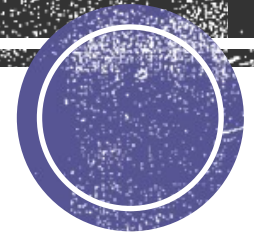


# Introduction To Histology



# General definitions

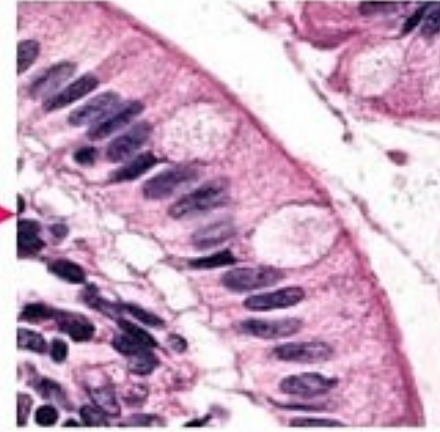
- Any individual living thing, plant or animal is called an **organism**
- **Protoplasm** (living substance of all organisms) protoplasm is composed of atoms combined to form molecules)
- **Cell** (smallest unit of protoplasm capable of independent existence)
- **Tissues** [cells serving same general functions are bound together by variable amount of intercellular substance (Matrix) to form tissue]
- **Organs** (two or more tissues are combined to form large functional units)
- **Organ system** (several organs having interrelated functions)



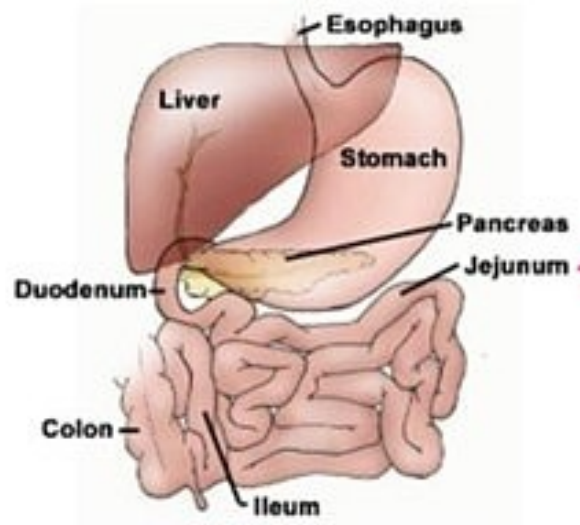
**Cell**



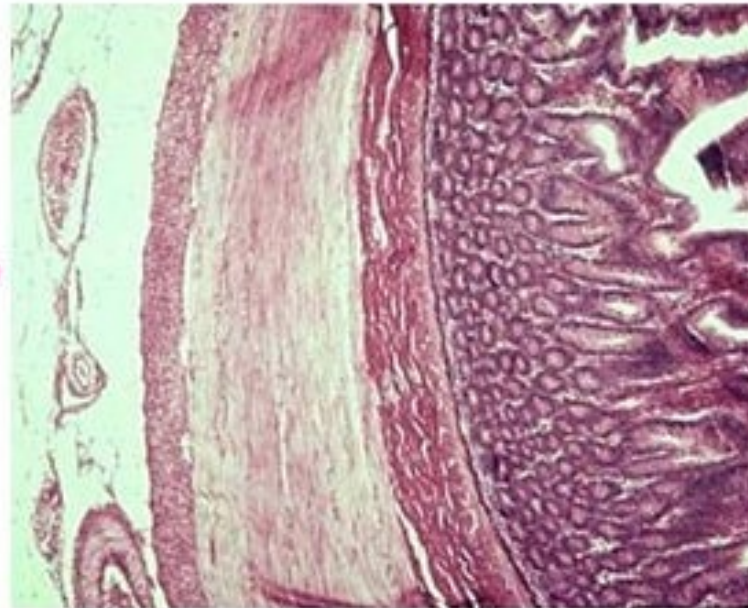
**Tissue**



**System**



**Organ**



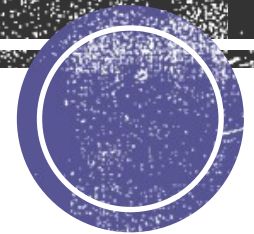
# Human Anatomy

Human anatomy deals with the study of structure of human body

- **Macroscopic anatomy (Gross)**
- **Microscopic anatomy (Histology)**
- **Developmental anatomy (Embryology)**
  
- Histology provides a structural basis for the study of function



# The Cell

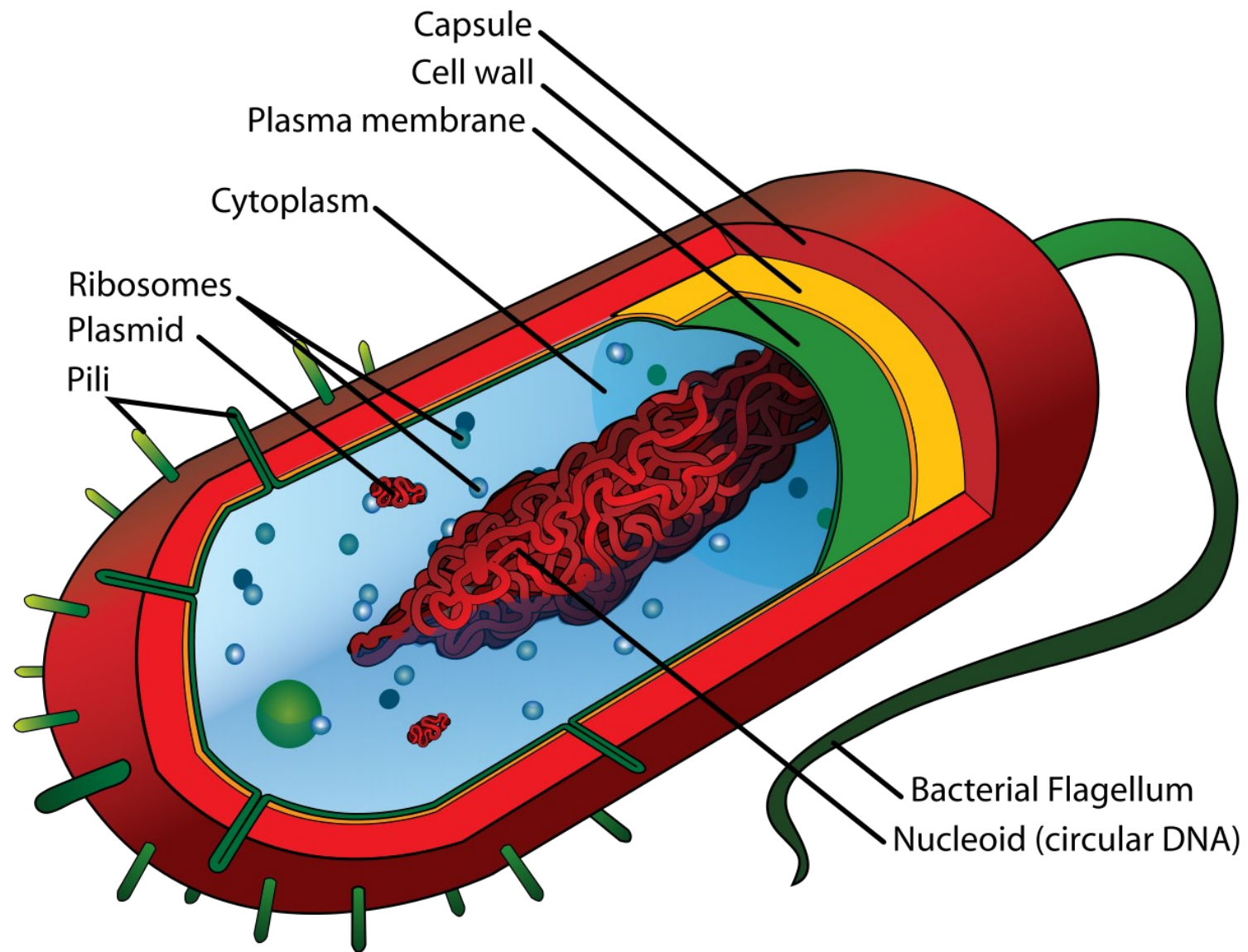


# Cell

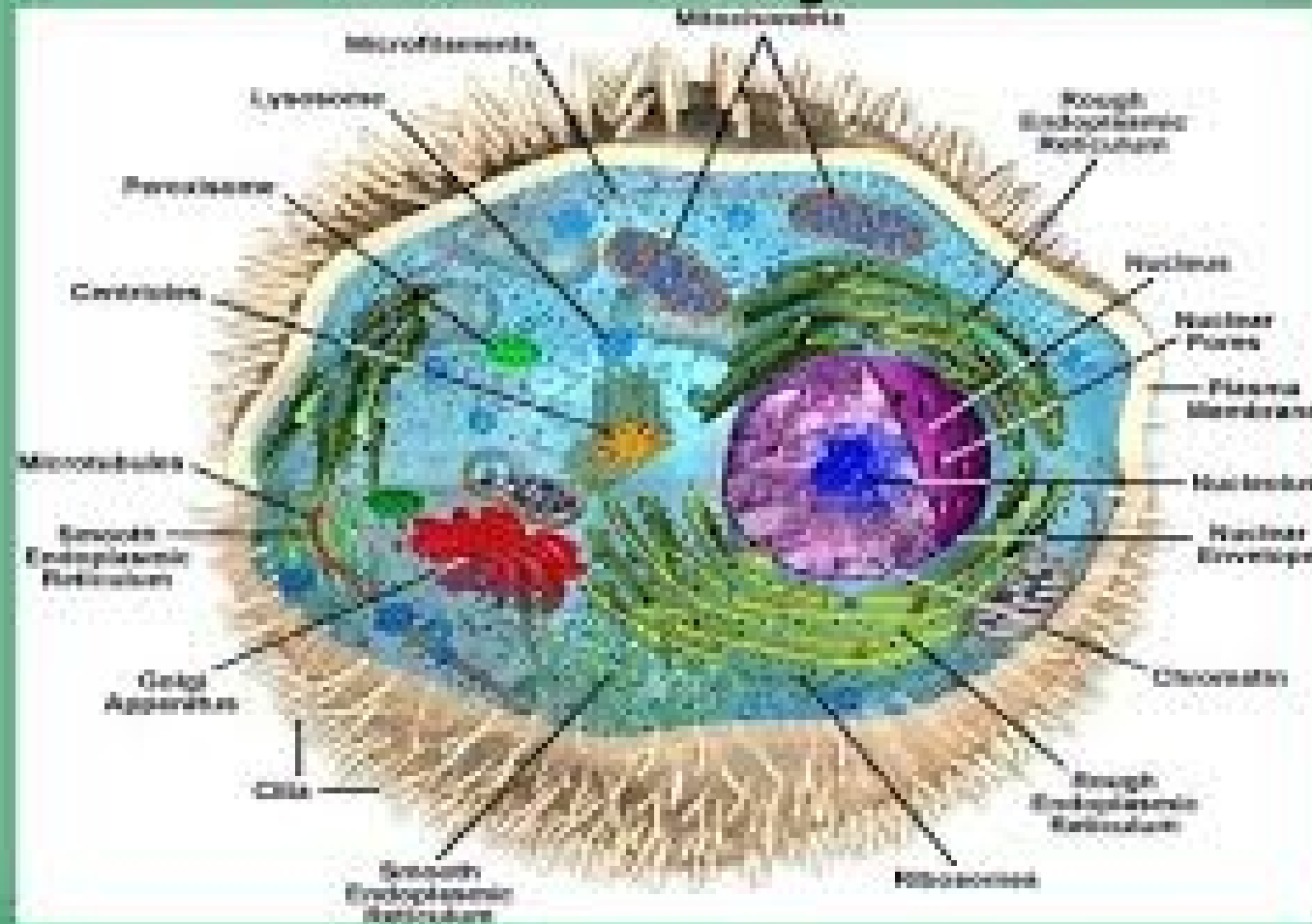
**Cell** (smallest unit of protoplasm capable of independent existence)

- Prokaryotic cells (no nucleus, bacteria)
- Eukaryotic cells (distinct nucleus limited by nuclear membrane, human body)
- Protoplasm inside the nucleus is known as **Karyoplasm**, whereas remainder of protoplasm of cell is called **Cytoplasm**.





# Parts of a Eukaryotic Cell



# Shape and size of human cell

- **Shape:** in most tissues shape of cell is modified e.g cuboidal, columnar, polygonal, pyramidal, cylindrical, fusiform or irregular etc
- **Size:** size generally varies between 5 and 50micrometer, certain cells may be large e.g mature ovum (120micrometer) and some large neurons (150 micrometer)



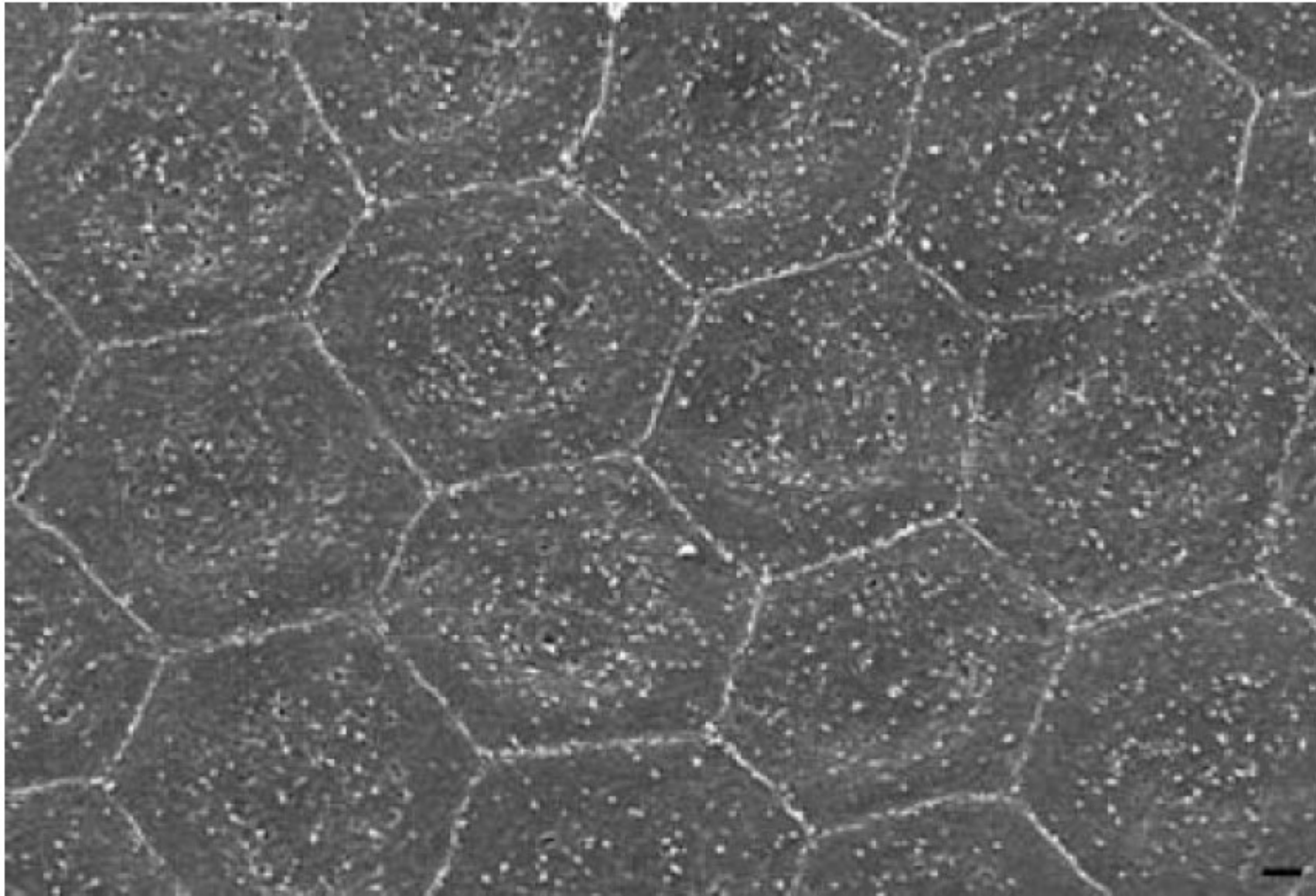


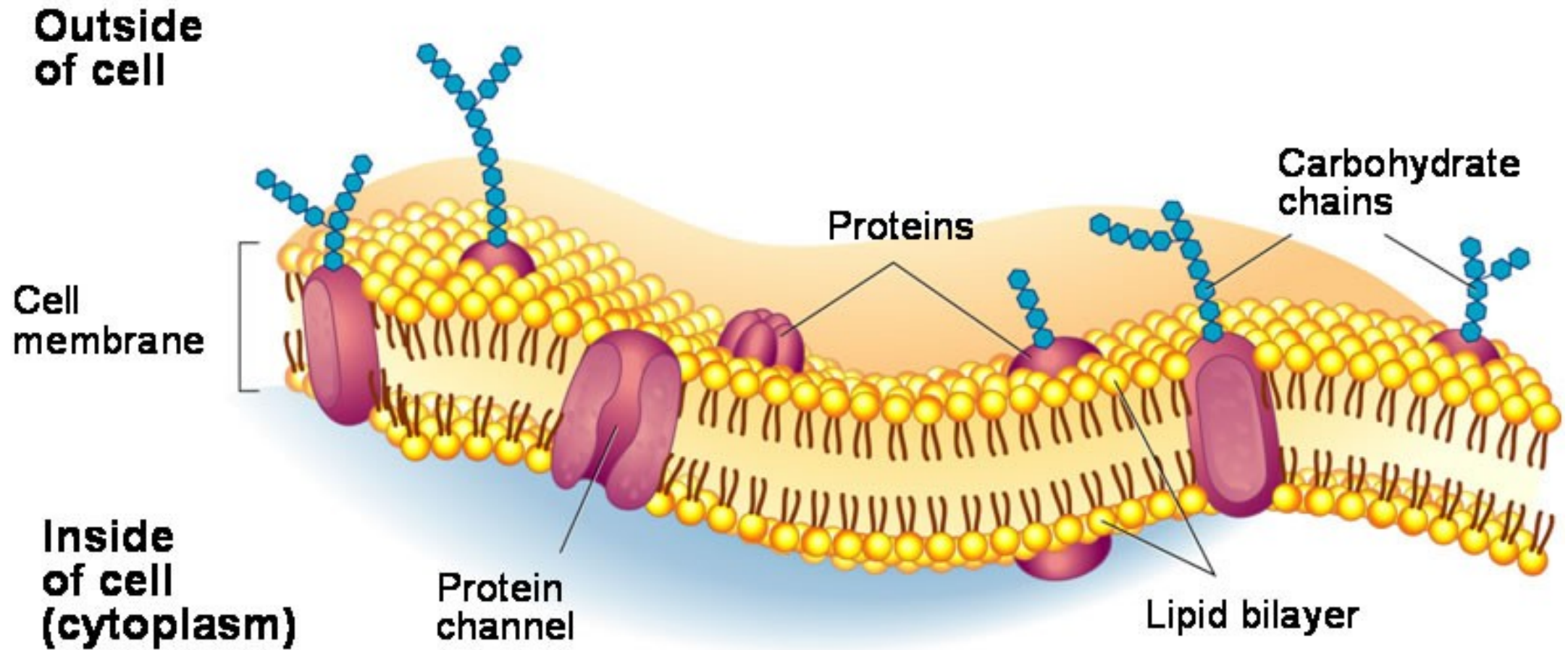
Figure 1 - Scanning electron micrograph of normal corneal endothelium of ostrich, showing polygonal cells of uniform in size and shape. The predominant number of cells are hexagonal. x 750; Bar = 10 $\mu$ m.



# Cell membrane

- All cells are bounded by a limiting membrane which is called cell membrane (plasma membrane or plasmalemma)
- **Transport across cell membrane:** CM controls interaction of cell with extra cellular environment. All materials that enter or leave the cell must pass through it.
- **Passive transport** (movement from higher concentration to low conc. No input of energy)
- **Active transport** (transport against concentration gradient by spending energy)
- **Vesicular transport** (mechanism by which small and large molecules enter or leave cell is called vesicular transport)
- **Endocytosis** (vesicular transport by which substance enter the cell)
- **Exocytosis** (secretory products are released from cell surface by exocytosis)

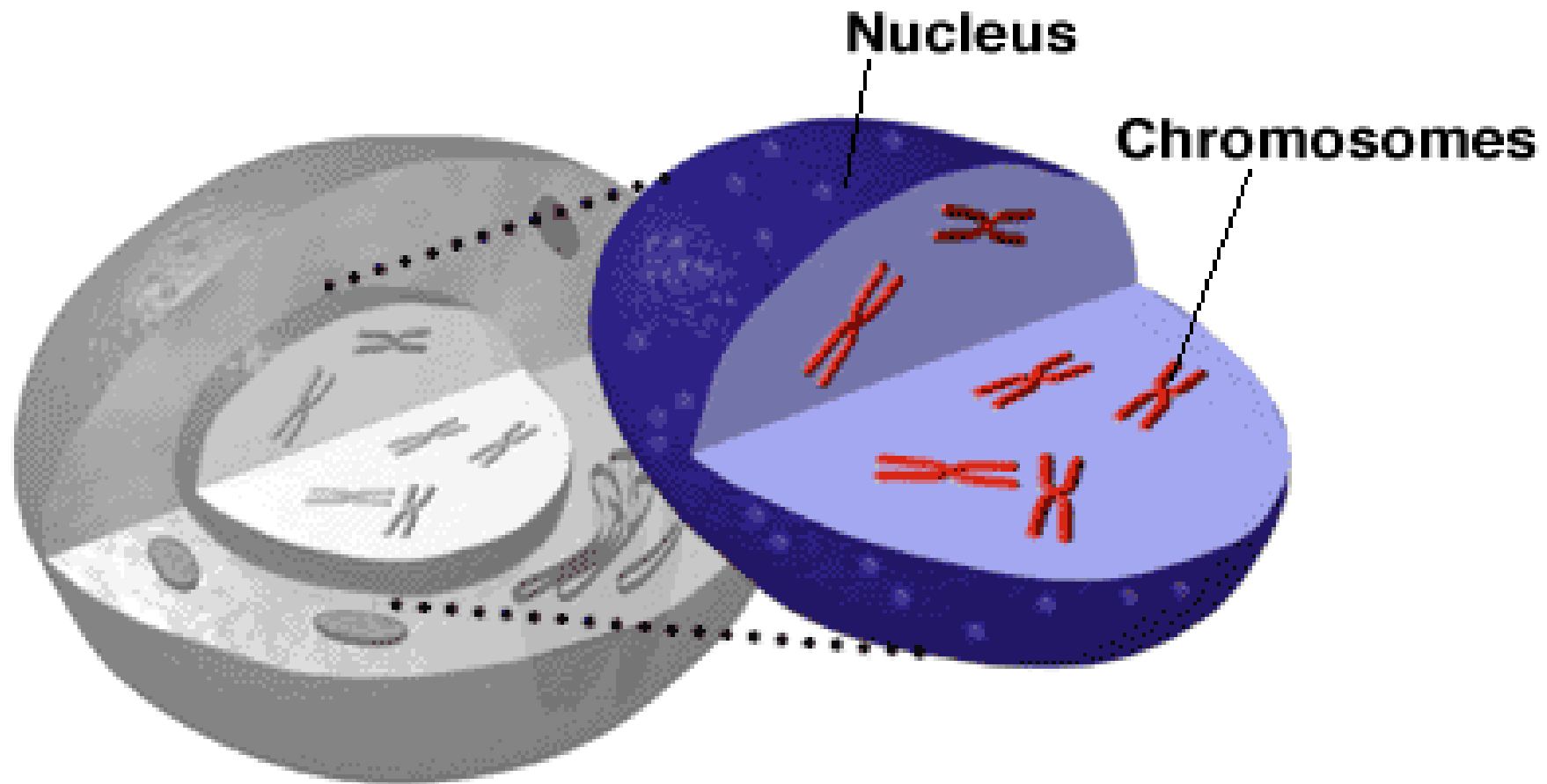




# Nucleus

- It contains genetic material of the cell
- Essential for life of cell, if it is removed cell will die due to stoppage of protein synthesis
- Position of nucleus generally depends on the shape of cell
- Normally centrally located but sometimes eccentrically located
- Usually one nucleus is present in cell
- Certain cells may be binucleate (liver cells)
- Multinucleate (skeletal muscle cells)

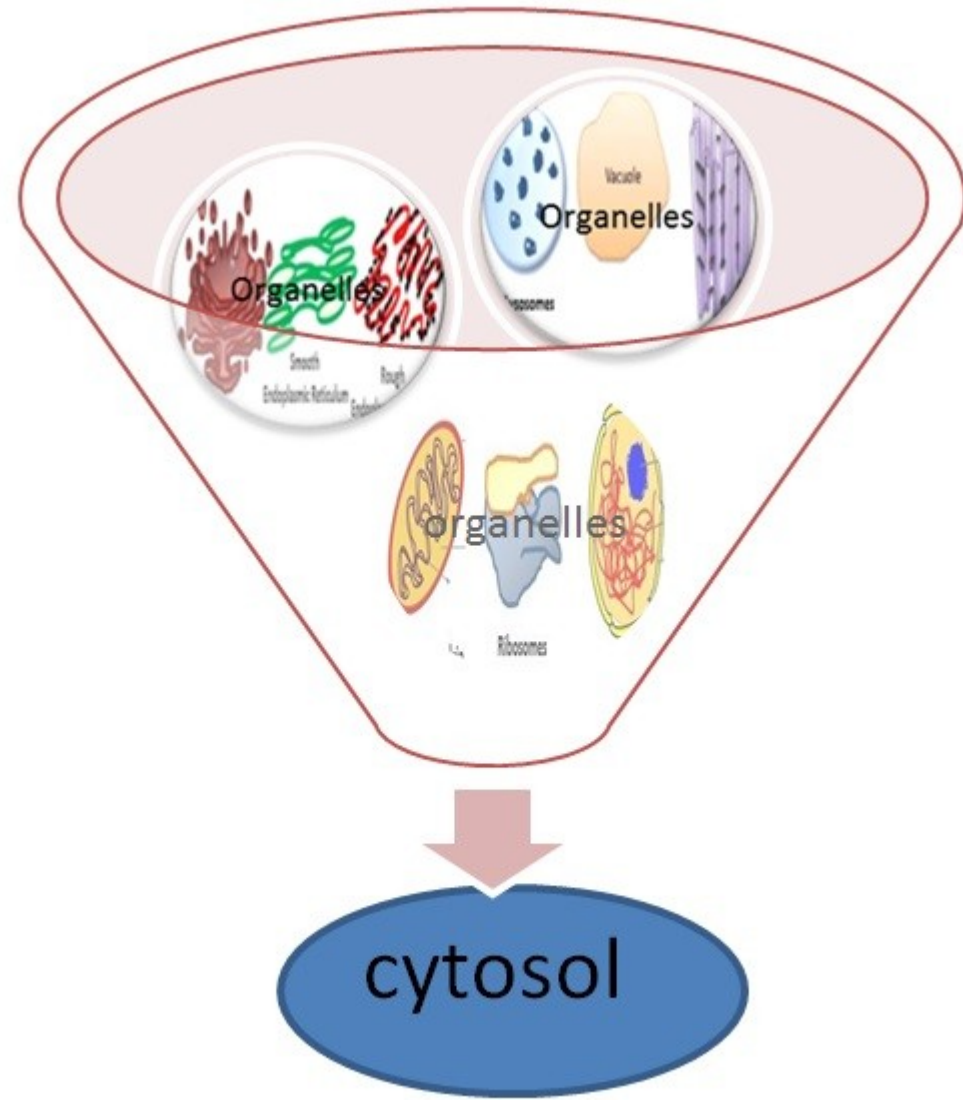




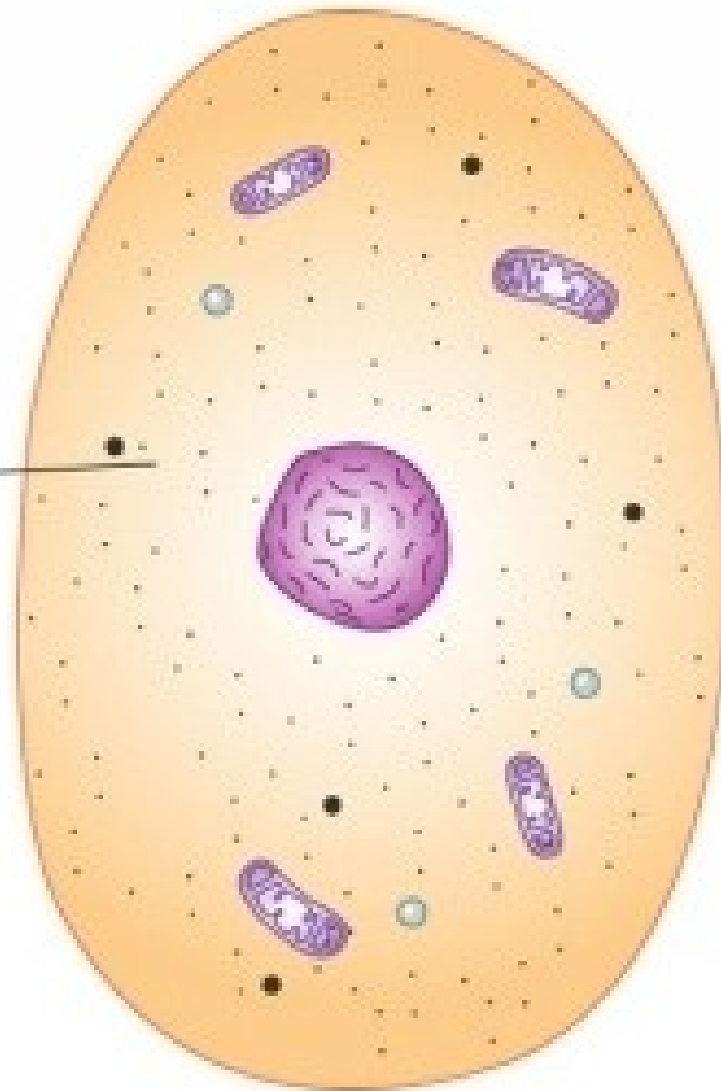
# Cytoplasm

- Cytoplasm occupies the space between cell membrane and nuclear envelope.
- Metabolic processes of cell occur in cytoplasm but controlled by nucleus
- Cytosol (cytoplasm consists of a fluid matrix)
- Cytoplasmic Organelles (organelles are metabolically active structures that carry out specific functions for the cell, cytoplasmic organelles include
  1. Mitochondria
  2. Ribosomes
  3. Rough endoplasmic reticulum
  4. Smooth endoplasmic reticulum
  5. Golgi apparatus
  6. Endosomes
  7. Lysosomes
  8. Peroxisomes
  9. Proteasomes and centrioles



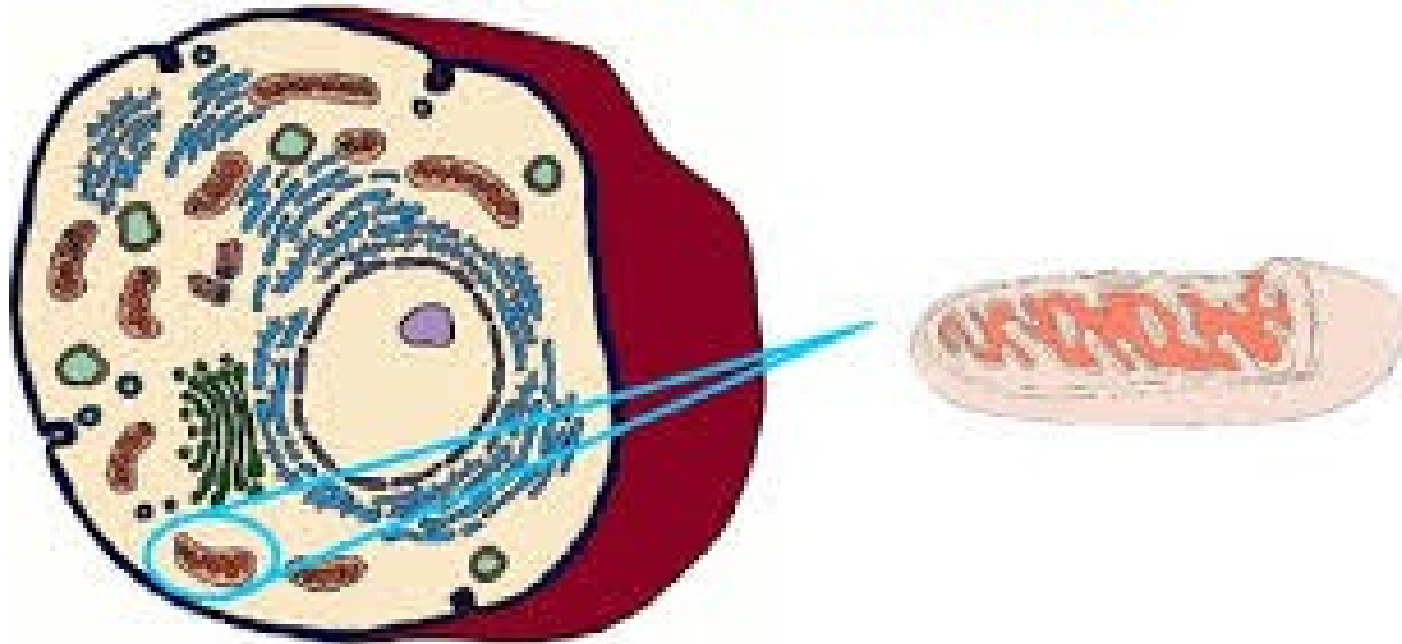


cytoplasm



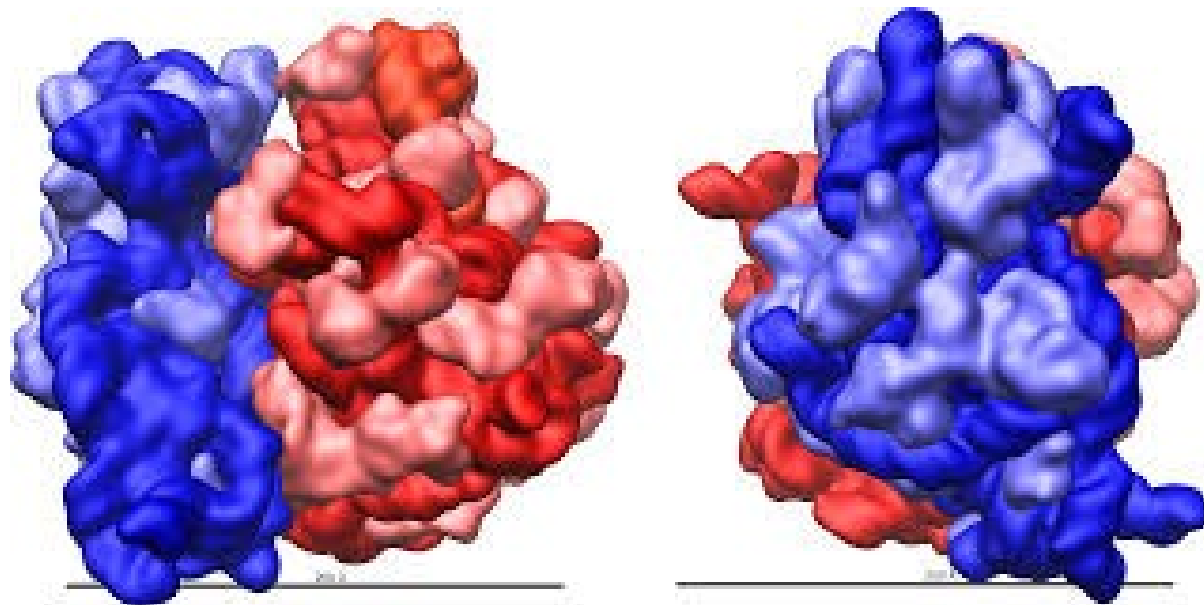
- **Mitochondria** are often referred to as the powerhouses of the cells. They generate the energy that our cells need to do their jobs.

## Mitochondria



# Ribosome

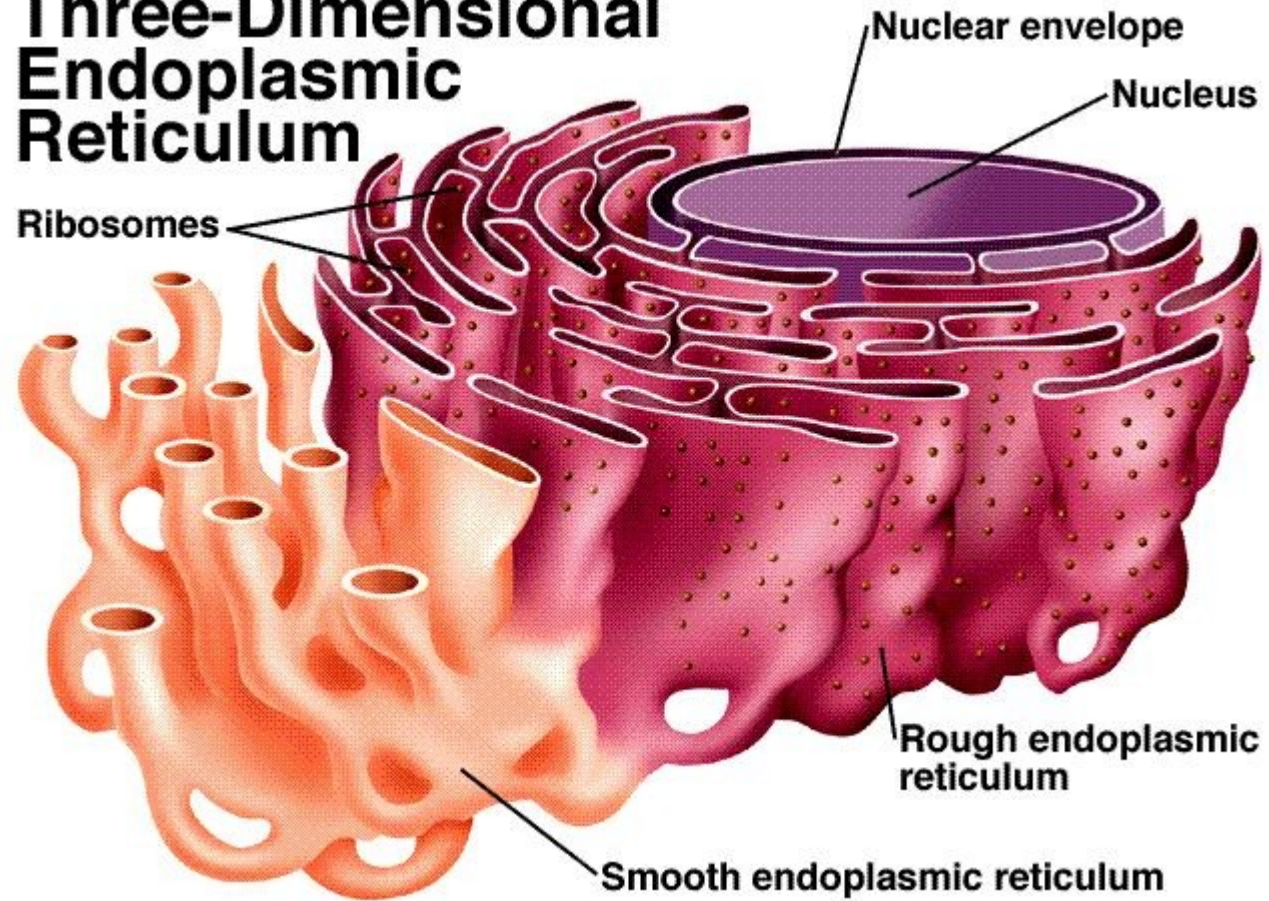
- The **ribosome** is a complex of over 50 proteins plus its own complement of RNA, often denoted rRNA. There are free **ribosomes** that are suspended in the cytoplasm of the cell, but many of them are attached to the rough endoplasmic reticulum associated with the nuclear envelope of the cell.



- *Rough ER (RER) is involved in some protein production, protein folding, quality control . It is called 'rough' because it is studded with ribosomes*
- *Smooth E R (SER) is associated with the production and metabolism of fats and steroid hormones. It is 'smooth' because it is not studded with ribosomes and is associated with smooth slippery fats*



## Three-Dimensional Endoplasmic Reticulum



- The Golgi apparatus, or Golgi complex, functions as a factory in which proteins received from the ER are further processed and sorted for transport to their eventual destinations: lysosomes, the plasma membrane, or secretion.



## Golgi Apparatus

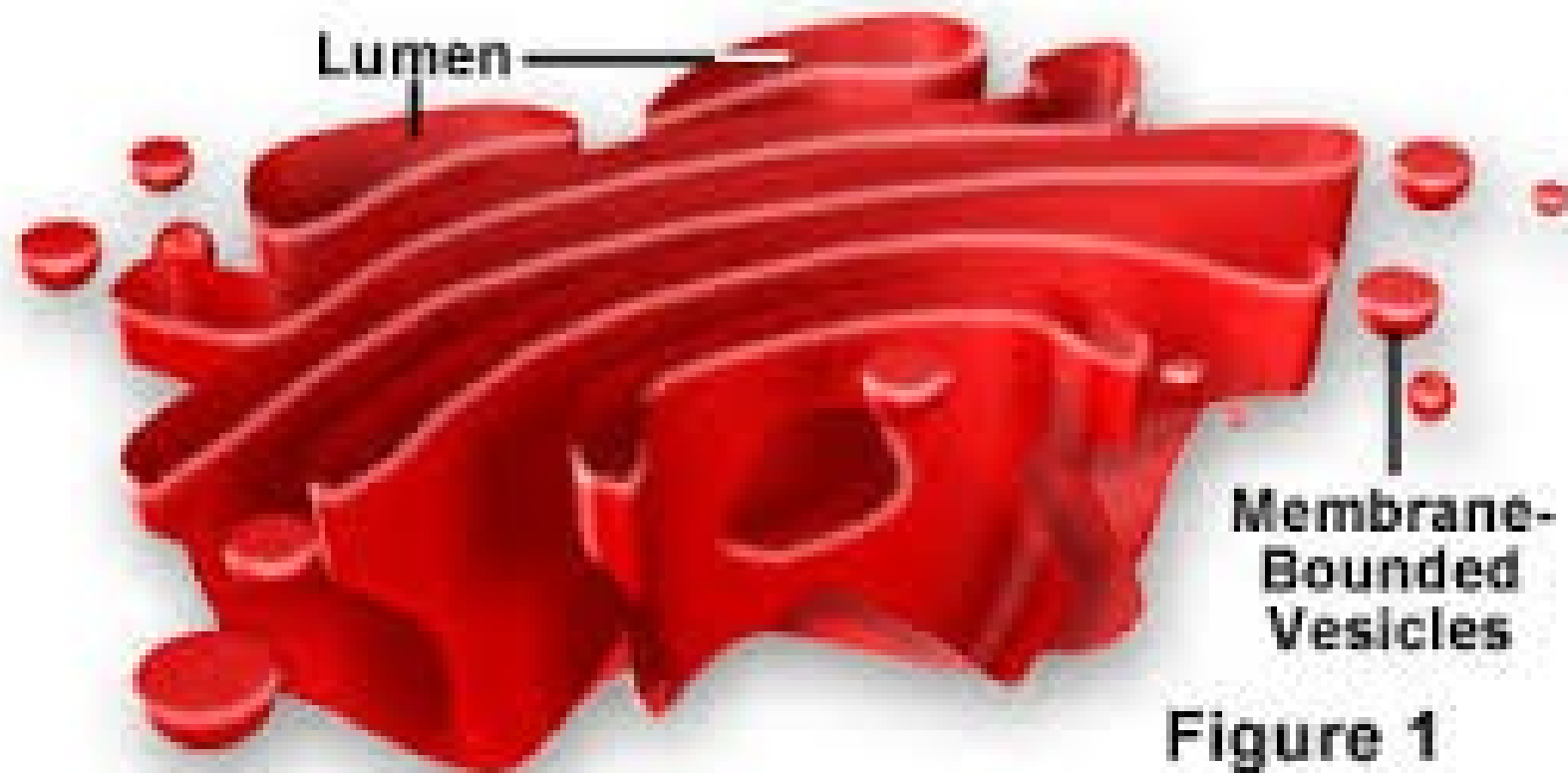


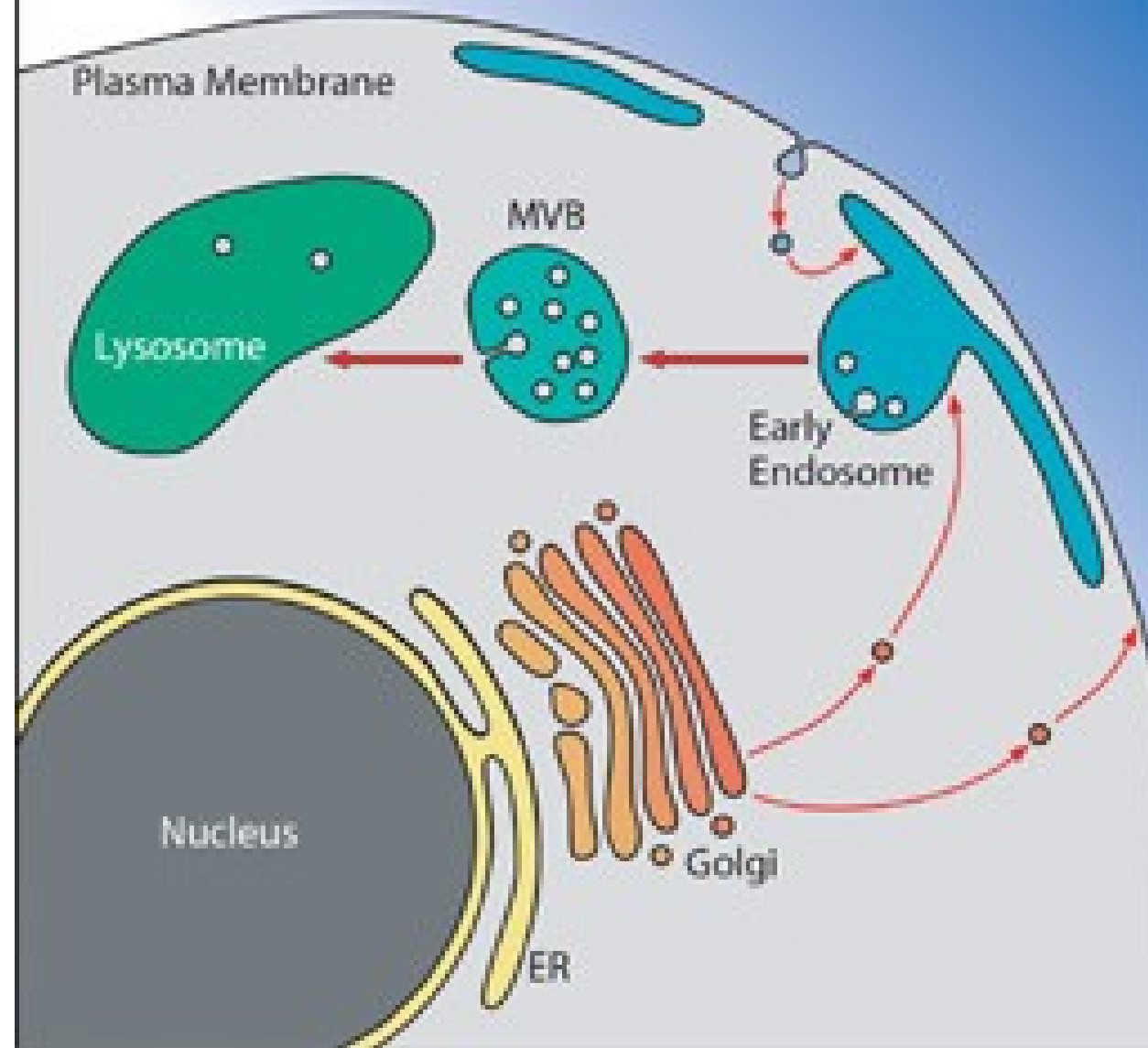
Figure 1



- In biology, an **endosome** is a membrane-bounded compartment inside eukaryotic cells. It is a compartment of the endocytic membrane transport pathway from the plasma membrane to the lysosome



# The Endosomal System of Eukaryotic Cells



- **Proteasomes** are protein complexes inside all eukaryotes and archaea, and in some bacteria. In eukaryotes, they are located in the nucleus and the cytoplasm. The main function of the **proteasome** is to degrade unneeded or damaged proteins by proteolysis, a chemical reaction that breaks peptide bonds.



- **Peroxisomes** are small, membrane-enclosed organelles (Figure 10.24) that contain enzymes involved in a variety of metabolic reactions, including several aspects of energy metabolism



- A **centriole** is a small set of microtubules arranged in a specific way. There are nine groups of microtubules. When two **centrioles** are found next to each other, they are usually at right angles. The **centrioles** are found in pairs and move towards the poles (opposite ends) of the nucleus when it is time for cell division.



# Cell division

- **Mitosis** (The process of cell division which results in the production of two daughter cells from a single parent cell )
- **Meiosis** (Meiosis is the type of cell division by which germ cells (eggs and sperm) are produced )



# Cell Death

Types of cell death

- Necrosis
- Apoptosis

**Necrosis:** also known as accidental cell death only occurs in pathological conditions.

**Apoptosis:** also known as programmed cell death. In apoptosis the cell shrinks and decreases in size and finally cells breaks into many pieces called as apoptotic bodies.



Thank You!

The image features the words "Thank You!" in a highly decorative, hand-drawn style. The letters are thick and outlined in black, with various internal patterns and colors. The word "Thank" is in the top row, and "You!" is in the bottom row. The letters are decorated with patterns like wavy lines, zig-zags, and solid colors. There are several stylized flowers around the text: a large pink flower with a yellow center in the bottom left, a blue flower with a purple center in the top right, and a blue flower with a purple center in the middle right. The background is white.