



The Plant Cell

<https://youtu.be/pwymX2LxnQs>

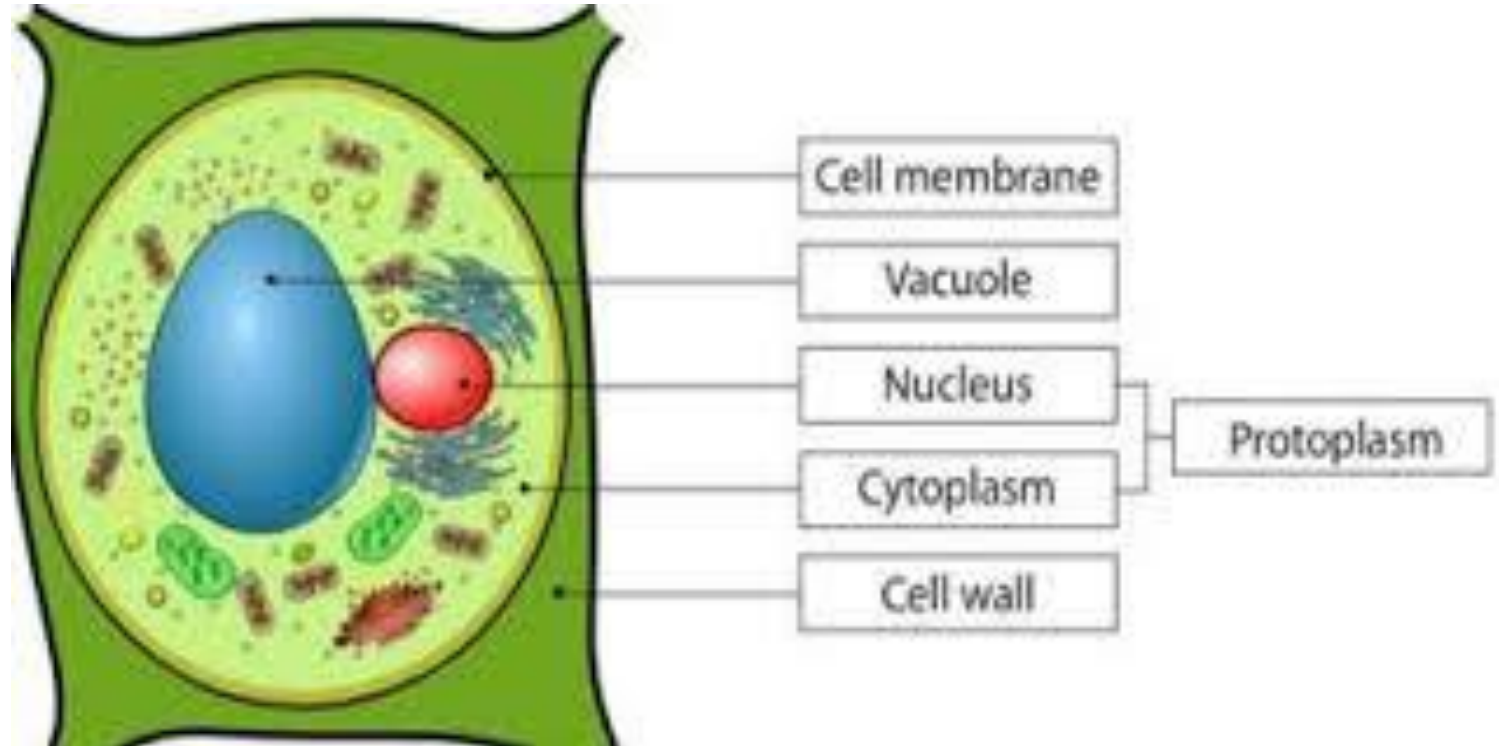


Plant cells

- eukaryotic cells
- the kingdom Plantae
- found in green plants
- have a membrane-bound nucleus
- have a variety of membrane-bound cell organelles
- have structural organelles that are not found in the animals' cells including the cell wall, vacuoles, plastids e. g Chloroplast.

Basic Cell Structure

- 1. Cell wall
- 2. Cell membrane
- 3. Protoplasm



cell wall

- Structure : It is a specialized matrix that covers the surface of the plant cell. Every plant cell has a cell wall layer which is a major distinguishing factor between a plant cell and an animal cell.
- The plant cell wall is multi-layered and consists of up to three sections.
 - the middle lamella,
primary cell wall,
secondary cell wall.
- While all plant cells have a middle lamella and primary cell wall, not all have a secondary cell wall.

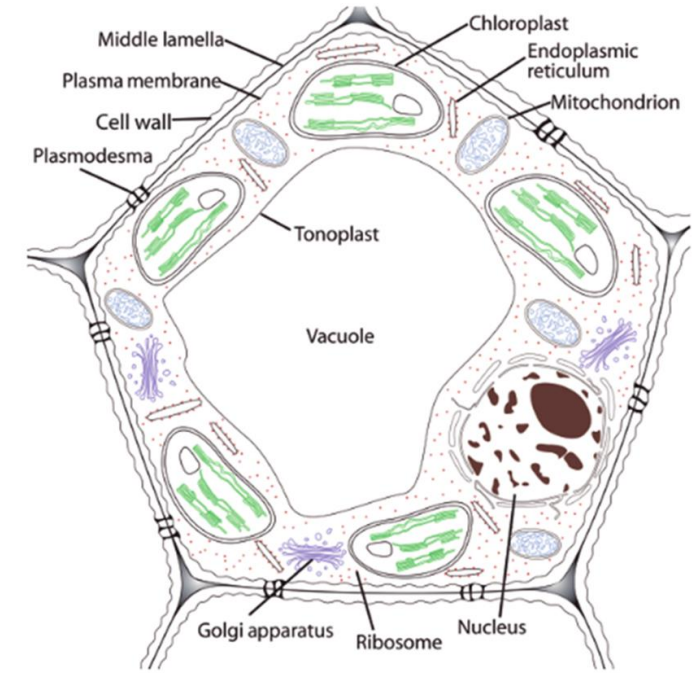


Figure 1.1 Components of a plant cell.





Function of cell wall

- Providing the cell with mechanical protection and shielding the cell from the chemically harsh environment, provided by the secondary wall layer.
- It is semipermeable hence it allows in and out, the circulation of materials such as water, molecular nutrients, and minerals.
- It also forms provides a rigid building block to stabilize the plant to produce some of its structures, for example, the stem and leaves of the plants.
- It also provided a site for storage of some elements such as the regulatory molecules that detect pathogens in the plant, hindering the development of diseased tissue.
- The thin primary walls serve as structural and supportive functional layers when the cell vacuoles are filled with water, exerting turgor pressure on the cell wall, thus maintaining the plants' stiffness and preventing plants from losing water and withering.

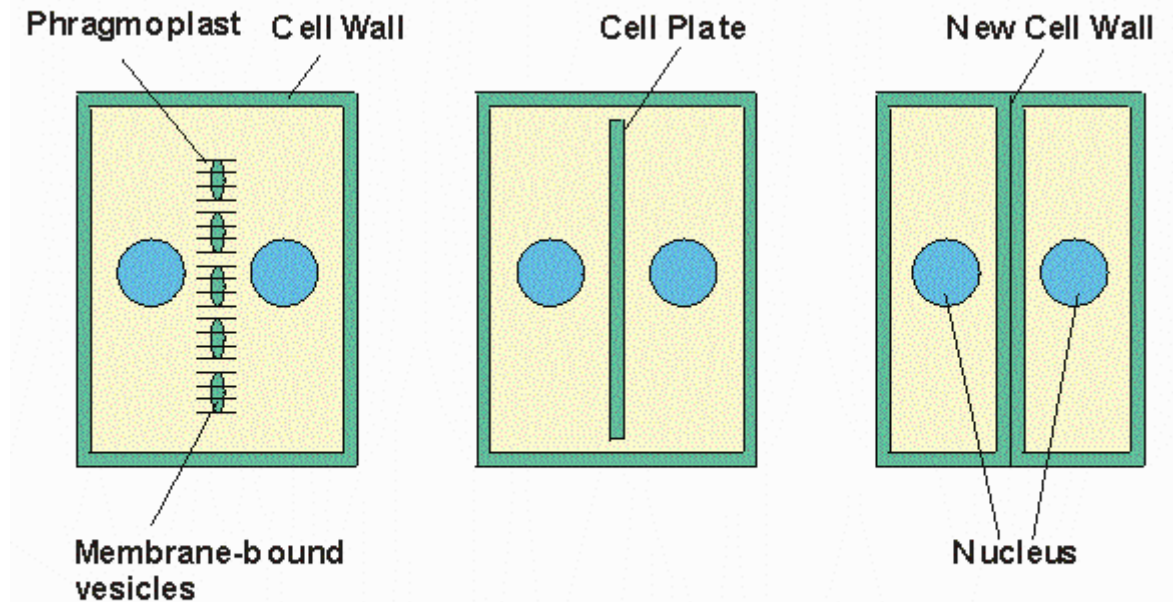
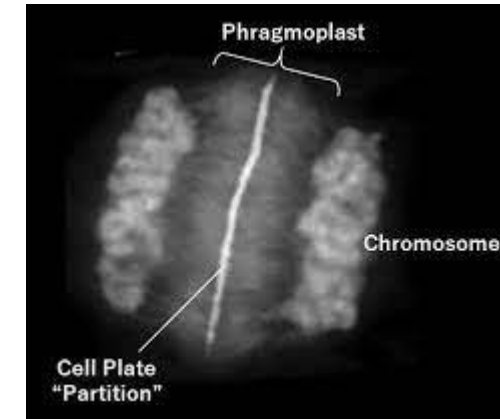
Origin of cell wall

Phragmoplast

- forms during late cytokinesis

-During telophase, these Golgi vesicles are transported on microtubules to form a phragmoplast (a vesicular structure) at the metaphase plate. There, the vesicles fuse and coalesce from the center toward the cell walls; this structure is called a **cell plate**.

-As more vesicles fuse, the cell plate enlarges until it merges with the cell walls at the periphery of the cell. Enzymes use the glucose that has accumulated between the membrane layers to build a new cell wall. The Golgi membranes become parts of the plasma membrane on either side of the new cell wall.



Cytokinesis in a plant cell



Components of cell wall

1. Cellulose

3. Pectin substance

5. Suberin

7. Wax

9. Mucilage

2. Hemicellulose

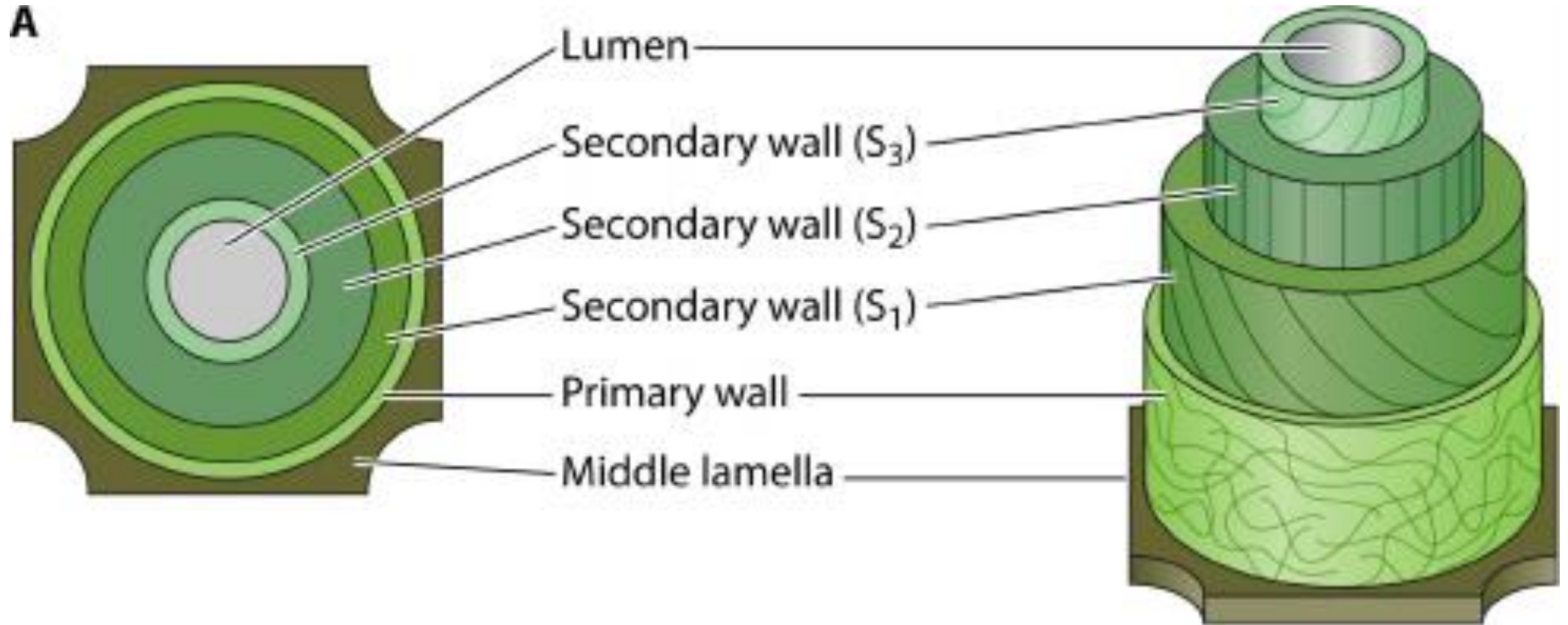
4. Lignin

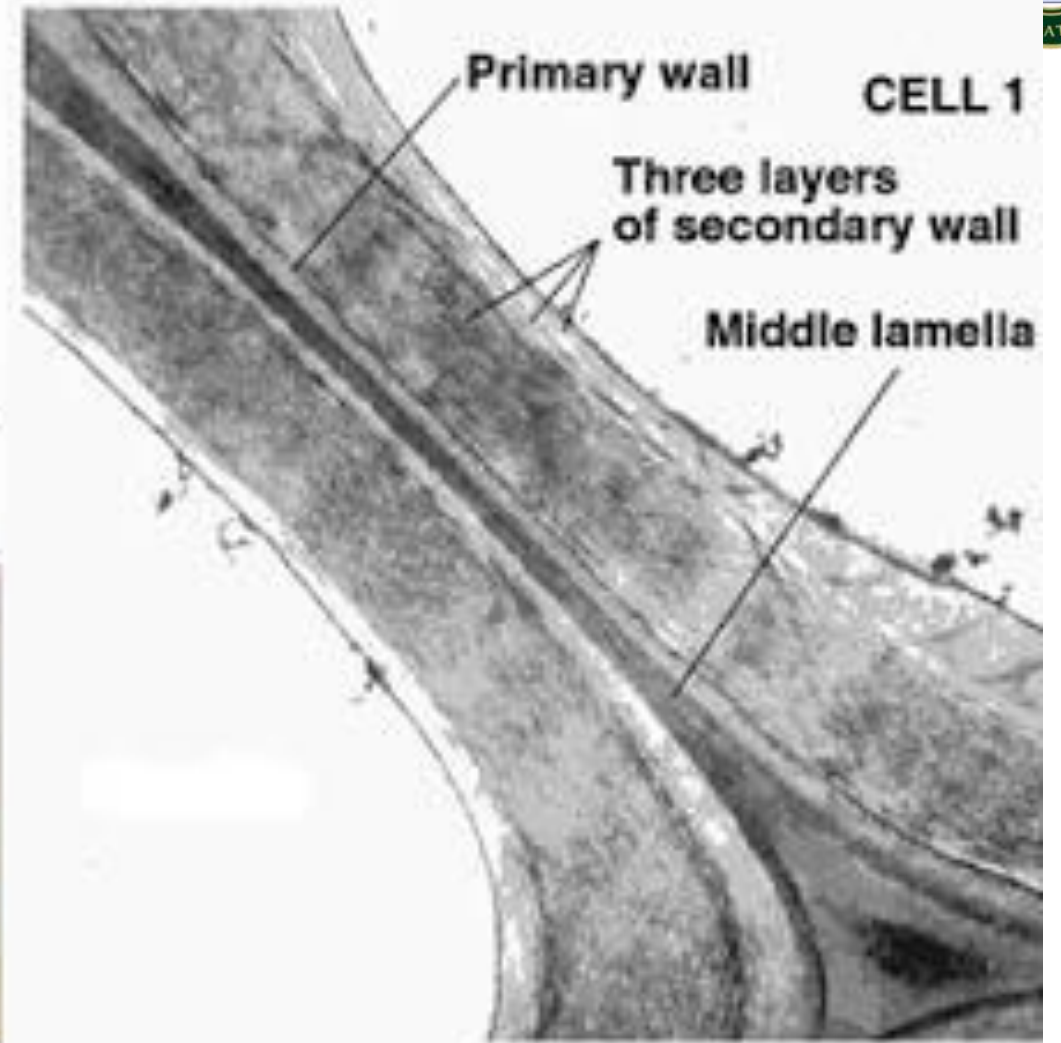
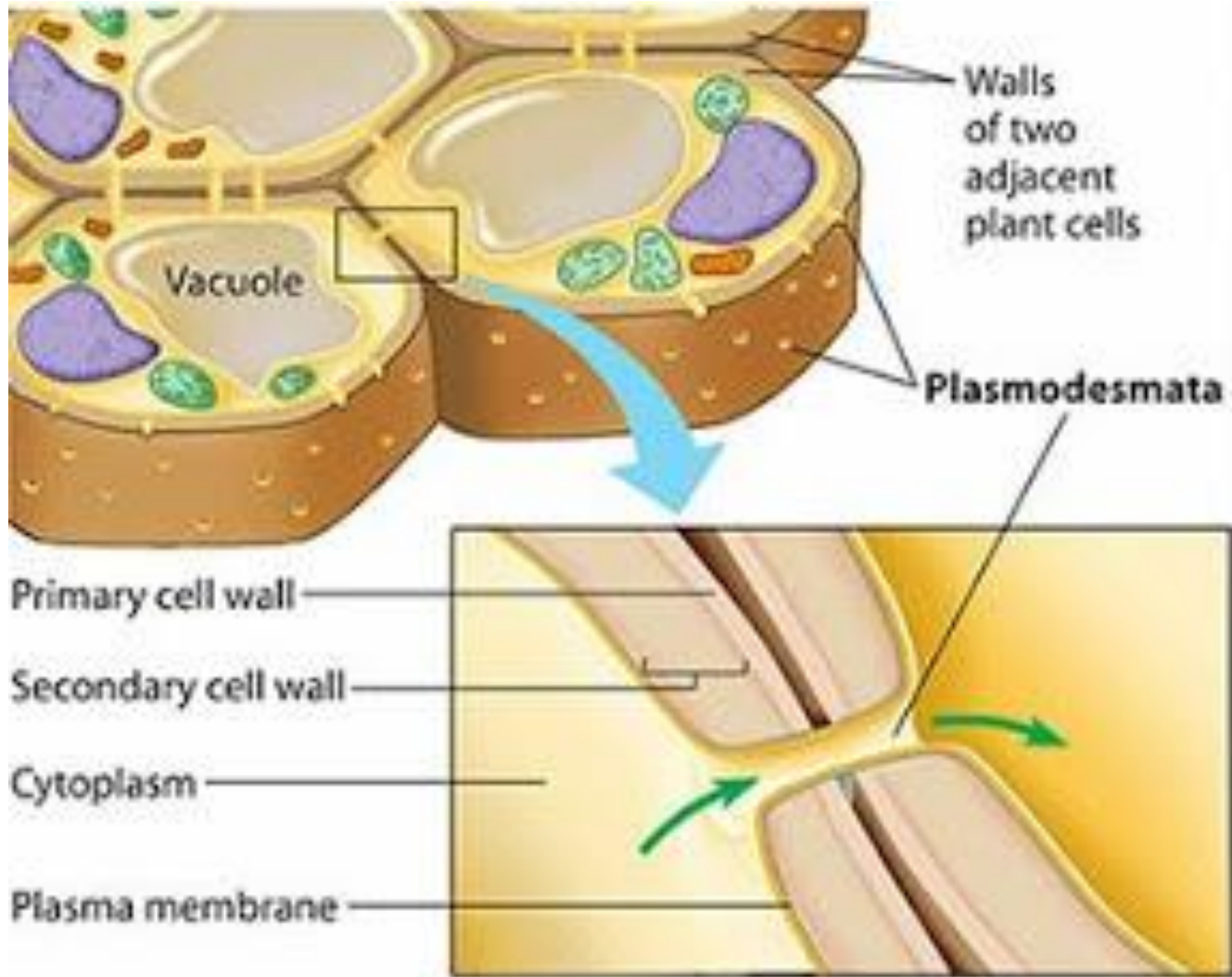
6. Cutin

8. Gum

10. Water

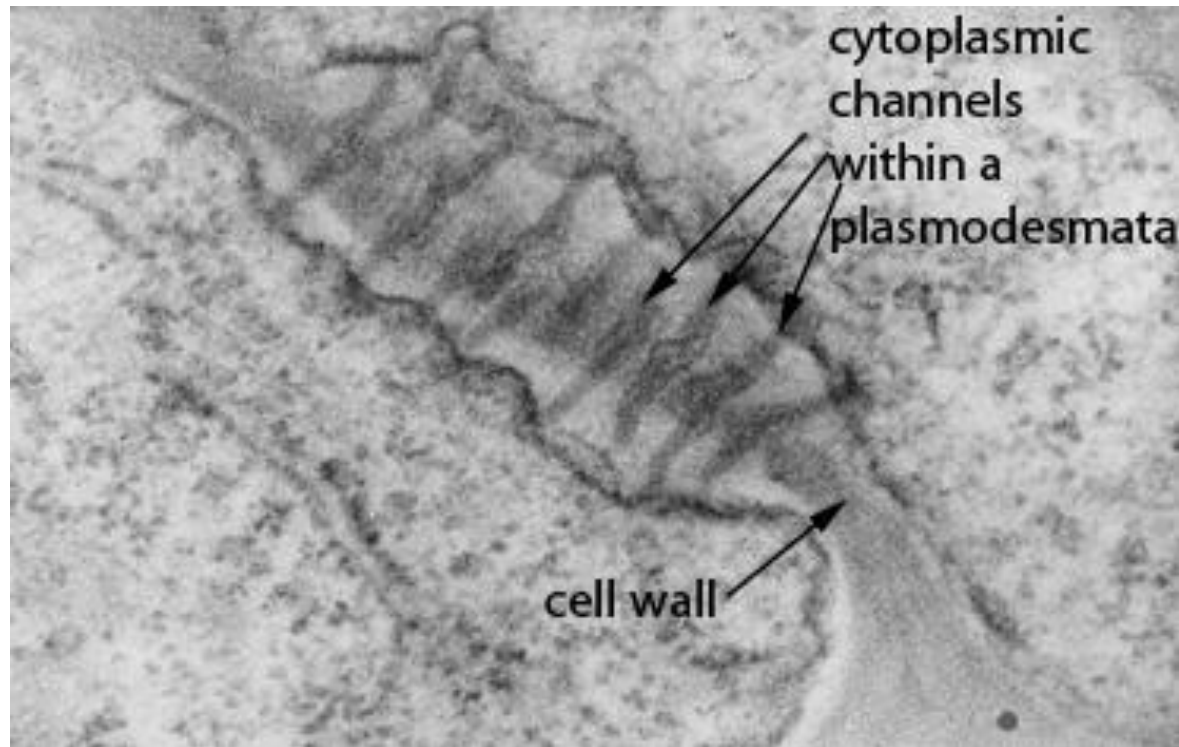
Cell wall layers





Plasmodesmata

Plasmodesmata are protoplasmic strands that connect the protoplasts of neighboring cells.





- **Middle lamella:**

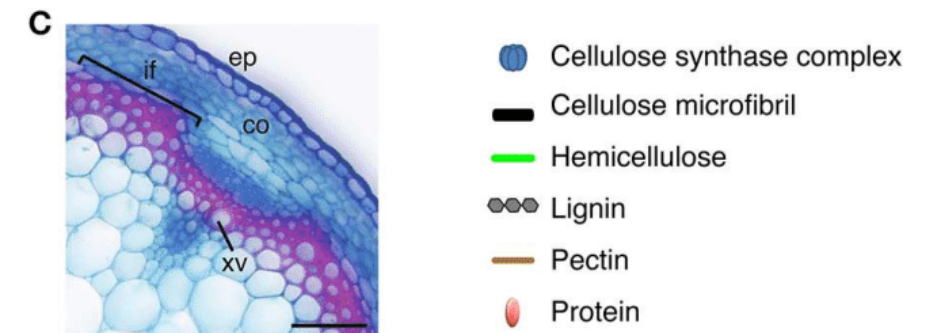
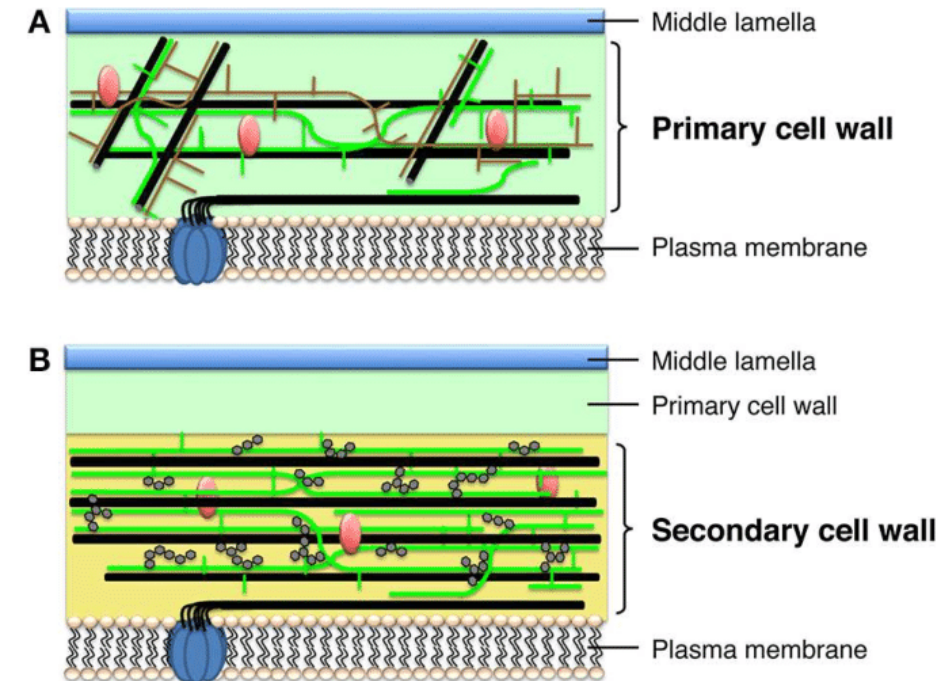
- contains calcium and magnesium pectate
- Pectins aid in cell adhesion by helping the cell walls of adjacent cells to bind to one another.

- **Primary cell wall:**

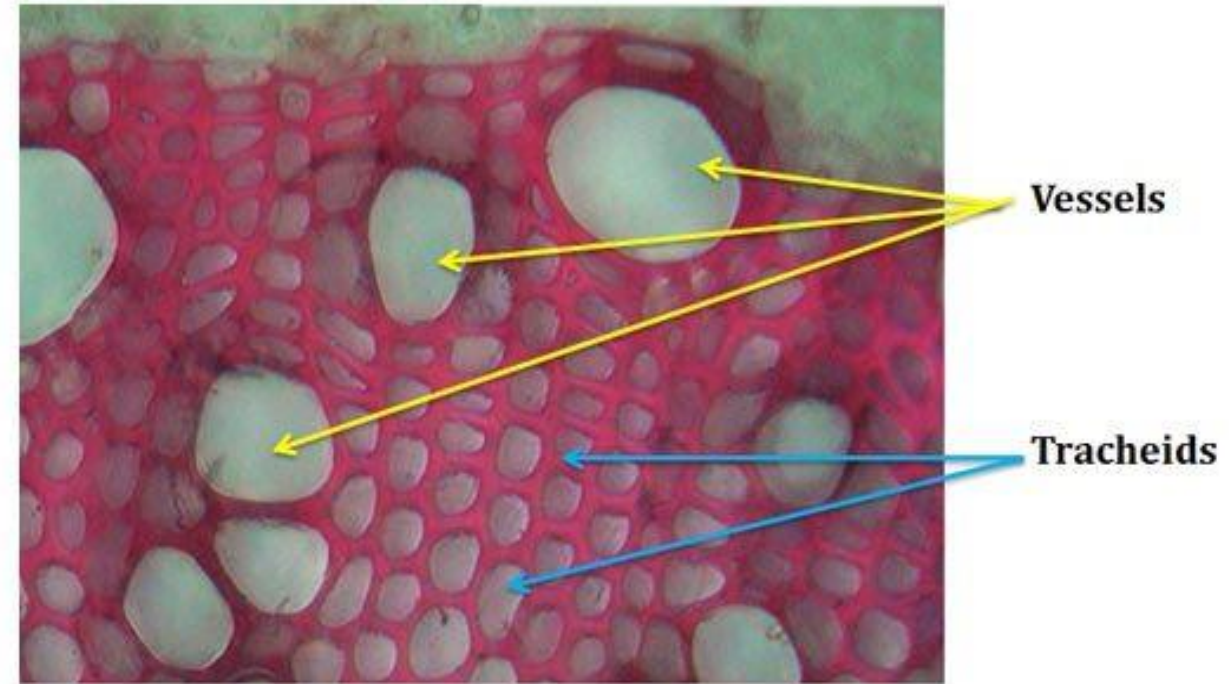
- formed between the middle lamella and plasma membrane in growing plant cells
- It is primarily composed of cellulose microfibrils contained within a gel-like matrix of hemicellulose fibers and pectin polysaccharides.
- provides the strength and flexibility needed to allow for cell growth.

- **Secondary cell wall:**

- formed between the primary cell wall and plasma membrane in some plant cells.
- This rigid layer strengthens and supports the cell.
- In addition to cellulose and hemicellulose, some secondary cell walls contain lignin. Lignin strengthens the cell wall and aids in water conductivity in plant vascular tissue cells.

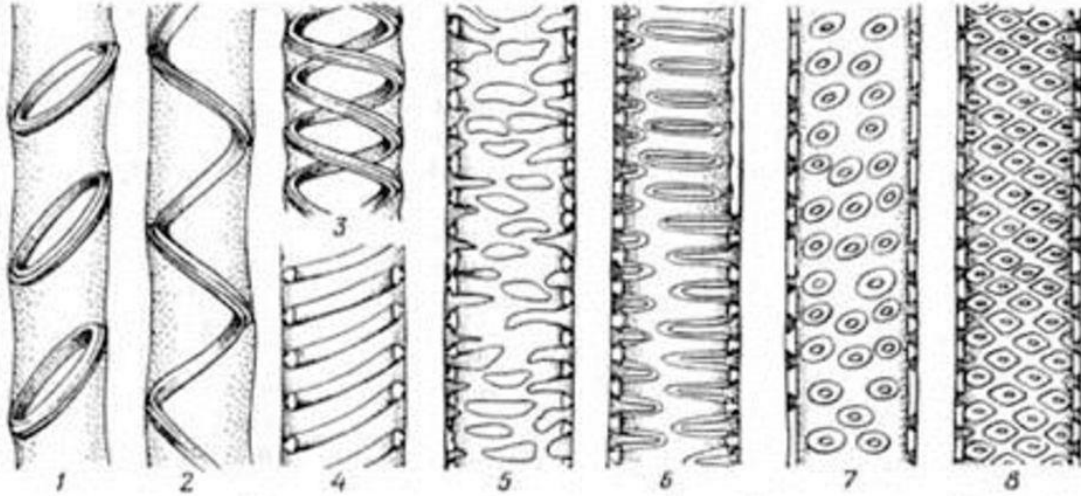


- Cellulose synthase complex
- Cellulose microfibril
- Hemicellulose
- Lignin
- Pectin
- Protein



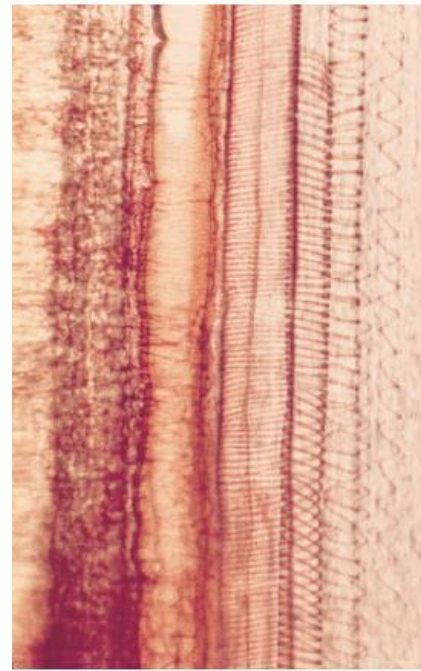
CS of Dicot Stem showing Vessels & Tracheids

Secondary Wall Thickenings



1 = annular thickening 2-4 = helical thickening 5 = reticulate thickening
6 = scalariform pitted wall 7 = opposite pitted wall 8 = alternate pitted wall

photomicrograph of xylem tissue in LS



drawing of xylem vessels in TS and LS

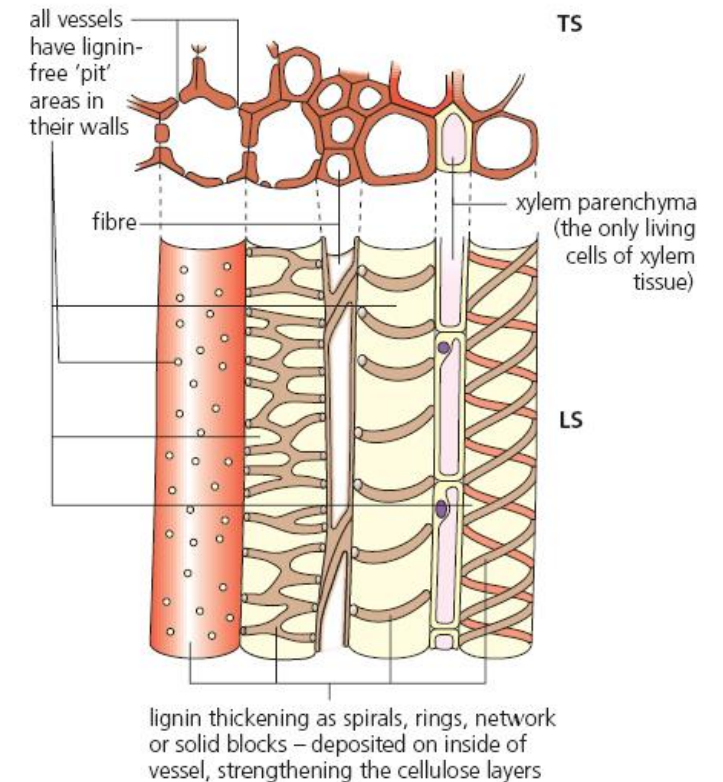


Figure 7.4 The structure of xylem tissue
Dr. Sasithorn Pangsuban

Intercellular spaces

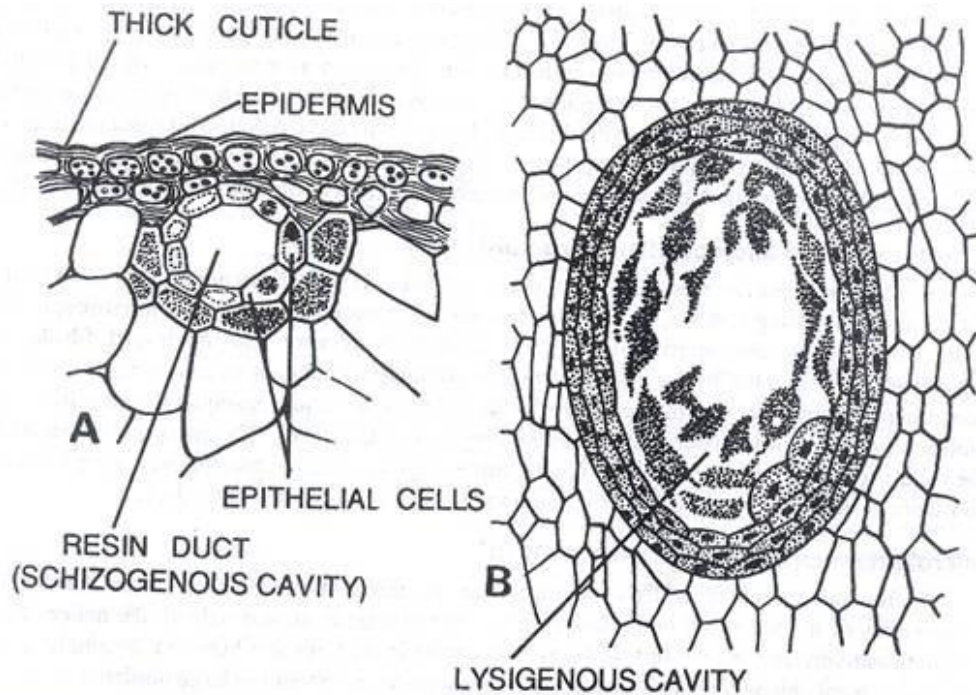
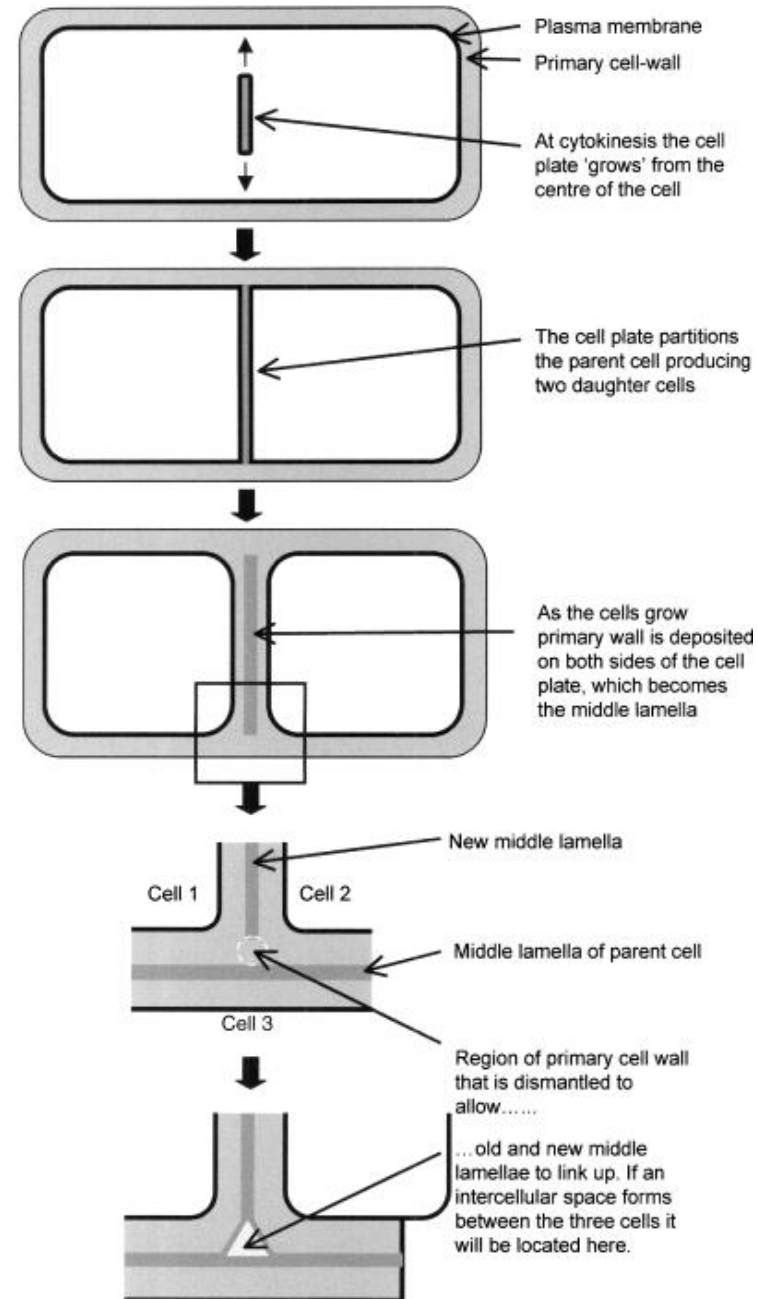
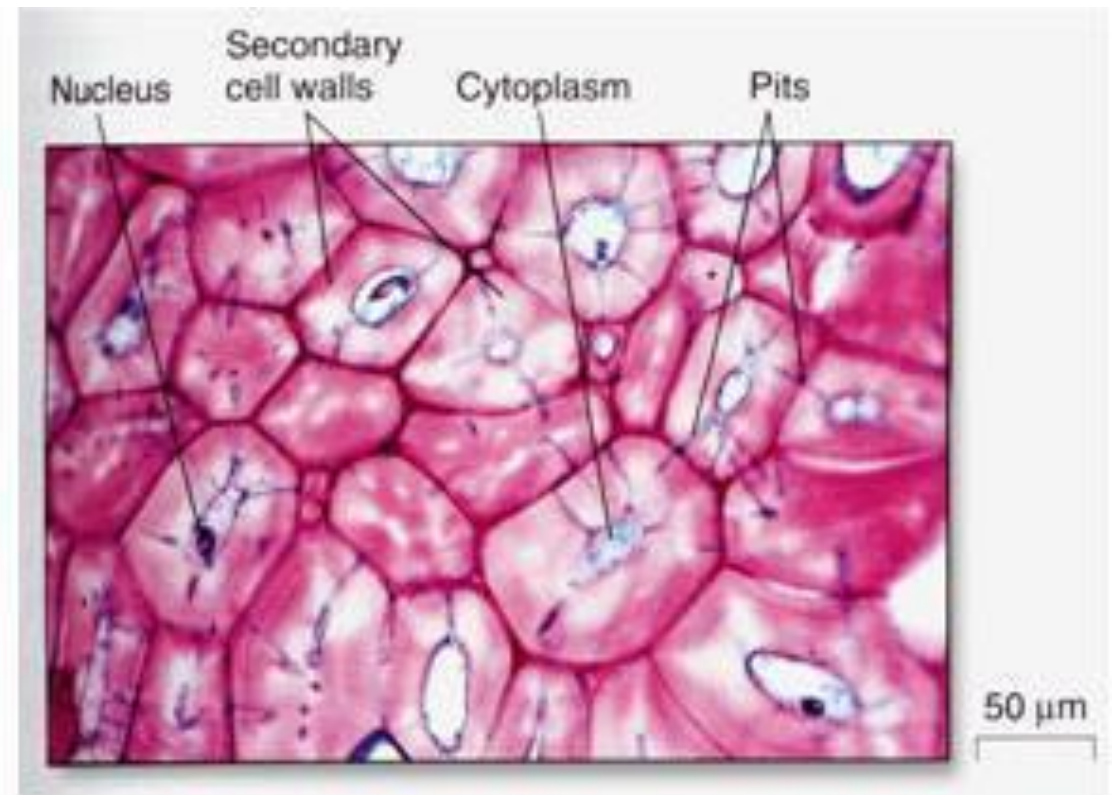
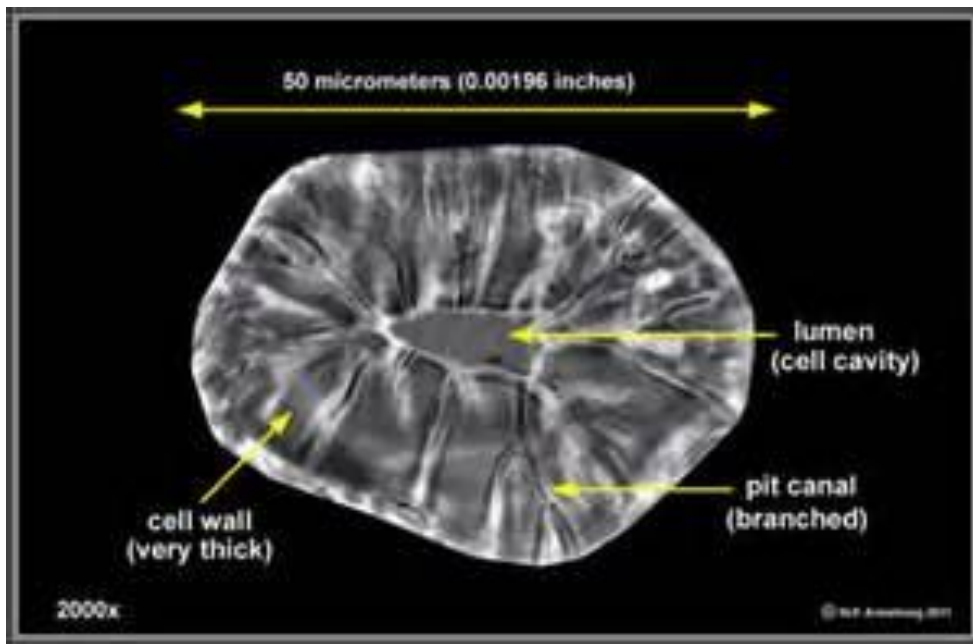


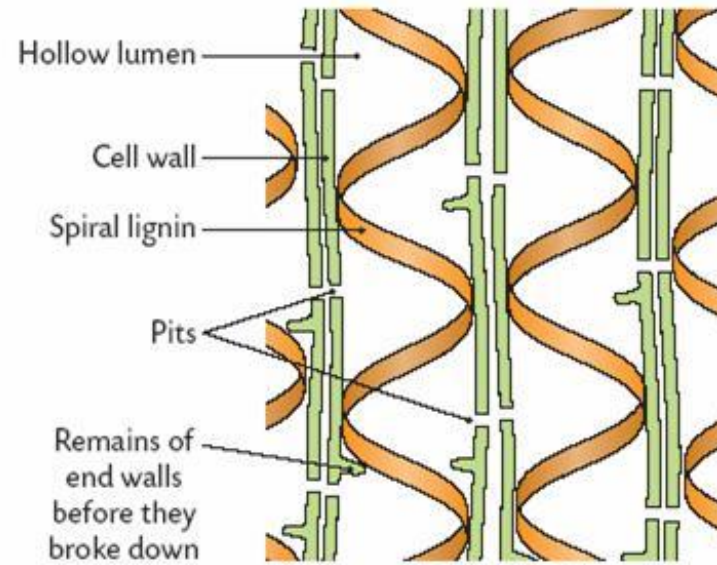
Fig. 34.17. Intercellular spaces. A, a schizogenous intercellular space in *Bryophyllum* stem; B, a schizogenous intercellular space in leaf of *Sequoia sempervirens*.



Pits act as the channels for the transport of water and minerals between adjacent cells.

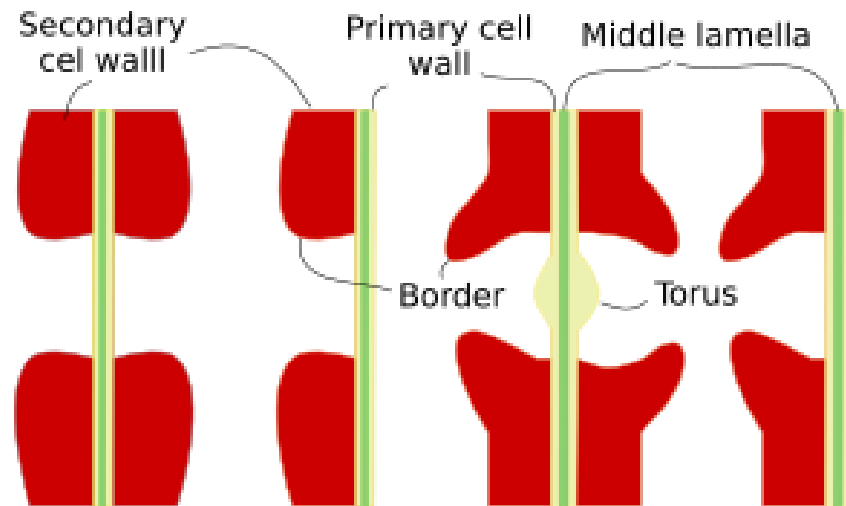


Pits



Vessels

PITS

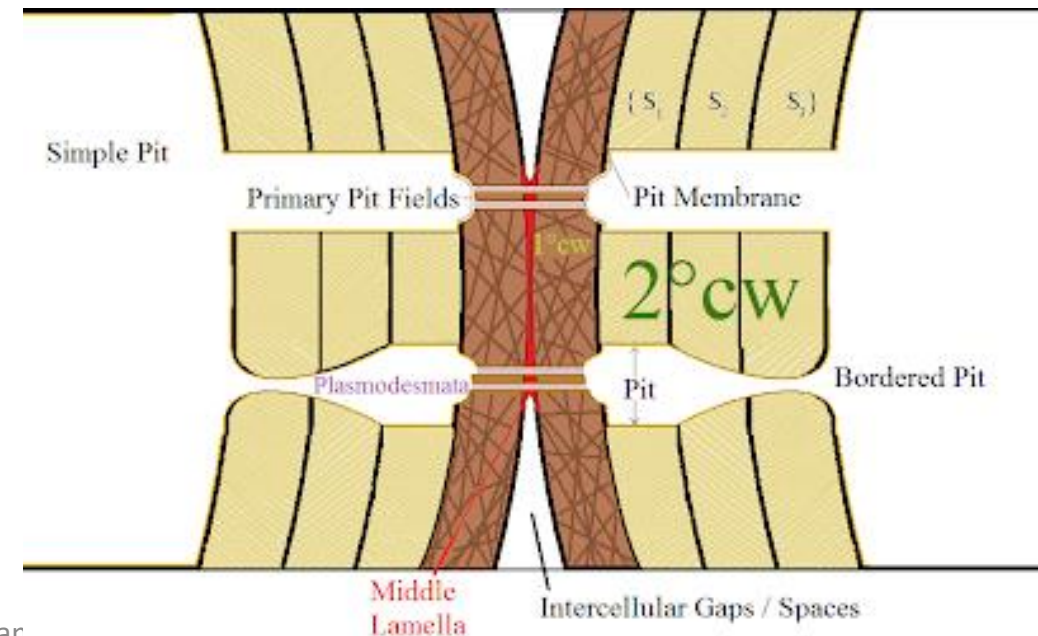


Simple

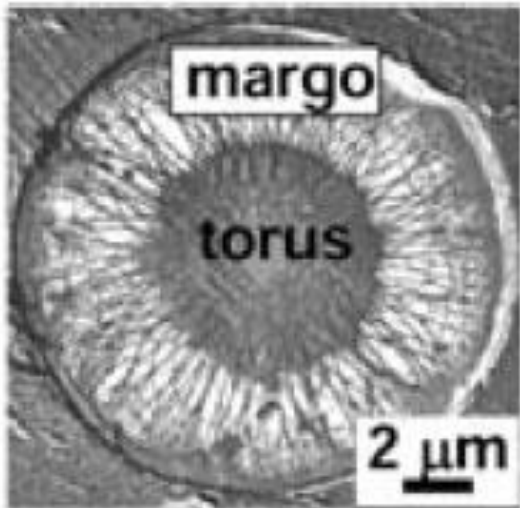
Half simple

Bordered

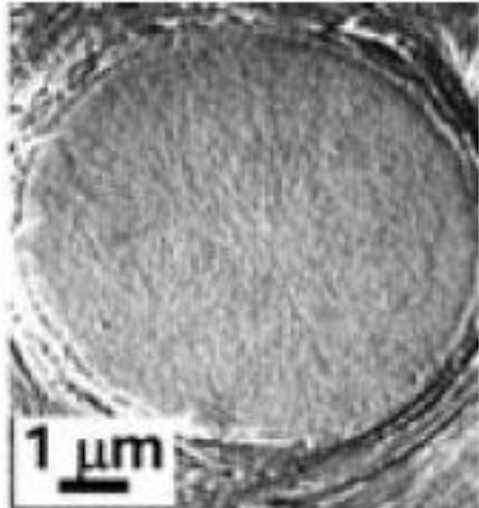
Half bordered



- Torus : - a circular thickening structure
- not have in angiosperm
 - composed of primary cell walls materials
 - pit membrane surrounding is call **margo**

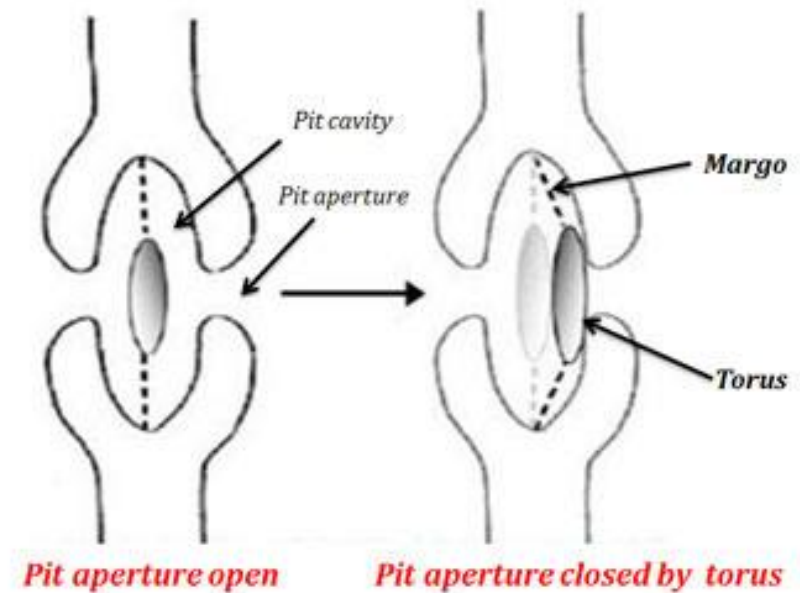


conifer



angiosperm

Opening and Closing of Pit





Cell membrane

- <https://youtu.be/qBCVVszQQNs>



Protoplasm

- <https://youtu.be/IWU6ma5405U>



TABLE 2.1 ■ An Inventory of Plant Cell Components

Cell wall	Middle lamella	
	Primary wall	
	Secondary wall	
	Plasmodesmata	
Protoplast	Nucleus	Nuclear envelope Nucleoplasm Chromatin Nucleolus
	Cytoplasm	Plasma membrane Cytosol (cytoplasmic ground substance, hyaloplasm) Organelles bounded by two membranes: Plastids Mitochondria Organelles bounded by one membrane: Peroxisomes Vacuoles, bounded by tonoplast Ribosomes Endomembrane system (major components): Endoplasmic reticulum Golgi apparatus Vesicles Cytoskeleton: Microtubules Actin filaments



The End