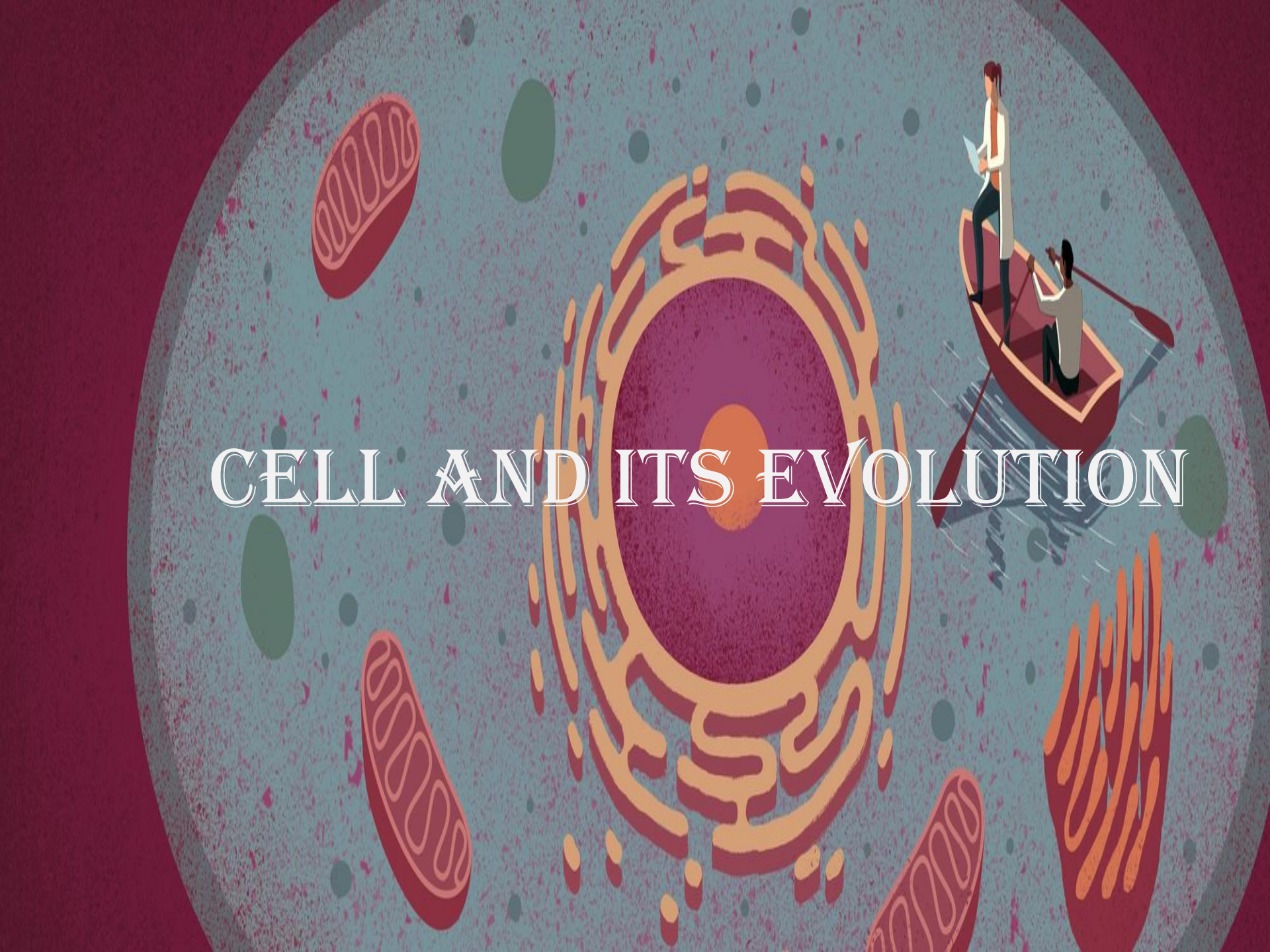
CELL AND ITS EVOLUTION

# INTRODUCTORY BIOCHEMISTRY

Chapter: 3
Cell and Its Evolution
Lecture - 8

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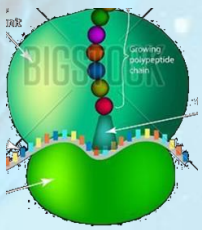
# Ribosomes

Ribosomes are tiny spheroidal dense particles (of 150 to 200 $A^0$ diameters) that are primarily found in most prokaryotic and eukaryotic cell.

They are structures containing approximately equal amounts of RNA and proteins

•In prokaryotic cells, the ribosomes often occur freely in the cytoplasm. In eukaryotic cells, the ribosomes either occur freely in the cytoplasm or remain attached to the outer surface of the membrane of the endoplasmic reticulum.

•The location of the ribosomes in a cell determines what kind of protein they make. If the ribosomes are floating freely throughout the cell, it will make proteins that will be utilized within the cell itself. When ribosomes are attached to the endoplasmic reticulum, it is referred to as rough endoplasmic reticulum or rough ER.




https://byjus.com/biology/endoplasmic-reticulum/

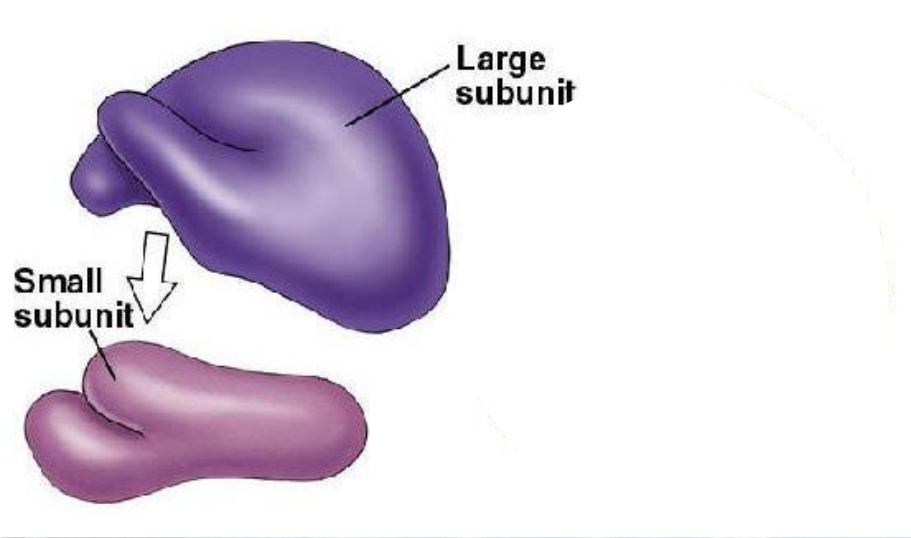
# Ribosomes

**Structure of Ribosomes**

Each ribosome is divided into two subunits:

**1.A smaller subunit** which binds to a larger subunit and the mRNA pattern, and

**2.A larger subunit** which binds to the tRNA, the amino acids, and the smaller subunit.

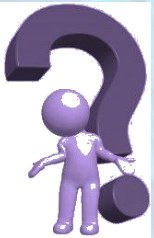



•Prokaryotes have 70S ribosomes respectively subunits comprising the little subunit of 30S and the bigger subunit of 50S.

•Eukaryotes have 80S ribosomes respectively comprising of little (40S) and substantial (60S) subunits.

The large subunit sits on top of the small subunit, with an RNA template sandwiched between the two.

# What does the ribosome do?



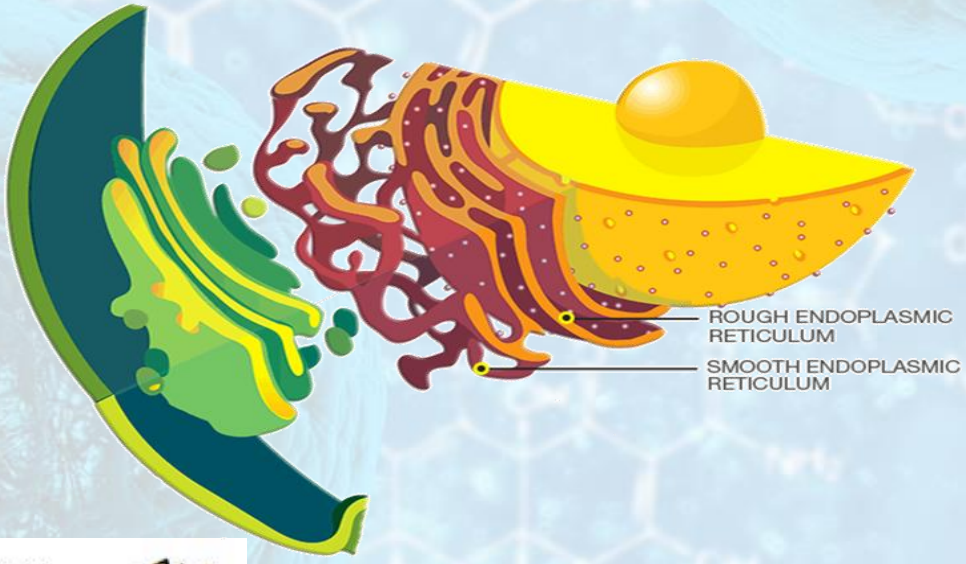
**Synthesize Protein**


The smaller subunit is where the mRNA binds and is decoded, and in the larger subunit, the amino acids get added. Both of the subunits contain both protein and ribonucleic acid components.

The two subunits are joined to each other by interactions between the rRNAs in one subunit and proteins in the other subunit.

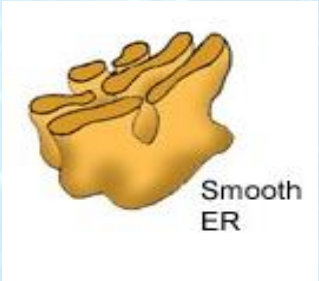
# Endoplasmic reticulum (ER)

ER is a continuous membrane system that forms a series of flattened sacs within the cytoplasm of eukaryotic cells. In animal cells, the ER usually constitutes more than half of the membranous content of the cell.




Differences in certain physical and functional characteristics distinguish the two types of ER, known as rough ER and smooth ER.

Rough ER is named for its rough appearance, which is due to the ribosomes attached to its outer (cytoplasmic) surface. Rough ER lies immediately adjacent to the cell nucleus, and its membrane is continuous with the outer membrane of the nuclear envelope.


•The smooth endoplasmic reticulum, on the other hand, does not have ribosomes.The smooth endoplasmic reticulum has a tubular form.

# Endoplasmic reticulum (ER)

## Functions of Endoplasmic Reticulum

both the types of ER perform specific functions:

## Smooth Endoplasmic Reticulum Function:

•Smooth ER is responsible for the synthesis of essential lipids such as phospholipids and cholesterol.
•Smooth ER is also responsible for the production and secretion of steroid hormones.
•It is also responsible for the metabolism of carbohydrates.
•The smooth ER store and releases calcium ions. These are quite important for the nervous system and muscular systems.

## Rough Endoplasmic Reticulum Function:

•The majority of the functions of rough ER is associated with protein synthesis.
•The rough endoplasmic reticulum also plays a vital role in protein folding.
•Also ensures quality control (regarding correct protein folding).
•The second most important function after protein synthesis and protein folding is protein sorting

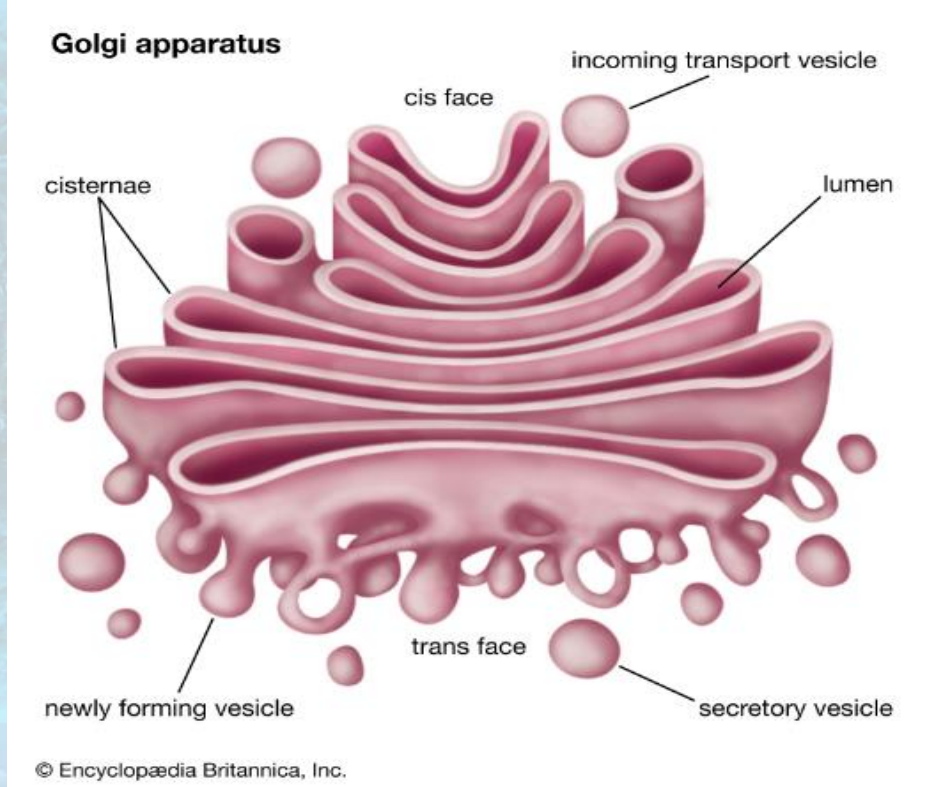
# Golgi apparatus

Golgi apparatus, also called Golgi complex or Golgi body, membrane-bound organelle of eukaryotic cells (cells with clearly defined nuclei) that is made up of a series of flattened, stacked pouches called cisternae.

These are cell organelles existing as an arrangement of a few fluid-filled dishes

The Golgi apparatus itself is structurally polarized, with three primary compartments

The three primary compartments of the apparatus are known generally as “cis” (cisternae nearest the endoplasmic reticulum), “medial” (central layers of cisternae), and “trans” (cisternae farthest from the endoplasmic reticulum).




In general, the Golgi apparatus is made up of approximately four to eight cisternae, although in some single-celled organisms it may consist of as many as 60 cisternae.

# Golgi apparatus

The cisternae are held together by matrix proteins, and the whole of the Golgi apparatus is supported by cytoplasmic microtubules.

## Functions of Golgi apparatus

- Secretory proteins and glycoproteins, cell membrane proteins, lysosomal proteins, and some glycolipids all pass through the Golgi apparatus at some point in their maturation.
- Produces lysosomes
- In plant cells, much of the cell wall material passes through the Golgi as well.

https://www.britannica.com/science/Golgi-apparatus
https://byjus.com/neet/difference-between-endoplasmic-reticulum-and-golgi-apparatus/

| Endoplasmic Reticulum | Golgi Apparatus |
|---|---|
| What are they? | |
| These are cell organelles that exist as a network of vesicles and tubules | These are cell organelles existing as an arrangement of a few fluid-filled dishes |
| Size | |
| These are the largest organelles present in the eukaryotic cells | Smaller compared to the endoplasmic reticulum |
| Types | |
| There are two sub-compartments – rough ER and smooth ER | Found as is |
| Intracellular Location | |
| Section of it is continuous with the cell's nuclear envelope. Precisely, the rough ER's density is greater near the nucleus and Golgi apparatus, whilst the smooth ER appears to be evenly situated throughout the cell. | It is not directly linked with the nucleus. Rather, it is found in the cell's cytosol in the vicinity of the rough ER. |
| Ribosomes | |
| Membrane-bound ribosomes are found on the rough endoplasmic reticulum's surface. | Ribosomes are not found on its surface. |
| Association with Lysosomes | |
| Synthesises lysosomal hydrolases | Produces lysosomes |
| Role | |
| Processing and folding membranes, secreted and transmembrane proteins, synthesising membrane lipids or their precursors and lipid metabolism | Involved in lipid metabolism, processing glycoproteins and formation of lysosomes |