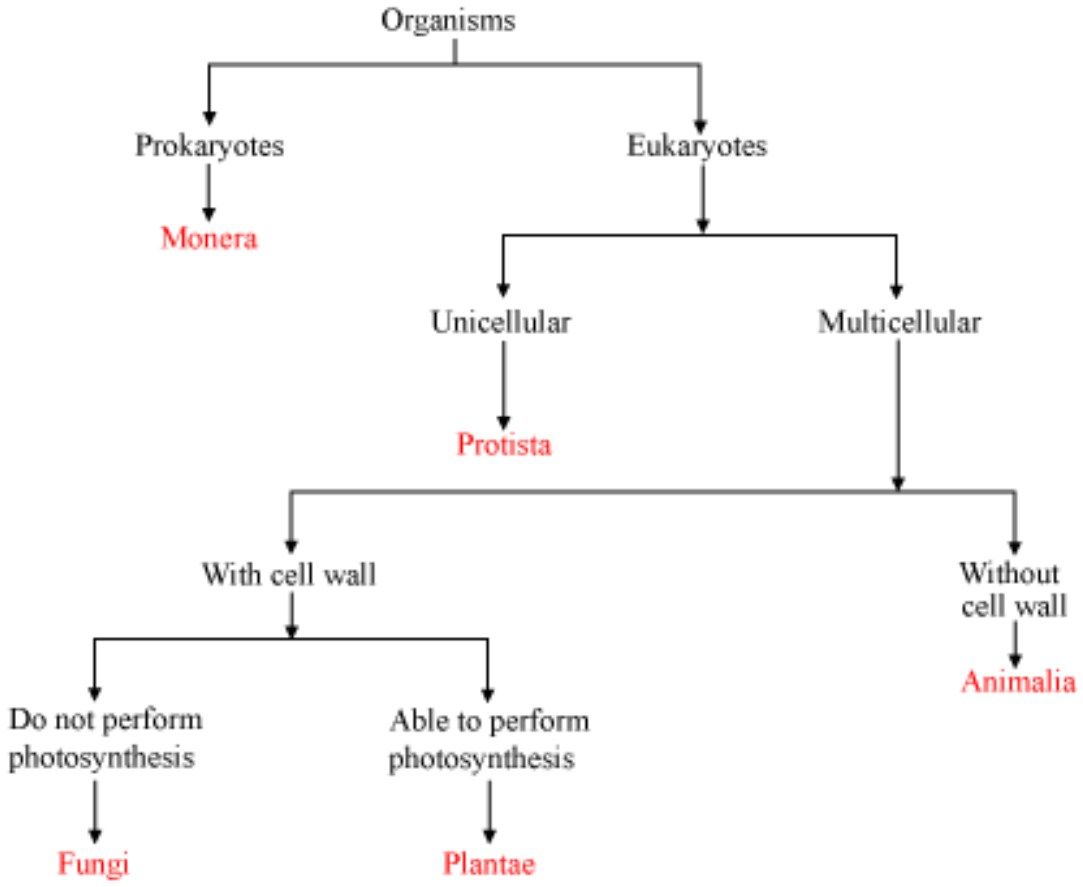
Five Kingdom Classification

- **Diversity**: It refers to the variety and variability among living organisms from all sources including land, water, and other ecosystems.
- **Classification**
    - It refers to the identification, naming, and grouping of organisms into a formal system based on similarities in internal and external structures or evolutionary history
    - It helps in organising the diversity of life forms in detail.
    - Characteristic - A feature that helps identify or describe a person or a thing
    - There are certain characteristics that are considered more fundamental than others. These fundamental characteristics make broad divisions in living organisms.

- **Principles of classification**
    - **Nature of cell (Fundamental characteristic):** On the basis of the nature of cell, living organisms are classified as: **prokaryotes and eukaryotes**
    - **Cellularity:** On the basis of cellularity, organisms are classified as: **unicellular and multicellular**
    - **Mode of nutrition**: On the basis of mode of nutrition, organisms are classified as: **Autotrophs and heterotrophs**

- R.H. Whittaker (in 1969) proposed a five-kingdom classification of living organisms
- The five kingdoms proposed by Whittaker are: Monera, Protista, Fungi, Plantae, and Animalia



Kingdom Monera: It includes mainly bacteria, blue-green algae, or cyanobacteria

- **Important features of Monera**:
    - Absence of well-defined nucleus or membrane-bound organelles- prokaryotic organisms.
    - All of them are unicellular
    - Can be autotrophic or heterotrophic

Kingdom Protista: It Includes protozoans such as, *Amoeba*, *Paramecium*, diatoms etc

- **Important features of protista**:
    - Unicellular, eukaryotic organism
    - Can be autotrophic or heterotrophic

Kingdom Fungi: Commonly known fungi are *Yeast*, mushroom, *Penicillium*, *Aspergillus*, etc.

- **Important features of fungi**:

- Multicellular eukaryotic organisms
- Always heterotrophic (saprophytes)
- Cell wall made of chitin

Kingdom Plantae

- **Important features of Plantae**:
  - Multicellular eukaryotic organisms
  - Most of the plants contain chlorophyll. Hence, they are autotrophic
  - Cell wall is made of cellulose

Kingdom Animalia

- **Important features of Animalia**:
  - Multicellular eukaryotic organisms
  - Chloroplast is absent. Hence, they have heterotrophic mode of nutrition
  - Cell wall is absent

Kingdom Plantae: It include five divisions:

1. Division Thallophyta: Includes *Spirogyra, Cladophora*, *Ulva*

- Characteristic feature of Thallophyta:
  - Plant body is not differentiated into true root, stem, and leaves
  - Spores are produced as a result of fertilization

2. Division Bryophyta (also called amphibians of plant kingdom): Includes mosses, *Riccia*, *Marchantia*

- Characteristic feature of Bryophyta:
  - Specialised vascular tissues (such as xylem) for the conduction of water are absent
  - Body is differentiated into stem and leaf-like structures
  - Naked embryo i.e. spores are present.

3. Division Pteridophyta: Includes ferns, *Marsilea*, *Equisetum*

- Characteristic feature of Pteridophyta
    - Specialised vascular tissues for the conduction of water are present.
    - Naked embryo i.e. spores are present
    - The plant body is differentiated into roots, stems, and leaves.

4. Division Gymnospermae: Includes *Pinus*, cedar, fir, Juniper, *Cycas*, etc

- Characteristic feature of Gymnospermae:
    - Seed bearing, non-flowering plants.
    - Bear naked seeds, not enclosed inside fruits.
    - Vascular bundles are present, but xylem lacks vessels and phloem lacks companion cells.
    - Flowers are absent. Instead, male and female cones are found.

5. Division Angiospermae: Includes all flowering plants

- Characteristic feature of Angiospermae:
    - Flowering plants in which seeds are enclosed inside fruits.
    - These plants bear flowers that consist of four whorls – calyx, corolla, androecium, and gynoecium
    - Seeds develop inside the ovary, which develops into a fruit

- Major groups of Angiosperms
    - **Monocotyledons:** Seeds that have one cotyledon. E.g. maize, wheat etc
    - **Dicotyledons**: Seeds that have two cotyledons. E.g. Sunflower, gram etc

Kingdom Animalia

- Kingdom Animalia can be divided into two major groups on the basis of the presence or absence of notochord- N**on-chordata** and C**hordata**

- Non-chordata can be further divided into the following phyla:

i. Phylum Porifera: Includes sponges such as *Spongilla*, *Euplectella*, etc

- **Characteristic features of Porifera**:
  - Cellular level of organisation
  - Mainly found in marine habitats
  - Posses canal system for circulating water.

ii. Phylum Coelenterata: Includes organisms such as hydra, sea anemone, etc.

- **Characteristic features of Coelentrata**:
  - Tissue level of organisation
  - Body cavity (coelom) is present
  - Diploblastic i.e body is made of two layers of cells.

iii. Phylum Platyhelminthes: Includes flatworms, liver flukes and planarians

- **Characteristic features of Platyhelminthes**:
  - Bilateral symmetry
  - Triploblastic i.e. three layers of cells are present
  - true internal body cavity is absent

iv. Phylum Nematoda (Aschelminthes): Includes roundworms - *Ascaris*

- **Characteristic features of Nematoda**:
  - Bilaterally symmetrical
  - Triploblastic
  - Pseudocoelom (false coelom) is present

v. Phylum Annelida: Includes segmented worms such as earthworms and leeches

- **Characteristic feature of Annelida**:
  - Bilaterlly symmetrical
  - Triploblastic
  - Body is segmented

vi. Phylum Arthropoda: Includes crabs, prawns, insects, spiders, scorpions, etc

- **Characteristic features of Arthropoda**:
  - Largest group of the animal kingdom.
  - Bilaterally symmetrical and segmented
  - Coelomic cavity is blood-filled
  - Presence of Jointed legs and open circulatory system

vii. Phylum Mollusca: Includes snails, octopus, *Pila*, etc

- **Characteristic features of Mollusca**:
  - Bilaterally symmetrical, little segmentation
  - Coelomic cavity is reduced
  - Open circulatory system and kidney-like organ for excretion is present.

viii. Phylum Echinodermata: Includes marine animals such as starfishes, sea urchins, etc

- **Characteristic feature of Echinodermata**:
  - Spiny skinned organisms
  - Free living marine organisms
  - Triploblastic and coelomate
  - Skeleton is made of calcium carbonate

Chordata can be further divided into sub-phyla P**rotochordata** and V**ertebrata**

(1) P**rotochordata:** Includes *Herdmania* and *Amphioxus*

Characteristic features of P**rotochordates**

- Triploblastic, and have a coelom
- Bilaterally symmetrical
- Notochord at some stages of life is present.
- Notochord is a flexible rod-like structure that forms the supporting axis of the body in the chordates.

(2) Vertebrata: Animals having true vertebral column. Some common features are- presence of notochord, coelom, dorsal nerve chord.
The sub-phylum Vertebrata is further divided into five classes:

i. Class Pisces: Includes all fishes

Characteristic features of Pisces:

- Exclusively aquatic animals
- Body is streamlined and covered with scales
- They are cold blooded animals
- Heart is two chambered
- Skeleton is bony or cartilaginous
- Oviparous, they lay eggs in water

ii. Class Amphibia: Includes frogs, toads, and salamanders

Characteristic features of Amphibia:

- Scales are absent
- Cold blooded animals
- Heart is three chambered
- Respire through gills /lungs
- Oviparous, they lay eggs in water
- These animals have a dual mode of life (in water and land); respire through gills, skin, and lungs

iii. Class Reptilia: Includes reptiles such as lizard, snake, turtle, etc

Characteristic features of Reptilia:

- Cold blooded animals
- Most of them have three chambered heart (Crocodiles have four chambered heart)
- Skin is covered with scales
- These animals are completely terrestrial. They breath through lungs
- Lay eggs on land (oviparous)
- Heart is four chambered

iv. Class Aves: Includes all birds

Characteristic features of Aves:

- Warm-blooded animals with four chambered heart
- They breathe through lungs
- Have feathers and forelimbs modified for flight.
- Exclusively egg-laying animals

v. Class Mammalia: Includes kangaroo, rat, dolphin, elephant, horse, human, tiger, etc

Characteristic features of Mammalia:

- Warm-blooded animals with four chambered heart
- Most of them are viviparous except for platypus and *Echidna* which are oviparous.
- These animals have milk-producing glands (mammary glands) to nourish their young ones.