

Eukaryote



What do trees, monkeys, plankton and mushrooms have in common?

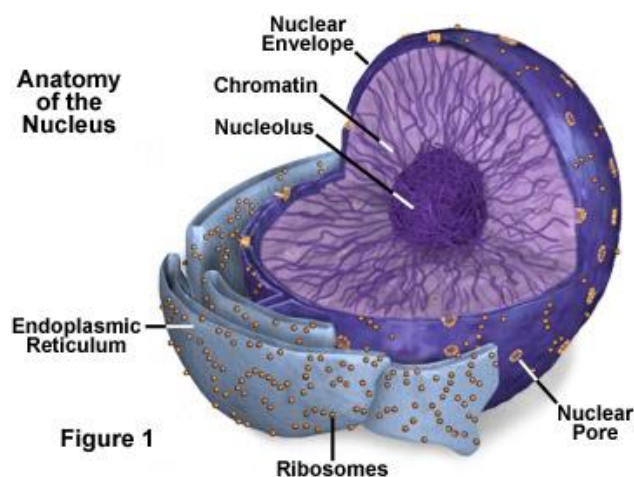
They are all members of the Eukaryote domain!
You are a member of the Eukaryote domain too!

Plants, animals, protists, and fungi, are all members of the domain. All members of the domain Eukaryote have *eukaryotic cells*. Eukaryotic cells have three main components: cell membrane, nucleus and variety of other organelles.

The cell membrane:

The cell membrane is a complex barrier separating every cell from its external environment, regulates what passes into and out of the cell.

The nucleus:



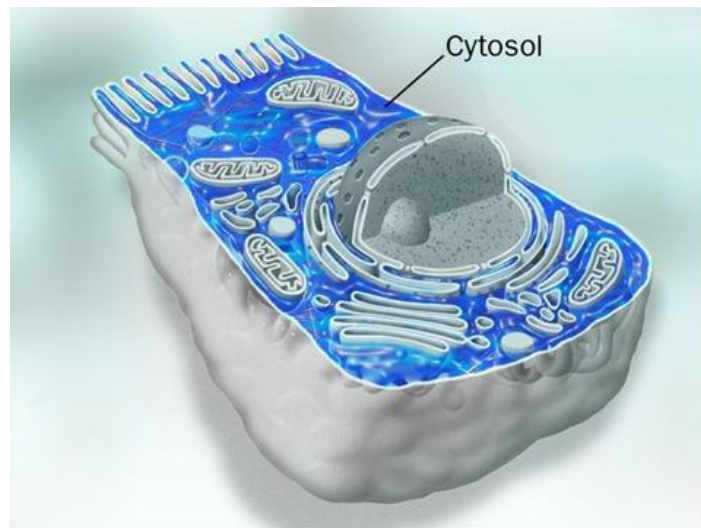
1. The largest organelle in a Eukaryotic cell.
2. The nucleus contains the cell's chromosomes (human 46, fruit fly 6), which contain both linear DNA and proteins known as histones.

3. Most cells have a single nucleus, some cells have more than one (fungi have many nuclei in their cytoplasm).

4. A double membrane called the nuclear envelope surrounds the nucleus. Which has many nuclear pore by which mRNA and proteins can pass.
5. Most nuclei contain at least nucleolus (nucleoli), where ribosomes are synthesised (ribosomes translate mRNA into proteins).

Cytoplasm:

1. Everything within the cell membrane, which is not the nucleus, is known as the cytoplasm.
2. Cytosol is the jelly-like mixture in which the other organelles are suspended, so **cytosol + organelles = cytoplasm**.

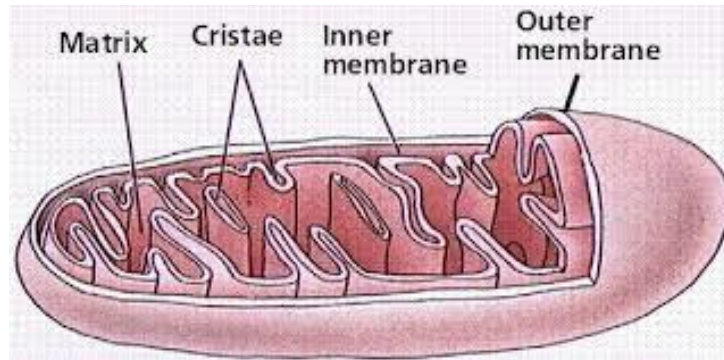


Mitochondria:

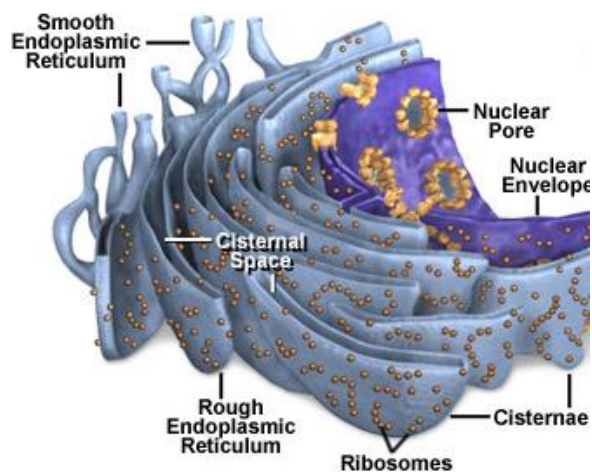
1. Found scattered throughout the cytosol.
2. Mitochondria are the sites of aerobic respiration, in which energy from organic compounds is transferred to ATP (ATP is the molecule that most cells use as their main energy). For this reason, they are sometimes referred to as the **powerhouse**.

3. Mitochondria are surrounded by two membranes

- a. The smooth outer membrane serves as a boundary between the mitochondria and cytosol.
- b. The inner membrane has many long folds, known as crista.



Endoplasmic reticulum (ER):

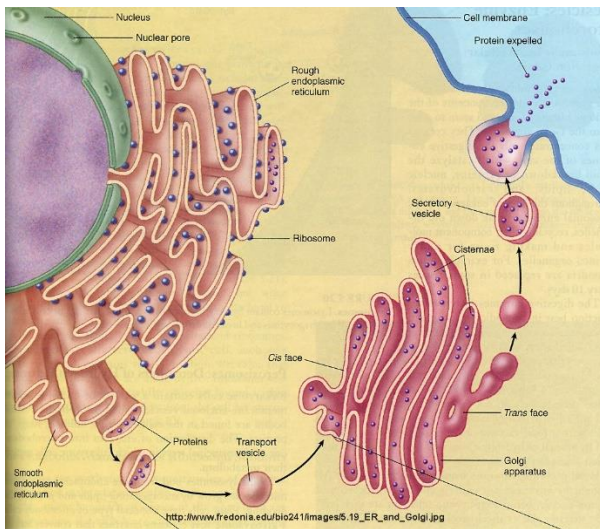


1. The ER is a system of membranous tubules and sacs.
2. The primary function of the ER is to act as an internal transport system, allowing molecules to move from one part of the cell to another.
3. The number of ER inside a cell depending on the cell's activity.
4. There are two types of ER:
 - a. Rough ER
 - b. Smooth ER, where polypeptide are converted into functional proteins

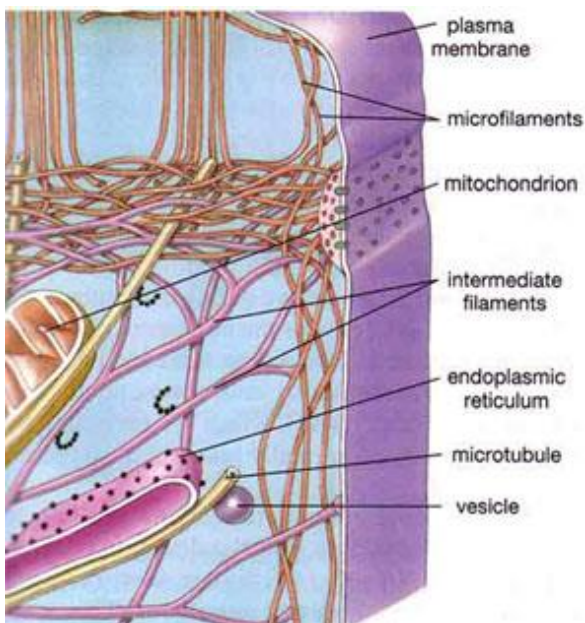
Ribosomes:

1. Ribosomes are not surrounded by a membrane.
2. Ribosomes are the site of protein synthesis in a cell.
3. Line the membranes of Rough endoplasmic reticulum (rough ER).
4. They exist in two sizes:
 - a. 70s are found in all prokaryotes
 - b. 80s found in all eukaryotic cells

Golgi apparatus:



1. The Golgi apparatus is a system of membrane, made of flattened sac-like structures.
2. It works closely with the ER to modify proteins for export by the cell.



Cytoskeleton:

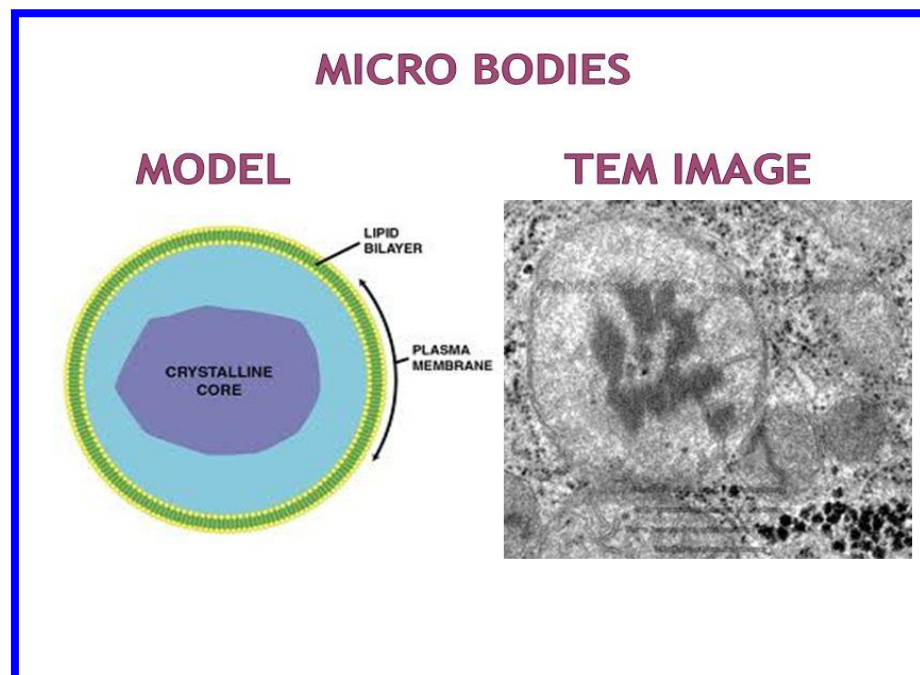
1. Just as your body depends on your skeleton to maintain its shape and size, so a cell needs structures to maintain its shape and size
2. In animal cells, which have no cell wall as in plant cell, cytoskeleton maintains the shape of the cell, and helps the cell to move

3. The cytoskeleton consists of two structures:

- a. **Microfilaments**, made of actin they are common in motile cells
- b. **Microtubules**, made of tubulin, they form the *centriole*.

Microbodies:

1. Is a type of organelle that is found in the cells of plants, protozoa, and animals.
2. These microbodies are the different type of bodies, these are present in the cytosol of the cell, these are also called as cytosomes.
3. A microbody is usually a vesicle with a spherical shape surrounded by a single phospholipid bilayer membrane and they contain a matrix of intracellular material including enzymes and other proteins.
4. microbodies include peroxisomes, glyoxysomes .

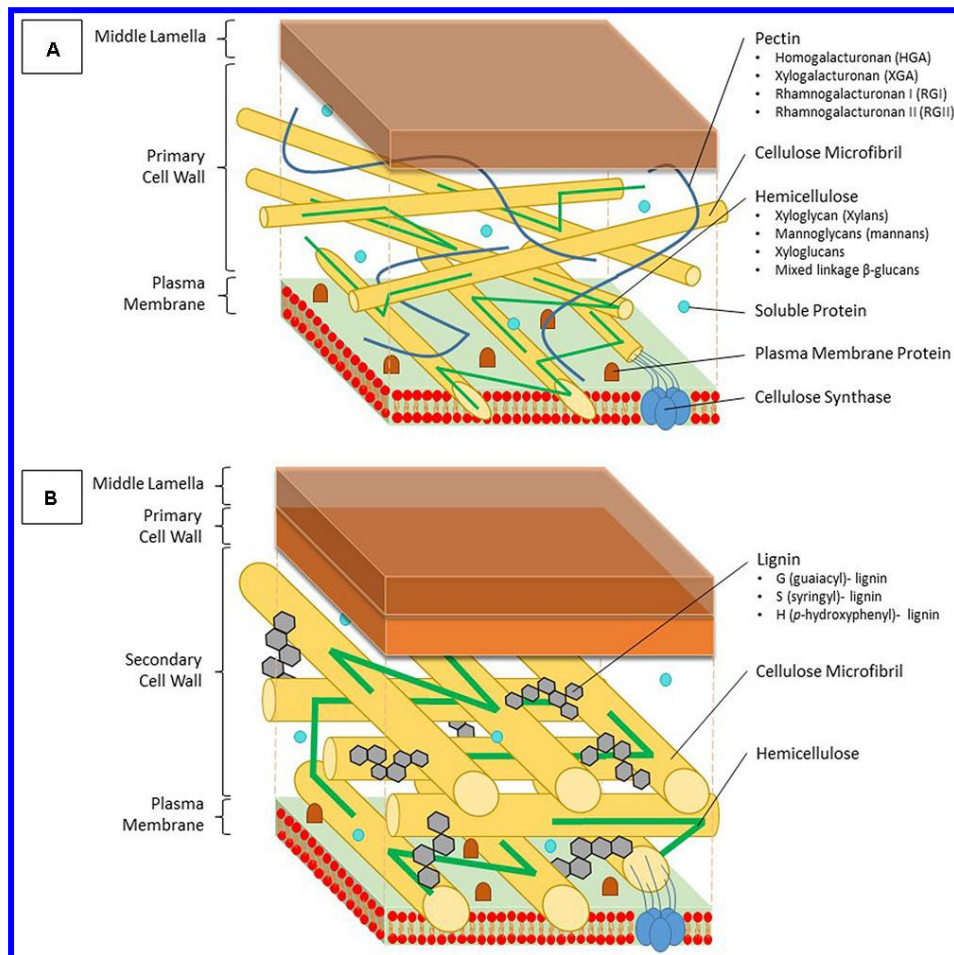


Cell wall and the chloroplast:

The **cell wall** is the outermost layer of cells in **plants, bacteria, fungi,** and many **algae** that gives shape to the cell and protects it from infection. In plants, the cell wall is made up mostly of **cellulose** as well as non-cellulosic polysaccharides (**sugars**), **proteins, lignin** and **water**.

The cell wall consists of:

- 1- Middle lamella:** It is the first layer formed during cell division. This layer rich in pectin and joins together adjacent plant cells and holds them together.
- 2- Primary cell wall:** It is formed after the middle lamella. In general it is a thin, flexible and extensible layer composed of cellulose, pectin and hemicelluloses.
- 3- Secondary cell wall:** formed inside the primary cell wall. It is a thick layer rich in lignin that strengthens and waterproofs the wall and is formed inside the primary cell wall that has stopped increasing in surface area when the cell is fully grown.



Cell Wall Function:

- 1- Gives the cell a definite shape and structure.
- 2- Provides structural support.
- 3- Protection against infection and mechanical stress.
- 4- Separates interior of the cell from the outer environment.
- 5- It enables transport of substances and information from the cell insides to the exterior and vice versa.
- 6- Helps in osmotic-regulation.
- 7- Prevents water loss.
- 8- The physiological and biochemical activity of the cell wall helps in cell-cell communication.

Plasmodesmata: Are small holes in the wall that let nutrients, waste, and ions pass through.

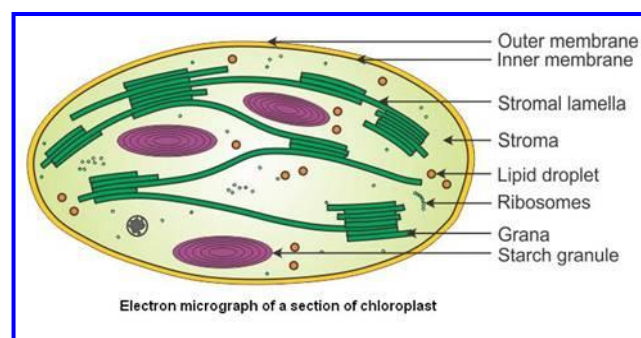
The chloroplast and other plastids:

- In 1883 Schimper first used the term "Plastid" for special cytoplasmic organelles present in eukaryotic plant cells.
- The chloroplast is a green organelle found only in plant cells.
- Chloroplasts are the site of photosynthesis, a process that allows plants to use the Sun's energy to make food.
- Chloroplast is characterized by the presence of pigments such as chlorophyll and carotenoids and by their fundamental role in photosynthesis.
- There are other colored plastids these are grouped under the name chromoplasts :

Yellow or orange chromoplasts occur in petals, fruits, and roots of certain higher plants.

Red color of ripe tomatoes is the result of chromoplasts that contain the red pigment **lycopene**.

Colorless plastids or leucoplasts are found in embryonic and germ cells.



Multicellular organization

In most multicellular organisms, we find the following organization:

- 1. Cellular level:** the smallest unit of life capable of carrying out all the function of living things.
- 2. Tissue level:** a group of cells that performs a specific function in an organism.
- 3. Organ level:** several different types of tissue that function together for a specific purpose.
- 4. Organ system level:** several organs working together to perform function. The different organ system in a multicellular organism interact to carry out the processes of life.
- 5. Plants** have four organs they are: **roots, stems, leaves and flowers.**

