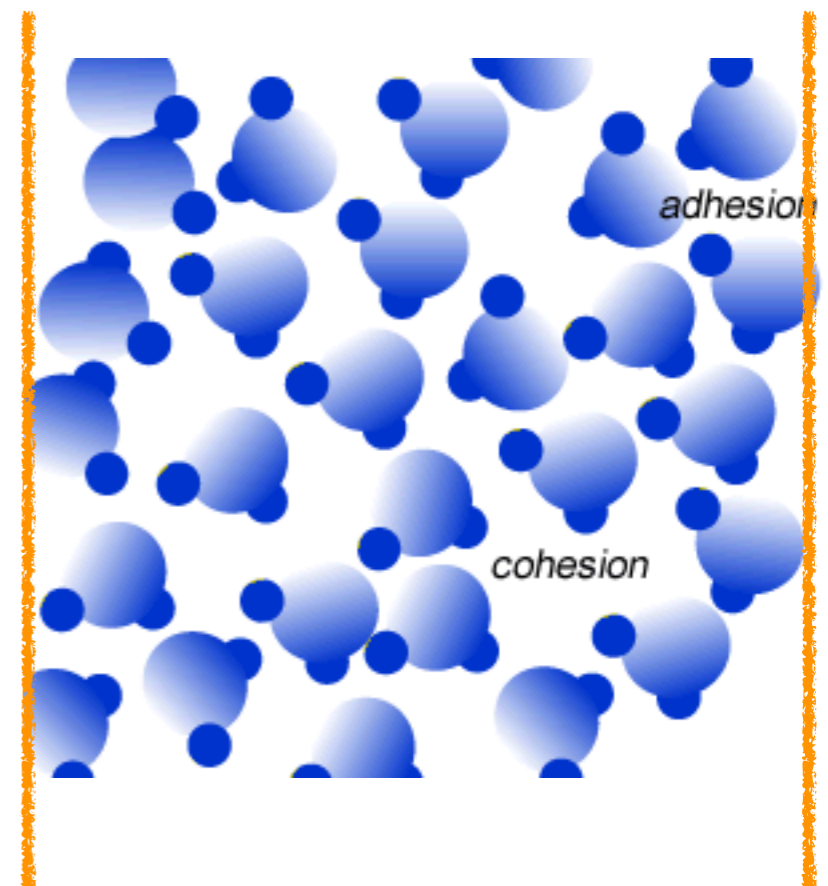
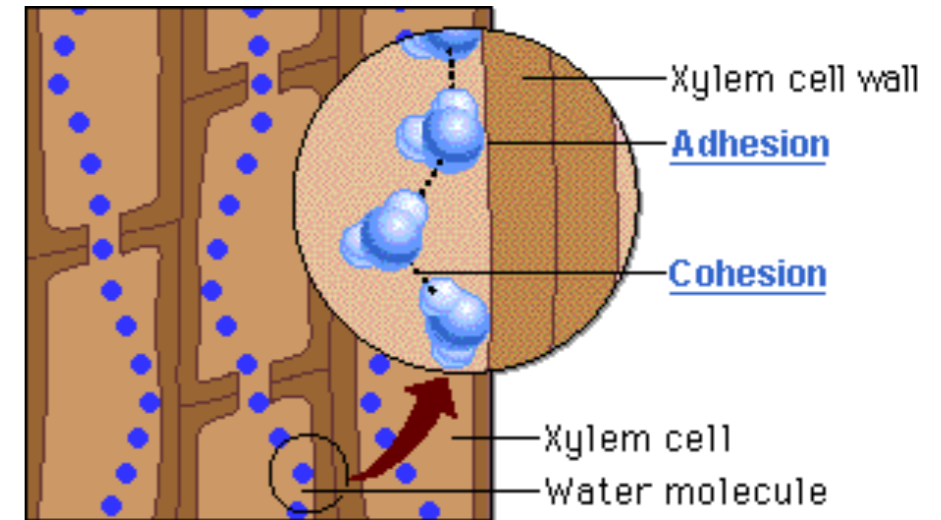


- Share two facts you learned from the video



Properties of Water

- **Adhesive property** - ability to stick to other polar molecules
- used in leaves - water adheres to cellulose that make up plant cell walls
 - if water evaporates from cell walls of leaves, adhesion cause water to be drawn from vessels called **xylem**
 - keeps walls moist so they can absorb CO₂



Transpiration

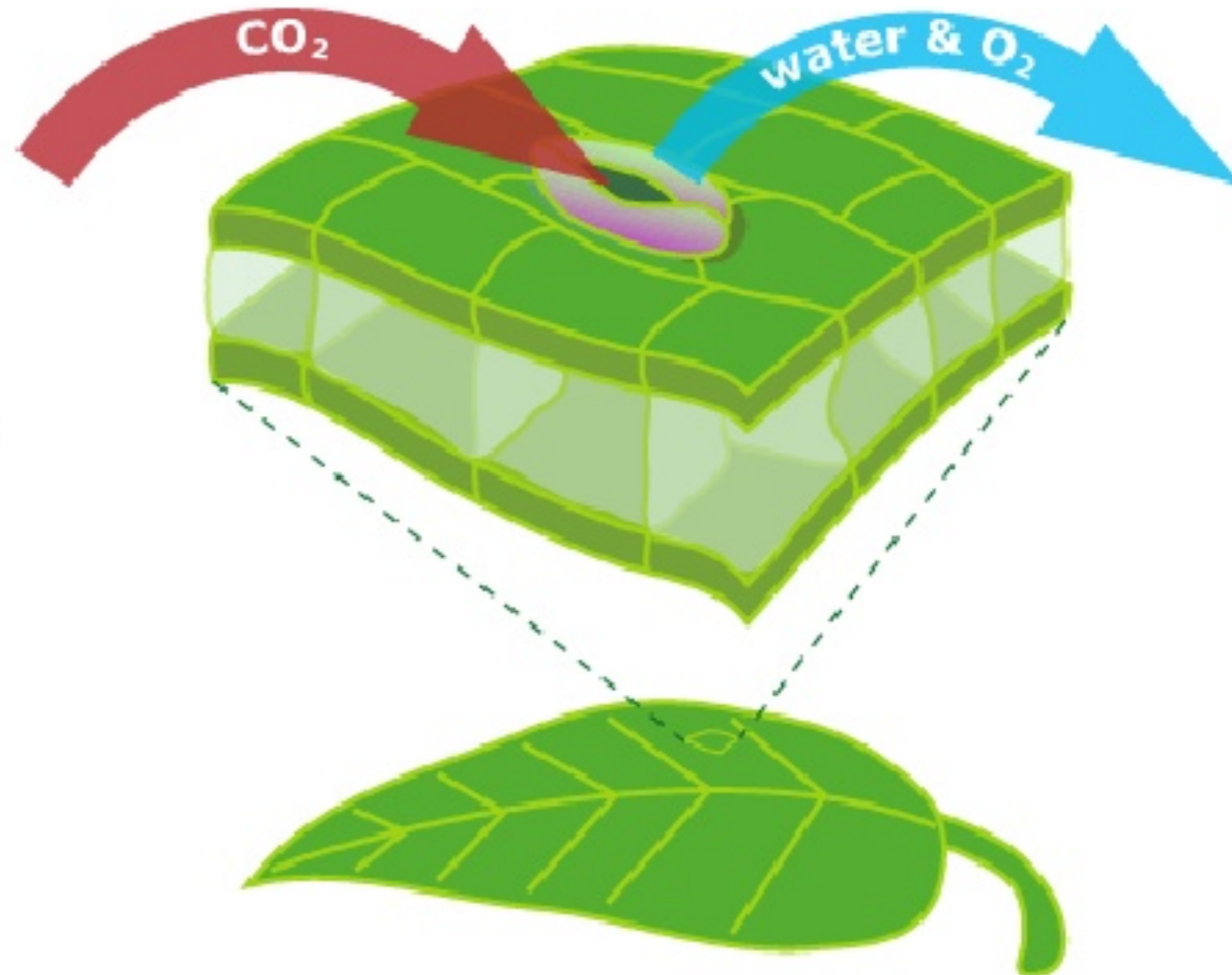
PLANTS: Gas exchange in leaves

Carbon dioxide enters, while water and oxygen exit, through a leaf's stomata.

LEAVES can perform gas exchange

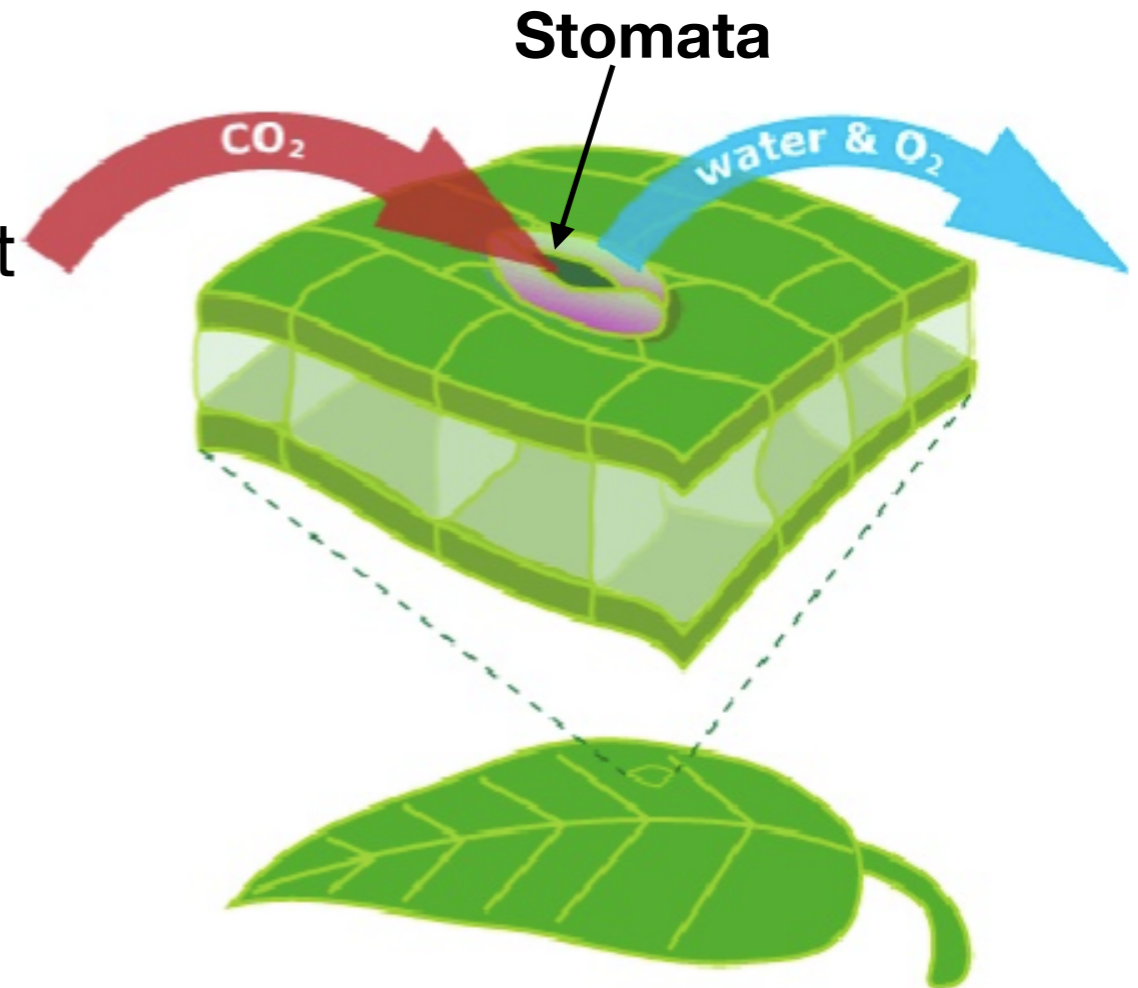
-Using air holes called **stomata** (singular = **stoma**)

-A pair of guard cells open and close the stoma



Transpiration

- Photosynthesis involves gas exchange along with the use of water and sunlight
- CO₂ is taken in as a raw material/O₂ is a waste gas
- CO₂ intake is essential and occurs through pores called stomata
- Stomata limit water loss (transpiration) by guard cells (pairs) that open and closes during gas exchange
- most land plants contain stomata

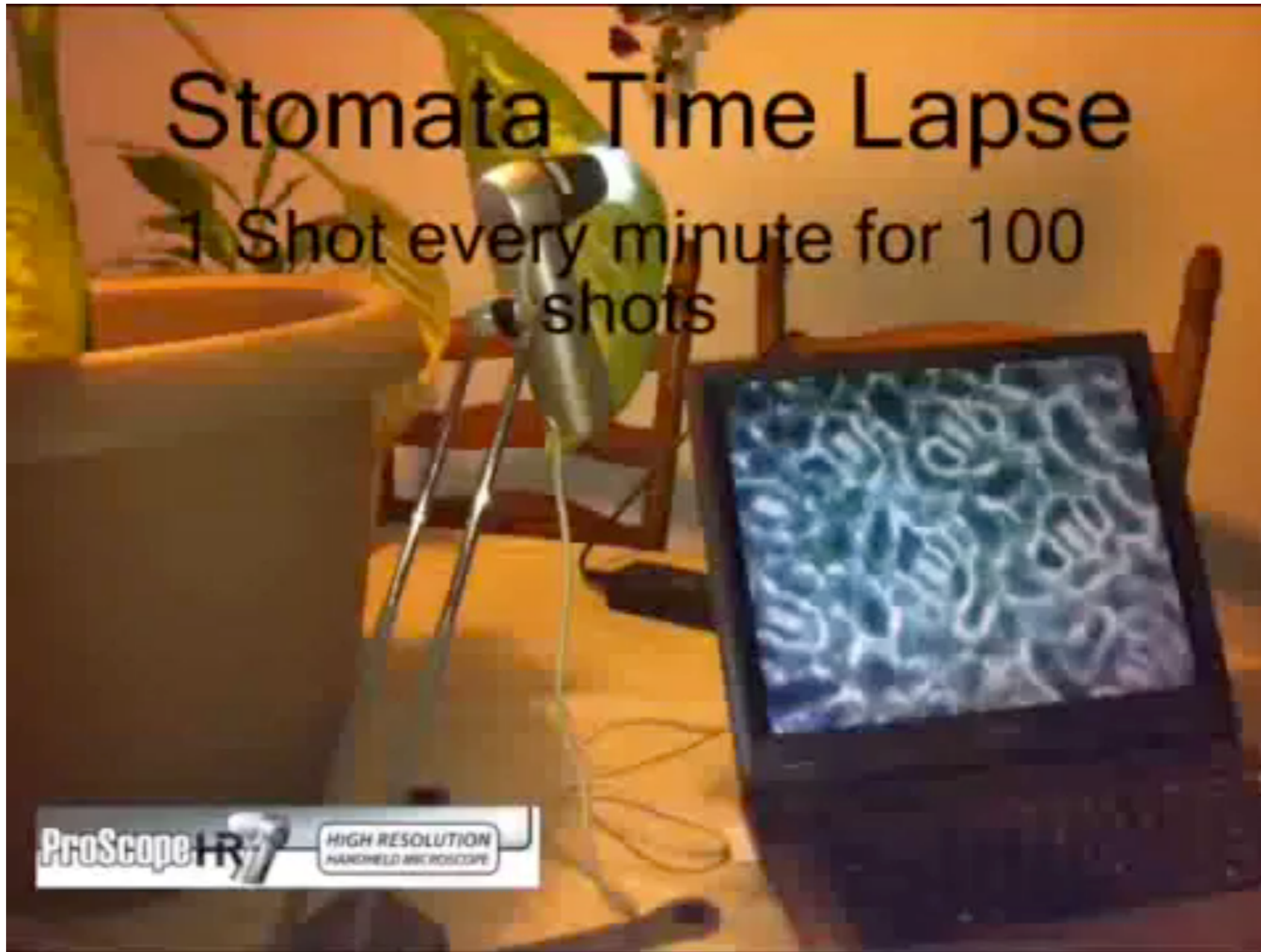


Stomata Time Lapse

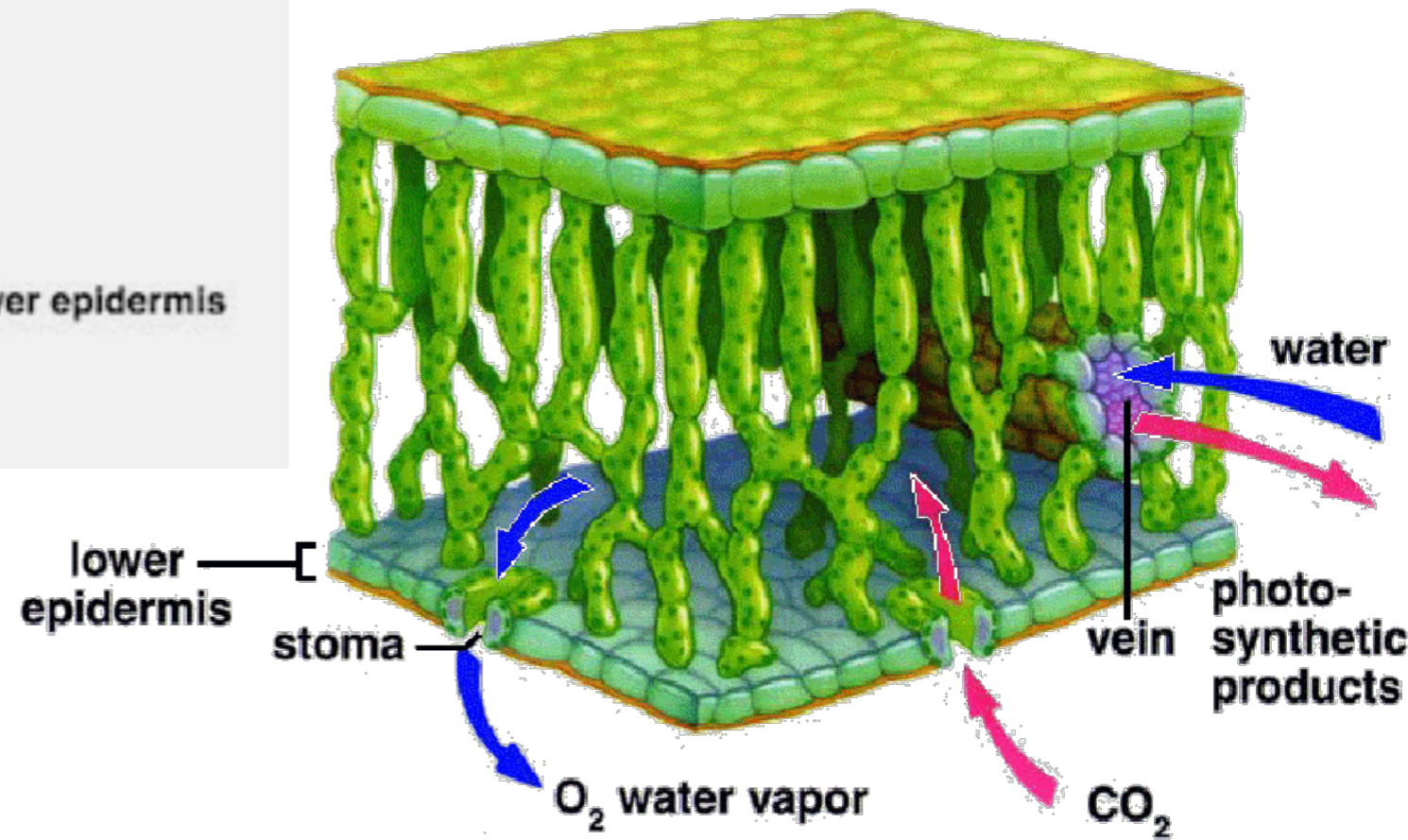
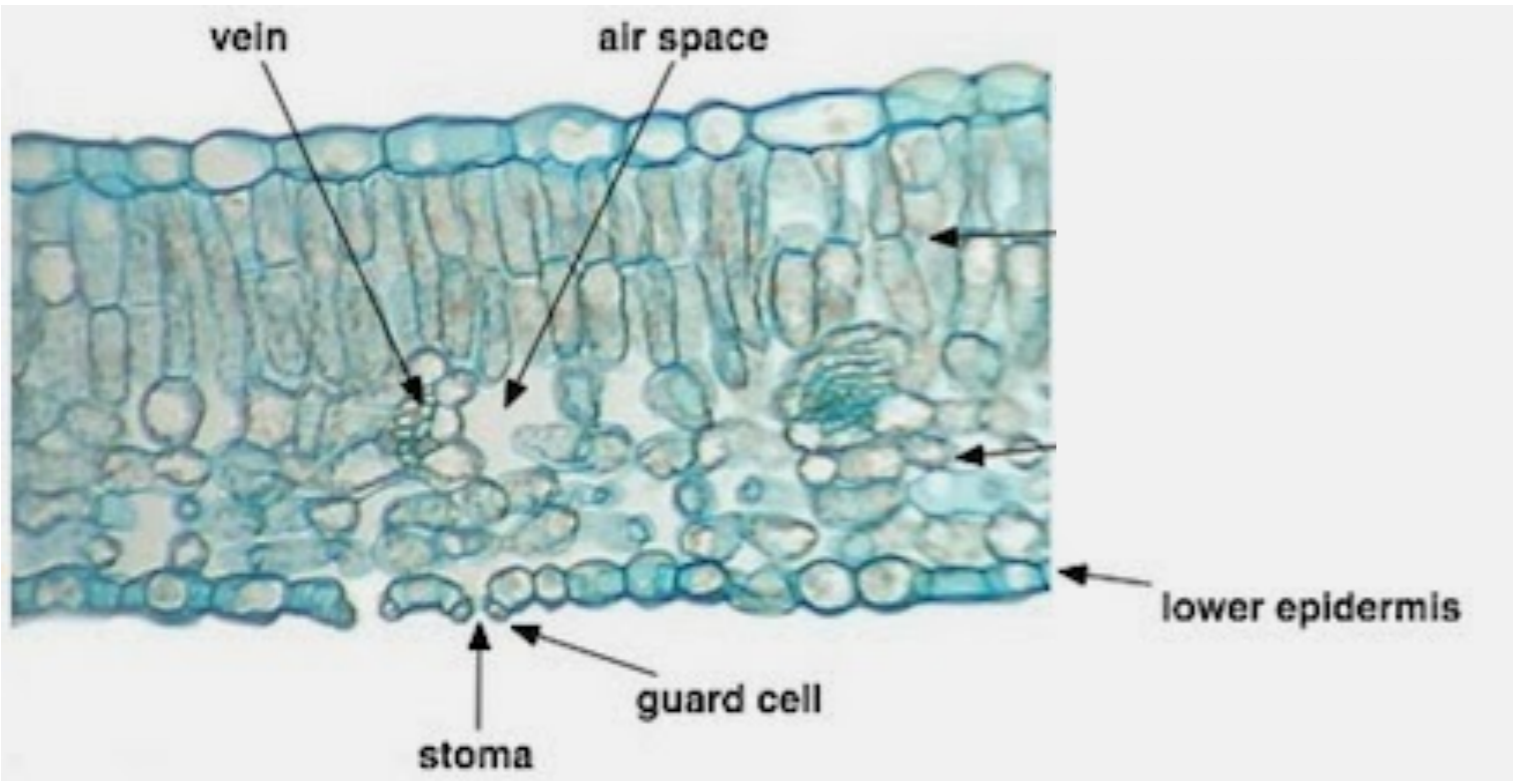
1 Shot every minute for 100
shots

ProScope IR7

HIGH RESOLUTION
HANDHELD MICROSCOPE



Leaf Cross section



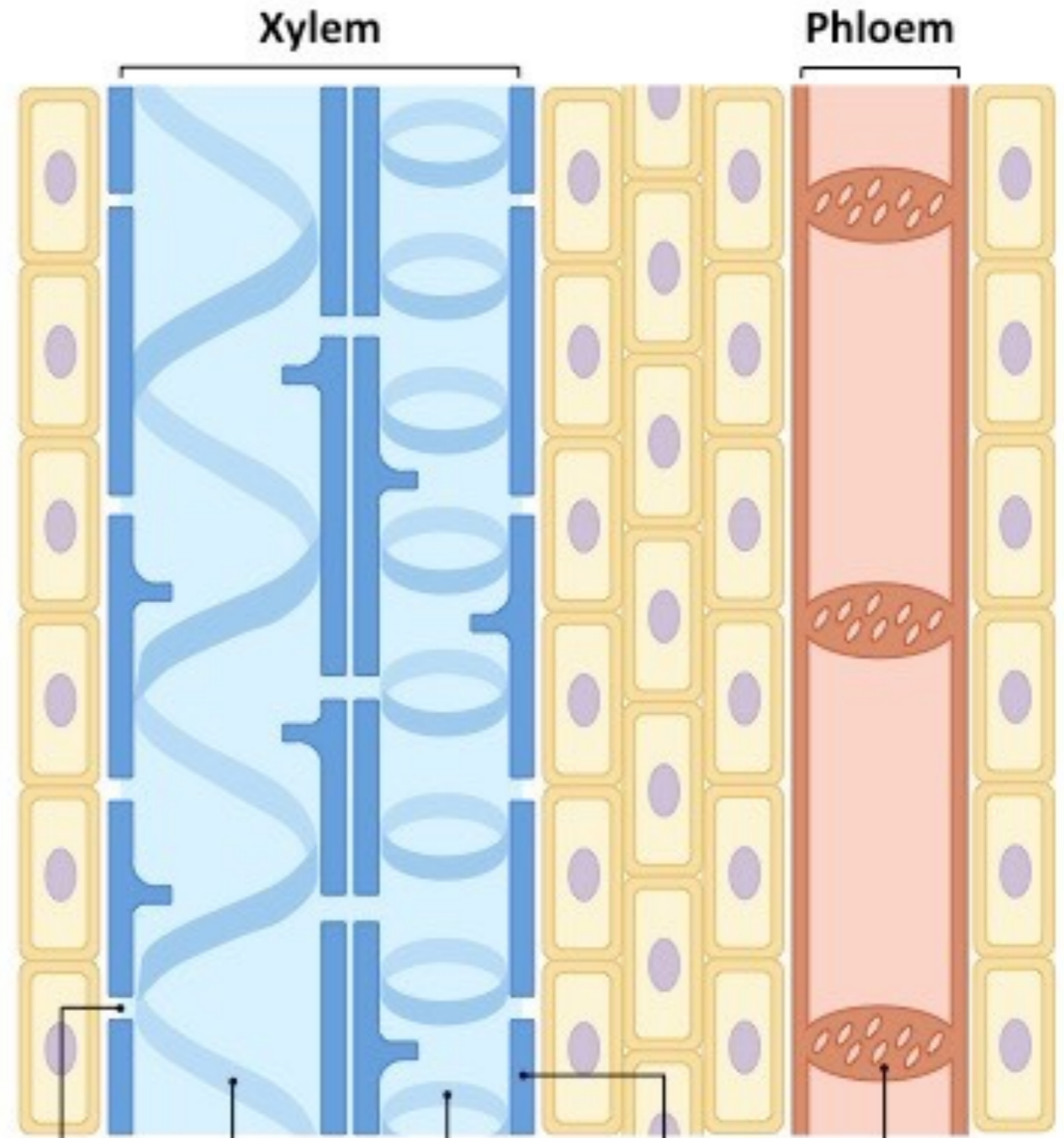
Vascular Tissue Structure

Microscope Image



mature xylem
young xylem

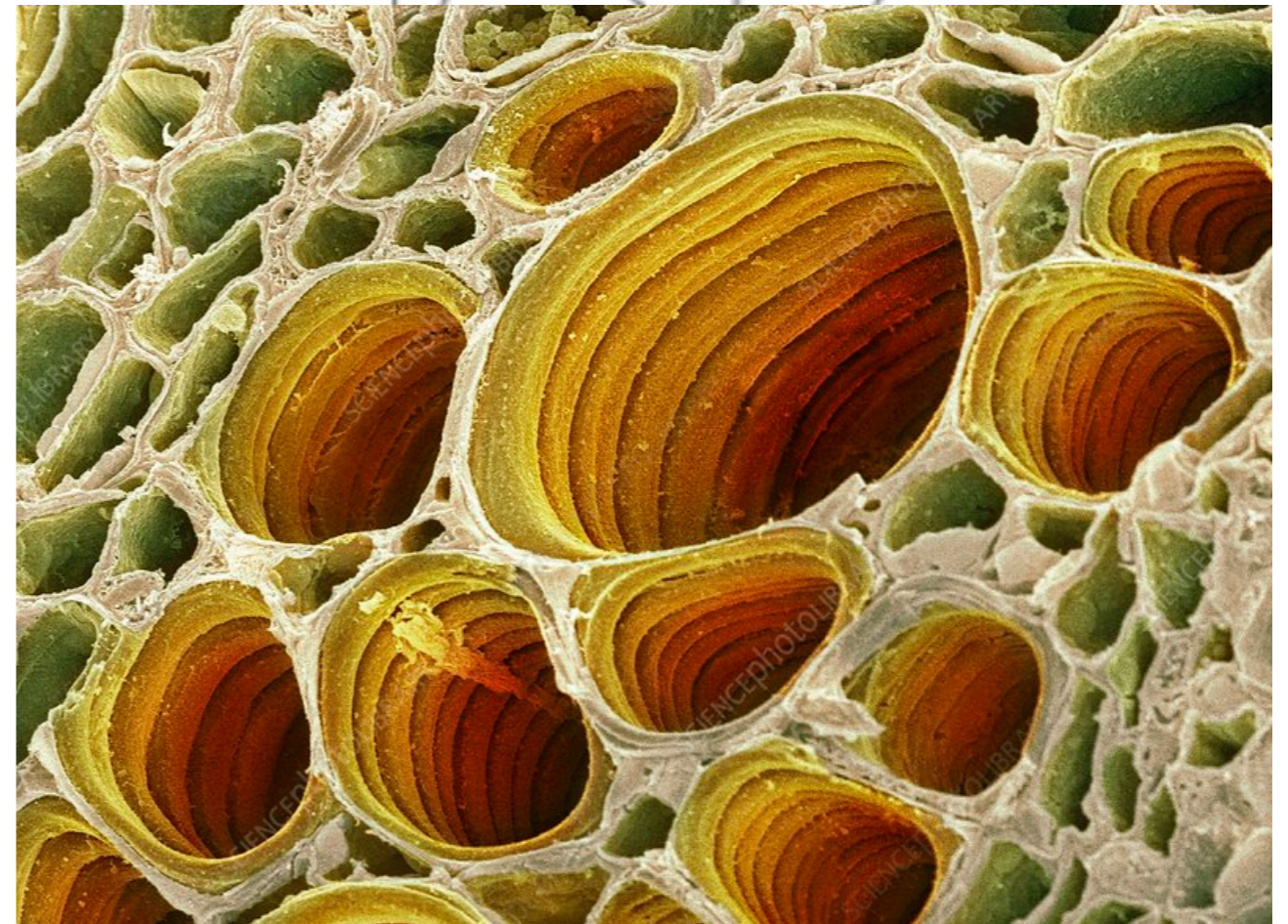
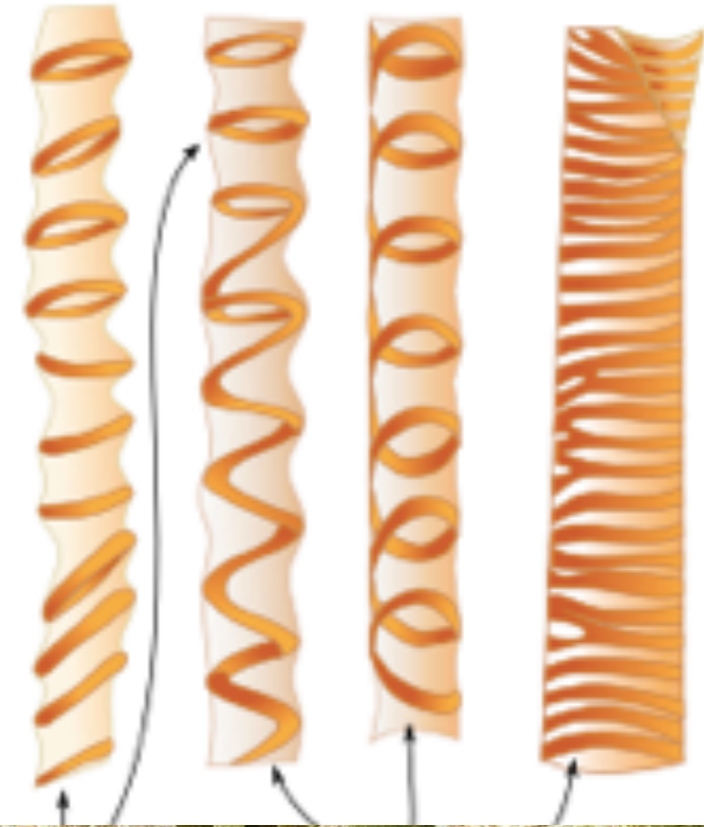
Diagrammatic Representation



Pit
Spiral Lignin
Annular Lignin
Cell Wall
Sieve Plate

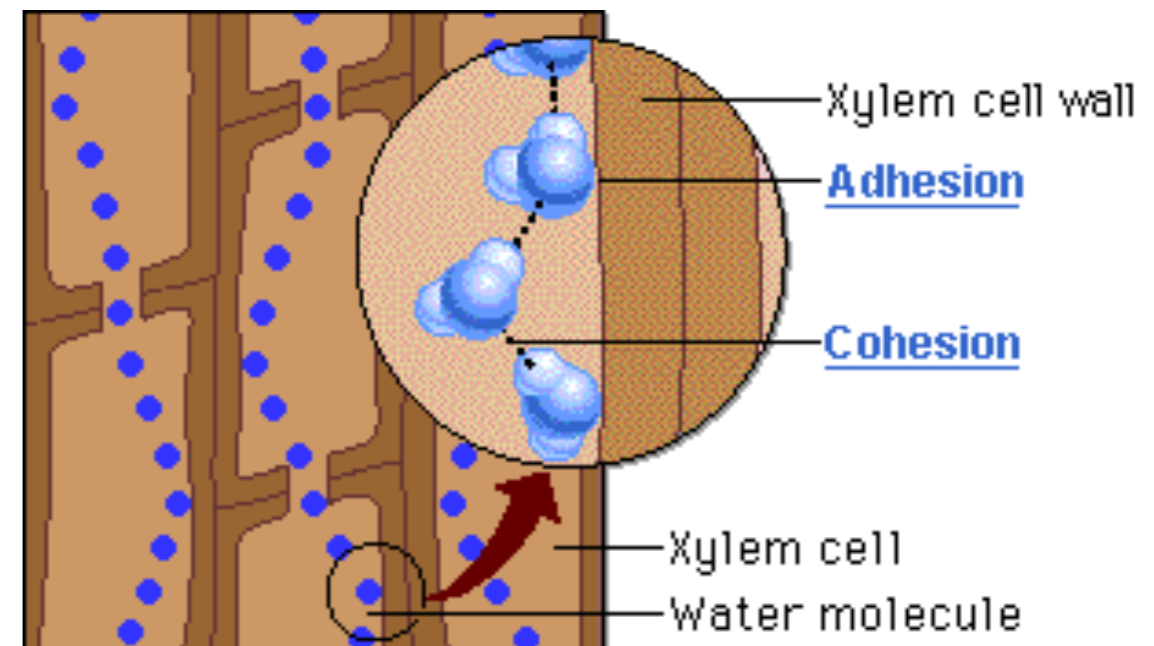
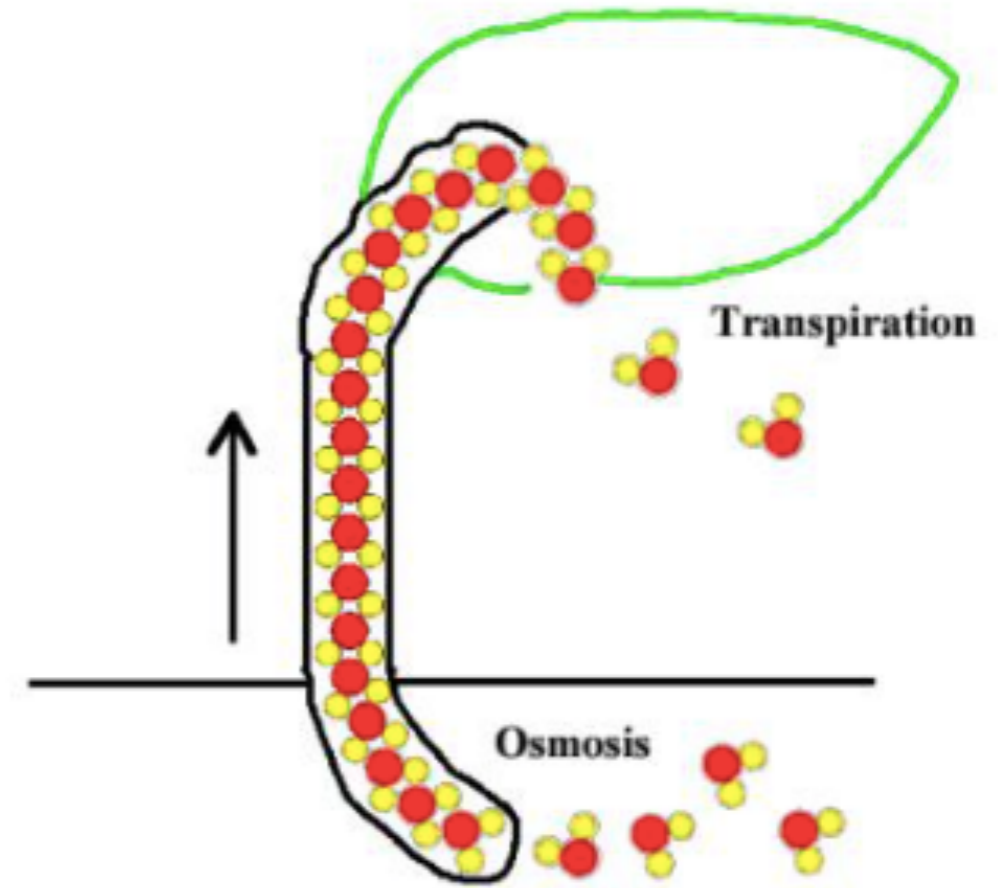
Vascular Tissue Structure

- Xylem- water transport vessels
 - long continuous tube with thickened cell walls of **cellulose**
 - lined with the polymer of lignin
 - rigid
- formed by cells end to end- when mature, they're non living.
- water moves along passively
- lower pressure inside then in the atmosphere
- cohesion exist between water molecules and adhesion to xylem
- these keep a continuous stream moving up the plant



Tension in Leaf Cell Walls Maintains Transpiration

- evaporated water is replaced by nearest available sources by **adhesion**
- leaf vein xylem is the water replacement source
- **adhesion** generates a pulling force to draw water from xylem
- results in a pressure drop → creating a pulling force
- this pulling force transmits down xylem to roots (this pulls water upwards)
- This transpirational-pull is enough to pull water up to the top of the highest trees



LOOKING at plant leaf cross section

- > view on low or medium power
- > find stomata, spongy mesophyll, palisade mesophyll, leaf vein, epidermis, air space for gas exchange
- > calculate estimate size and calculate magnification

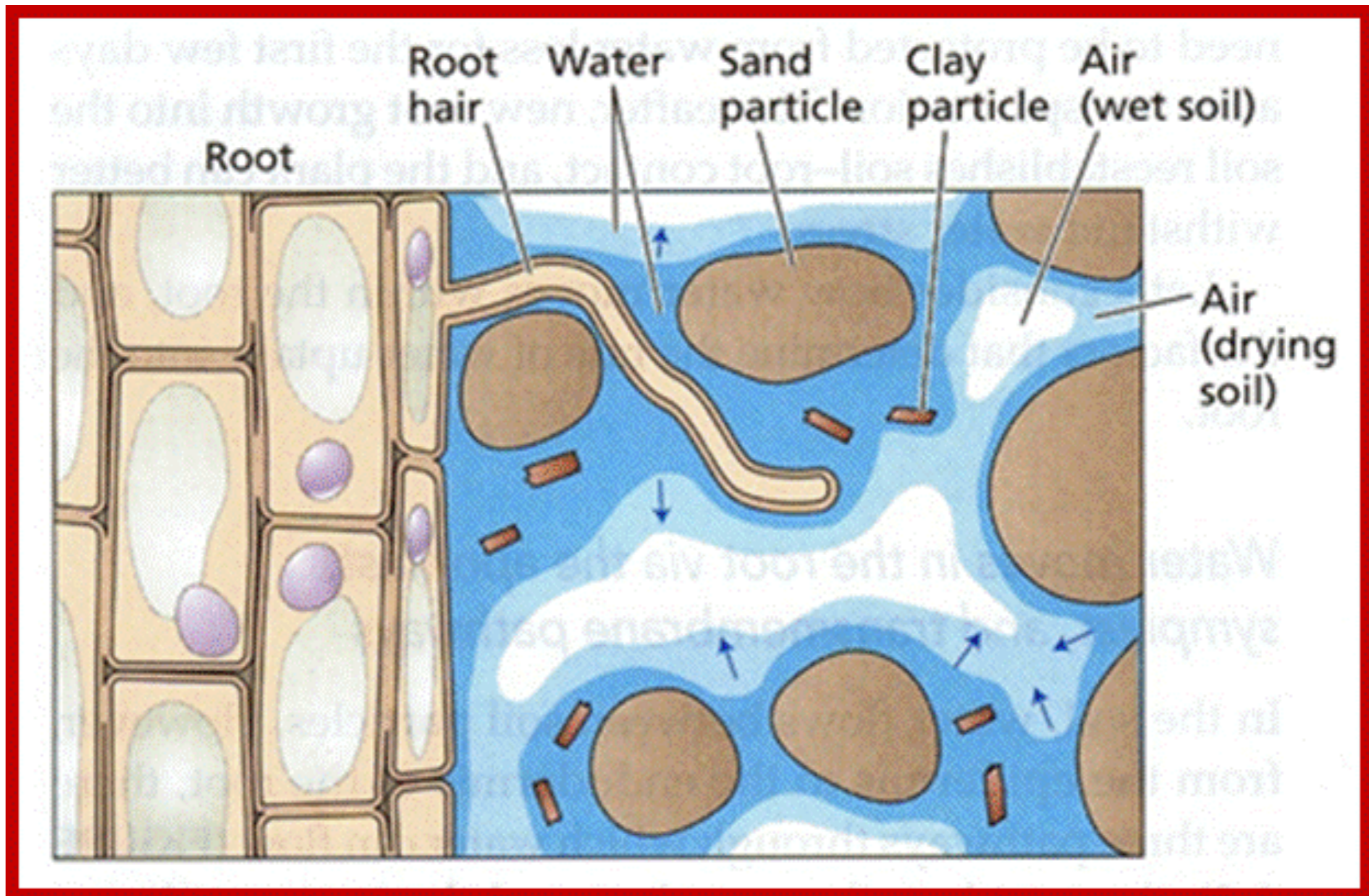
Looking at lettuce leaf

- > make a wet mount, View on high power
- > find stomata , guard cells (2) epidermis, stoma
- > calculate estimate size and calculate magnification

Looking at Lettuce stock Cross section

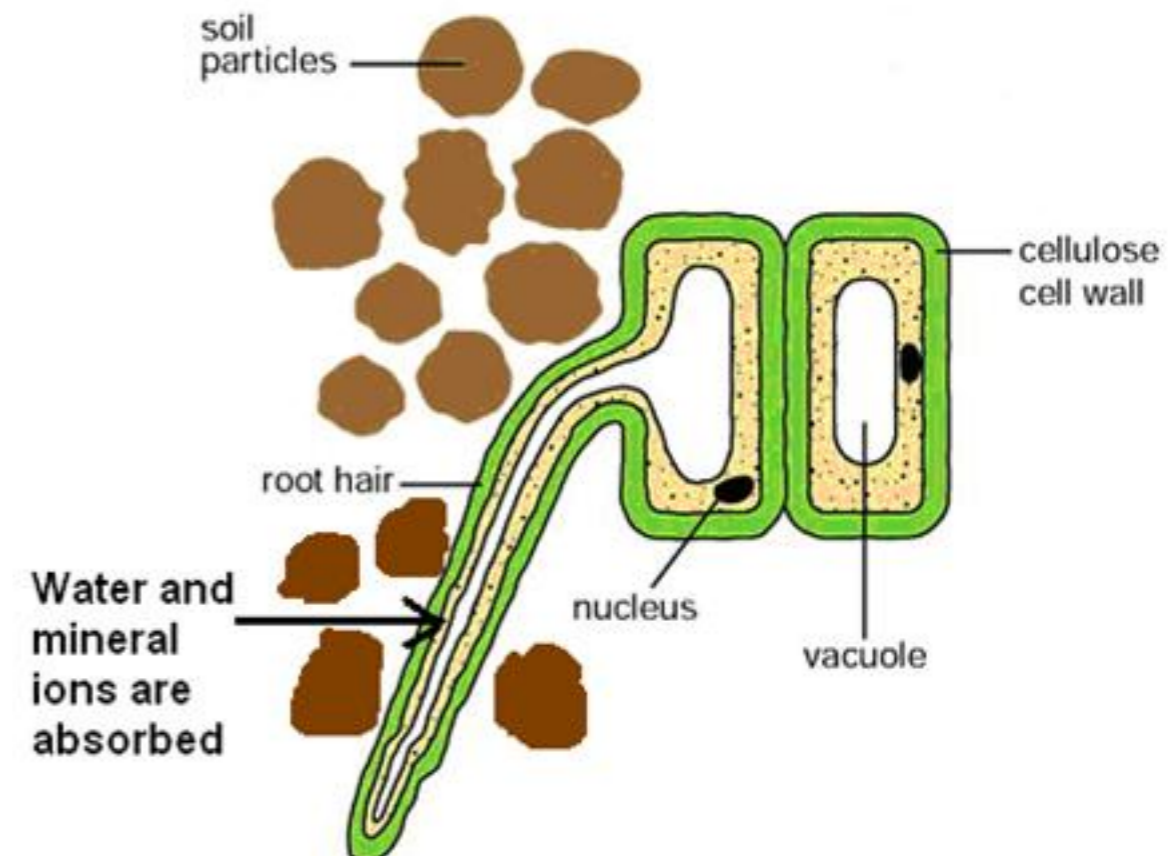
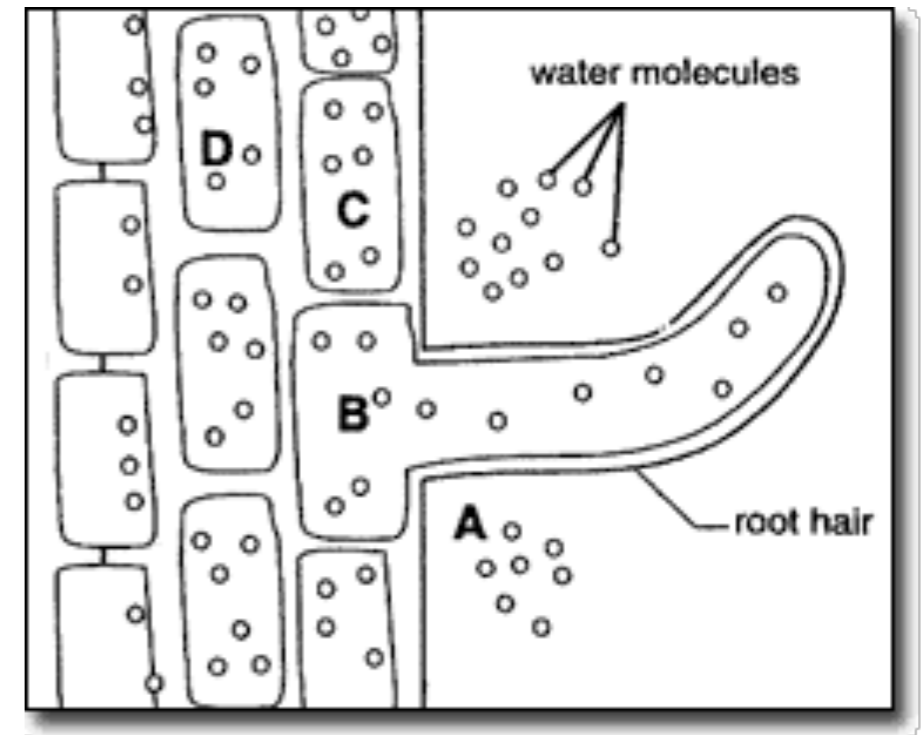
- > make a wet mount
 - > find vascular tissue and Draw and label
 - > calculate estimate size and calculate magnification
- >

Root Absorption of Water

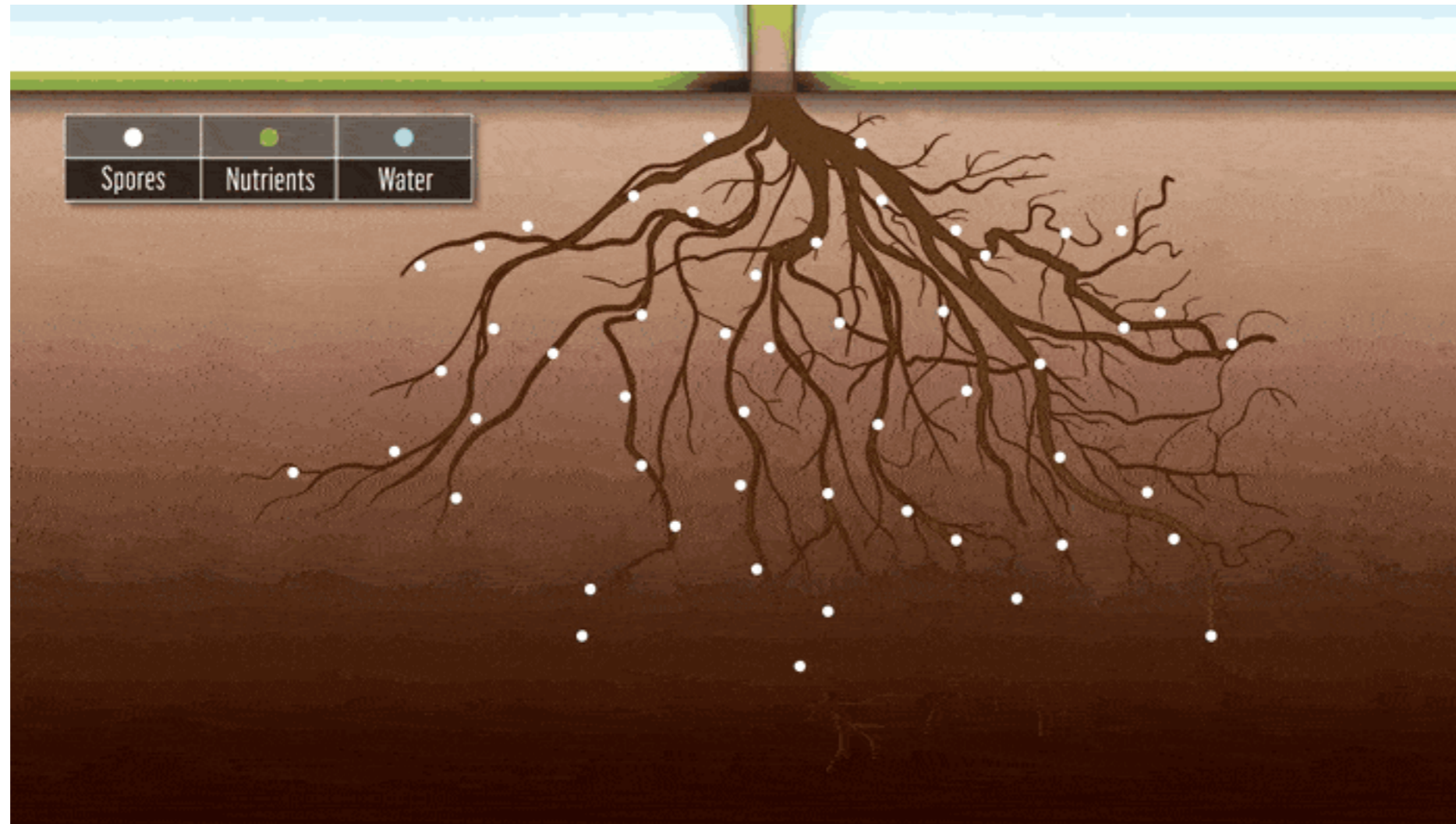


Root Absorption of Water

- Roots have higher minerals and ion concentrations compare to soil (100x or more)
- Gradient created by **active transport**
- This creates a water gradient with higher concentration in soil compared to cells
- water moves down the gradient (high to low) **OSMOSIS**

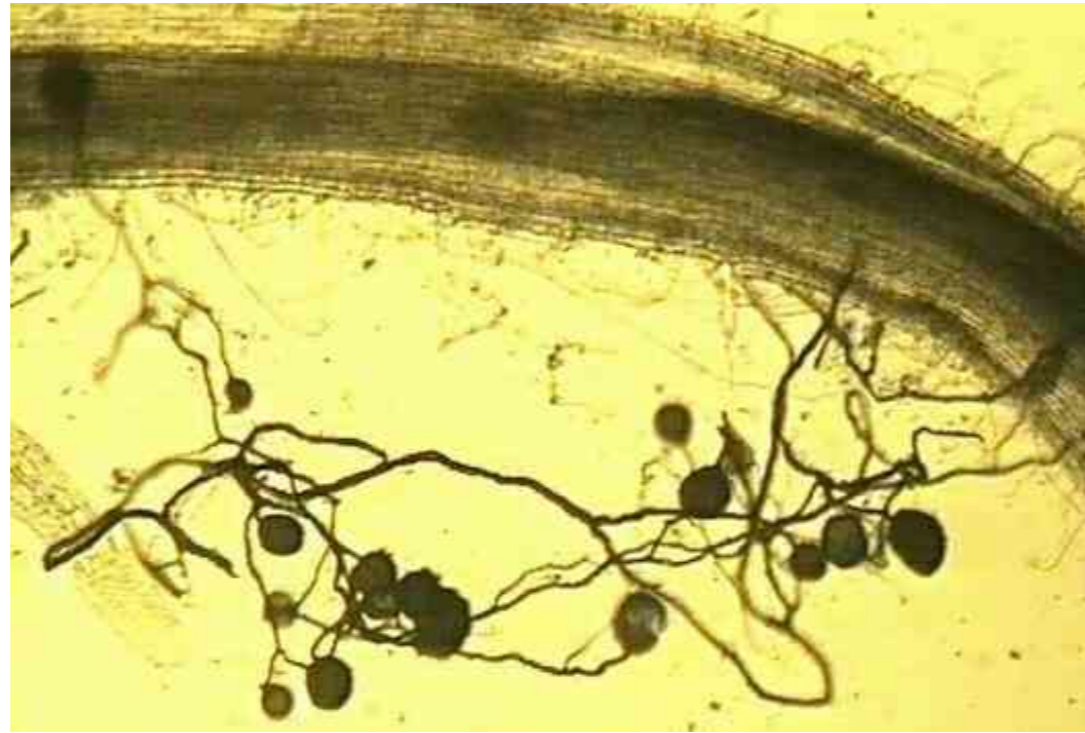


Root Absorption of Water



- some plants use fungi to aid ion absorption (mycorrhizal fungi)
- with some ions such as phosphates and nitrates, fungi might interact with roots to aid absorption of ions trapped or inaccessible
- fungi benefit from plants which supply sugars

Root Absorption of Water



- Homework assignment

1. Do a web search/ read about Xerophytes (cactus) and water uptake strategies (pg 409-410)

read about examples *Ammophila arenaria*,
Gymnocalycium baldianum **and** *Euphorbia obesa*

2. Do a web search/ read about plants that live in salty soils (Halophytes) How do they get enough fresh water?

Root Absorption of Water

