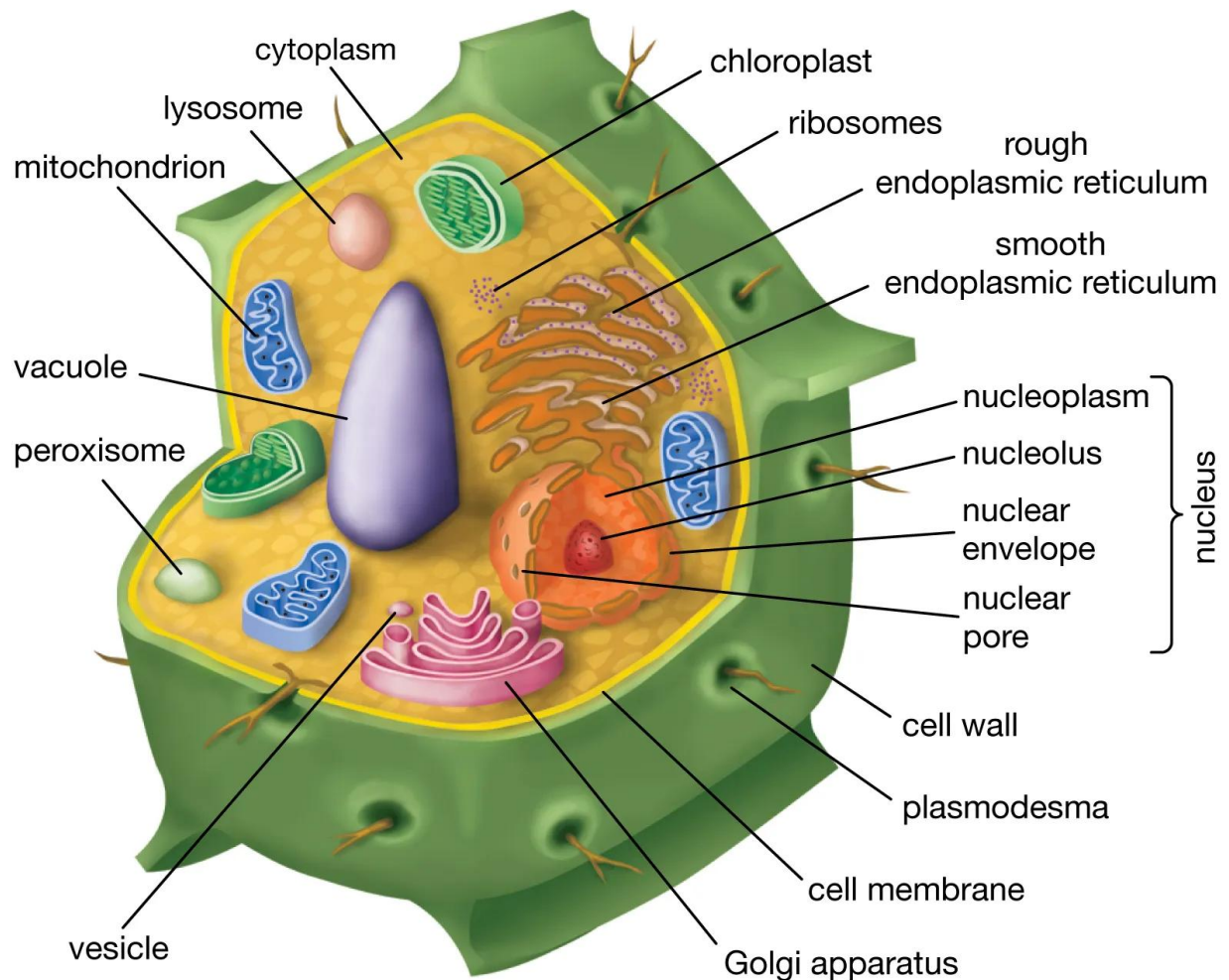


# Practical Notes: Study of Cell Organelles in a Plant Leaf Cell

In this practical, the ultrastructure of a typical plant leaf cell is studied using models or microphotographs. The plant cell is characterized by the presence of a rigid cell wall, large central vacuole, chloroplasts, and plasmodesmata, which distinguish it from animal cells.

## Plant cell



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Figure 1: Diagram of a typical plant cell showing major organelles.

## Detailed Description of Plant Cell Components

### 1. Middle Lamella and Cell Wall

- The outermost covering between adjacent plant cells, mainly made of calcium and magnesium pectates.
- The primary wall consists of cellulose, hemicellulose, and pectins; secondary wall (in mature cells) may have lignin, suberin, or cutin.
- Provides rigidity, protection, and shape.
- Contains plasmodesmata: cytoplasmic bridges that allow intercellular communication and transport.

### 2. Plasma Membrane

- Lies just beneath the cell wall.
- Follows the fluid mosaic model, composed of a lipid bilayer with proteins.
- Semipermeable: regulates movement of substances into and out of the cell.

### 3. Nucleus

- Surrounded by a double membrane with pores.
- Contains nucleoplasm, chromatin, and nucleolus.
- DNA is linear and associated with histone proteins.
- Controls cellular activities and stores genetic information.
- Nucleolus synthesizes rRNA and forms ribosome subunits.

### 4. Chloroplasts

- Double-membrane organelles with stroma and thylakoid membranes organized into grana.
- Contain circular DNA, RNA, and 70S ribosomes, making them semiautonomous.
- DNA is associated with non-histone proteins.
- Function: Photosynthesis and starch storage.

### 5. Mitochondria

- Double-membrane structure with inner folds called cristae and matrix inside.
- Also semiautonomous with circular DNA and 70S ribosomes.
- Function: Cellular respiration and ATP production.
- DNA associated with non-histone proteins.

### 6. Endoplasmic Reticulum (ER)

- Network of membranes continuous with the nuclear envelope.
- Rough ER (RER): with ribosomes, site of protein synthesis.
- Smooth ER (SER): without ribosomes, involved in lipid synthesis and detoxification.

## **7. Golgi Apparatus (Dictyosomes)**

- Stacked cisternae with vesicles.
- Functions in modification, packaging, and secretion of proteins and lipids.
- Plays a role in cell wall synthesis in plants.

## **8. Vacuole**

- Large central vacuole surrounded by tonoplast.
- Contains cell sap (water, sugars, salts, pigments, secondary metabolites).
- Maintains turgor pressure, stores metabolites, and contributes to cell elongation.

## **9. Peroxisomes**

- Single-membrane organelles containing oxidative enzymes.
- Involved in photorespiration in plants.

## **10. Lysosomes**

- Contain hydrolytic enzymes for intracellular digestion.
- Rare in mature plant cells but present in some tissues.

## **11. Ribosomes**

- Non-membranous, made of rRNA and proteins.
- Plant cytoplasm has 80S ribosomes; chloroplasts and mitochondria contain 70S ribosomes.
- Site of protein synthesis.

## **12. Plasmodesmata**

- Cytoplasmic connections between adjacent plant cells.
- Lined by plasma membrane and contain a central desmotubule derived from ER.
- Allow symplastic transport of water, ions, and signaling molecules.