

# Introduction to Botany. Lecture 10

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# Outline

## 1 Questions and answers

## 2 Plant cell

- Cell boundaries
- Cellular transport



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## 1 Questions and answers

## 2 Plant cell

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# Previous final question: the answer

What is the difference between chloroplasts and mitochondria?



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What is the difference between chloroplasts and mitochondria?

- While chloroplasts are synthesizing organic compounds, mitochondria produce most of cytoplasmic ATP (energy source) in the plant cell.
- The inner membrane of mitochondria form cristae
- Chloroplasts contain thylakoids bearing chlorophyll in their membrane

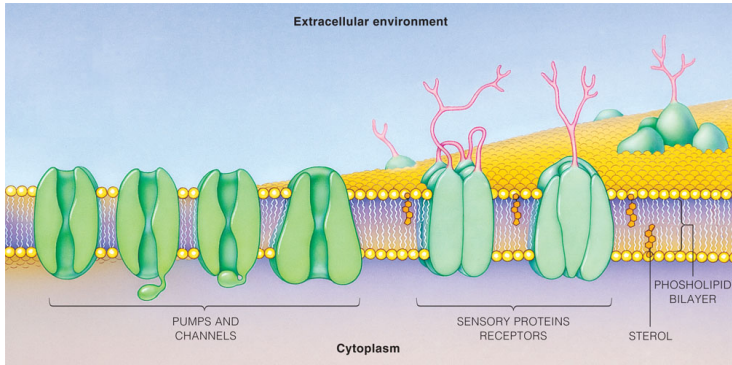


# Plant cell

## Cell boundaries



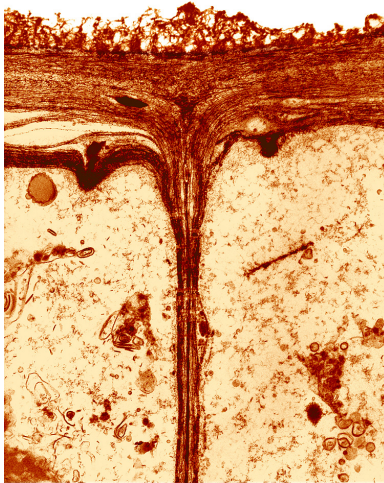
# Plasma membrane



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Phospholipids, sterols, proteins: pumps, receptors, channels

# Cell wall 1

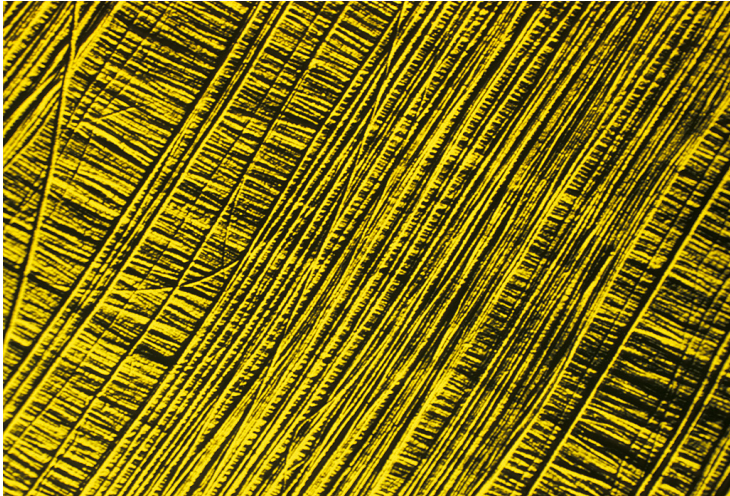


Root cells of an onion showing the cell wall (TEM  $\times 47,000$ )





# Cell wall 2



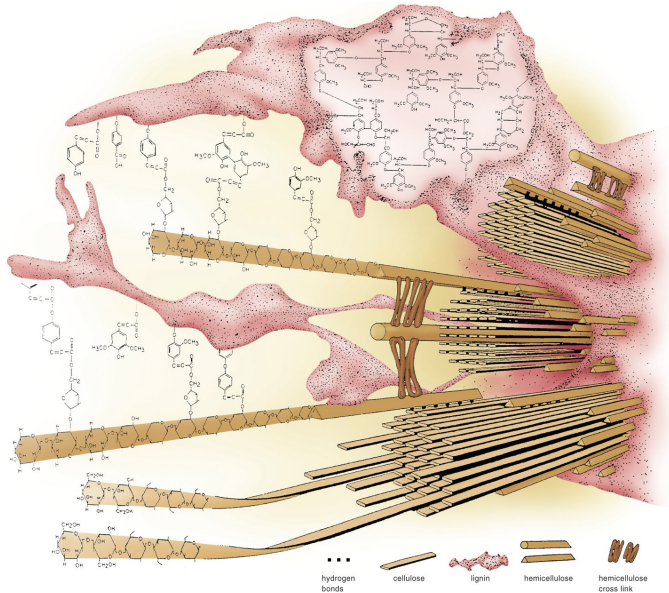
Cellulose fibers in the plant cell wall (SEM)

# Primary and secondary cell walls

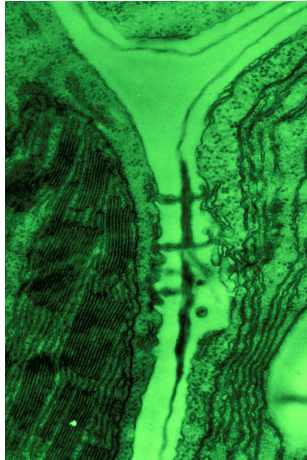
- **Primary cell wall** consists mostly of cellulose and proteins, they are thin and flexible
- **Secondary cell wall** includes hydrophobic lignine and suberine; this inclusion leads to the death of cell. However, dead cells are very useful for plants



# Secondary cell wall: molecules



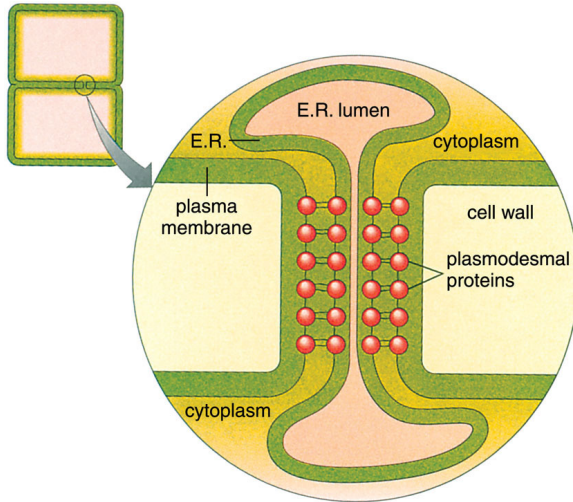
# Plasmodesmata 1



Plasmodesmata in a corn leaf between a mesophyll cell and a bundle sheath cell (TEM)



# Plasmodesmata 2



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E.R. = endoplasmic reticulum (endoplasmic network)



# Vacuoles, osmosis and turgor pressure

- If cell vacuoles contain more concentrated solution of salts then water surrounding cell (i.e., water outside is *hypotonic*), water will flow inside a cell. It is called **osmosis**
- Cell wall prevents cell from explosion due to high **turgor pressure**
- When water flows outside a cell, cell content will shrink: this is **plasmolysis**



# Symplast and apoplast

- **Symplast** — name for continuous cytoplasm in set of cells
- **Apoplast** — space outside cell; area of considerable metabolic activity



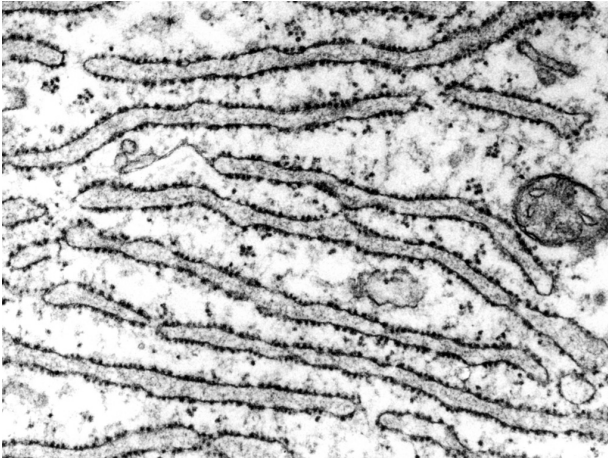
# Plant cell

## Cellular transport





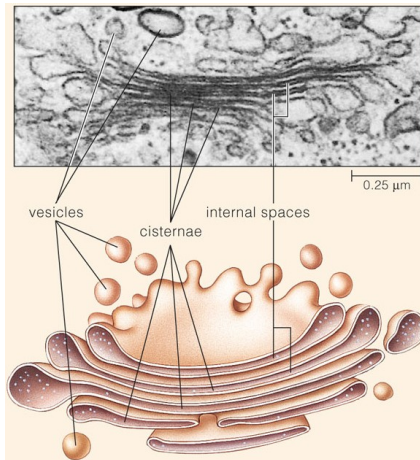
# Endoplasmic reticulum (network), ER



Rough endoplasmic reticulum with ribosomes along outer surface. Manufactures many proteins destined for secretion or for incorporation into membranes (TEM)

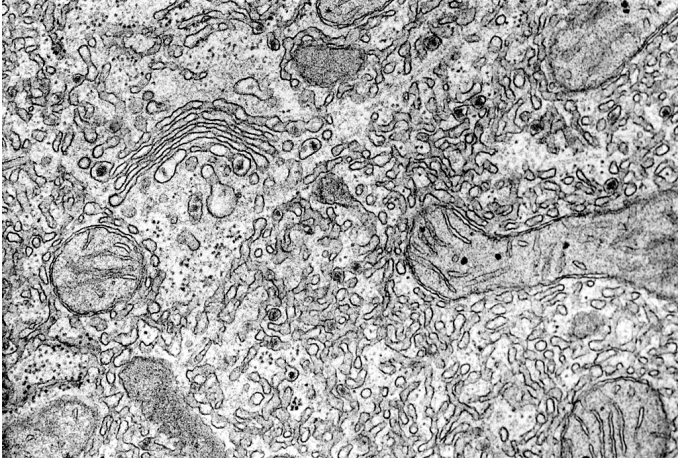


# Golgi apparatus (dictyosomes) 1



The Golgi is an organelle composed of stacks of flattened, membranous sacs mainly responsible for modifying, packaging, and sorting proteins that will be secreted or targeted to other organelles of the internal membrane system or to the plasma membrane

# Golgi apparatus (dictyosomes) 2



Golgi complex and smooth endoplasmic reticulum in a liver cell (TEM)



# Final question (2 points)



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List at least two differences between plant and animal cells.



# Summary

- Vacuole, chloroplasts and cell wall are three most important cell parts specific to plants.
- There are **two ways** of moving things between plant cells: through symplast or through apoplast
- **ER** handles ribosomes and packages proteins
- **Golgi apparatus** guides the movement of proteins



# For Further Reading



A. Shipunov.

*Introduction to Botany* [Electronic resource].

2010—onwards.

Mode of access:

[http://ashipunov.info/shipunov/school/biol\\_154](http://ashipunov.info/shipunov/school/biol_154)



Th. L. Rost, M. G. Barbour, C. R. Stocking, T. M. Murphy.

*Plant Biology*. 2nd edition.

Thomson Brooks/Cole, 2006.

*Chapter 3.*

