PARMAR SSC

PLANT KINGDOM

Lecture - 4

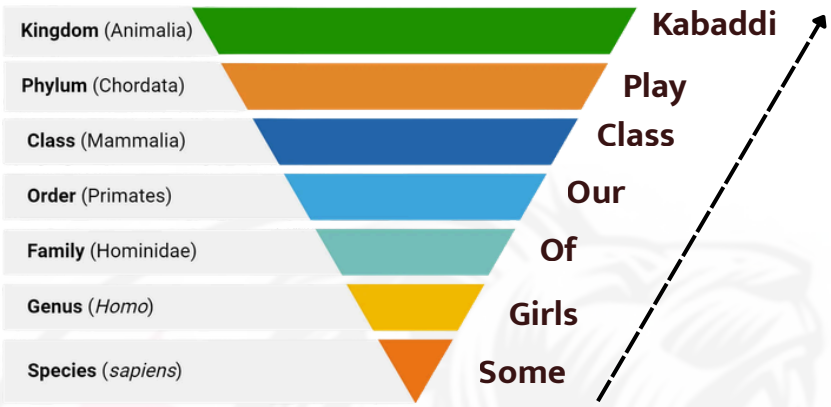


BY PARMAR SIR

Taxonomy

- It is the science of describing, naming, and classifying organisms, including all plants, animals, and microorganisms.

Linnaeus System of Classification



Two Kingdom Classification

- Proposed by Carolus Linnaeus (1758), who is known as the **Father of Taxonomy**.
- He divided all living organisms into two kingdoms:
  - **Kingdom Plantae** – included plants, algae, and fungi.
  - **Kingdom Animalia** – included all animals.
- Carolus Linnaeus published his book **Systema Naturae in 1735**, in which he described and classified organisms systematically for the first time and introduced the concept of taxonomy.
- He is also known as the **Father of Modern Botany** and the **Father of Binomial Nomenclature**.

Three Kingdom Classification

- **Proposed by:** Ernst Haeckel (1866).
- Coined the term "**Ecology**".
- **Kingdoms**: Plantae, Animalia, Protista (New kingdom added for unicellular organisms: Amoeba, Paramecium, Euglena).

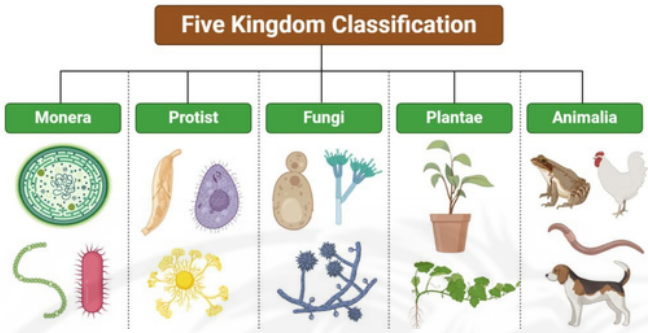
Three Domain Classification

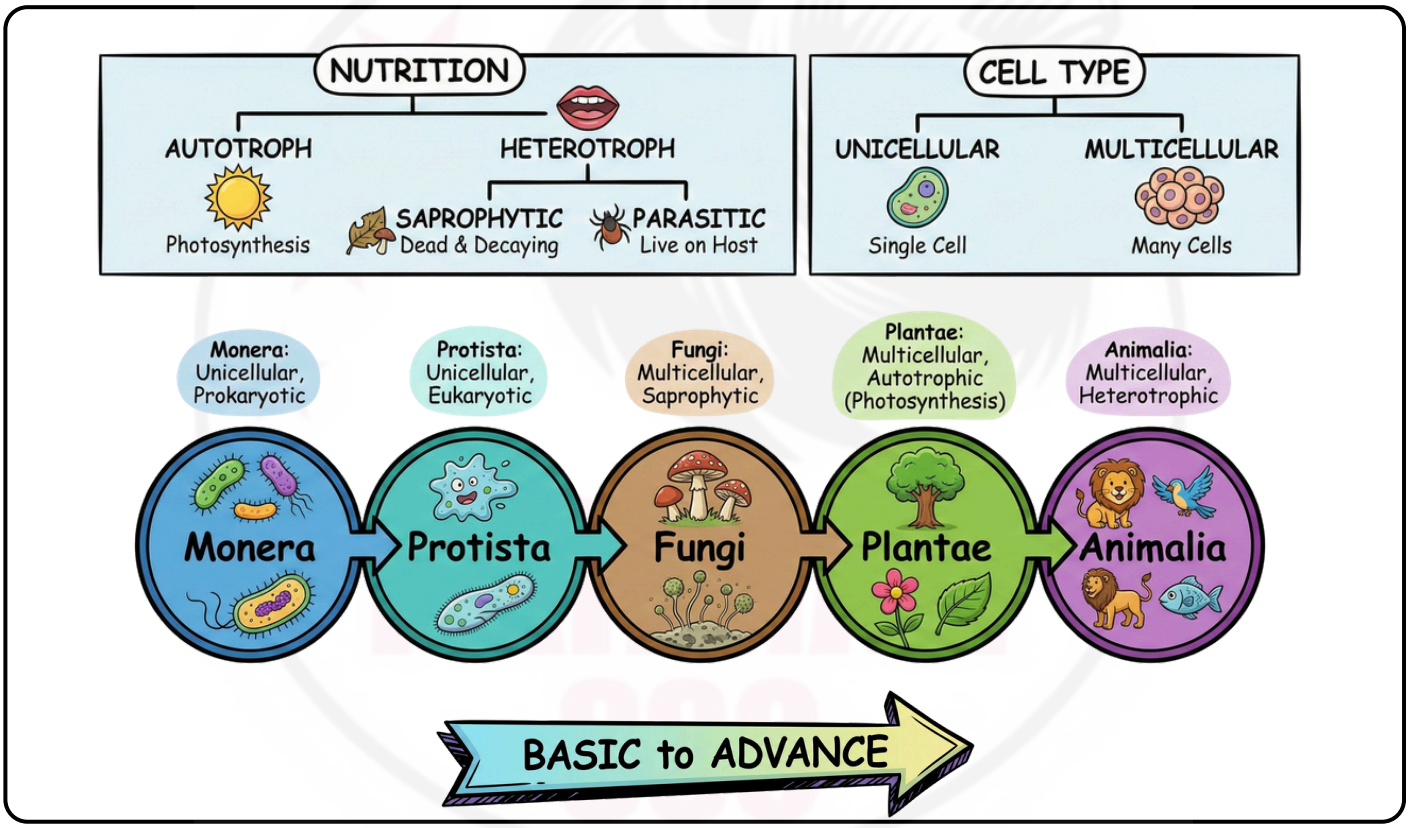
- **Proposed by:** Carl Woese (1990).
- **Domains**:

1. Bacteria (True prokaryotes),
2. Archaea (Prokaryotic cells distinct from bacteria found in extreme environments),
3. Eukarya (All eukaryotic organisms: Protists, Fungi, Plants, Animals).

Five Kingdom Classification

- **Proposed by:** R.H. Whittaker (1969).
- **Kingdoms**: Monera, Protista, Fungi, Plantae, Animalia.
- **Basis of classification:** Cell structure, mode of nutrition, body organization, reproduction





- **Cavalier-Smith** divided the living organisms into six kingdoms.

KINGDOM MONERA

- **Cell type:** Prokaryotic (no true nucleus or membrane-bound organelles).
- **Organization**: Unicellular, microscopic.
- **Cell Wall**: Made up of peptidoglycan (in bacteria)., Eub
- **Nutrition**: Autotrophic (photosynthetic or chemosynthetic) or heterotrophic (saprophytic or parasitic).
- **Example:** Cyanobacteria (blue-green algae) photosynthetic, Eubacteria etc.

Classification of Kingdom Monera

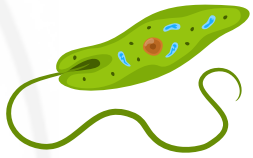
Eubacteria (True bacteria)	Archaebacteria (Ancient bacteria)
• Most common group. • Cell wall contains peptidoglycan.	• Live in extreme environments (hot springs, salt lakes, swamps). • Cell wall lacks peptidoglycan

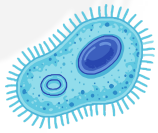
KINGDOM PROTISTA

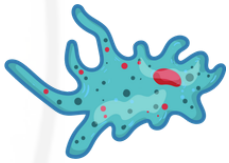
- **Cell type:** Eukaryotic (has a true nucleus and organelles), cell wall is absent.
- **Organization:** Mostly unicellular, some colonial or simple multicellular.
- **Locomotion:** Through appendages.
- **Nutrition:**

1. Autotrophic (Algae)
2. Heterotrophic (Protozoans).

Classification of Kingdom Protista







Phylum Protozoa

- Cell type Unicellular.
- **Mode of Nutrition:** Heterotrophic.
- **Habitat:** Mostly aquatic.
- **E.g.** Euglena (uses flagellum), Amoeba (uses pseudopodia), Paramecium (uses cilia), Plasmodium.

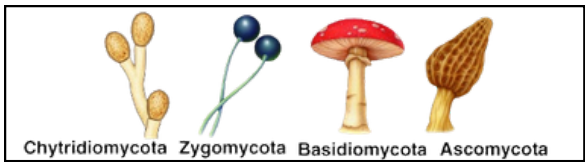
Kelp is classified under the phylum Protista

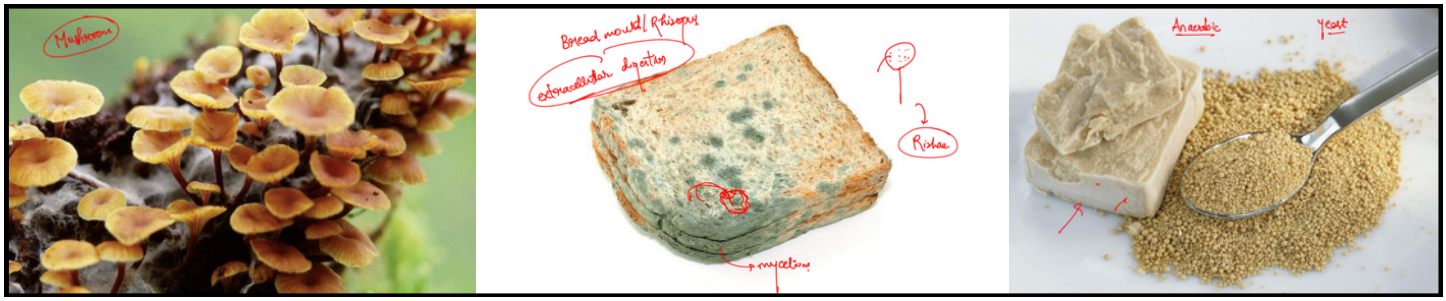




KINGDOM FUNGI

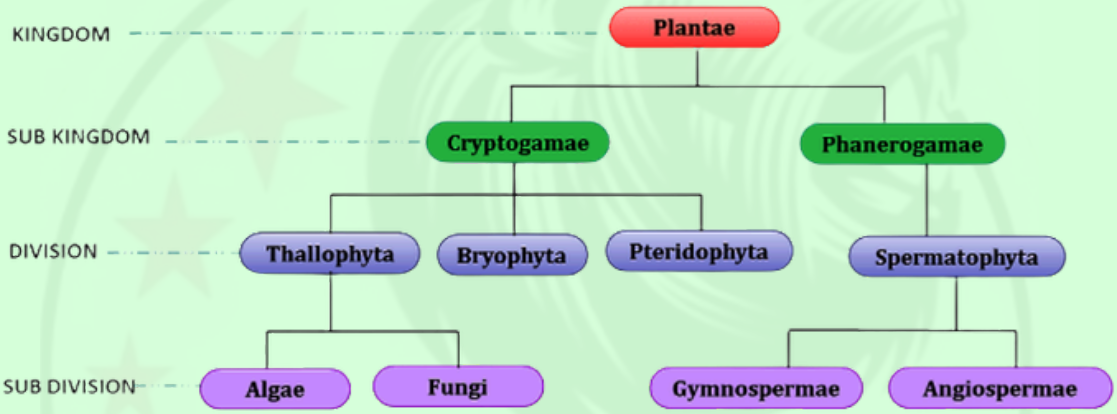
- **Cell Type:** Eukaryotic (has a true nucleus and membrane-bound organelles).
- **Organization:** Mostly multicellular, but some are unicellular (E.g. Yeast).
- **Cell Wall:** Present and is made of chitin (not cellulose).
- **Nutrition:** Heterotrophic, typically saprophytic (feed on decaying organic matter), but some are parasitic or mutualistic.
- **Symbiotic relationship:** E.g. Lichen (Blue-green algae + Fungi). → Natural indicator
- The fungus provides shelter, protection, and access to water and nutrients.
- The blue-green algae (or green algae) produce food for the fungus through photosynthesis.





- **Mycology:** The branch of biology that deals with the study of fungi.
- **Phycology (Algology):** The branch of biology that deals with the study of algae.

KINGDOM PLANTAE



- In Thallophyta, Bryophyta the dominant plant body is haploid and gametophytic.
- In Gymnosperms and Angiosperms, the dominant plant body is diploid and sporophytic.

Cryptogamae	Phanerogamae
Seeds, fruits, flowers are absent.	Seeds, fruits, flowers are present.
Reproductive organs are hidden.	Reproductive organs are exposed.
Less evolved plants.	Highly evolved plants.
E.g. Thallophytes, Bryophytes, and Pteridophytes.	E.g. Gymnosperms and Angiosperms.

KINGDOM PLANTAE

- **Cell Type:** Eukaryotic (has a true nucleus and membrane-bound organelles).
- **Organization**: Multicellular.
- **Cell Wall**: Made up of cellulose (provides structure and support).
- **Nutrition**: Autotrophic (producing their own food via photosynthesis using chlorophyll).

Classification Basis

- Differentiation of plant body and distinct components.
- Presence or absence of vascular tissues.
- Ability to bear seeds.
- Seeds are enclosed within the fruits.
- Ability to produce flowers.

Phylums of Kingdom Plantae

1. Thallophyta (Algae)

- **Cell type:** Eukaryotic.
- **Phycology:** Study of Algae.
- **Structure:** Simple, do not have well-differentiated body parts such as roots or stem (they have thallus).
- **Vascularity:** Non-vascular (no specialized tissue for transporting water and nutrients).
- **Habitat:** Mostly aquatic, mostly found in freshwater or marine environments.
- **Movement:** Non-motile.
- **Nutrition:** Autotrophic, photosynthetic (contain chlorophyll).
- **Types and Examples**:
  - **Chlorophyceae (Green algae):** Chlorella (rich in proteins), Spirulina (superfood), Spirogyra, Ulothrix, Ulva, Chara.
  - **Phaeophyceae (Brown algae):** Sargassum, Laminaria (Kelp), Ectocarpus.
  - **Rhodophyceae (Red algae):** Gelidium, Porphyra, Gracilaria, Polysiphonia.

- Green algae store their food in the form of starch.
- Brown algae store their food in the form of mannitol and laminarin.



- **Agar** is obtained from red algae such as **Gelidium and Gracilaria**. It is a hydrocolloid and is used in the preparation of jelly.
- **Algin** (alginic acid) is a hydrocolloid obtained from **brown algae**.
- **Carrageenan** is obtained from **red algae** and is used as a hydrocolloid (gelling agent) in food products such as jelly.

Trick to remember
Chlorophyceae

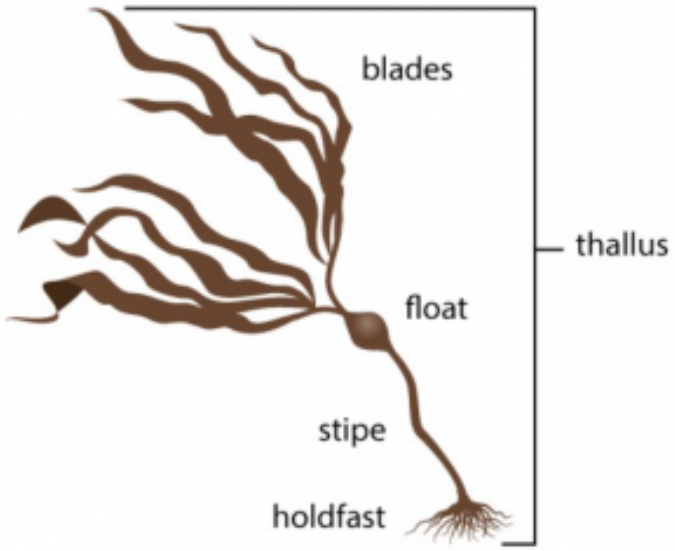
- S- Spriogyra
- U- Ulothrix
- V- Volvox
- C-Chara
- C- Cladophora

SUVCC

Trick to remember
Phaeophyceae

- S- Saragassum
- E- Ectocarpus
- L- Laminaria(aka Kelp, Mannitol is a sweet alcohol made from kelp)
- F- Fucus

SELF



2. Bryophyta (Bryophytes)

- Known as "Amphibians of plant kingdom" (exists both in land and water).
- **Vascularity:** Non-vascular plants (no specialised tissues for water and food conduction; lack xylem and phloem).
- **Nutrition**: Autotrophic.
- **Structure**: Well-differentiated body however lack true roots, stems and leaves.
- Roots like structure present in bryophytes are called Rhizoids.
- **Reproduction**: Through spores (no seeds) in water.
- **Male reproductive part:** Antheridium.
- **Female reproductive part:** Archegonium.
- **Habitat**: Found in damp and moist areas.
- **Examples**:
  - **Mosses**: Funaria.
  - **Liverworts**: Marchantia, Riccia.

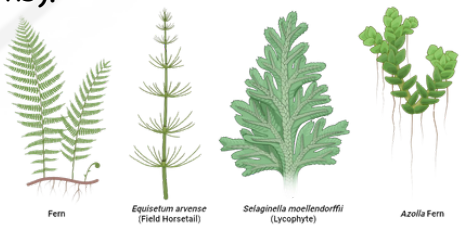

Liverwort


Hornwort


Moss

3. Phylum Pteridophyta

- Considered as the first terrestrial vascular plants (have xylem and phloem).
- Well-differentiated roots, stems, and leaves (called fronds in ferns).
- Leaves are made of leaflets that bear spores called Sporophylls.
- They have hidden reproductive organs (cryptogams).
- **Habitat**: Found in cracks of rocks, moist, and shady places
- **Examples**: Marsilea, Ferns, Horsetails, Selaginella, Adiantum.



Gymnosperms



- **Meaning**: Gymno (without cover) and Sperma (seeds without fruits).
- **Vascularity**: Vascular plants, have true roots, stem and leaves (with xylem and phloem).
- **Note:** Phloem Companion and Xylem Vessel are absent.
- **Seeds**: Seed-producing plants, but seeds are naked (not enclosed in fruit).
- **Characteristics**: Usually perennials, evergreen, and mostly woody plants.
- **Examples**: Pines, Deodar, Cycas.

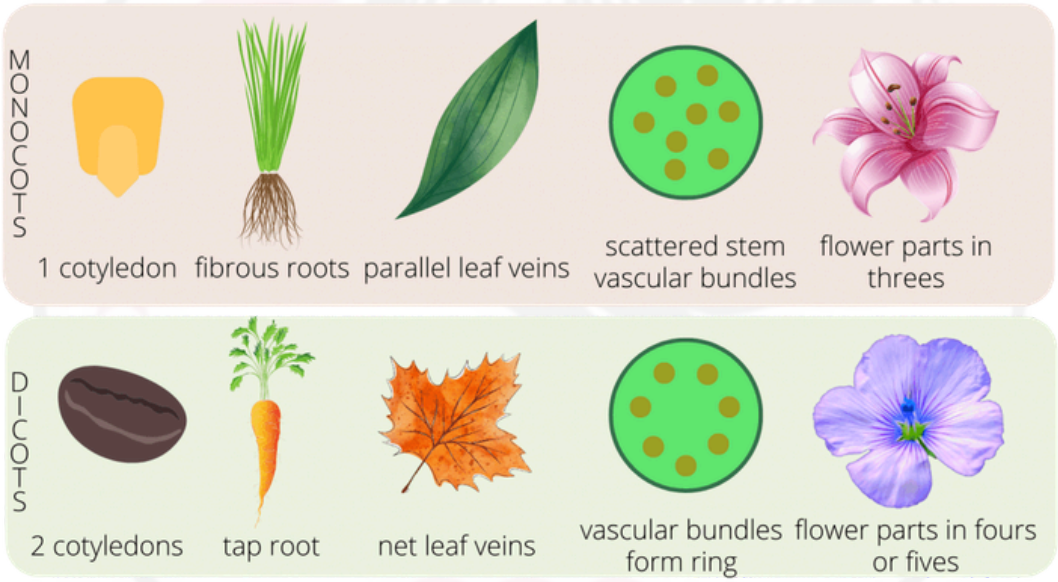
Angiosperms

- **Meaning**: Angio (covered) and Sperma (seeds).
- **Characteristics**: Flowering plants; produce seeds enclosed within fruit.
- **Vascularity**: Vascular plants with xylem and phloem; highly evolved.
- **Reproduction**: Flowers are the reproductive organs.
- **Flower to Fruit:** Ovary gets modified into fruit; ovules become seeds.

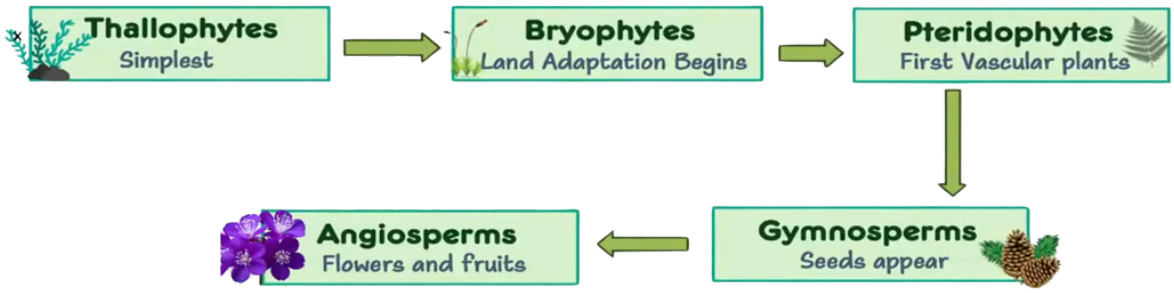
Classes

- **Monocots**: Have one cotyledon.
- ***E.g.***, grasses, lilies, wheat, Rice, Onion, Garlic.

- **Dicots**: Have two cotyledons.
- **E.g.**, roses, sunflowers, Tamarind, Mango, Pea, Gram.



Plant Evolution Order



- In algae, the cell wall is mainly composed of an outer layer of cellulose and an inner layer of pectin.



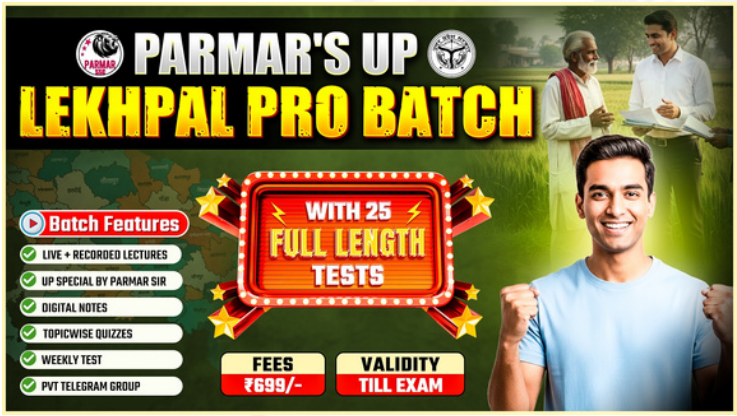


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