


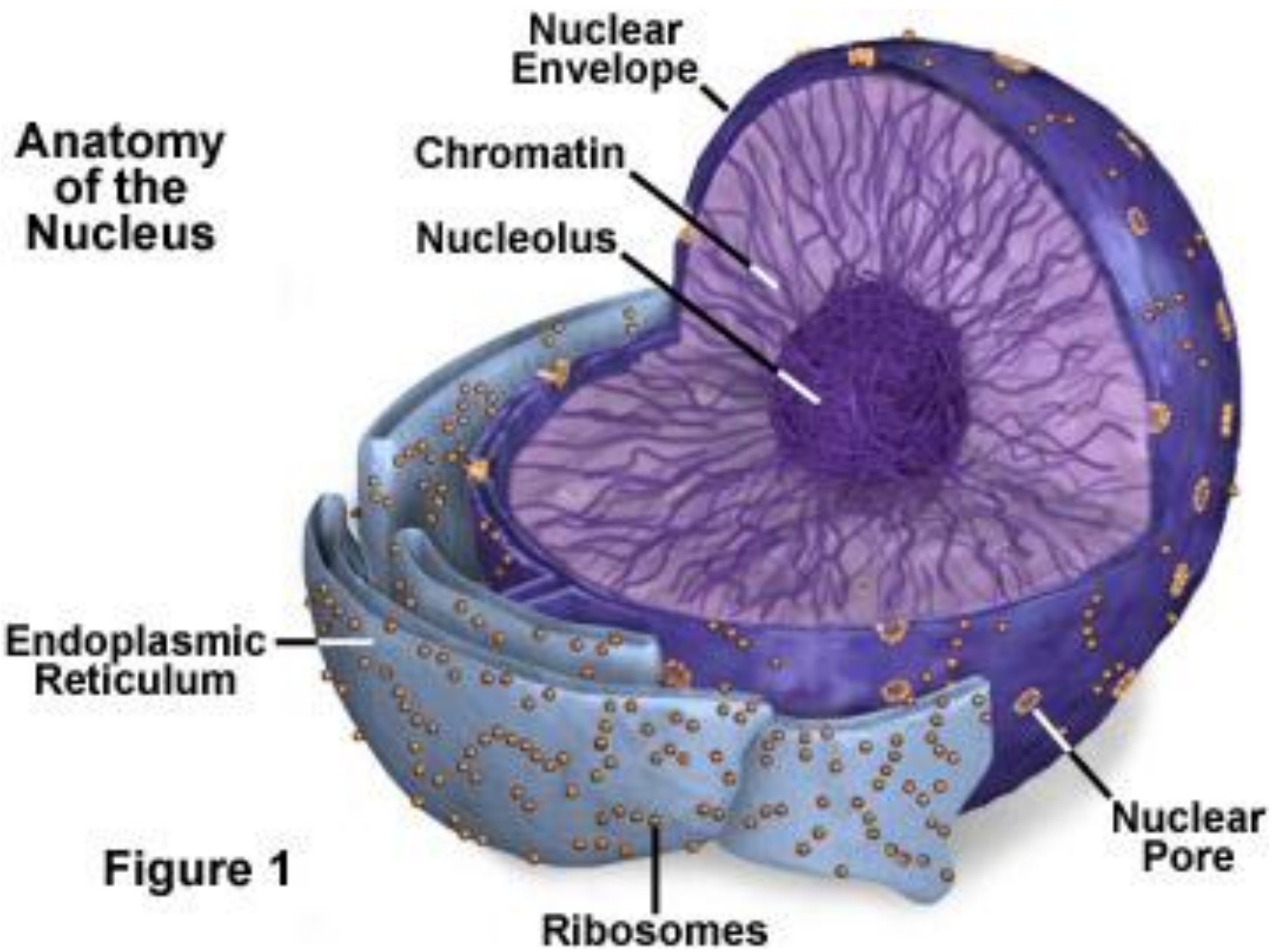
# Structure of Eukaryotic cells

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- ▶ Eukaryotic cells feature membrane delimited nuclei containing two or more linear chromosomes; numerous membrane-bound cytoplasmic organelles: mitochondria, RER, SER, lysosomes, vacuoles, chloroplasts; ribosomes and a cytoskeleton. Also, plants, fungi, and some protists have a cell wall.

# Nucleus

- ▶ **Nuclear envelope:** The nuclear envelope is a double-layered plasma membrane. To allow some chemicals to enter the nucleus, the nuclear envelope has structures called Nuclear pores.
- ▶ **Nucleolus:** The nucleolus appears in a microscope as a small dark area within the nucleus. The nucleolus is the area where there is a high amount of DNA transcription taking place.
- ▶ **Chromatin:** Chromosomes consist of chromatin. This is made up of strings of DNA. This DNA is wound around a histone core and organized into nucleosomes.



**Figure 1**

# Endoplasmic reticulum

- ▶ The endoplasmic reticulum is a cellular organelle made up of a series of extended folded intracellular membranes. It is continuous with the nuclear membrane.
- ▶ There are two main types of endoplasmic reticulum:
  - RER: rough endoplasmic reticulum (site of protein synthesis) associated with ribosomes
  - SER: smooth endoplasmic reticulum (site of lipid synthesis)

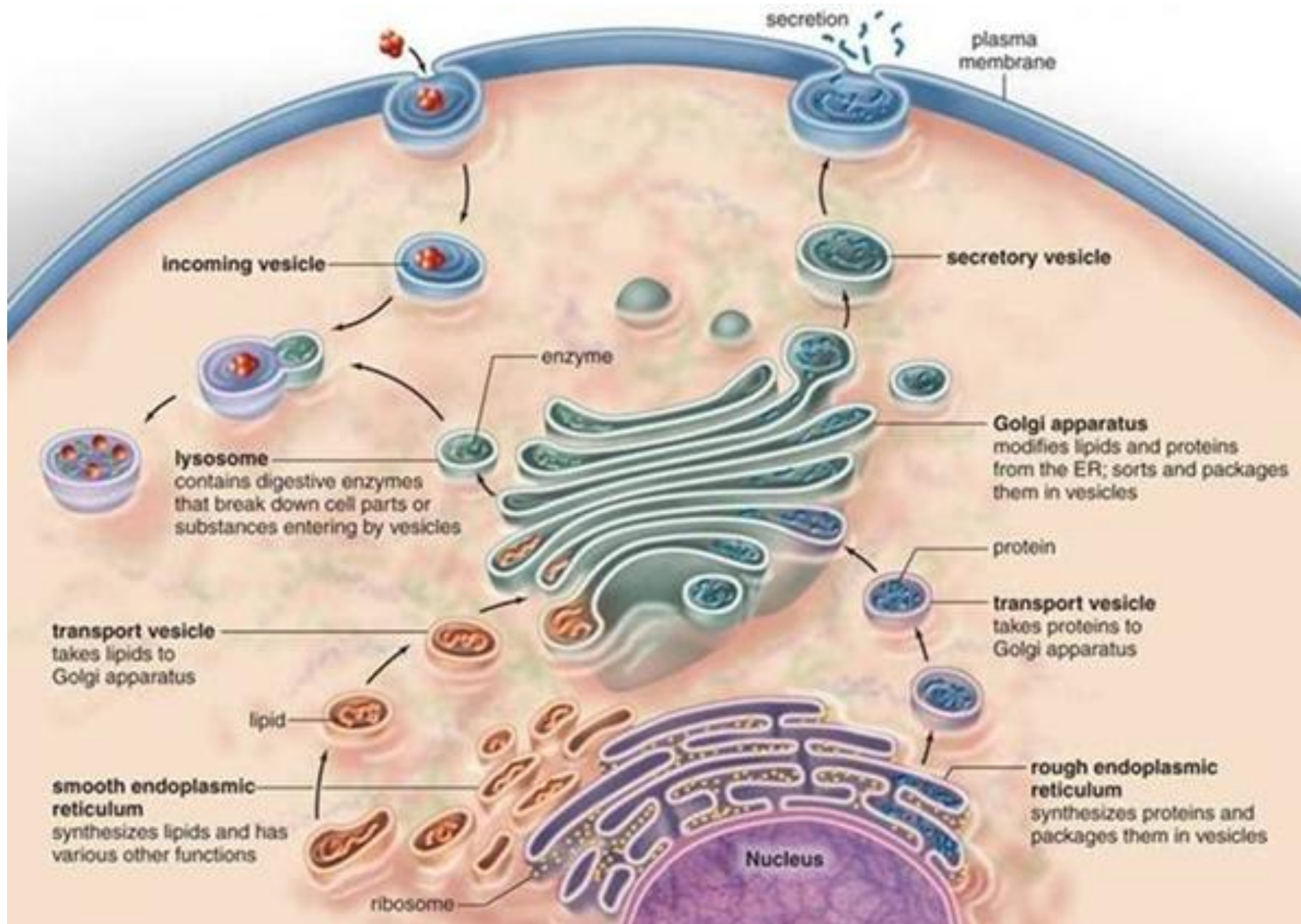


# Rough Endoplasmic Reticulum

▶ Proteins are directed to the RER by a **signal sequence** of a growing polypeptides on the ribosome.

1. If the protein is destined to become a membrane bound protein then the protein synthesis will continue until termination. The ribosome can then dissociate, allowing protein folding within the RER lumen to occur and continuation to the golgi apparatus for processing of the polypeptide.

2. If the protein is destined for storage for later secretion after stimulation or for continuous secretion then a protease-enzyme which cuts proteins at the peptide bond-can cut the signal sequence from the growing polypeptide. Continuation to the golgi etc. can then occur.



incoming vesicle

secretion

plasma membrane

secretory vesicle

enzyme

**lysosome**  
contains digestive enzymes that break down cell parts or substances entering by vesicles

**Golgi apparatus**  
modifies lipids and proteins from the ER; sorts and packages them in vesicles

protein

**transport vesicle**  
takes proteins to Golgi apparatus

**transport vesicle**  
takes lipids to Golgi apparatus


lipid

**smooth endoplasmic reticulum**  
synthesizes lipids and has various other functions

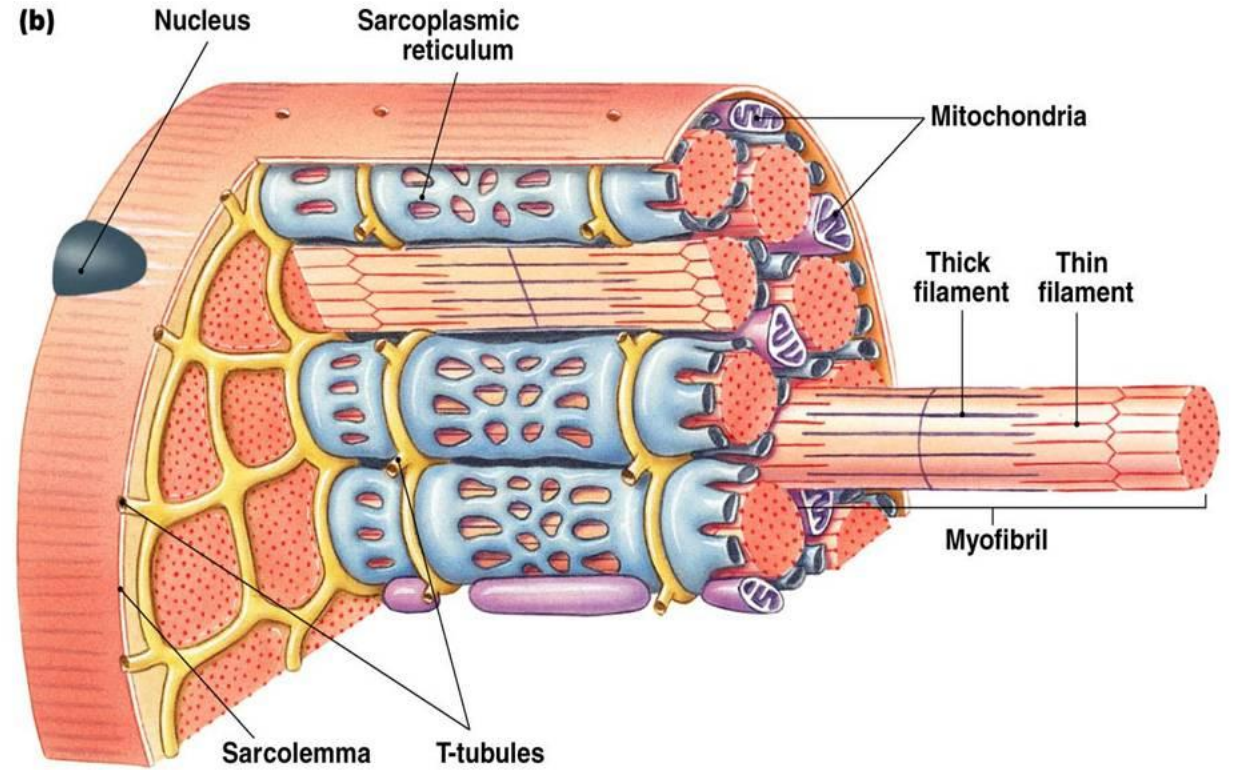
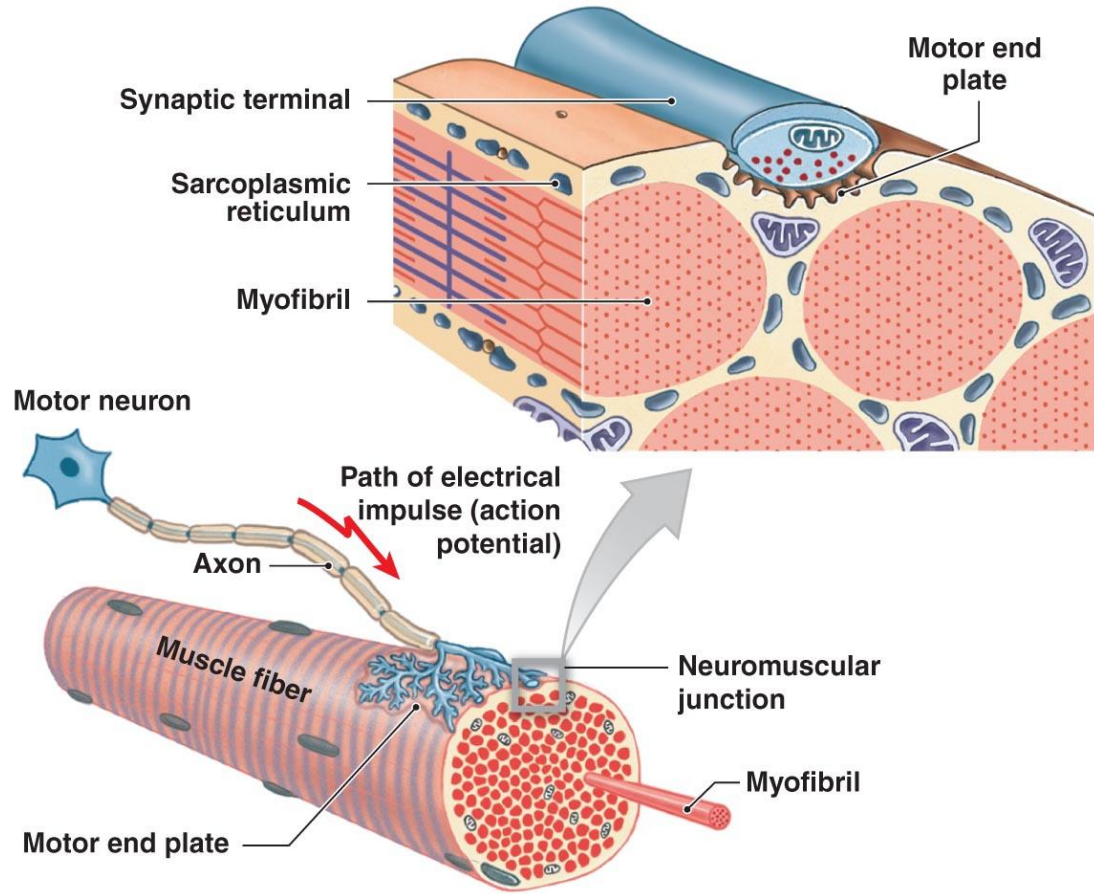
**rough endoplasmic reticulum**  
synthesizes proteins and packages them in vesicles

**Nucleus**

ribosome

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- ▶ **Smooth Endoplasmic Reticulum:** Smooth endoplasmic reticulum produces enzymes for lipid and carbohydrate biosynthesis and detoxification  
RER
  - ▶ **Sarcoplasmic Reticulum:** This is a specialised form of endoplasmic reticulum found in some muscle cell types particularly striated, skeletal muscle. Its main function is different from the other 2 types in that it mainly acts as a storage of calcium. This reticulum has voltage gated channels which respond to signals from 'motor neurones' to open and release calcium into the cytoplasm.





The structural relationship between a skeletal muscle fiber and its lone neuromuscular junction

# The Golgi apparatus

- ▶ The golgi apparatus is made up of multiple stacks of bilipid membranes.
- Proteins made on the RER are modified and then sorted
- Formation of secretory vesicles
- Formation of lysosomes (intracellular digestion)

# Other membrane-bound cytoplasmic organelles include:

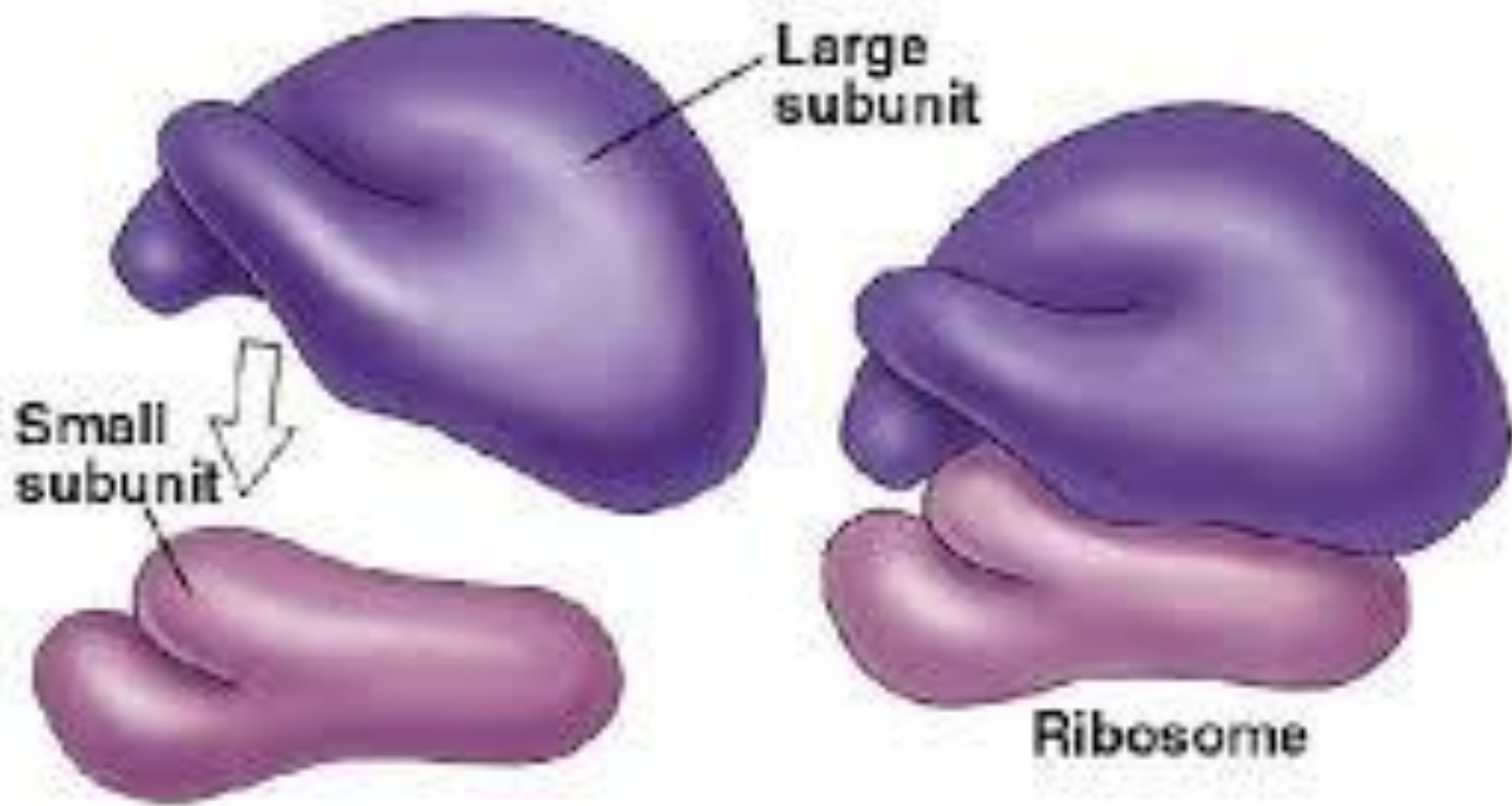
- ▶ Microbodies (generic term)
- ▶ Glyoxysome (transforms fat into carbohydrate in plants)
- ▶ Peroxisome (uses oxidative metabolism to form hydrogen peroxide and is destroyed by catalase)

# Ribosomes

- ▶ Ribosomes are the site of protein synthesis. Ribosomes themselves are synthesized in the cell nucleoli and are structured as two subunits, the large and the small. These parts are composed of RNA and protein.
- ▶ Prokaryotic and eukaryotic ribosomes are different, the eukaryotic ones being larger and more complicated.



# Ribosome



# Cytoskeleton

- ▶ Cytoskeleton is a collective term for different filaments of proteins that can give physical shape within the cell and are responsible for the 'roads' which organelles can be carried along.
- Gives the cell shape
- Anchors other organelles
- Vital to intracellular transport of large molecules
- ▶ The cytoskeleton is composed of 3 main types of filaments:
  - Actin filaments (7 nm)
  - Microtubules: (25 nm) polymer of tubulin; 13/ring.
  - Intermediate Filaments

