CELLS

STRUCTURE AND FUNCTION

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DISCOVERY OF CELLS

- Robert Hooke (1665):
  - Observed a thin slice of cork with a microscope
  - Coined the word cells
- Antonie Philips van Leeuwenhoek (1675):
  - Inventor of compound microscope
  - First person to observe living cells: first to publish descriptions of some microscopic entities such as single-celled organisms, muscle cells, spermatozoa, capillaries, etc.

CELL THEORY

- Concluded by *Schleiden* (1838), *Schwann* (1839) and *Virchow* (1858)
- Matthias Schleiden
  - Concluded that all plants are composed of cells
- Theodor Schwann
  - Concluded that all animals are made of cells
- Rudolf Ludwig Karl Virchow
  - Concluded that all organisms are composed of cells and that cells originate only from preexisting cells, and not from inanimate matter

CELL THEORY

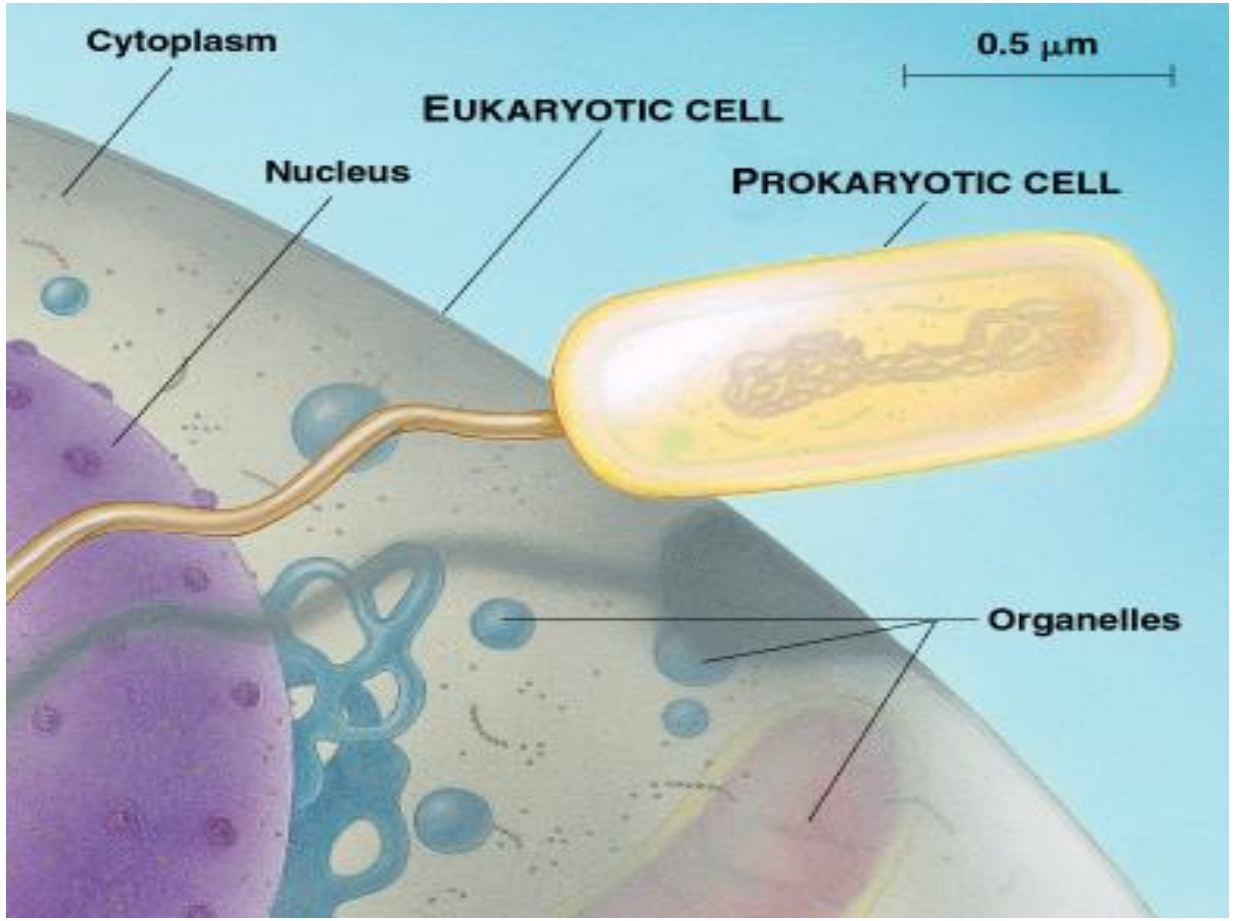
- All living things are composed of one or more cells.
- Cells are organisms' basic units of structure and function
- Cells come only from preexisting cells

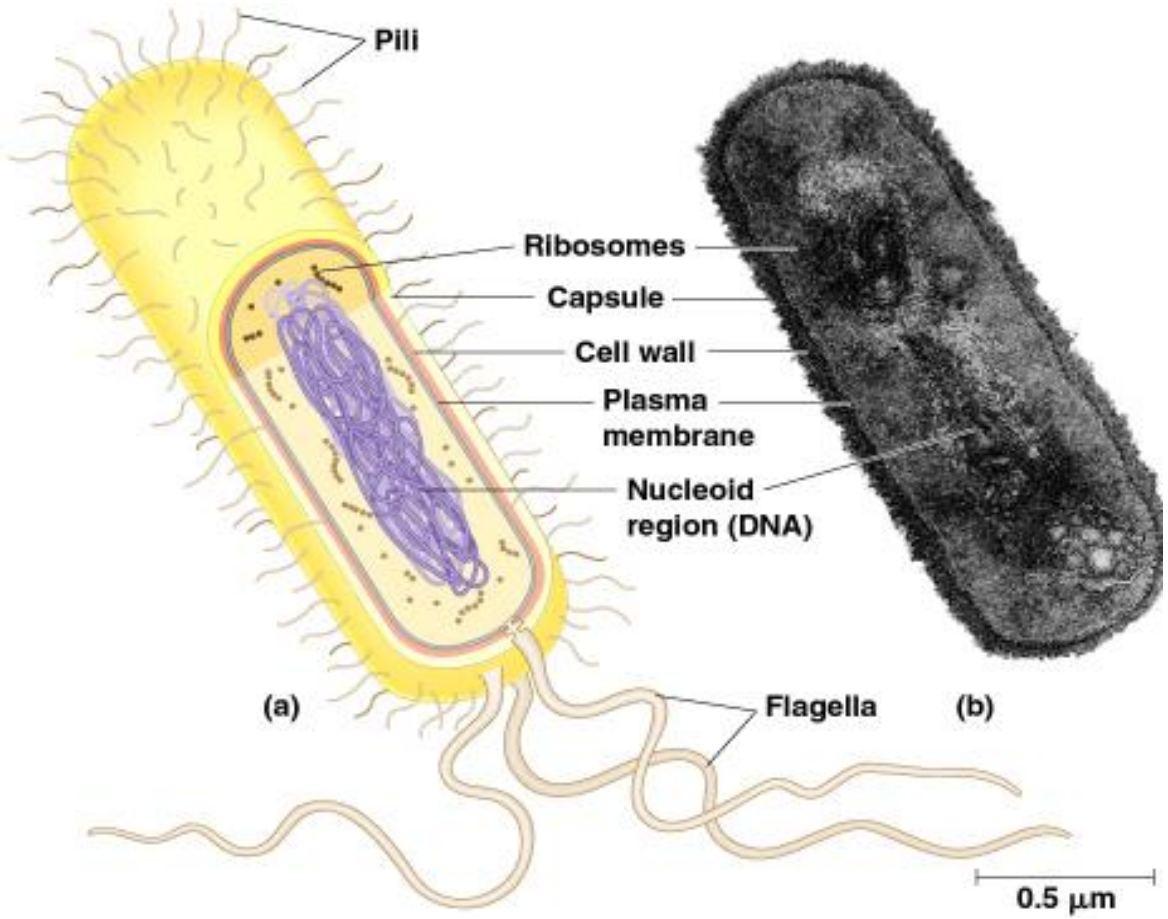
- *"**All organisms are made up of one or more cells, within which the life process of metabolism and heredity occur.**"*

PROKARYOTES vs. EUKARYOTES

	PROKARYOTES	EUKARYOTES
DEFINITION	Resemble one another in form, have little internal organization, strong cell wall that encloses them	Have more elaborate interior organization, have different organelles that create separate compartments for cellular function
NUCLEUS?	NO	YES
MEMBRANE BOUND ORGANELLES	NO	YES (many)
SIZE	1-10 µm	10-50 µm
EVOLUTION	3.5 billion years ago	1.5 billion years ago
CYTOPLASM	YES	YES
CELL MEMBRANE	YES	YES
CELL WALL	Some do	Plants
RIBOSOMES	YES	YES
DNA	Circular Free Floating	Chromosomes in nucleus
Sample Organism(s)	Bacteria	Plants, animals, fungi, and protists

PROKARYOTES vs. EUKARYOTES





STRUCTURE OF THE CELL

- Main components
  - Cell membrane – continuous in the cell's internal membrane
  - Cytoplasm – living matter within the cell, has fluid jellylike substance called hyaloplasm
  - Nucleus – control unit of the cells, enclosed in a nuclear membrane

STRUCTURE OF THE CELL

- **Plasma Membrane**
- **Nucleus**
- **Nucleolus**
- **Chromosomes**
- **Mitochondria**
- **Rough Endoplasmic Reticulum**
- **Smooth Endoplasmic Reticulum**
- **Golgi Complex / Apparatus**
- **Lysosomes**
- **Cytoskeleton**
- **Microtubules**
- **Cilia and Flagella**

CELL: Main Components

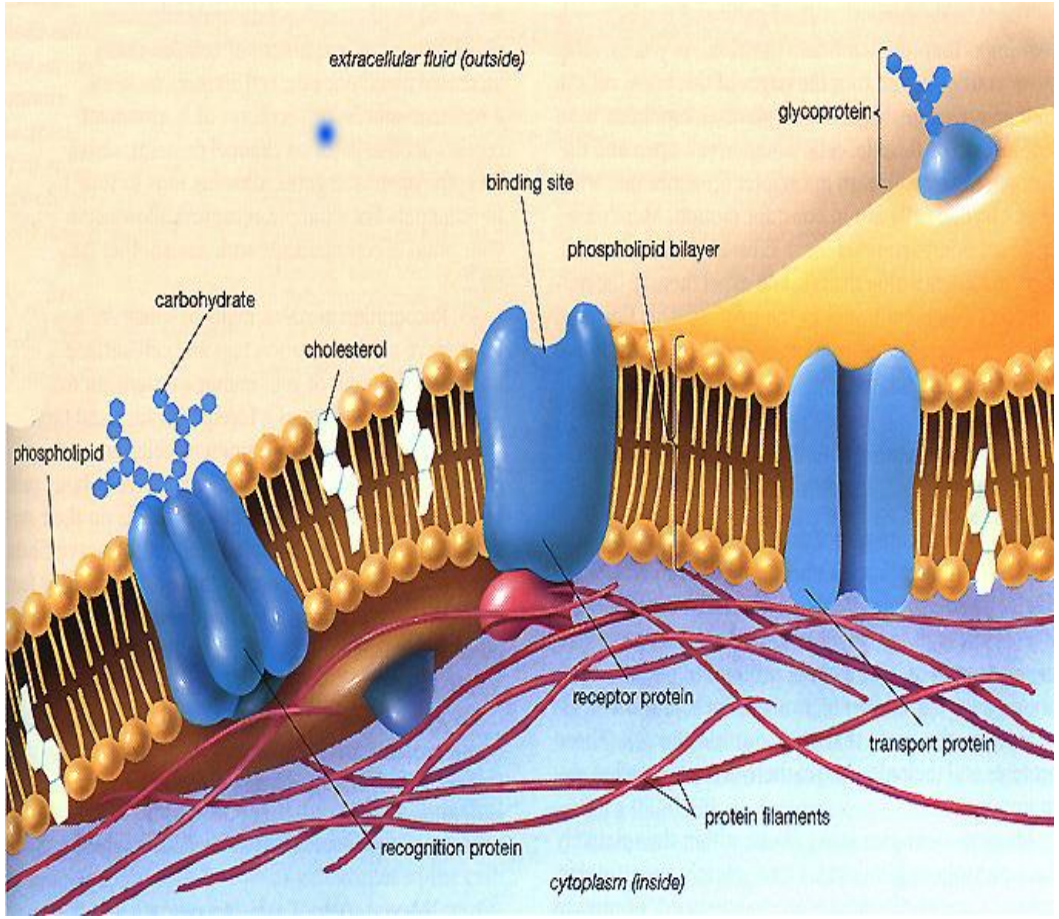
- **Plasma Membrane / Cell Membrane**

  Structure: composed of double layer phospholipids in which proteins are embedded

  Function: - gives form to the cell and controls the passage of materials

  - acts as a selectively permeable boundary between the cell and its external environment

  - controls the passage of materials in and out of the cell



CELL: Main Components

- **Nucleus**

  Structure: separated by a porous nuclear membrane within the cytoplasm, sphere shaped, contains the *nucleolus*

  Function: - control center of the cells

  - storage center of cells' DNA

  - **Nucleolus** – aggregate of granules made of ribonucleic acid (RNA)

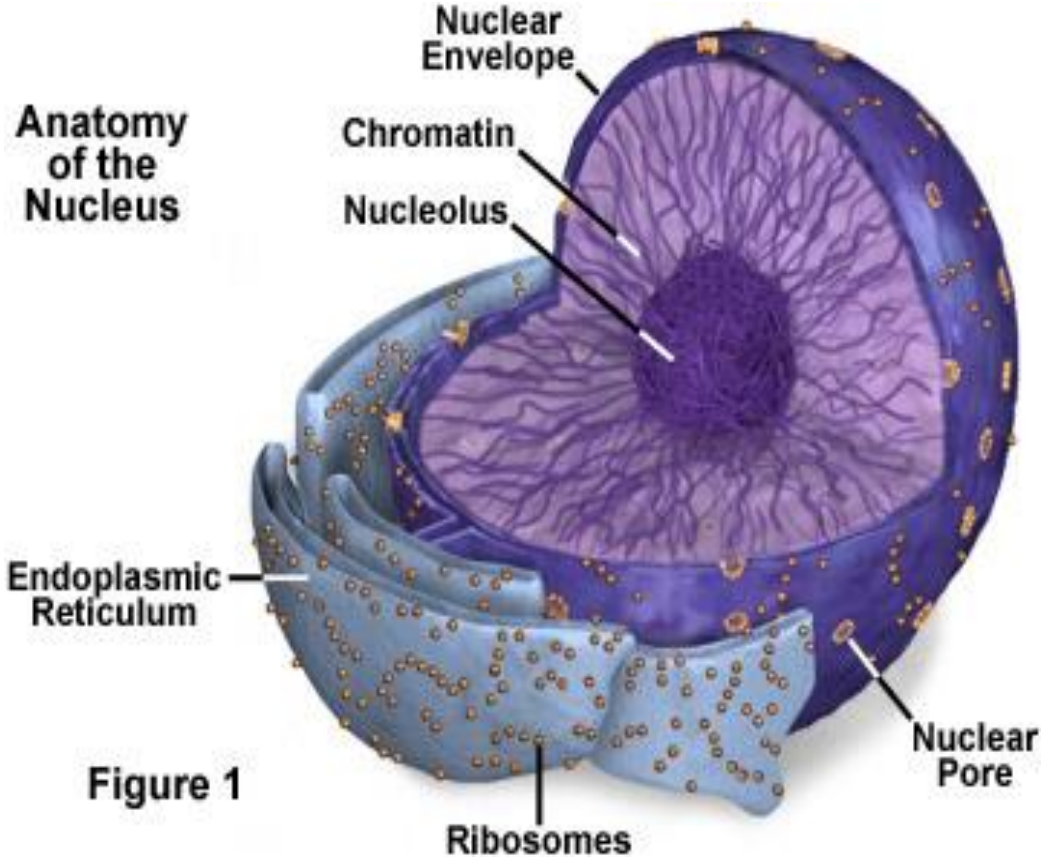


Figure 1

CELL: Main Components

- **Cytoplasm**

  Structure: gelatin-like fluid that lies inside the cell membrane

  Function: - contains salts, minerals and organic molecules

  - surrounds the organelles

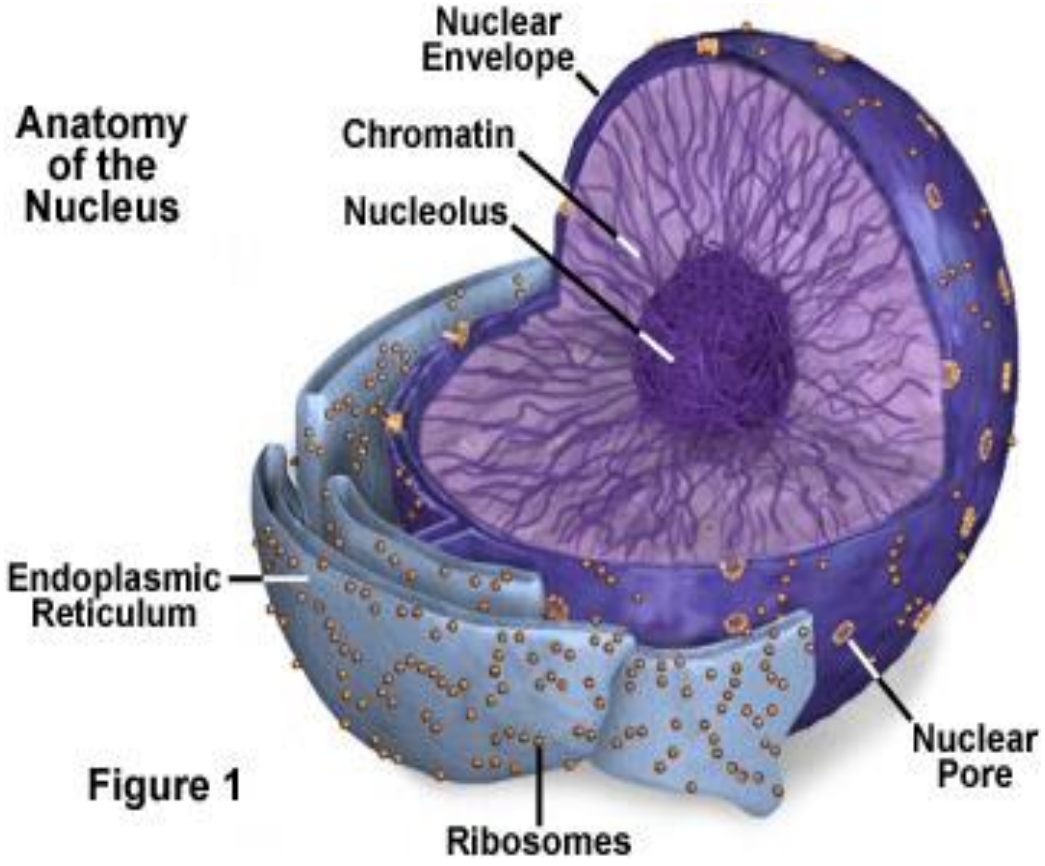


Figure 1

CELL: Genetic Composition

- Chromosomes

  Structure: threadlike strands, composed of nuclear DNA

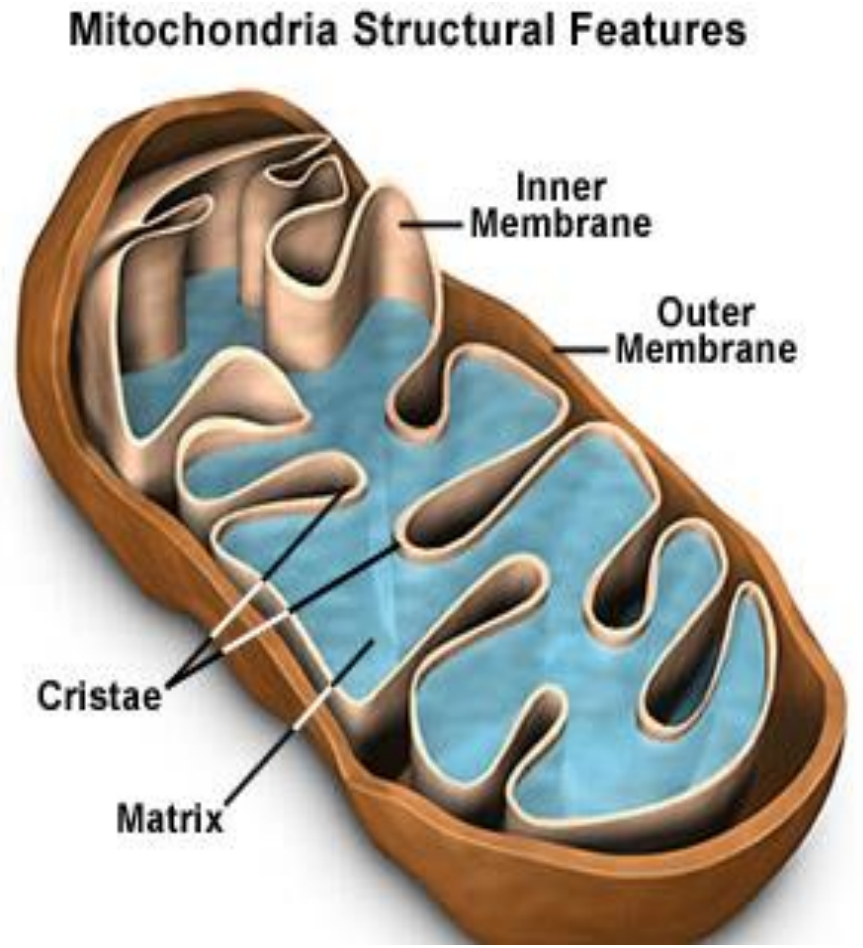
  Function: carries genetic information

CELL: Energy Processing

- **Mitochondria**

  Structure: double walled membranous sacs with folded inner partitions called *cristae*

  Function: releases energy from food molecules and transform energy into usable ATP which happens during cellular respiration



CELL: Cell Manufacturers

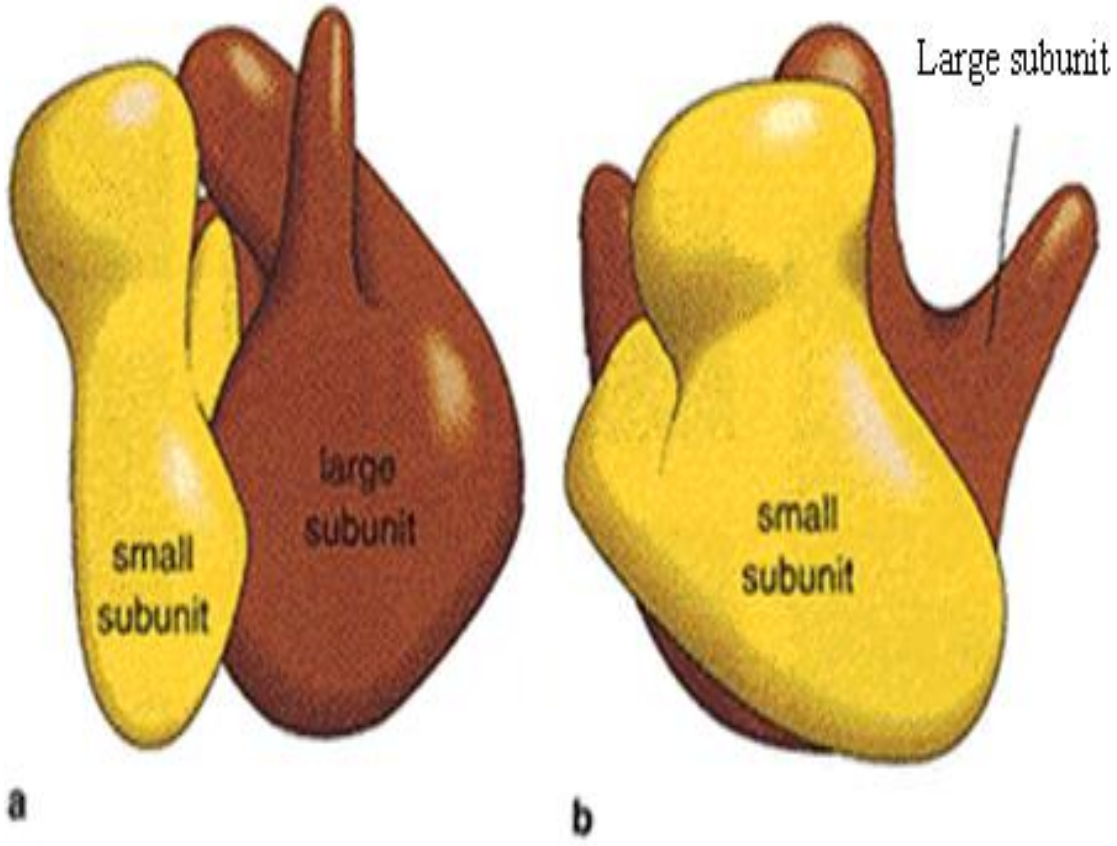
- **Ribosomes**
- **Endoplasmic Reticulum**
  - **Rough Endoplasmic Reticulum**
  - **Smooth Endoplasmic Reticulum**
- **Golgi Apparatus / Complex**

CELL: Cell Manufacturers

- **Ribosomes**

  Structure: - granular particles composed of protein and RNA molecules,
  - consists of two subunits made of protein and RNA

  Function: - synthesize protein molecules that may be used to build cell structures or to function as enzymes



CELL: Cell Manufacturers

- **Endoplasmic Reticulum**

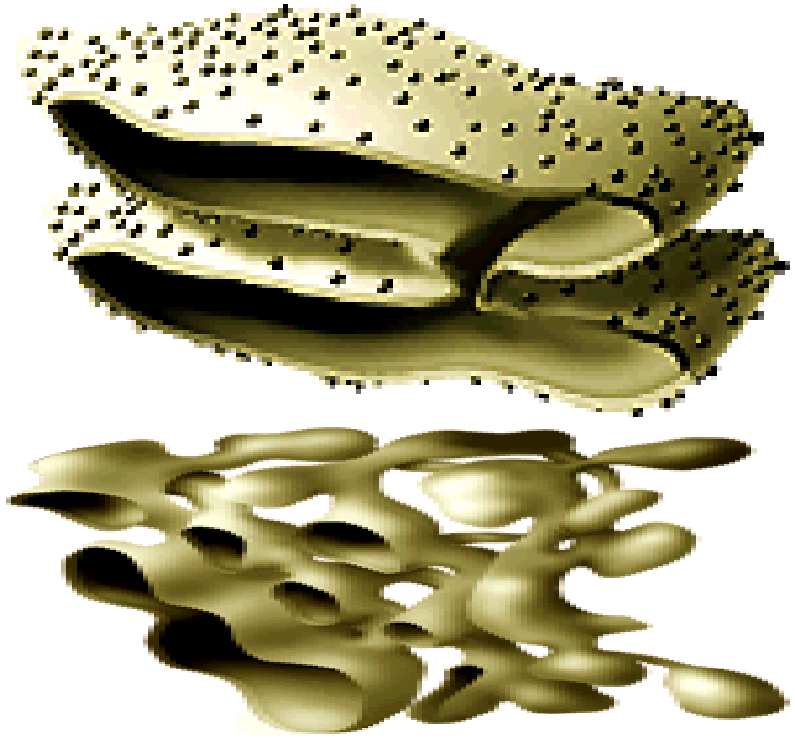
- a series of membranous channels that traverse the cytoplasm of most eukaryotic cells
- A continuous network extending from the cell membrane to the nuclear membrane
  - **Rough Endoplasmic Reticulum (rER)**

    Structure: - ribosomes are attached at the ER

    Function: - active protein synthesis
  - **Smooth Endoplasmic Reticulum (sER)**

    Structure: - does not contain ribosomes

    Function: - synthesis and transport of lipids or detoxification of poisons within the cells



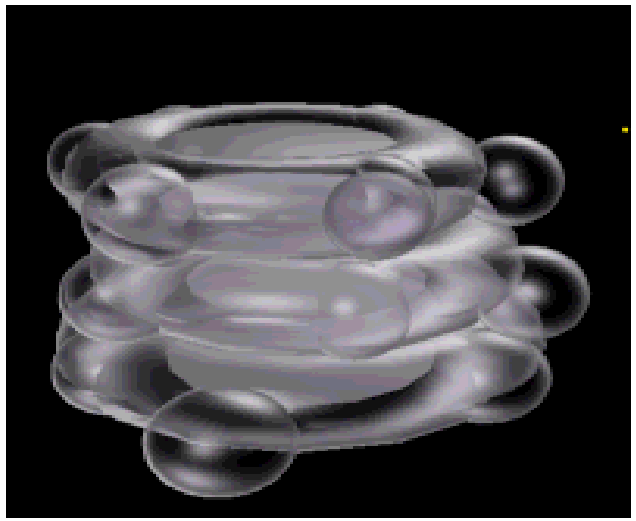
CELL: Cell Manufacturers

- **Golgi Apparatus / Complex**

  Structure: cluster of flattened membranous sacs that are continuous within the channels of the sER

  Function: - receiving → processing → packaging → shipping

  - responsible for the storage, modification and packaging of materials produced for secretory export, its outer portion releases secretory material within vesicles that migrate to the surface of the cell



CELL: Breakdown of Materials

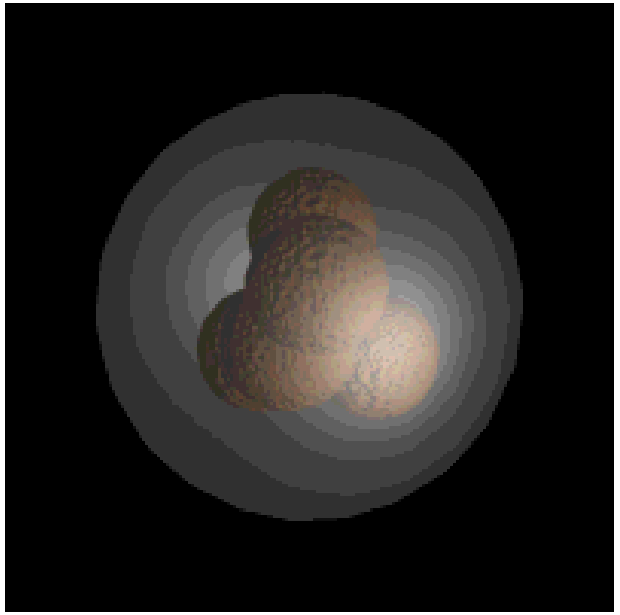
- **Lysosomes**

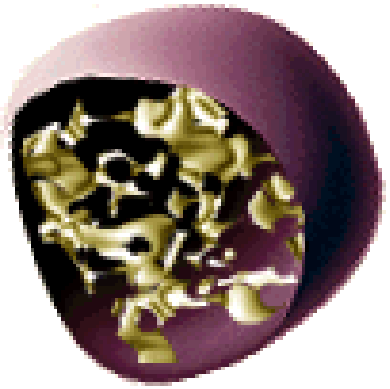
  Structure: - single walled membranous sacs

  - contain hydrolytic enzymes within the single membranes

  Function: - responsible in digestion of nutrients, bacteria and damaged organelles

  - used to destroy certain cells (apoptosis)





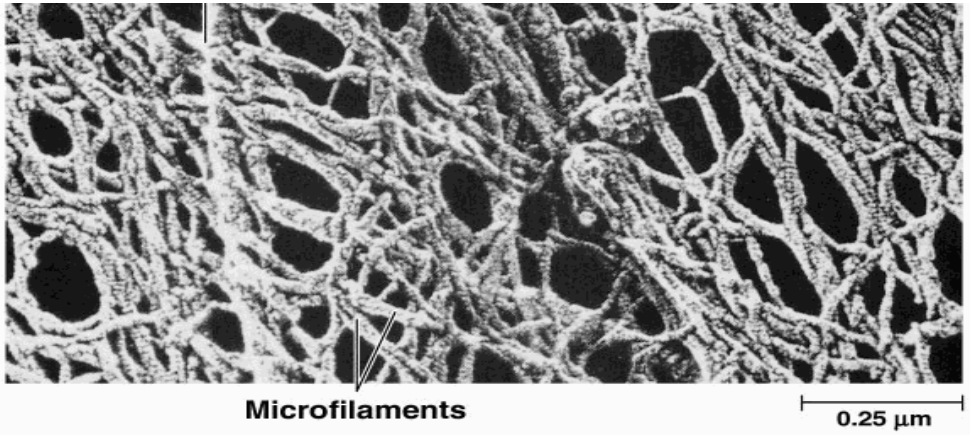
CELL: Support and Movement

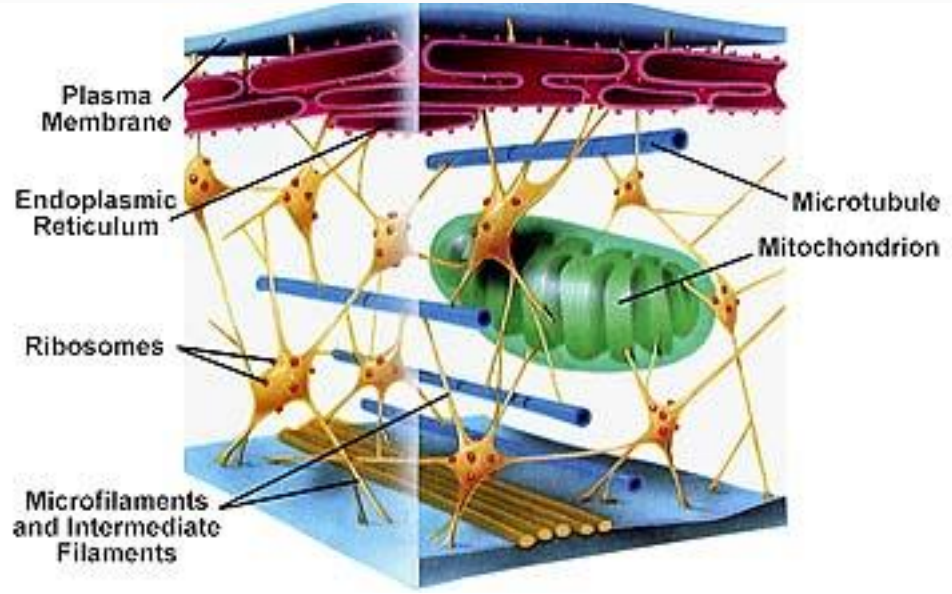
- **Cytoskeleton**

  Structure: a network of thin, fibrous elements made up of microtubules (hollow tubes) and microfilaments (threads made out of actin)

- *Function*: - acts as a support system for organelles

  - maintains cell shape



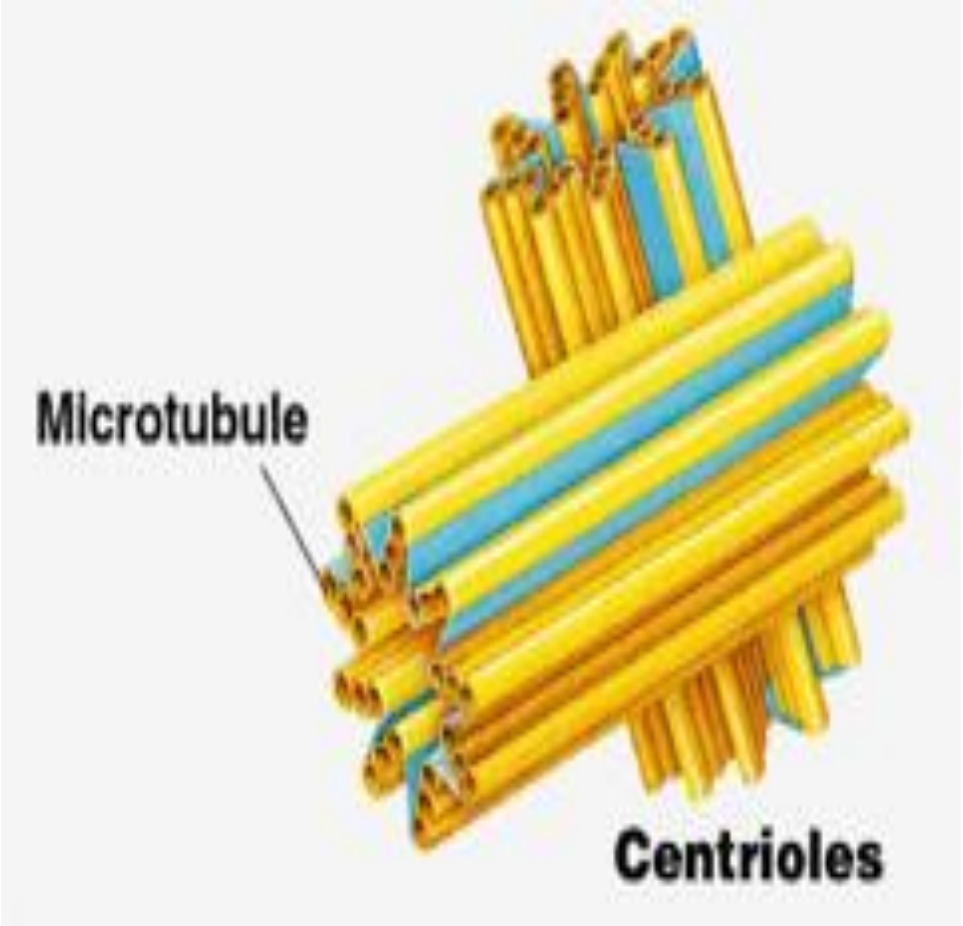


CELL: Support and Movement

- **Microtubules**

  Structure: - thin hollow tubes

- *Function*: - supports the cytoplasm and transport materials within cytoplasm



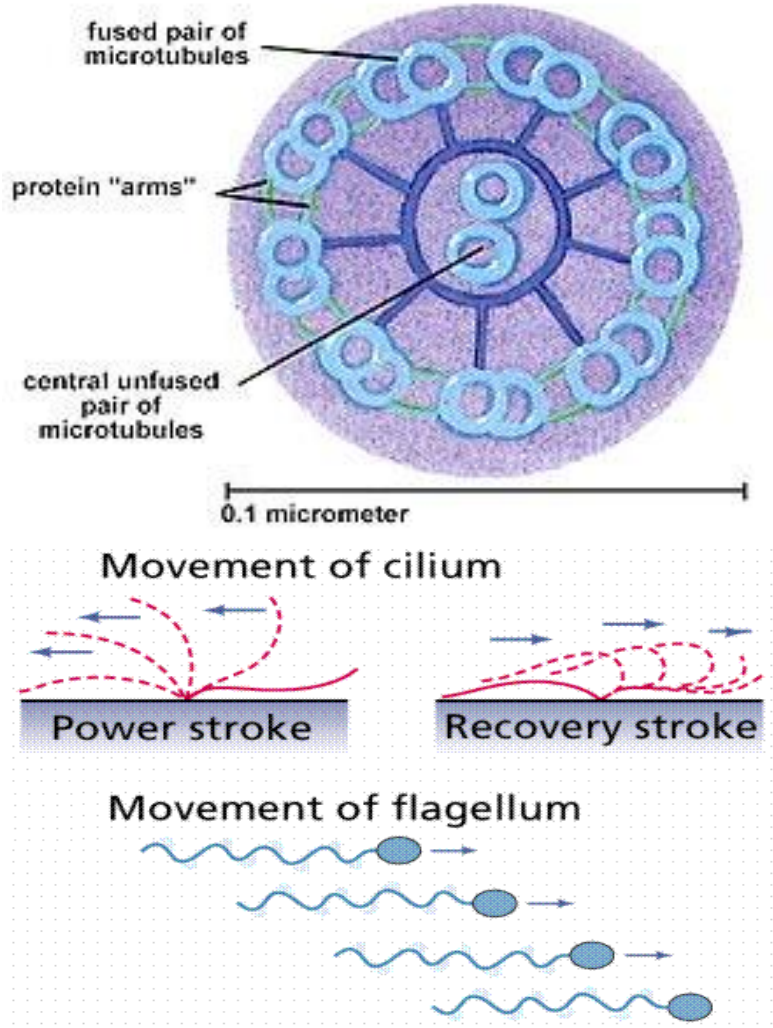
CELL: Support and Movement

- **Cilia and Flagella**

  Structure: - minute cytoplasmic projections that extends from the cell surface

  - When they are present in large numbers on a cell they are called cilia
  - When they are less numerous and longer they are called flagella
  - Both organelles are composed of nine pairs of microtubules arranged around a central pair.

  Function: - cell motility



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