

## CELL BIOLOGY

### MILESTONES IN CELL BIOLOGY

- 1500's - Convex lenses with a magnification greater than 5x became available.
- 1600's (early) - First compound light microscopes used in Europe. Two convex lenses to make objects look larger, but the images suffered badly from color distortion.
- 1632 - Antoni van Leeuwenhoek of Holland produced over 500 single lens microscope. Using these primitive microscopes, which had an astonishing magnification of 270x, he discovered bacteria, human red blood cells, sperm cells, and protozoa.
- 1665 - Robert Hooke introduced the term "cell" in describing the microscopic structure of cork; he believed that the cell walls were the important part of the otherwise empty structure.
- 1838 - Matthias Schleiden and Theodor Schwann proposed the *cell theory for plants and animals; plants and animals are composed of groups of cells and that the cell is the basic unit of living organisms.*
- 1855 - Rudolf Virchow extended the cell theory by stating that: *new cells are formed only by the division of previously existing cells.*
- 1880 - August Weismann added to Virchow's idea by pointing out that: *all the cells living today can trace their ancestry back to ancient times (the link between the cell theory and evolution).*

## THE MODERN CELL THEORY

## CELL BIOLOGY

1. All living organisms are composed of one or more cells.
2. Cells are the basic units of structure and function in all organisms.
3. All cells come from previously existing cells.
4. The activity of an entire organism depends on the total activity of its independent cells.

## TYPES OF LIVING THINGS

- Living things are called organisms and cells are the functioning unit structure from which organisms are made. They are extremely small and can only be seen properly through a microscope.
- Cells can be divided into two basic kinds:
  - **Prokaryotic** - simple cells that lack a distinct nucleus and membrane-bound organelles.
  - **Eukaryotic** - more complex cells that have a nucleus and membrane-bound organelles. There are four broad groups of eukaryotic cells, but the two we will focus upon are **plant** and **animal** cells.

## CELL STRUCTURES AND ORGANELLES

- There are structures and organelles that are common to both plant and animal cells.
  - **Vacuole** - filled with an aqueous solution of ions; function in storage and waste disposal.
  - **Mitochondrion** - the cell energy transformers, converting chemical energy into ATP. The number in a cell depends on its metabolic activity.
  - **Cytoplasm** - A watery solution containing dissolved substances, enzymes, and the cell organelles and structures.
    - The watery solution, not including any other cell parts, is called the **cytosol**.
    - **Cell membrane** - also called the plasma membrane. The cell surface, it encloses the entire cell and its contents.
    - **Nucleus** - A conspicuous organelle containing most of the cell's genetic information (DNA). It has many holes called nuclear pores that allow communication between the nucleus and the rest of the cell.
    - **Nucleolus** - a dense, solid structure within the nucleus that manufactures ribosome parts.
    - **Ribosome** - small structures that manufacture proteins. Some are free in the cytosol while others are attached to the rough endoplasmic reticulum.

- **Endoplasmic Reticulum (ER)** - a network of tubes and flattened sacs. It is continuous with the cell membrane and the nuclear membrane. There are two types:

- **Rough ER** - has attached ribosomes and is a site of protein synthesis.

- **Smooth ER** - lacks attached ribosomes.

It is a site of fat and carbohydrate metabolism, including hormone synthesis.

- **Lysosome** - small sacs that contain and transport enzymes that break down food, foreign, and waste material.

- **Golgi Apparatus (Golgi Body)** - A series of flattened, disc-shaped sacs, stacked one on top of the other and connected with the ER.

It stores, modifies, and packages proteins before it "tags" them and sends them off to their destination.

- There are structures that are found only in plant cells:

- **Cell wall** - a semi-rigid structure outside the cell membrane. It is mainly composed of a sugar called cellulose. It supports the cell and limits its volume.

- **Chloroplast** - specialized structures that contain a green pigment called chlorophyll. They are the sites of photosynthesis and occur mainly in leaves.

- *There is usually one large central vacuole.*

- There are structures that are found only in animal cells:

- **Centrioles** - aid in cell division.

- *There are numerous smaller vesicles.*











