



Key Takeaways

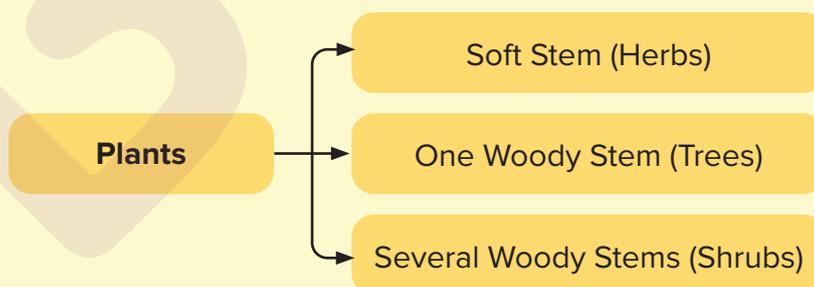
- Biological Classification
- Two Kingdom Classification
- Three Kingdom Classification
- Four Kingdom Classification
- Five Kingdom Classification
- Three Domains of Life

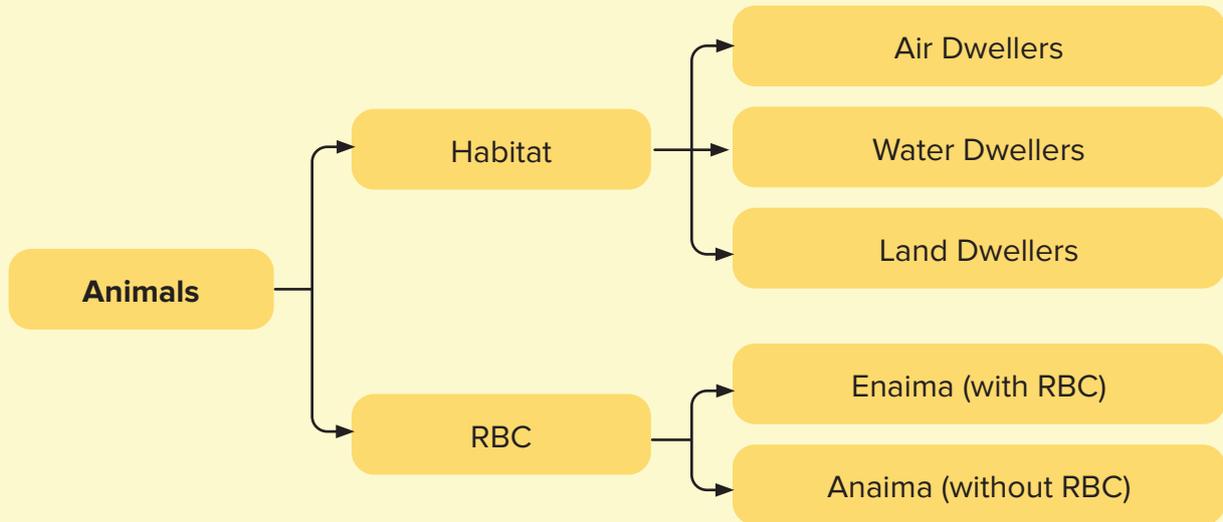
Biological Classification

- **Biological classification** is a scientific study of the arrangement of organisms into categories in a hierarchy based on their similarities and dissimilarities.
- **Objectives of classification**
 - I. **Identification** and **description** of organisms
 - II. **Arrangement** of organisms in various categories
 - III. Establishing a **phylogenetic system** indicating the origin and evolution of the species

Aristotle: Father of Biology

- He proposed the earliest scientific classification **based on simple morphological characters**.
- **Morphological characters** are the structural features such as shape, size, or colour of an organism.
- He classified living things into **plants** and **animals**. These were classified further as shown below:

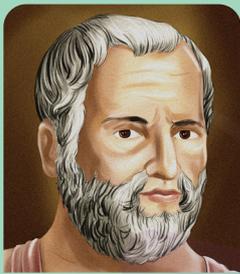




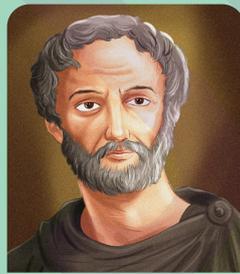
- The advantage of Aristotle's classification was that it was the **first novel attempt of classification** of living organisms.
- Aristotle's system was a type of **artificial system of classification**.

Artificial System of Classification

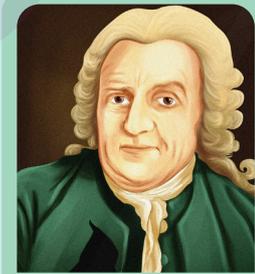
- **Artificial system of classification** is a system that classifies organisms on the basis of **only one** or a **few** specially chosen **morphological features**.
- **Morphological characters** are the structural features such as shape, size, or colour of an organism.
- Scientists associated with the artificial system of classification are as shown:



Theophrastus



Pliny the Elder



Carolus Linnaeus

First novel attempt of classification of living organisms

Merits of artificial system of classification

Quick and easy as only a few characters were considered

Demerits of artificial system of classification

Arbitrary and unstable

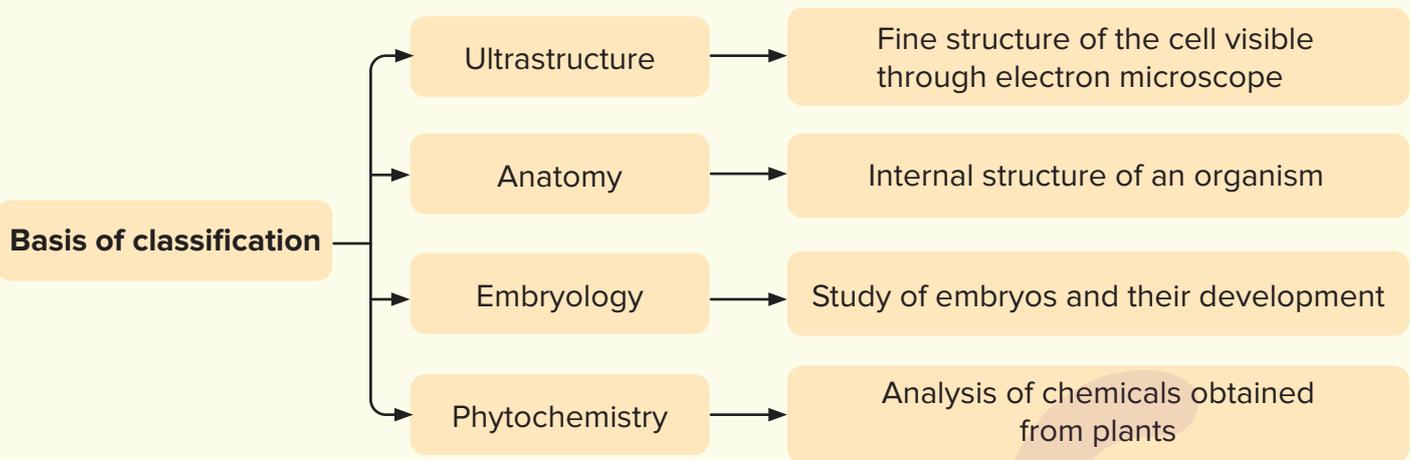
Only a few characters were considered

Evolutionary relationships were not studied

Identifying new species was difficult

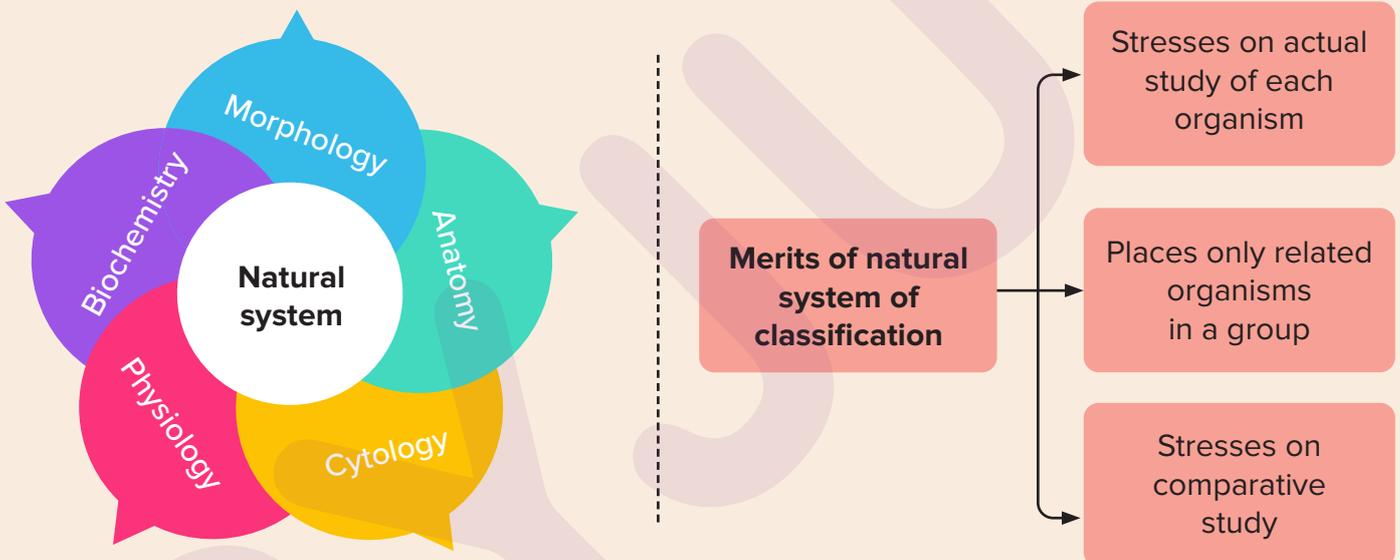
Bentham and Hooker's System of Classification

- It was a type of **natural system of classification**.



Natural System of Classification

- It is a type of classification system that classifies organisms on the basis of not just **external morphological features** but also **internal features**.



Engler and Prantl's System of Classification

- Adolf Engler and Karl Prantl** classified flowering plants based on the **complexity of floral morphology**.



Adolf Engler



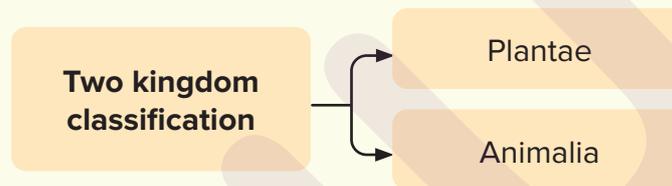
Karl Prantl

- It was a type of **phylogenetic system of classification**.
 - » Phylogenetic classification system is based on the **evolutionary relationships** between the organisms.
 - » Evolutionary relationships are the **similarities** and **dissimilarities** that an organism exhibits with its ancestors.
 - » Sources of evolutionary relationships are as follows:
 - (a) Common ancestors
 - (b) Fossil records (Difficult to get)

Kingdoms of classification

Two Kingdom Classification

- **Carolus Linnaeus**, the Father of Systematic Botany, proposed the two kingdom classification (1758).



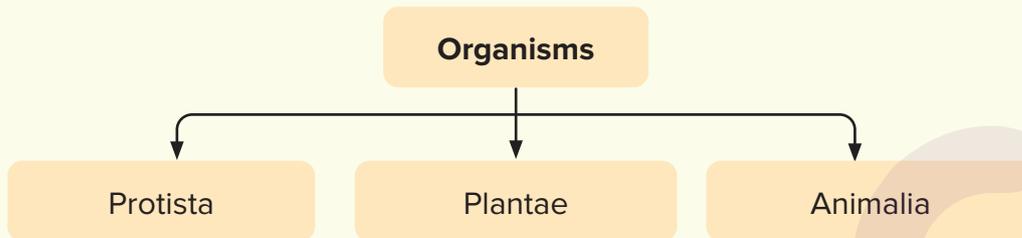
- He also wrote the books, ***Species Plantarum*** and ***Systema Naturae***. These books listed all the plants and animals known at that time.
- There was a major difference between the classification devised by Aristotle and Linnaeus. Aristotle used **habitat** and **morphology** as the basis of classification while Linnaeus considered **morphological similarities, dissimilarities and fossil records**, and organized all plants and animals from the level of kingdoms all the way down to species.

Demerits of two kingdom classification

- No distinction between eukaryotes and prokaryotes
- No distinction between unicellular and multicellular organisms
- No distinction between photosynthetic (algae) and non-photosynthetic (fungi) organisms
- Few organisms did not fall into either category (*Euglena*)

Three Kingdom Classification

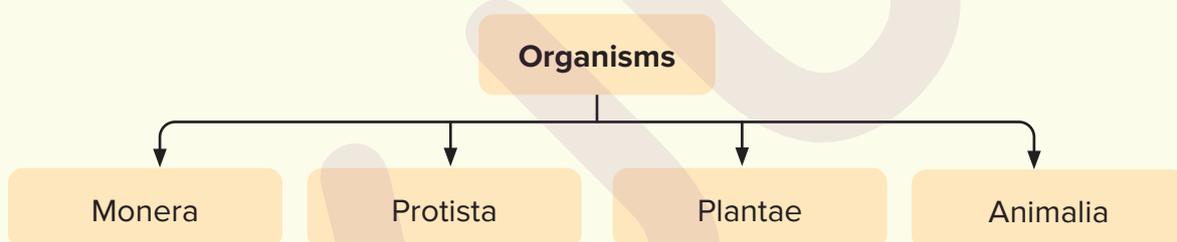
- **Ernst Haeckel** proposed the three kingdom classification.
- He established a new kingdom: Protista
 - Protists were organisms that did not have tissue. Example: prokaryotes, protozoa, sponges, algae and fungi.
- Organisms containing chlorophyll were called **chlorophyllous**.



- **Demerits** of this classification include the following:
 - Prokaryotic and eukaryotic organisms containing chlorophyll were grouped together.

Four Kingdom Classification

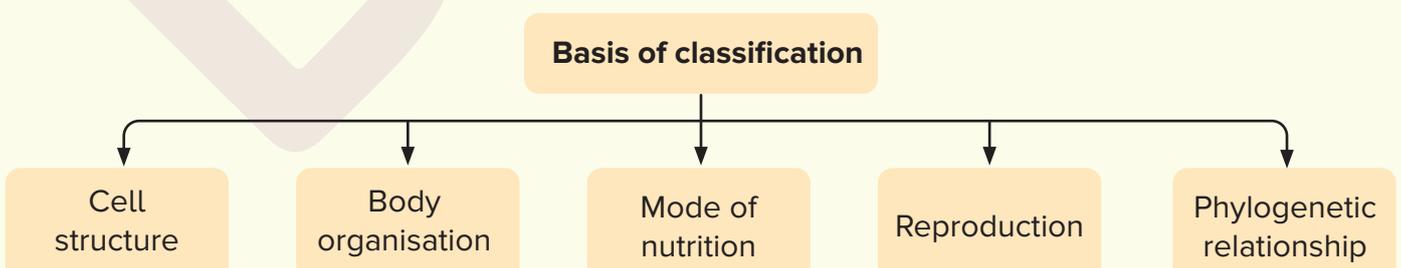
- **Herbert Copeland** proposed the four kingdom classification.
- He **established** the **Kingdom Monera**.



- **Demerits** of this classification include the following:
 - Algae, fungi, and protozoa were all included under Kingdom Protista.

Five Kingdom Classification

- **Robert H. Whittaker** proposed the five kingdom classification in 1969.
- He established the **Kingdom Fungi**.



- The table below depicts the five kingdoms with their characteristic features:

	Monera	Protista	Fungi	Plantae	Animalia
Cell type	Prokaryotic	Eukaryotic	Eukaryotic	Eukaryotic	Eukaryotic
Cell wall	Present Non-cellulosic (polysaccharide + amino acid)	Present in some (varied composition)	Present (composed of chitin)	Present (composed of cellulose)	Absent
Nuclear membrane	Absent	Present	Present	Present	Present
Body organization	Cellular	Cellular	Multicellular/ Loose tissue	Tissue/ Organ	Tissue/Organ/ Organ system
Mode of nutrition	Autotrophic (chemosynthetic/ photosynthetic) Heterotrophic (saprophytic/ parasitic)	Autotrophic and Heterotrophic	Heterotrophic	Autotrophic	Heterotrophic

Merits of five kingdom classification

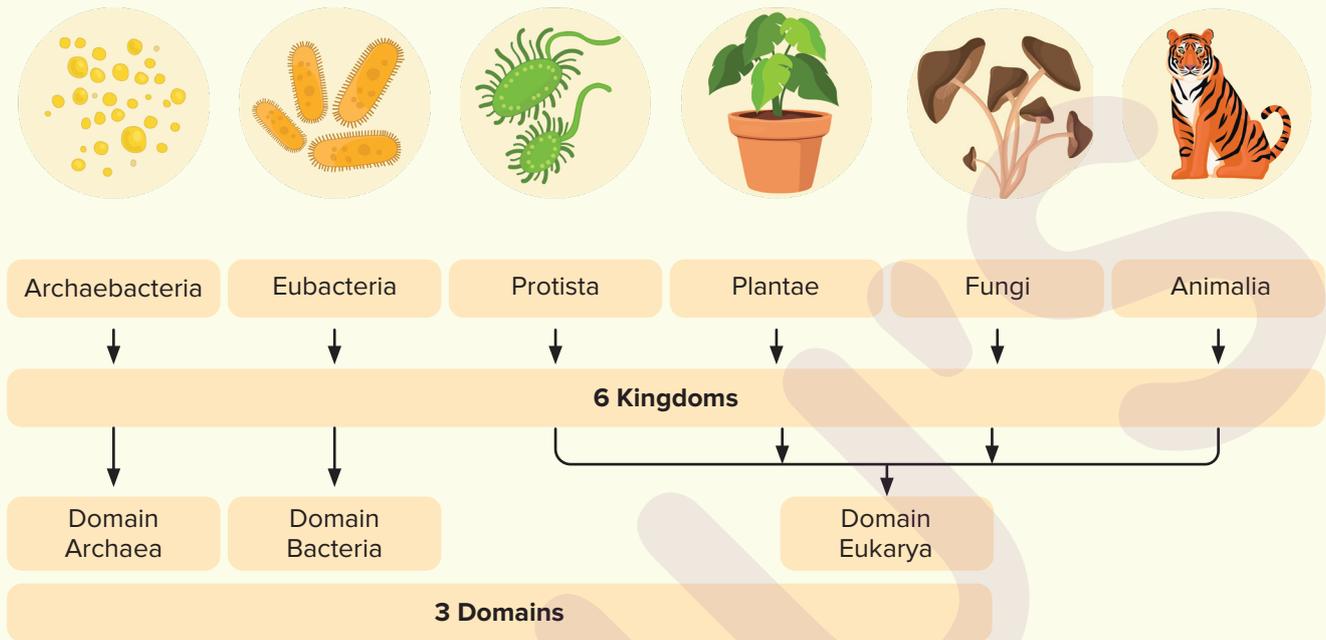
- Prokaryotes got a separate place in Kingdom Monera
- Unicellular and multicellular organisms were kept separate
- Fungi were placed in a separate kingdom as their mode of nutrition differs from all other plants
- Autotrophs and heterotrophs were placed separately
- Showed phylogenetic relationship

Demerits of five kingdom classification

- Some unicellular algae (*Chlamydomonas*) were kept in Kingdom Protista, away from remaining algae placed in Kingdom Plantae
- Chlorella* and *Chlamydomonas* (autotrophic) were placed with *Paramecium* and *Amoeba* (heterotrophic) in Kingdom Protista

The Three Domains of Life

- **Six kingdom or three domain classification** was proposed by **Carl Woese** in 1990.
- Three domain system was **loosely based on the traditional five kingdom system** but divided the prokaryotes into two “domains”, leaving the remaining eukaryotic kingdoms in the third domain.
- The three domains proposed were: Archaea, Bacteria, and Eukarya.



Domain Archaea

- This domain contains only **Kingdom Archaeobacteria** which are **primitive prokaryotes**.
- They live in **extreme environments** and are mostly **obligate anaerobes**.

Domain Bacteria

- This domain contains only **Kingdom Eubacteria** which are **prokaryotic organisms**.
- They **lack membrane bound cell organelles**.

Domain Eukarya

- This domain contains **Kingdoms Protista, Fungi, Plantae and Animalia**.
- It comprises of all **eukaryotic organisms** with **membrane bound cell organelles**.



Summary sheet

