BIOLOGICAL CLASSIFICATION

INTRODUCTION OF BIOLOGICAL CLASSIFICATION

INTRODUCTION OF BIOLOGICAL CLASSIFICATION

(1) Aristotle :- Father of biology & father of zoology

- He classified plants on the basis of morphological character (Growth habit) in three groups

  (i) Trees (ii) Shrubs (iii) Herbs

(2) Theophrastus :-.

(A) He is known as father of ancient plant taxonomy and father of botany.

(B) Theophrastus wrote book on plants ⇒ Historia plantarum

(C) He classified plant kingdom in to four groups on the basis of growth habit-

(a) Trees (b) Shrubs (c) Under shrubs (d) Herbs

(D) It is artificial classification.

(E) He proposed the term Annual, Biennial and Perennial.

(3) Carolus Linnaeus :- [1707 - 1778]

(A) His real name was -Carl Von Linne

(B) On the basis of work in Latin language, he changed his name to Carolus Linnaeus. He was the Swedish scientist

(C) He is known as father of taxonomy, father of plant taxonomy and father of animal taxonomy.

(D) Linnaeus gave the two kingdom system classification. He grouped plants and animals into kingdom Plantae and kingdom Animalia respectively.

TWO KINGDOM SYSTEM OF CLASSIFICATION:

- Proposed by **C. Linnaeus** and he classified all organisms into two kingdoms – **Kingdom plantae and kingdom Animalia**.

- Kingdom plantae involves autotrophic, fixed organisms while kingdom Animalia includes motile, heterotrophic organisms. Microorganisms involved in both the kingdoms.

ADVANTAGE OF TWO KINGDOM CLASSIFICATION:

- Classification of organisms into plants and animals was easily done and was easy to understand.

SHORTCOMINGS OF TWO-KINGDOM SYSTEM:

1. This system **did not distinguish between the eukaryotes and prokaryotes**. e.g. Bacteria and cyanobacteria are included under plants but the formers are prokaryotes.
2. **Unicellular and multicellular forms** have been placed in both the kingdoms though they have different organisation.
3. **A large number of organisms did not fall into either category.** e.g. Viruses are neither plants nor animals and placed at the border line of living and non-living.
4. **Photosynthetic (green algae) and non-photosynthetic (fungi) organisms were placed together.**

Thus two kingdom system of classification used for a long time was found inadequate.

THREE KINGDOM SYSTEM:

- **Ernst Haeckel** proposed it and three kingdoms are Plantae, Animalia and Protista.
- He separated all **one celled Eukaryotes** (Algae, Slime moulds, Protozoans, Fungi, bacteria) into separate kingdom **Protista**.

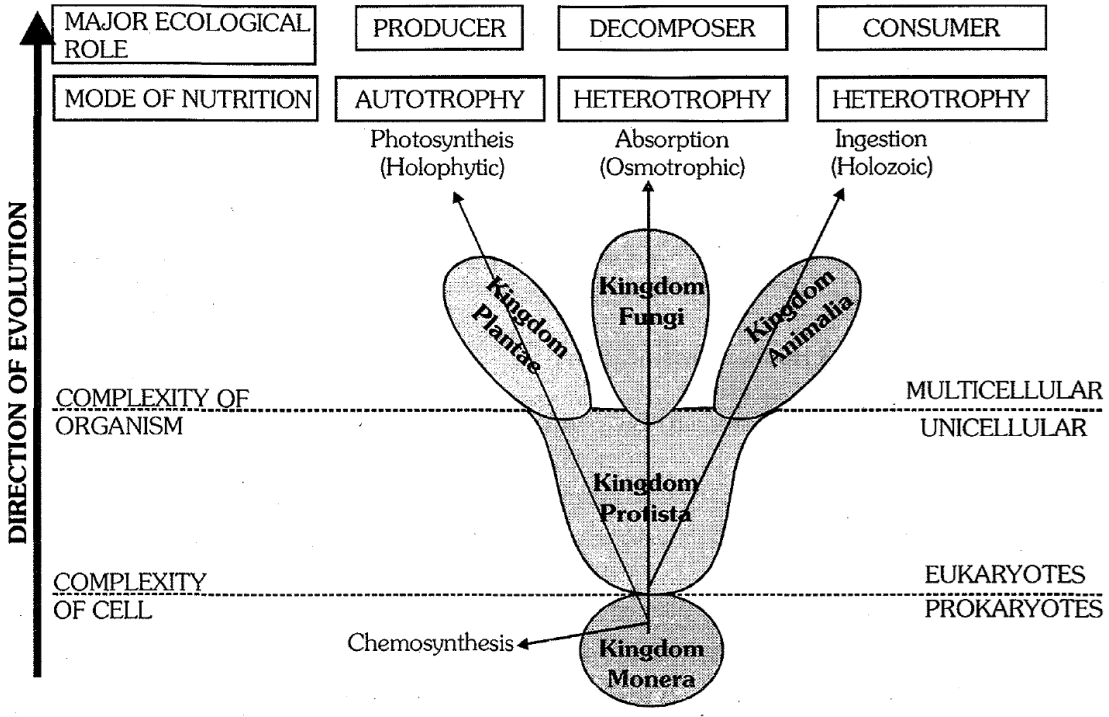
FOUR KINGDOM SYSTEM:

- It was proposed by **Copeland (1956)**.
- He established a new **kingdom Monera** for **all acellular prokaryotes** containing incipient nucleus like bacteria, blue green algae. The four kingdoms are monera, protista, plantae (metaphyta) and animalia (metazoa).
- **Copeland** used the term **Mycota for monerans**. **Dougherty** used the term **Monera**.

FIVE KINGDOM SYSTEM:

R.H. whittaker (1969) proposed a five kingdom classification. The kingdoms defined by him were named as Monera, Protista, Fungi, Plantae and Anirnalia. The main criteria used by him for making classification are :-

1. Cell structure (Complexity of cell)
2. Thallus organisation (complexity of organism)/Body organization
3. Mode of nutrition
4. Reproduction/Life style
5. Phylogenetic relationship



Five Kingdoms showing increasing complexity during evolution

TABLE: CHARACTERISTICS OF THE FIVE KINGDOMS

Character	Five Kingdoms				
	Monera	Protista	Fungi	Plantae	Animalia
Cell type	Prokaryotic	Eukaryotic	Eukaryotic	Eukaryotic	Eukaryotic
Cell Wall	Noncelluloic (Polysaccharide + amino acid)	Present in some	Present (without cellulose) with chitin	Present (cellulose)	Absent
Nuclear membrane	Absent	Present	Present	Present	Present
Body organisation	Cellular	Cellular	Multicellular / loose tissue	tissue / organ	Tissue / organ/ organ system
Mode of nutrition	Autotrophic (chemosynthetic and photosynthetic and Heterotrophic (saprophytic / parasitic)	Autotrophic (Photosynthetic) and Heterotrophic	Heterotrophic (saprophytic / parasitic)	Autotrophic (Photosynthetic)	Heterotrophic (Holozoic/ saprophytic etc.)

Merits:

(i) Fungi are separated from plants or protista and established as kingdom.

(ii) Prokaryotes and eukaryotes are separately recognised in this system.

Demerits:

(i) The position of Viruses is not clear.

(ii) Algae is placed into monera, protista and Plantae.

(iii) Protista is an artificial group.

ISSUES AND CONSIDERATIONS THAT INFLUENCED THE CLASSIFICATION SYSTEM:

Issues:

- Besides, gross morphology a need was also felt for including other characteristics like cell structure, nature of wall, mode of nutrition, habitat, methods of reproduction, evolutionary relationships, etc.
- Earlier classification systems plants included bacteria, blue green algae, fungi, mosses, ferns, gymnosperms and the angiosperms because all of these have cell wall.
- Prokaryotic bacteria and BGA were classified with eukaryotic groups.
- Unicellular organism like Chlamydomonas and Spirogyra were placed together under algae which is multicellular.
- Heterotrophic / Saprotrophic group like fungi were classified autotrophic green plants though they also showed a characteristic difference in their walls composition – the fungi had chitin in their walls while the green plants had a cellulosic cell wall.

Consideration:

- Fungi were placed in separate Kingdom because of difference in nutrition and cell wall.
- All prokaryotic organisms were grouped together under Kingdom Monera and the unicellular eukaryotic organisms were placed in Kingdom Protista.
- It has put together organisms which, in earlier classifications, were placed in different kingdoms. e.g. Kingdom Protista has brought together Chlamydomonas, Chlorella (earlier placed in Algae within Plants and both having cell walls) with Paramoecium and Amoeba (which were earlier placed in the animal kingdom which lack cell wall).
- This happened because the criteria for classification changed with time and this kind of changes will also take place in future too depending on the improvement in our understanding of characteristics and evolutionary relationships.
- Though plant and animal kingdoms have been a constant under all different systems, the understanding of what groups/organisms be included under these kingdoms have been changing; the number and nature of other kingdoms have also been understood differently by different scientists over the time.

Three Domain System:

- **Carl woese** proposed three **domains system – Archaea, Bacteria and Eukarya.**
- It is based on genetic characters particularly genetic analysis of **16S rRNA.**
- **6 Kingdoms** are included in three domains (6th Kingdom is Archaebacteria)
- **Domain** is an intermediate category in classification and represented as super Kingdom