



***Human biology***  
***Cells: The Basic Units of***  
***Life***

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# Reference

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- Text book of human biology by John Kenneth Inglis 3<sup>rd</sup> Ed (1985)

# Cells: The Basic Units of Life



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- ❖ All organisms are composed of:-
- ❖ Either one cell **unicellular** (e.g. bacteria)
- ❖ Or more cells **multicellular** (e.g. human body contains about a trillion cells)

# What are Cells?



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- ❖ **Cells:** are the basic structural and functional unit of life
- ❖ The study of cells is called **cytology**.



# Cell theory

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Cell theory consists of three principles:

- ✓ Cells are the fundamental units of life
- ✓ All organisms are made up of cells
- ✓ All cells come from pre-existing cells

# Types of cells

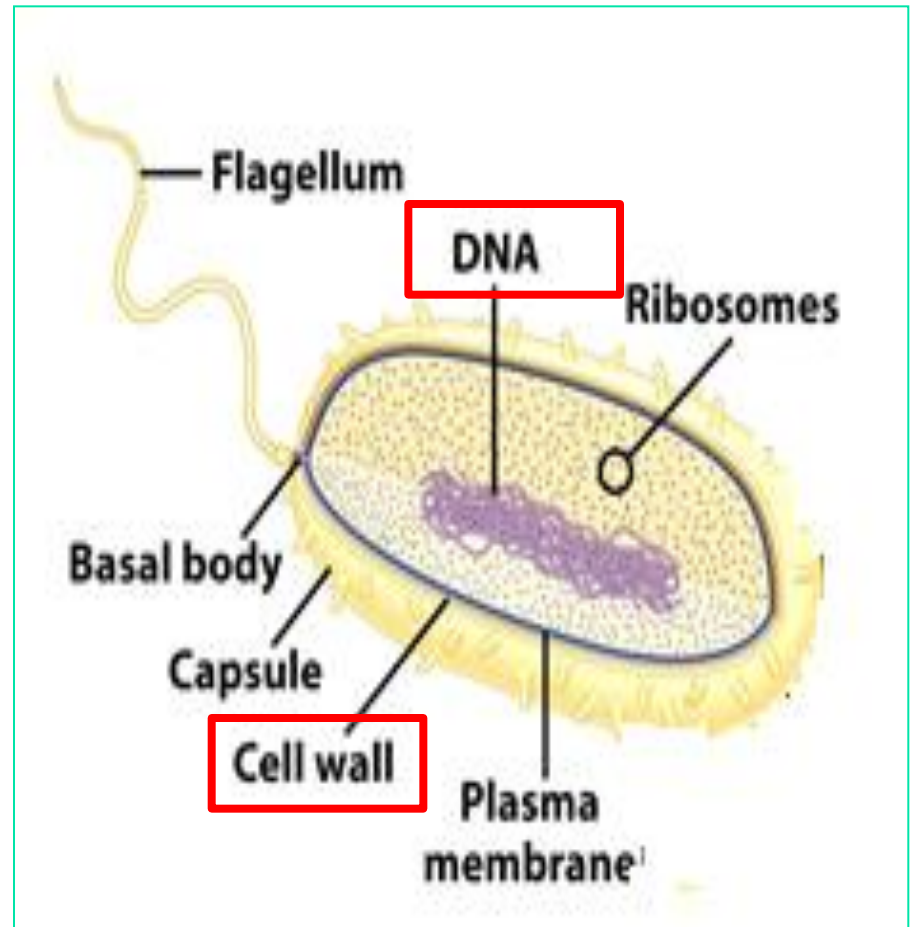


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- All living cells can be divided into two groups:
  1. **Prokaryotic cells**
  2. **Eukaryotic cells**

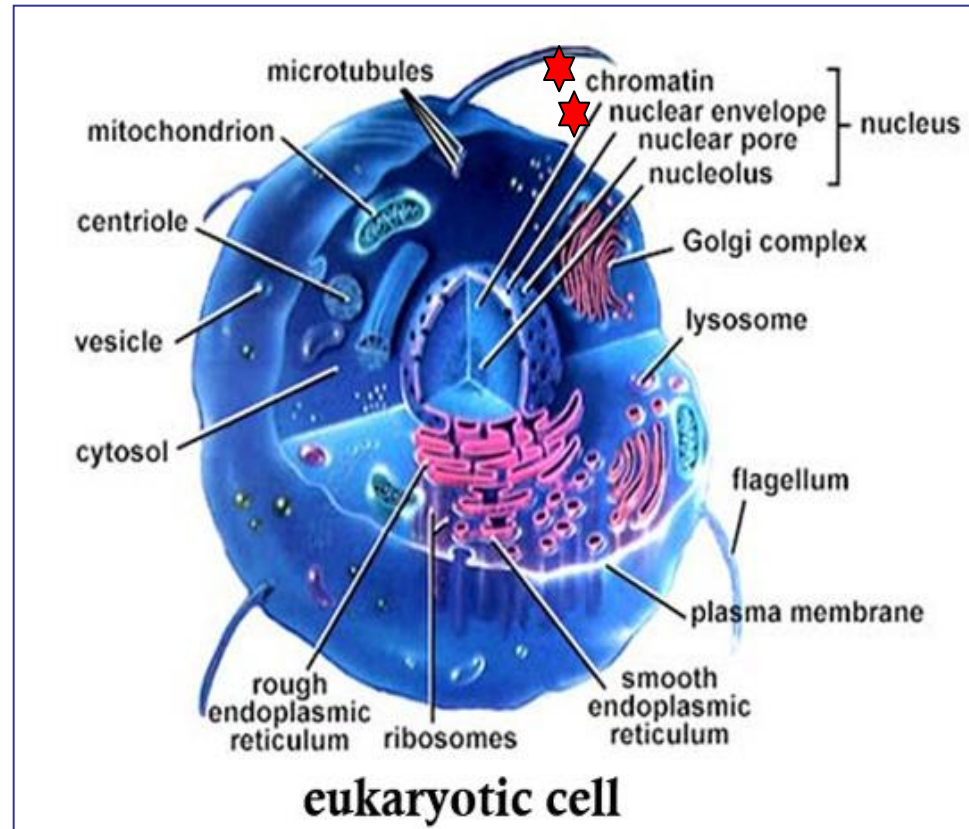
# Prokaryotic cells

- ✓ The genetic material is in the form of a **single long strand of DNA**
- ✓ No separate nucleus
- ✓ Fewer organelles in the cytoplasm
- ✓ A cell wall like plant e.g. bacteria.



# Eukaryotic cells

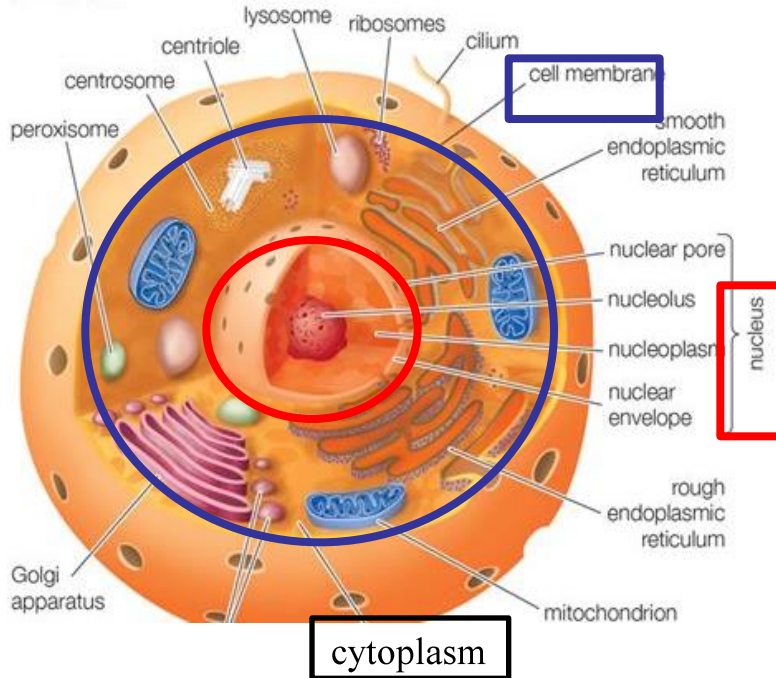
- ✓ The **genetic material** is in the form of **chromosomes**
- ✓ A nucleus surrounded by a **nuclear membrane**
- ✓ Many organelles in the cytoplasm e.g. animals, plants and fungi.



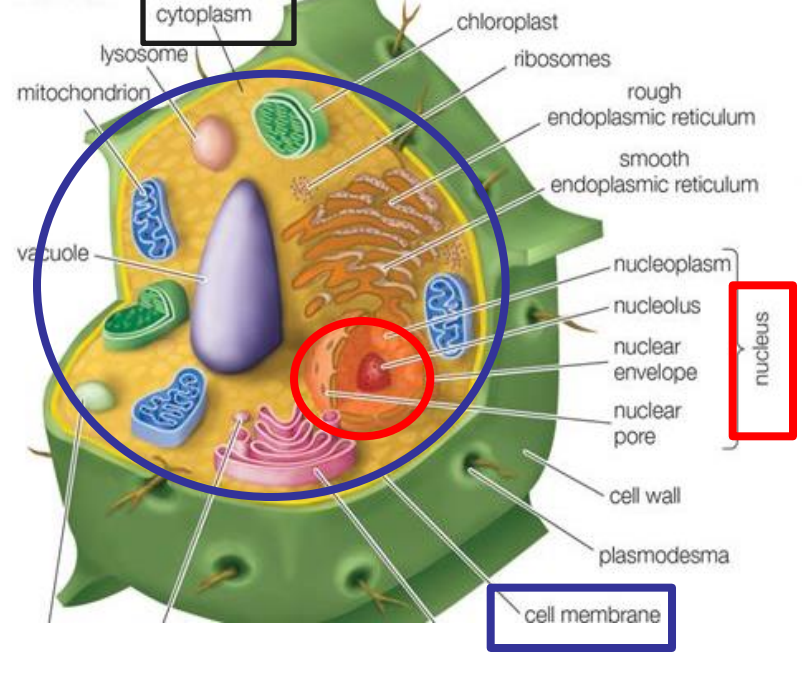


# Plants and animals

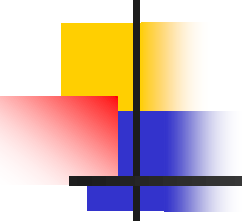
Animal cell



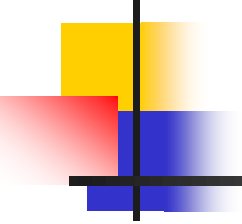
Plant cell



	Animal cells	Plant cells
1-	Cell wall is absent	Cell wall is present
2-	One or more small vacuoles	One large central vacuole
3-	Animal cells do not have chloroplast	Plant cells have chloroplast

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- **Cell wall:** The defensive walls of the plant, they are made of polysaccharide called cellulose. Animal cells do not have a cell wall.
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- **Vacuole:** Animal cells have one or more small vacuoles whereas plant cells have one large central vacuole that can take up to 90% of cell volume. In plant cells, the function of vacuoles is to store water
- Vacuoles in animal cells store water, ions and waste.

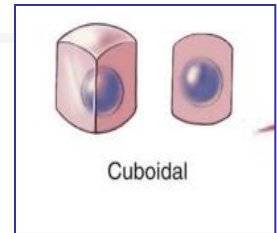
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- **Chloroplasts:** They are present in plant cells; these are packages of green pigment chlorophyll that is used to capture the light energy in the process of photosynthesis.
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- Plants are able to take in simple chemicals (water and salts from the soil and carbon dioxide from the air) and use them to synthesize complex molecules. Plants are therefore autotrophs (they can produce their own food from the substances available in their surroundings).
- Animals take in complex chemicals and break them down into simpler substances that can then be used by the body, this process called digestion animals are therefore heterotrophs.

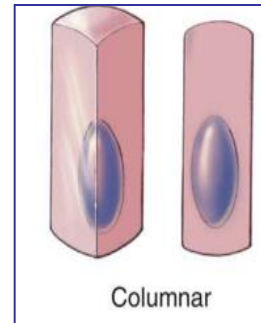
# Cell shapes

- Cells come in different forms because they have different function:-

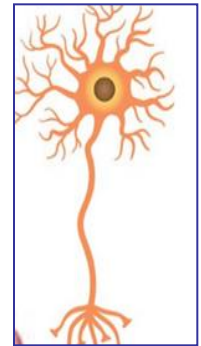
**Cube** like cell, cubical cells which is seen in cuboidal epithelium



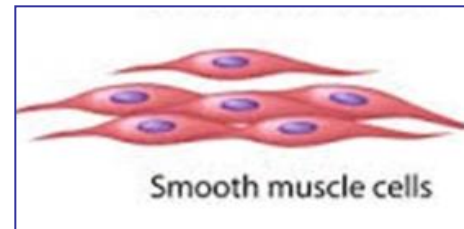
**Long column** like the goblet cell



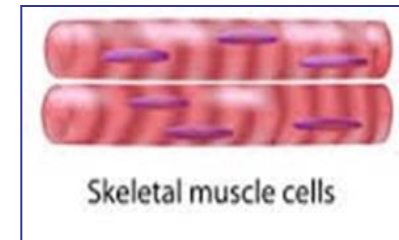
**Nerve cells** have long projections that help them carry electrical messages to other cells



**Spindle** shape in smooth muscle cells



**Rectangular** shape in skeletal muscle which is multinucleated



# What is the size of a cell?



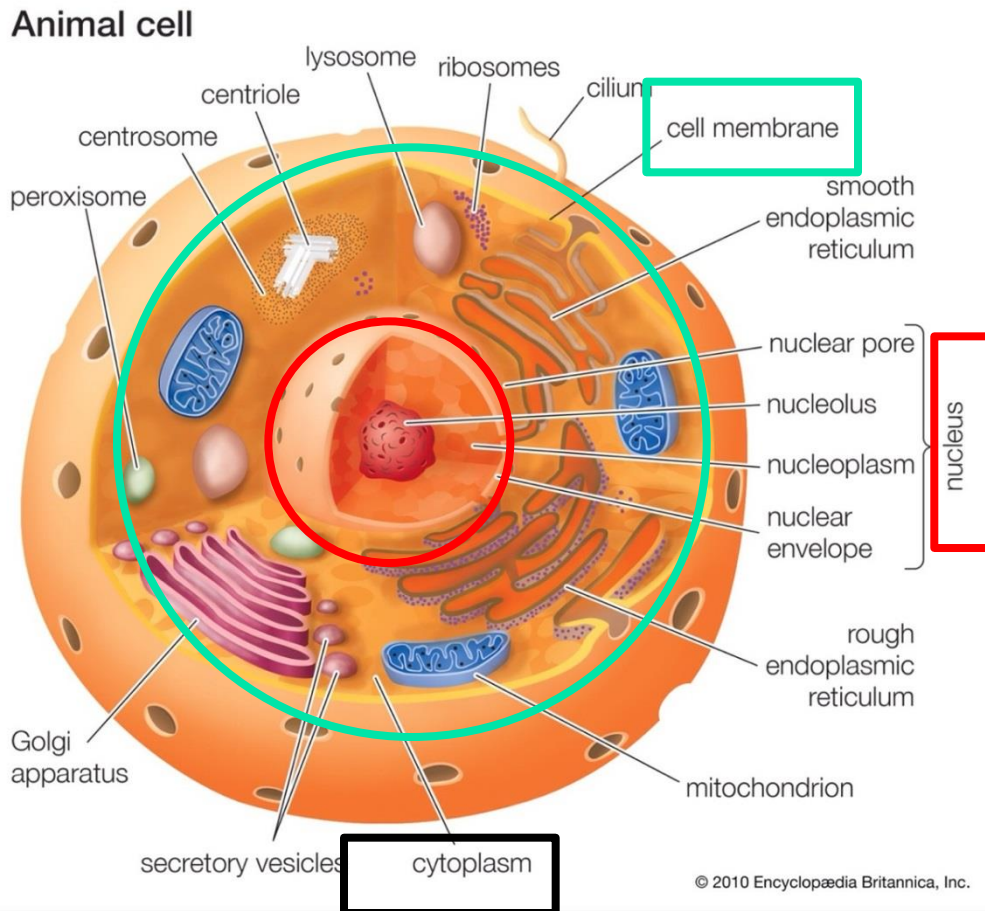
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- ❖ Some large cells e.g. an egg such as **frogspawn** can be seen with the unaided eye but most cells are much smaller and so we need a microscope to be able to examine them
- ❖ **Light microscopes** can resolve structures that are 200 nm
- ❖ **Electron microscopes** can resolve structures that are 0.2 nm

# Cells structures

- A cell consists of three main parts:-
  - ✓ **Nucleus**
  - ✓ **Cell membrane**
  - ✓ **Cytoplasm**
- Within the cytoplasm are many parts that do different functions these parts are called **organelles (small organs)**

# Typical animal cells



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- The nucleus is a large organelle that may or may not be centrally within the cytoplasm
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- It is enveloped in a double membrane that has nuclear pores to permit the two-way traffic of large molecules
- When the cell divides into two, chromatin coils up into rod-like **chromosomes**
- Most nuclei contain at least one nucleolus (plural, nucleoli), this is made up of RNA and aids in the production of structures called ribosomes.

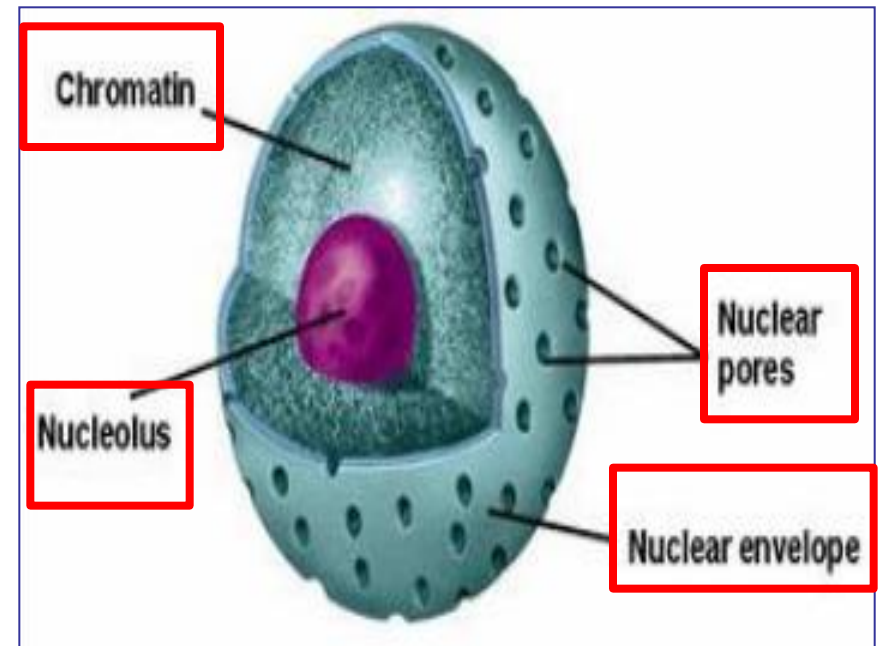


# The nucleus

**Nuclear membrane** that has nuclear pores to permit the two-way traffic of large molecules

**Chromatin** coils up into rod-like chromosomes during cell division

**Nucleolus** most nuclei contain at least one



**The endoplasmic reticulum** is a system of double-membraned tubular canals running throughout the cytoplasm.

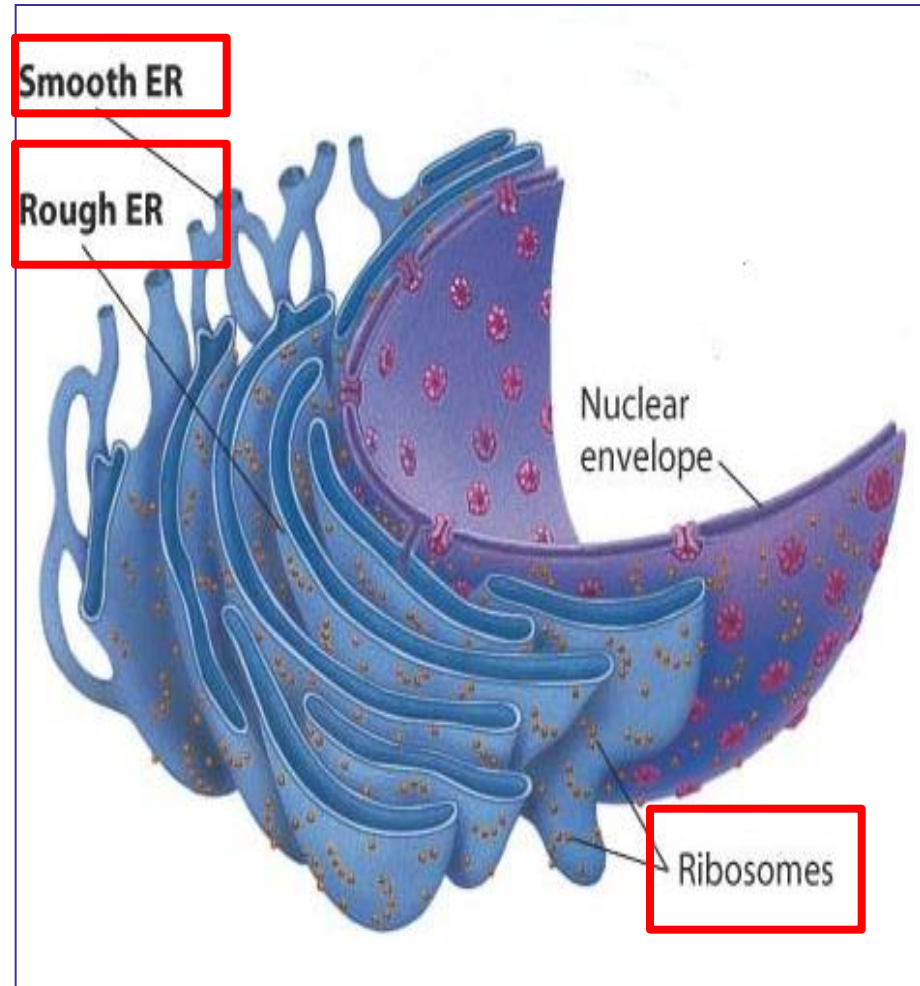


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Some of these membranes are dotted with extremely small granular particles called **ribosomes**. This membrane with ribosomes is described as **rough endoplasmic reticulum** and is the site of protein synthesis. The membranes without ribosomes are described as **smooth endoplasmic reticulum**

# Endoplasmic reticulum (ER)

- ❖ **ER** is a system of double-membraned tubular canals found in the cytoplasm
- ❖ **Rough** endoplasmic reticulum contains **ribosomes** the site of protein synthesis
- ❖ **Smooth** endoplasmic reticulum without ribosomes

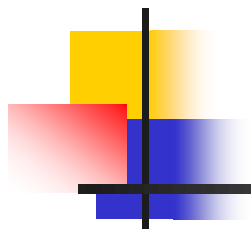




# Function of Smooth endoplasmic reticulum

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- Here fatty substances are synthesized as are some hormones. It is may also be true that dangerous chemicals are destroyed (detoxified) by enzymes located on these membranes



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**Thank you**