

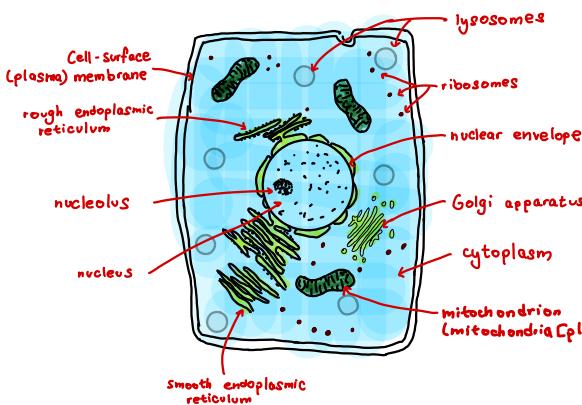
# Eukaryotic Cells

→ Organelles are components of cells with specific functions.

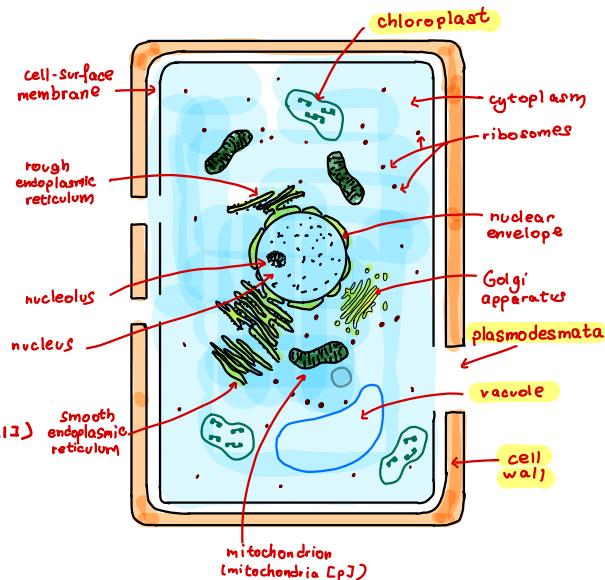
→ Animal, plant, algal and fungal cells are all eukaryotic.

## Overall Cell Structure

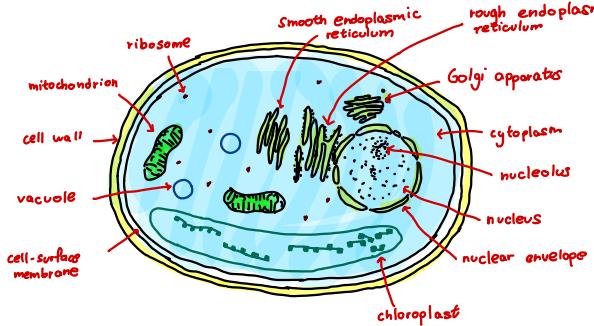
### Animal Cell Structure



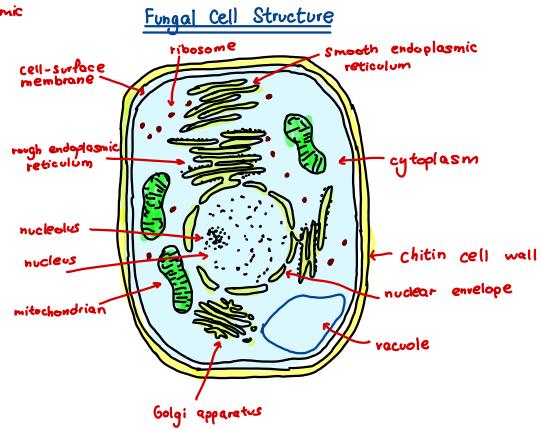
### Plant Cell Structure



### Algal Cell Structure



### Added extras from animal cells



• Unlike plants, algae can be unicellular or multicellular.

• Some algae have one large chloroplast rather than several smaller chloroplasts.

• Fungi can be multicellular or unicellular too.

• They are a lot like plant cells, however:

↳ their cell walls are made of chitin, not cellulose.

↳ they don't have chloroplasts (as they don't photosynthesise)

## Structures and Functions of Organelles

### Cell-Surface membrane

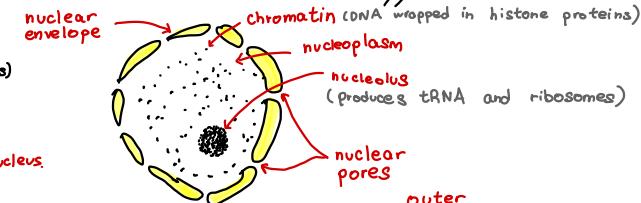
- Made mainly of lipids (phospholipid bilayer) and proteins.
- Regulates the movement of substances into and out of the cell.

It has receptor molecules which allow it to respond to chemicals like hormones.



### Nucleus

- Surrounded by a nuclear envelope (which contains many pores)
- Contains chromosomes and nucleolus
- Controls transcription of DNA.
- Pores allow substances like RNA to move in or out the nucleus.
- Nucleolus makes ribosomes.
- The outer membrane slowly forms into endoplasmic reticulum.



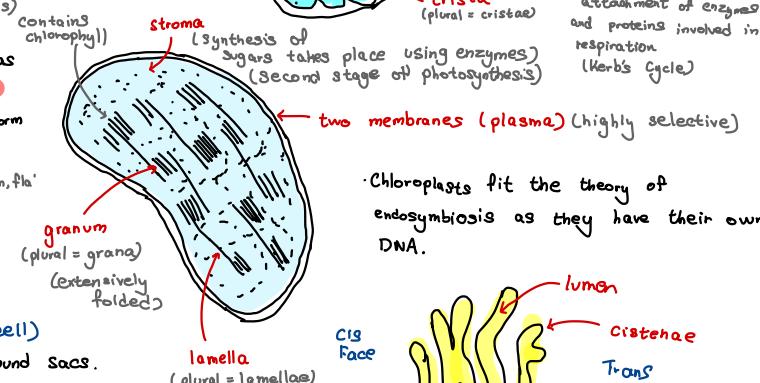
### Mitochondrion (power-house of the cell)

- Have a double membrane - inner is folded to form cristae.
- Inside contains the matrix, which contains enzymes involved in respiration.
- Where aerobic respiration occurs. (produces ATP - an energy source)
- Both membranes are rich in proteins.

→ Liver cells mitochondria detoxify ammonia with enzymes

### Chloroplast (Most plant cells) (not root hair cells)

- Found in plant cells and algal cells.
- Surrounded by a double membrane, also has membranes inside called thylakoid membranes.
- Thylakoid membranes are stacked up to form grana / thylakoids
- Grana are linked together by lamellae (thin, flat pieces of thylakoid membrane)
- Where photosynthesis takes place (some happens in the grana, other happens in the stroma) (Calvin cycle)

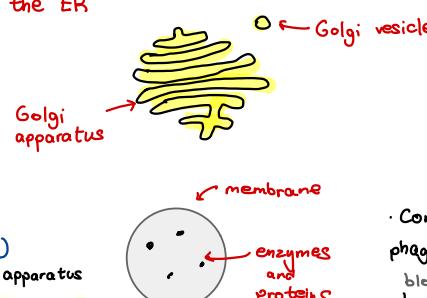


### Golgi apparatus (post-office of the cell)

- A group of fluid-filled membrane-bound sacs.
- Vesicles are seen at the edges.
- Processes and packages new lipids and proteins
- Makes lysosomes
- Modify and transform vesicles from the ER

### Golgi vesicle

- A small fluid-filled sac produced by the Golgi apparatus.
- Stores lipids and proteins made by Golgi apparatus and transports them out of the cell.



cells could commit suicide when:

- Cancer develops
- Error of mitosis
- Infected with virus

### Lysosome (recycling center of the cell)

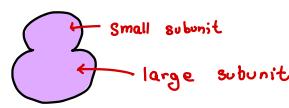
- A type of Golgi vesicle produced by the Golgi apparatus
- Involved in the immune response during phagocytosis.
- Contains digestive enzymes called lysozymes and used to digest invading cells or to break down worn out components of the cell. (digestion and hydrolysis)

involved in exocytosis

- Commonly found in phagocytic cells (e.g. white blood cells)
- Lysosomes break down the cell wall of bacteria.
- Also breaks down dead cells by autolysis.

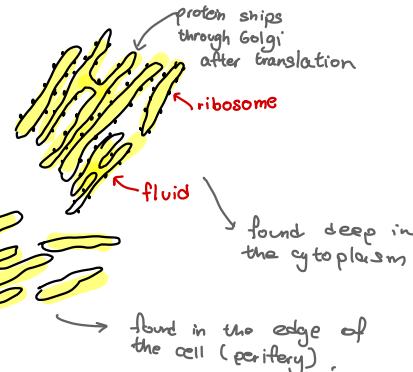
## Ribosome

- Floats free in the cytoplasm or attached to the rough endoplasmic reticulum.
- Made up of proteins and RNA.
- It is not surrounded by a membrane.
- where protein is made. → carries out translation during protein synthesis using tRNA
- Location of the ribosome determines its function.
- Ribosomes in the cytoplasm create proteins for use in the cytoplasm.
- Ribosomes bound to ER are used to create proteins for the outside of the cell.
- In eukaryotes their size is 80S (60S large + 40S small)
- In prokaryotes their size is 70S (50S large + 30S small)



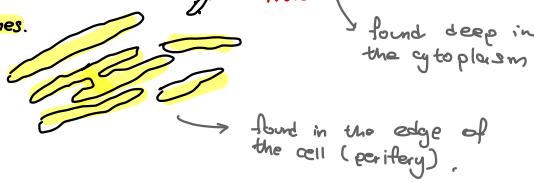
## Rough endoplasmic reticulum (RER)

- System of membranes enclosing a fluid-filled space.
- The surface is covered with ribosomes.
- Folds and processes proteins that have been made at the ribosomes.



## Smooth endoplasmic reticulum (SER)

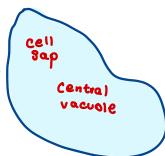
- Similar to rough endoplasmic reticulum, but with no ribosomes.
  - Synthesises and processes lipids (lipid synthesis)
  - Cells that secrete lipids/carbohydrates/sterooids have an excess of SER.
  - e.g. abundant in liver, skin oil glands
- due to detoxification  
(Liver cells will double the amount of SER when drinking alcohol)



→ Responsible for muscle contraction.

## Cell Vacuole (Plant version)

- A membrane-bound organelle found in the cytoplasm (membrane called tonoplast) tonoplast →
- Contains cell sap - a weak solution of sugar and salts.
- The surrounding membrane is called the tonoplast.
- Helps to maintain pressure inside the cell and keep the cell rigid. → stops plants wilting
- Involved in the isolation of unwanted chemicals inside the cell.
- Generally occupy more than 30% of the cell.
- Remove and store waste produced during autophagy



when part of the cell is broken down due to age or damage

Structurally and functionally related to lysosomes in animal cells

## Nucleolus

- A small dense spherical structure in the nucleus of the cell
- Non-membrane bound organelle
- Converts genetic information encoded by DNA into proteins (so it regulates the transcription of proteins as a result)
- The nucleolus is made of Ribonucleic Acid (RNA)
- Key location for the production of ribosomes.
- The ribosomes produced from the nucleolus are used to transcribe proteins for the cell in the process of transcription
- Made of RNA, DNA and proteins