Eukaryote cells have other characteristics that prokaryote cells are lacking

- All eukaryote cells (plants, fungi and protista) have an **endomembrane system**. This system consists of endoplasmic reticulum and golgi apparatus. They have different specialized functions, however they work in coordination.

- The most important example of endocytosis in plants is nitrogen binding bacteria that enter into the root cells of legumes.

- In addition, a **cytoskeleton** (cell skeleton) consisting of protein fibers and various motor proteins that provide intracellular motion within the cytoplasm is also present.

- Cell movements results from the activities of the cytoskeleton and related motor proteins. When we compare plants with animals, we usually say that they do not move actively; however intracellular structures and materials move just like animal cells. This movement is carried out via similar mechanisms.

- ## Components of the cytoskeleton:

Cytoskeleton is made up of three types of long, thin fibers. Microtubules are just like empty tubes; microfilaments are thinner and the third type is intermediate fibers having a fiber thickness in between. Walls of microtubules consist of numerous tubuline proteins.

Microfilaments consist of two actin fibers that are entwined with each other.

Intermediate filaments are made up of different proteins according to their types. These fibers which are the components of cytoskeleton provide structural support to the cells.

For example, intermediate filaments form a net just below the nucleic membrane and help to preserve the shape of the nucleus.

- Types of motor proteins:

Three types of motor proteins are present. These are small proteins called kinesin, dynein and myosin. They convert chemical energy to kinetic energy and each of them are responsible from different types of special movements that is beneficial for the cell.

- Myosins move rapidly, kinesin moves slower but is stable (these are motor proteins that carry proteins along the microtubules), and dyneins perform sliding.

- Each cytoskeleton fiber is found with a different motor protein. Kinesin and dynein attach to the microtubules and myosin interact with microfilaments.

- Myosin-microfilament system is the main protein in skeletal muscles of animals. Myosin movement along the microfilaments forms the basis for muscle contraction. Plants do not have a muscle tissue just like animals, however plant cells have mini muscles formed of microfilaments and myosins. Microfilament/myosin combination is responsible from cytoplasm flow. It also plays an important role in the division of plant cells and other eukaryote cells.

- In most eukaryote cells, **mitochondria** are present as the place in which chemical energy conversion reactions occur.

- **Peroxisomes** that protect the cytoplasm from the impact of destructive molecules and free radicals are also common organelles that are found in eukaryotes. Peroxisomes are especially important for plant cells that perform photosynthesis.

- **Nucleus** is the main region in which genetic information (DNA) is kept and preserved within the cell. Most eukaryote cells have only one nucleus, however some of them (including plant cells) may have more nuclei.

- DNA molecules in the eukaryote cells combine with proteins to form units called **chromosomes**. All species have specific chromosome numbers. While chromosome number found in some species may be few, it may be thousands in some other species.

Structure of The Cell

Though they have many differences that we have specified above, plants and animals have a common and very important property:

Both plants and animals (in other words all living beings) are **made up of cells** and the **primary material of a cell is a fluid called protoplasm**.

PART 1- COMPARTMENTS

Membrane Structure and Membranous Organelles

- **Cells, basic units of life, require membranes for their existence.** Plasma membrane defines each cells boundary and **helps create and maintain electrochemically distinct environment within and outside the cell.** Other membranes enclose eukaryotic organelles such as the **nucleus, chloroplast** and **mitochondria.**

- Membranes also form internal compartments, such as **Endoplasmic Reticulum (ER) in the cytoplasm** and **thylakoids in the chloroplast.**
- **The principal function of membranes is to serve as a barrier to the diffusion of most water-soluble molecules.** These barriers limit compartments wherein the chemical composition can differ from the surroundings can be optimised for a particular activity. **Membranes also serve as scaffolding for certain proteins.**

1.1. Common properties and inheritance of cell membranes

- All cell membranes consist of a **bilayer of polar lipid molecules** and associated **proteins**. In an aqueous environment membrane lipids self-assemble with their hydrocarbon tails clustered together, protected from contact with water. Besides mediating the formation of bilayers, the property causes membranes to form closed compartments. As a result, every membrane is an asymmetrical structure, with one side exposed to the contents inside the compartment and the other side in contact with the external solution.

- **The lipid bilayer serves as a general permeability barrier** because most water-soluble (polar) molecules cannot readily traverse its nonpolar interior. **Proteins perform most of the other membrane functions and thereby define the specificity of each membrane system.** Virtually all membrane molecules are able to diffuse freely within the plane of the membrane, permitting membranes to change shape and membrane molecules to rearrange rapidly.
- **Cells must maintain the integrity of all their membrane-bounded compartments to survive, so all membrane systems must be passed from one generation of cells to the next in a functionally active form.**

1.2. The fluid-mosaic membrane model

- **The fluid-mosaic membrane model** describes the **molecular organisation of lipids** and **proteins in cellular membranes.** In most cell membranes, lipids and proteins (glycoproteins) make roughly equal contributions to the membrane mass.

- The **lipids** belong to several **classes**, including **phospholipids (the most common type of membrane lipids), galactosylglycerides, glucocerebroides** and **sterols (cholesterol, camposterol**, **sitosterol**, **stigmasterol).** These molecules share an important physicochemical property: They are **amphipathic**, containing both **hydrophilic (water-loving)** and **hydrophobic (water-hating)** domains.

- **Provides mechanical links between cytosolic and cell wall compounds.**

- The original fluid-mosaic membrane model included two basic types of **membrane proteins: peripheral proteins (water-soluble)** and **integral proteins (water-insoluble)**.

- As membrane components, **proteins** perform a wide array of functions:

1. **Transporting molecules and transmitting signals across the membrane.**
2. **Processing lipids enzymatically.**
3. **Assembling glycoproteins and polysaccharides.**