

Chapter 2: The Invisible Living World

✨ Class 8 Science (Curiosity) — Handcrafted Study Notes ✨

1. Introduction to the Microscopic World 🔍

Human eyes cannot see objects below a certain size threshold. For centuries, tiny organisms remained hidden until the invention of optical magnifying devices!

- *Lens:* A piece of glass shaped like a lentil seed (thick in middle, thin at edge).
- *Organisms:* All living beings (plants, animals, microbes) of varying shapes, sizes, and colors.

📖 Historical Milestones in Microscopy

- *Robert Hooke (1665):* Published *Micrographia*. Examined thin slices of cork under his microscope (magnified 200–300 $\times$) and discovered tiny, empty honeycomb-like compartments. Coined the term "CELL" for the basic unit of life.
- *Antonie van Leeuwenhoek (1660s):* Crafted superior lenses and observed live bacteria and blood cells. Known as the "Father of Microbiology".

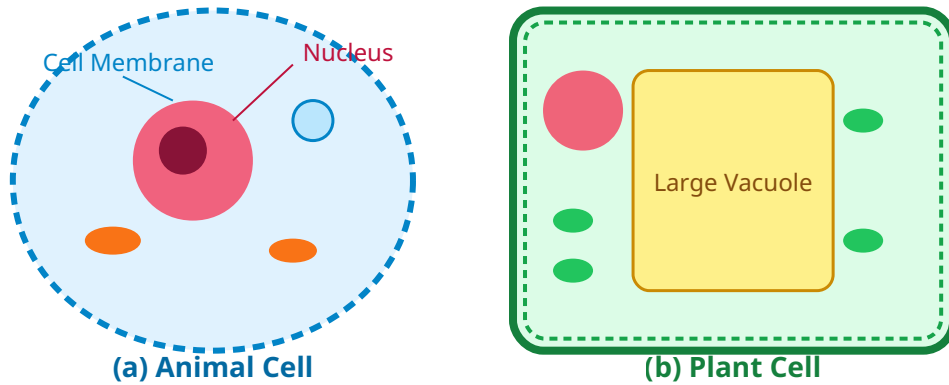
2. What is a Cell? 🧬

The cell is the fundamental structural and functional unit of all living organisms.

Basic Components of a Cell:

- *Cell Membrane:* Outer porous boundary enclosing cytoplasm and nucleus. Controls entry/exit of substances.
- *Cytoplasm:* Jell-o like matrix between membrane & nucleus where carbohydrates, proteins, fats & cell processes occur.
- *Nucleus:* Spherical body regulating all cell activities, growth, and hereditary information.
- *Cell Wall:* Rigid outer protective cover found in plant cells, fungi, and bacteria (absent in animal cells).

Schematic Comparison: Animal Cell vs Plant Cell



Comparison Table: Plant Cell vs. Animal Cell

Feature	Plant Cell 	Animal Cell 
Cell Wall	Present (Rigid, gives shape & strength)	Absent
Plastids / Chloroplasts	Present (Chlorophyll for photosynthesis)	Absent
Vacuole	Single, very Large central vacuole	Absent or small, temporary vacuoles
Shape	Fixed, rectangular/polygonal	Flexible, irregular / round / spindle

3. Levels of Organization in Organisms

Living organisms show structured hierarchical levels from simple blocks to complex beings:



- **Multicellular Organisms:** Made of many cells (e.g., humans, trees, animals). Life starts as a single-celled egg which divides repeatedly.
- **Unicellular Organisms:** Perform all life functions inside a single cell (e.g., Amoeba, Paramecium, Bacteria, Yeast).

Mind-Blowing Fact!

The yolk of an ostrich egg is a single cell measuring 130 mm – 170 mm in diameter — the largest known single cell in the living world!

4. Microorganisms (Microbes)

Microorganisms are tiny living beings invisible to the naked eye. They live everywhere: air, water, soil, extreme hot springs, ice zones, and inside human bodies/gut!

Major Groups of Microorganisms:

Group	Characteristics	Examples
Protozoa	Unicellular, irregular or fixed shape, move using pseudopodia or cilia.	Amoeba, Paramecium
Fungi	Non-green (no chlorophyll), branched filaments or single-celled.	Yeast (unicellular), Bread mould, Penicillium
Algae	Contain chlorophyll, plant-like, aquatic. Microalgae produce >50% Earth's O ₂ !	Spirulina, Chlorella, Diatoms
Bacteria	Unicellular, lack well-defined nucleus (have Nucleoid instead). Spherical/rod/spiral shape.	Lactobacillus, Rhizobium



Note on Viruses:

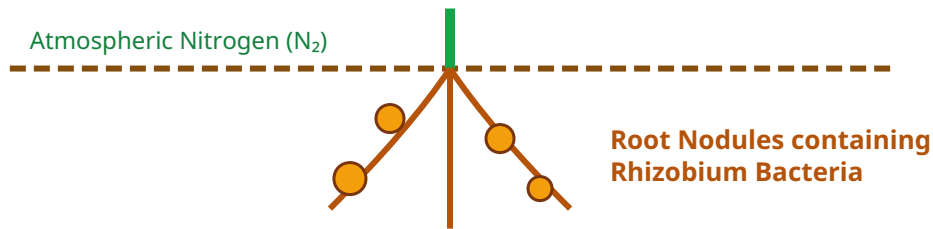
Viruses are microscopic & acellular (not made of typical cellular components). They are considered on the borderline of living & non-living because they multiply only when inside a living host cell.

5. Beneficial Roles of Microbes in Our Life

A. Cleaning the Environment & Nutrient Cycling

- **Decomposers:** Microbes (bacteria & fungi) break down organic waste, dead leaves, and animal dung into nutrient-rich manure.
- **Biogas Production:** Anaerobic bacteria decompose plant/animal waste in oxygen-free setups to produce biogas (methane + CO₂), used as clean fuel.
- **Oil Spill Cleanup:** Dr. Ananda Mohan Chakrabarty developed a genetically modified bacterium (1971) to break down oil spills.

Bio-Fertilizers & Nitrogen Fixation (Rhizobium)



Legumes (peas, beans, lentils) host Rhizobium in root nodules to fix atmospheric N₂ into soil nutrients, reducing dependence on chemical fertilizers!

B. Microorganisms in Food Industry

- *Fermentation by Yeast: Yeast respires to produce Carbon Dioxide (CO₂) gas bubbles, expanding dough and making bread, cakes, bhaturas, idli, and dosa soft & fluffy. Produces a mild alcohol aroma.*
- *Curd Formation (Lactobacillus): Lactobacillus bacteria feed on milk sugar (lactose) in lukewarm conditions, converting it into lactic acid, curdling the milk.*
- *Food Preservation: High concentrations of salt and sugar in pickles and murabbas prevent microbial growth via osmosis.*

C. Superfood Microalgae

- *Spirulina: Called a superfood! Rich in protein (>60%), low in fat/sugar, and high in Vitamin B₁₂. Grown easily in tanks.*

6. Key Concepts Summary

1. *Prokaryotic vs Eukaryotic feature: Bacteria lack a nuclear membrane (have nucleoid), whereas plants, animals, fungi & protozoa have true nuclei.*
2. *Decomposition: Optimal temperature & moisture are required for microbes to decompose organic waste.*
3. *Vedic Heritage: Ancient texts like Atharvaveda mention 'Krimi' (visible 'Drishya' & invisible 'Adrishya' entities).*