**Biological Classification**

**Arrangement of organisms in hierarchical series based on similarities & dissimilarities**

### Need for Biological Classification

- Study of 1 or 2 organisms is not enough to know vital features of a group.
- All kinds of organisms do not occur in one locality.
- Helps in knowing the relationship between the different groups of organisms.
- Helps in knowing the evolutionary relationship between organisms.

### Levels of Classification

- **Domain**
- **Kingdom**
- **Phylum**
- **Class**
- **Order**
- **Family**
- **Genus**
- **Species**

### First Attempt of Classification

- **Aristotle**
- **PLANTAE** (Multicellular, eukaryotic)
- **ANIMALIA** (Multicellular, eukaryotic)
- **FUNGI** (Multicellular, eukaryotic)
- **PROTISTA** (Eukaryotic, Unicellular and Multicellular)
- **EUBACTERIA** (Unicellular, prokaryotic)
- **ARCHAEBACTERIA** (Unicellular, prokaryotic)

### Key Features of Systems

- Classified organisms into 2 kingdoms
- Added Protists: Lacked capability of tissue differentiation
- Added Monera: EM studies showed prokaryotes possess different nuclear structure
- Separate group of Fungi. Classified on the basis of 5 criteria.
- 3 domains divided into 6 kingdoms

### Types of Classification System

- **Given by Linnaeus in 1758**
  - Plantae
  - Animalia
- **Given by Ernst & Haeckel in 1866**
  - Protista
  - Plantae
  - Animalia
- **Given by Copeland in 1956**
  - Monera
  - Protista
  - Plantae
  - Animalia
- **Given by RH Whittaker in 1969**
  - Monera
  - Protista
  - Fungi
  - Plantae
  - Animalia
- **Given by Carl Woese in 1990**
  - Archaea
  - Bacteria
  - Eukarya
  - Archaeabacteria
  - Eubacteria
  - Protista
  - Fungi
  - Plantae
  - Animalia
Monera

- Unicellular organisms (except 1 mycelial group)
- Genetic material: Naked coiled DNA
- Nucleus & cytoplasmic organelles absent
- Cytoplasmic organelles: Both types of ribosome, simple chromatophores
- Gas vacuole may be present instead of sap vacuole
- Mode of nutrition: Absorptive, photosynthetic & chemosynthetic
- Motility: Non-motile, simple flagellar or gliding

Protista

- Single-celled eukaryotes
- Primarily aquatic
- Link between plants, animals & fungi
- Well defined nucleus & membrane-bound organelles
- Reproduction: Asexual & sexual
- Mode of nutrition: Photosynthetic, holotrophic & mixotrophic

Fungi

- Thallus is the plant body of true fungi
- Thallus organisation: Mycelial, non-mycelial
- Cell organisation: Made of chitin & cellulose or polygalactosamine-galactan
- Cell-wall: Cellulose-glycogen, cellulose-chitin or polygalactosamine-galactan
- Nutrition: Parasitic, saprophytic, symbiotic
- Reproduction:
  - Vegetative: fragmentation, budding & fission
  - Asexual: Sporangiospores, zoospores & conidia
  - Sexual: In all fungi (except Deuteromycotina)
- Classification: Phycymycetes (Rhizopus/mucor, Albugo), Ascomycetes (Yeast), Basidiomycetes, Deuteromycetes

Virus

- Not truly living species
- Genetic material: DNA or RNA
- Nucleoprotein & genetic material
- Capsid protects nucleic acid

Viroids

- Lack protein coat
- Smaller than virus
- RNA has low molecular weight

Lichens

- Symbiosis between algae & fungi
- Algal component: Phycobiont
- Fungal component: Mycobiont
Consists of green, brown and red algae, liverworts, mosses, ferns and seed plants.

**Features of Kingdom Plantae**
- Walled, multicellular & frequently vacuolated
- Plastids (photosynthetic pigment) present
- Motility: Non-motile & live, anchored to a substrate
- Reproduction: 
  - Asexual & sexual 
  - Form multicellular embryo 
  - Algae lack embryo stage
- Life cycle: Show alternation of generation

**Varieties in Kingdom Plantae**
- Algae
- Mosses
- Ferns
- Conifers
- Flowering plants

**Classification in Kingdom Plantae**
- **Thallophyta (Algae)**
  - Without specialized vascular tissues
  - Do not produce seeds
- **Bryophyta**
  - With specialized vascular tissues
  - Produce seeds
  - Gymnosperm
  - Monocot
  - Diicot
- **Pteridophyta**
  - With specialized vascular tissues
  - Produce seeds
  - Gymnosperm
  - Monocot
  - Diicot

**Animalia**
Consists of multicellular eukaryotic animals.

**Basis of Classification in Kingdom Animalia**
- Body symmetry: Asymmetrical, radial symmetry, bilateral symmetry
- Nature of coelom: Coelomate, acoelomate
- Arrangement of cells of embryonic layers: Diploblastic & triploblastic
- Notochord: Chordate, non-chordate
- Patterns of organ systems: Digestive system (incomplete & complete framework), circulatory system (open & closed type), reproductive system framework
- Segmentation: External & internal segments with serial repetition of some organs
- Levels of organization: Cellular level, tissue level, organ level & organ framework level

**Attributes & Hierarchy Patterns of Kingdom Animalia**

**Classification System**
- Kingdom
  - Phylum
    - Class
      - Order
        - Family
          - Genus
            - Species