Lec. Four
Plant Cell Protoplast

Dr. Anaam F. Hussain

Plant Cell

The Plant Cell consists of a more or less rigid cell wall and the protoplast, The protoplast consists of the cytoplasm and a nucleus, The cytoplasm-Viscous fluid-includes distinct membrane-bound organelles such as plastids and mitochondria; systems of membranes (endoplasmic reticulum and dictyosomes); nonmembranous entities such as ribosomes, actin filaments and microtubules

The rest of the cytoplasm is a liquid matrix in which the nucleus, various entities and membrane systems are suspended - it is typically referred to as the cytosol or ground substance .

Components of cytoplasm

*Interconnected filaments & fibers

* Fluid = cytosol

* Organelles (not nucleus)

* storage substances

Cytoskeleton:

Made of 3 fiber types

* Microfilaments, Microtubules and Intermediate filaments

functions:

1 .mechanical support, 2.anchor organelles and 3.help move substances

Centrioles :Pairs of microtubular structures

Play a role in cell division

Lysosomes

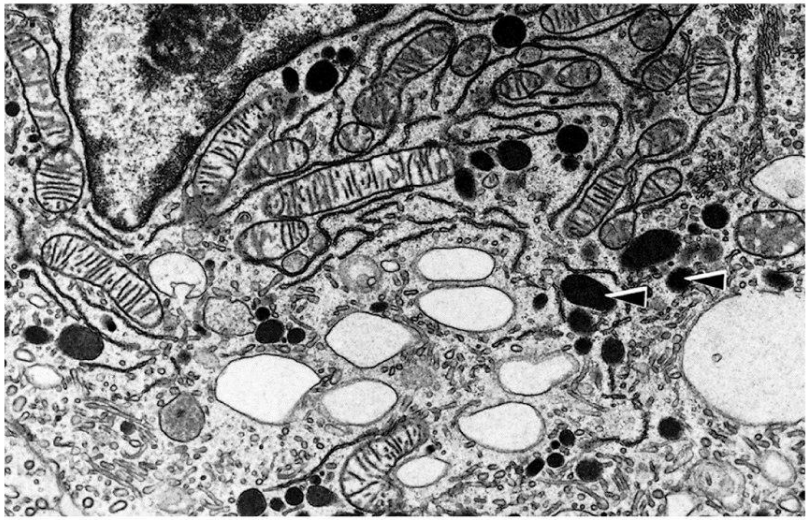
Contain digestive enzymes

Functions

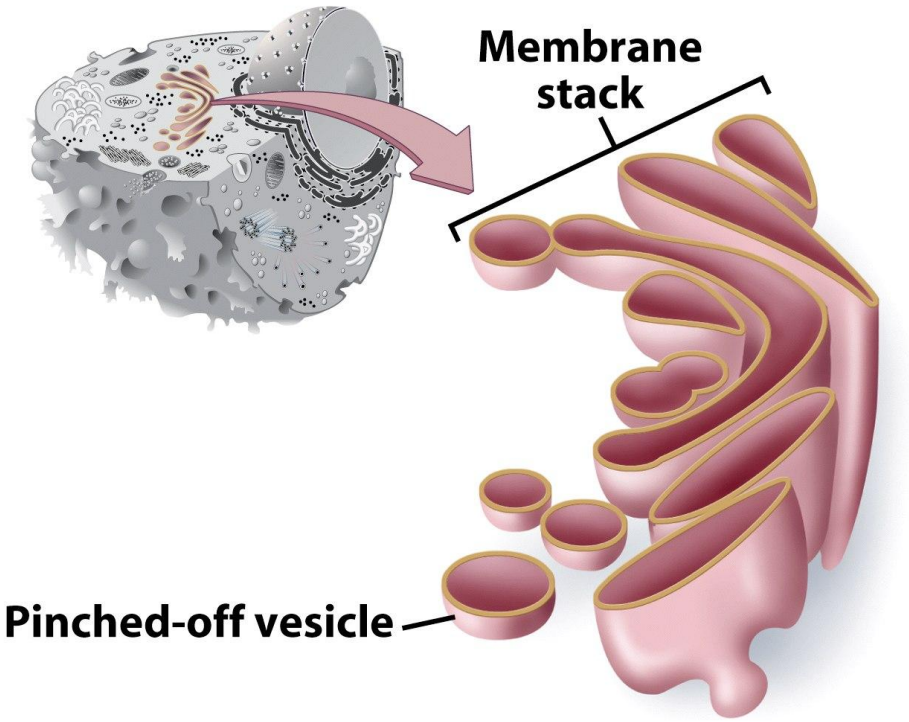
Aid in cell renewal

Break down old cell parts

Digests invaders



Golgi Apparatus: Involved in synthesis of plant cell wall
Packaging & shipping station of cell



Golgi Apparatus Function

1. Molecules come in vesicles
2. Vesicles fuse with Golgi membrane
3. Molecules may be modified by Golgi

Cell Nucleus: The nucleus is usually the most prominent structure in the protoplast of eukaryote cells , it is the genetic control center of the cell.

1. it controls the ongoing activities of the cell by determining which protein molecules are produced by the cell and when they are produced
2. it stores genetic information(DNA), passing it onto daughter cells during cell division

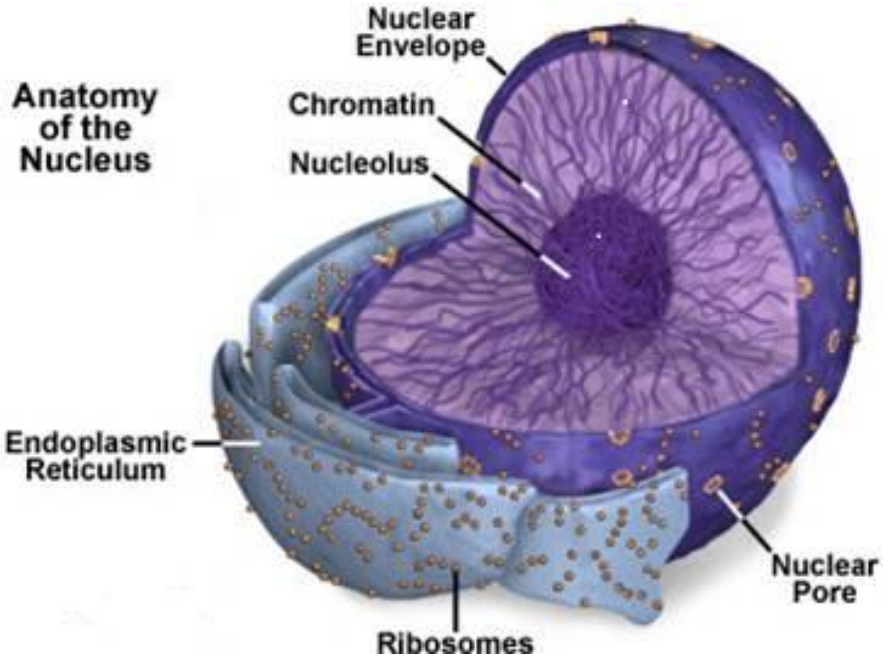
Structure of the Nucleus :

*Nuclear envelope

*Nucleoplasm

*Chromatin

*The nucleolus



DNA, or deoxyribonucleic acid: contains the information needed for the creation of proteins (which include enzymes and hormones) and is stored in the nucleus, as already said, in the form of chromatin or chromosomes.

Nuclear Envelope: is a double-layered membrane perforated with pores, which control the flow of material going in and out of the nucleus.

Nucleoplasm: A jelly-like (made mostly of water) matrix within the nucleus, helps the nucleus keep its shape and serves as the median for the transportation of important molecules within the nucleus

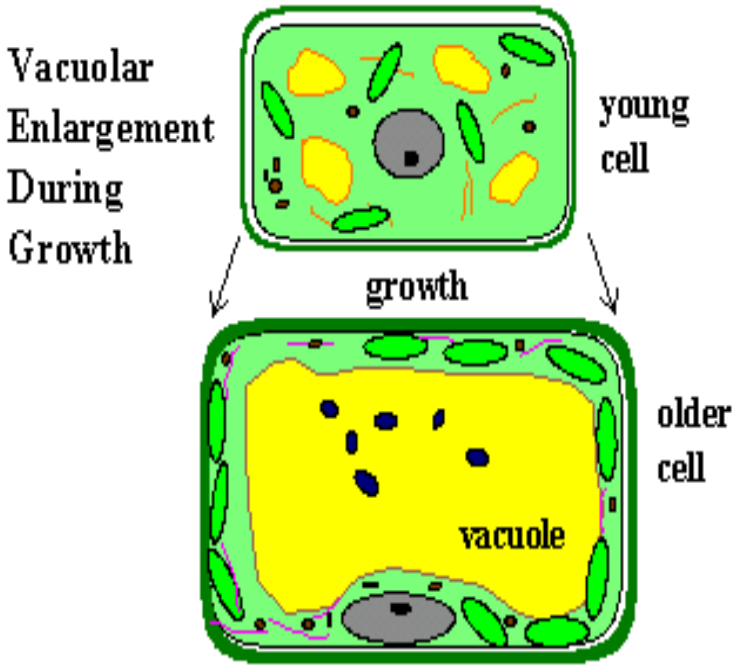
Chromatin & Chromosomes

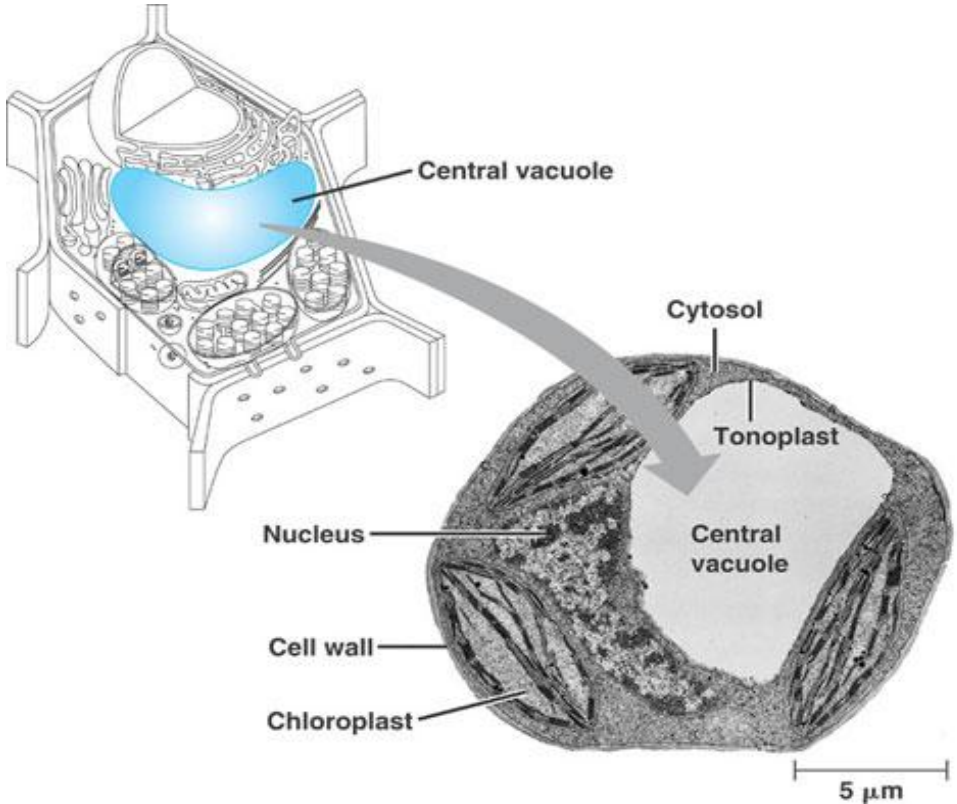
Chromosomes contain DNA in a condensed form attached to a histone protein.

Chromatin is comprised of DNA. There are two types based on function :Heterochromatin & Eurochromatin

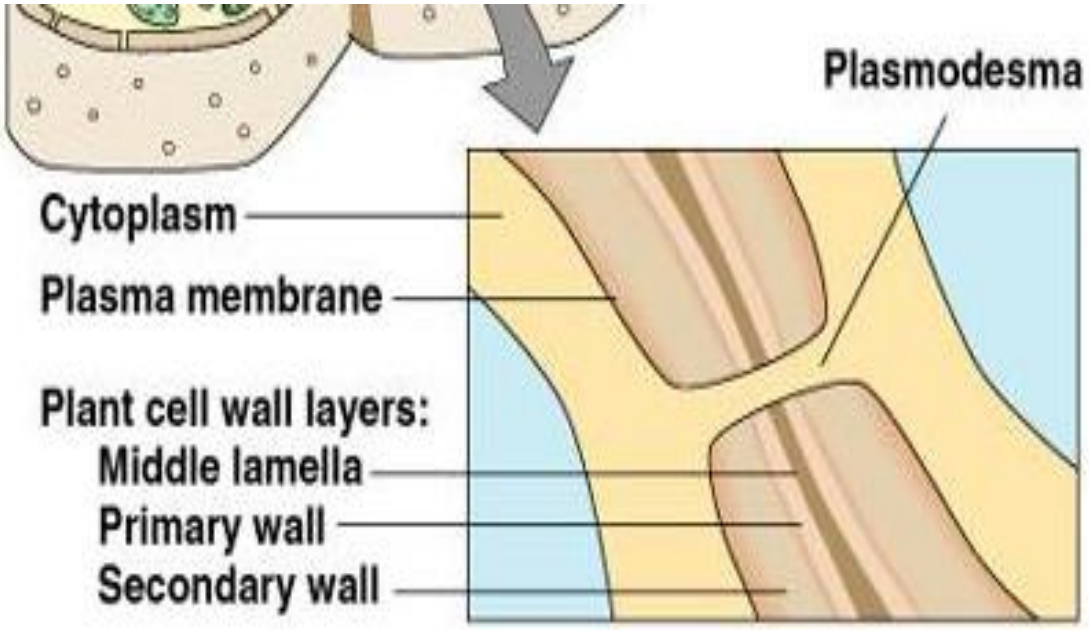
Endoplasmic reticulum (**ER**): is a type of organelle in eukaryotic cells that forms an interconnected network of flattened, membrane-enclosed sacs or tube-like structures known as cisternae. The membranes of the ER are continuous with the outer nuclear membrane. There are two types of endoplasmic reticulum: rough and smooth. The outer (cytosolic) face of the rough endoplasmic reticulum is studded with **ribosomes** that are the sites of protein synthesis. The smooth endoplasmic reticulum lacks ribosomes and functions in lipid manufacture and metabolism, the production of steroid hormones, and detoxification. The lacy membranes of the endoplasmic reticulum were first seen in 1945 using electron microscopy.

Vacuole: It is present at the centre and is water-filled volume enclosed by a membrane known as the tonoplast. The function is to maintain the cell's turgor, pressure by controlling movement of molecules between the cytosol and sap, stores useful material and digests waste proteins and organelles. Along with water based cell sap, vacuoles typically contain salts, sugars and some dissolved proteins. Ex. Beetroot cell vacuoles





Plasmodesmata: Pores in the primary cell wall through which the plasmalemma and endoplasmic reticulum of adjacent cells are continuous. Plasmodesmata allow the transport of substances from one cell to the next They are cytoplasmic threads which connect the living protoplasts of adjoining cells



Plastids: are a characteristic component of plant cells, Plastids are classified and named based on the kinds of pigments they contain

1.**Chloroplast:** is surrounded by two membranes and internally the plastid has a system of membranes which form flattened sacs called thylakoids and a substance called stroma ground (fluid)

2.**Chromoplasts:** lack chlorophyll but synthesize and retain carotenoid pigments which are responsible for the yellow, orange or red colors of many and some roots flowers, old leaves, some fruits

3.**Leucoplasts:** are non pigmented plastids some of which synthesize starch exposure to light they may while others produce oils or proteins(Upon develop into chloroplasts)

4.**Proplastids:**Proplastids are small, colorless or pale green undifferentiated plastids that occur in meristematic cells of roots and shoots - they will eventually develop into other, differentiated plastids such as the chloroplasts, chromoplasts or leucoplasts

As in mitochondria, which have a genome encoding 37 genes, plastids have their own genomes of about 100– 120 unique genes and, it is presumed, arose as prokaryotic endosymbionts living in the cells of an early eukaryotic ancestor of the land plants and algae.

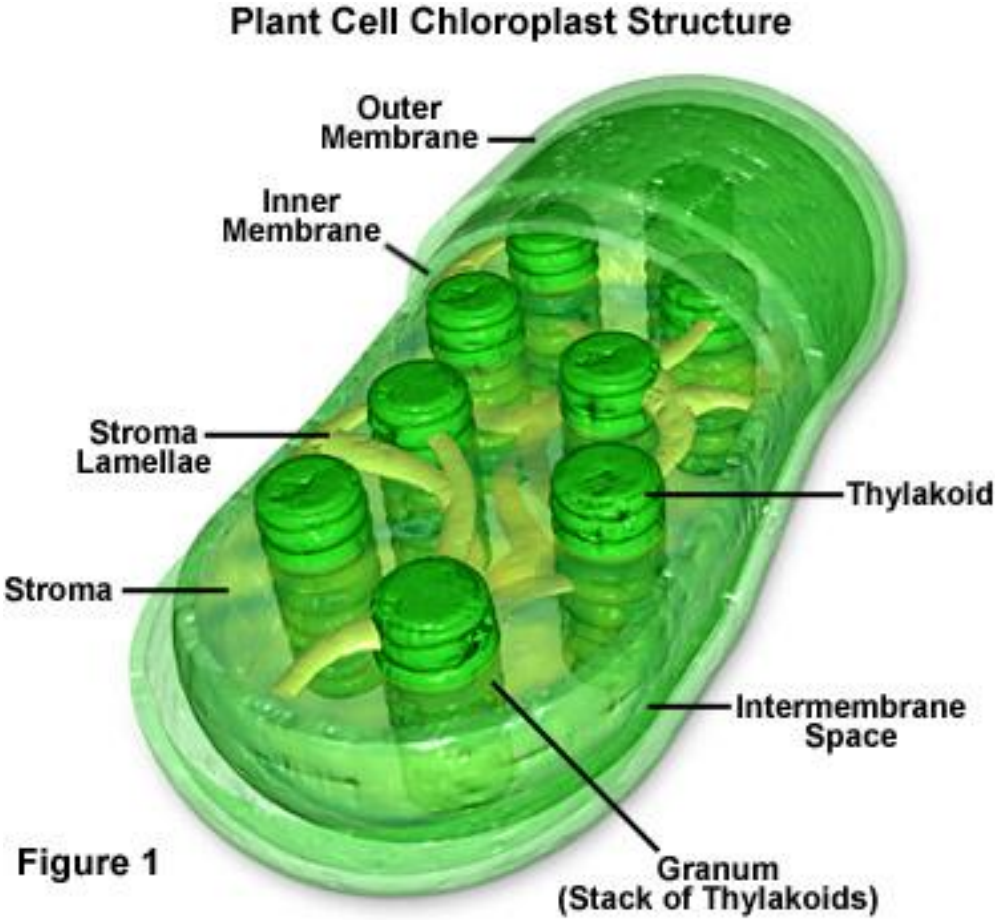


Figure 1

*__Mitochondrion__ is another organelle bounded by two membranes,the inner membrane is folded into many pleats called cristae

*Mitochondria are the sites of cellular respiration - converting organic molecules to ATP the main immediate energy source for living eukaryote cells - plant cells may hundreds to thousands of mitochondr have

ia