

LESSON-1 ORIGIN AND EVOLUTION OF LIFE AND INTRODUCTION TO CLASSIFICATION

The planet earth came into existence sometime between 4 and 5 billion years ago. Life evolved on planet earth about 3.5 billion years ago. Since then, approximately 15 million different species of organisms have evolved. But only about two million have been identified so far. In this lesson we will learn how life of these, at first originated on earth and how such a vast variety of organisms, popularly known as biodiversity, evolved through variation and natural selection.

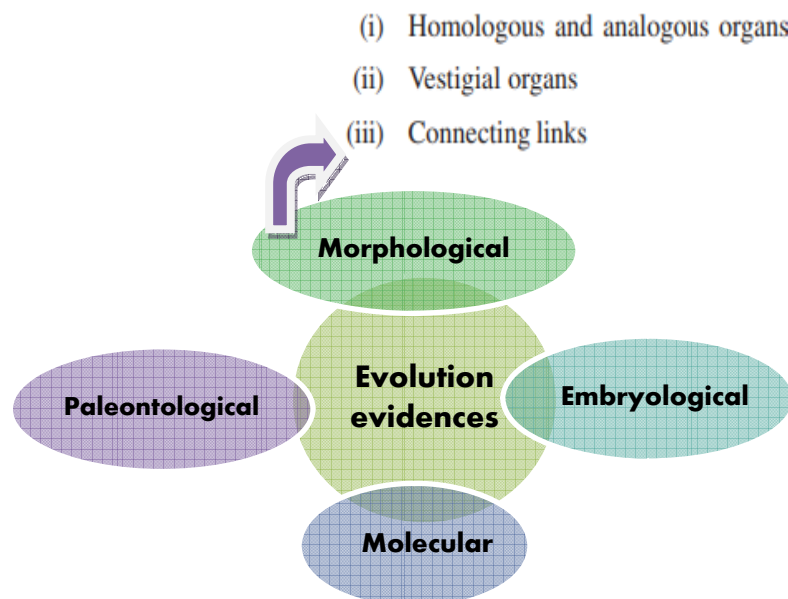
- **Origin of life** means the appearance of simplest primordial life from nonliving matter.
- **Evolution of life** means the gradual formation of complex organisms from simpler ones.
- The most accepted theory about origin of life is the chemosynthetic theory which states that “Life might have originated at first on earth through a series of combinations of chemical substances in the distant past and it all happened in water”.
- The formation of complex organisms through ‘gradual change’ from simple ancestral types over the course of geological time is termed Evolution or **Organic Evolution**
- The **theory of organic evolution** states that “*All living things on earth are here as a result of descent, with modifications from a common ancestor*”.

Homologous organs are the organs which are similar in structure and origin but may look very different and perform different functions. – e.g. Forelimbs of vertebrates

The structures which are functionally similar but structurally different are called **analogous organs**. E.g. Wing of an insect, and that of a bird

Vestigial organ is any small degenerate or imperfectly developed (non-functional) organ or part which may have been complete and functional in some ancestor.

The **connecting links** establish continuity in the series of organisms by proving that one group has evolved from the other.

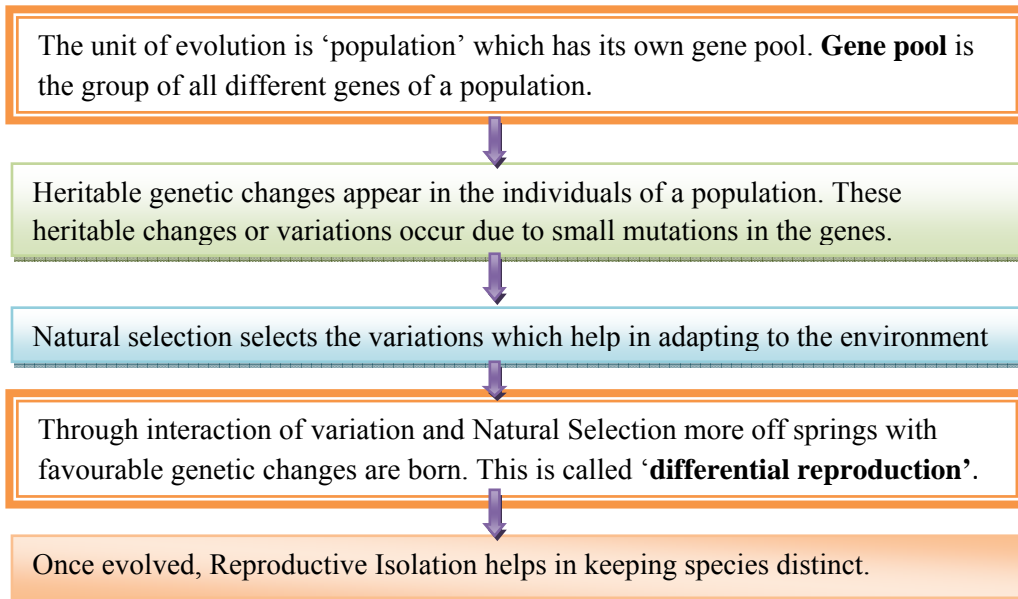


- **Embryology** is the study of development of an organism.
- **Palaeontology** is the study of fossils. Fossils are the remains or traces of animal and plant life of the past, found embedded in rock either as petrified hard parts or as moulds, casts or tracks.

Darwin's Theory of Natural Selection

- Darwin's theory of 'Origin of Species' by natural selection', explains the process of evolution through useful variation and natural selection.
- **Neo-Darwinism** is the modern interpretation of Darwinism based on natural selection, mutation and reproductive isolation. This is also called the modern synthetic theory.

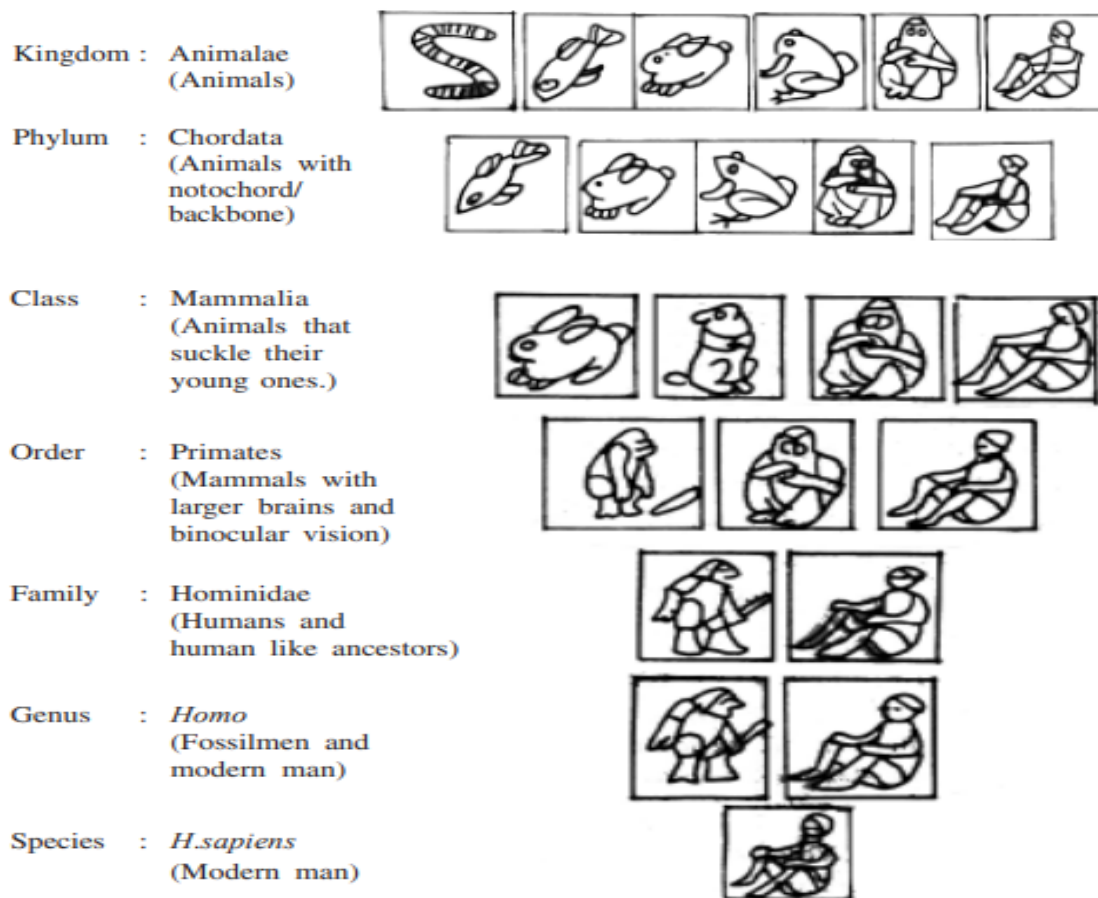
According to Darwin's Theory:



CLASSIFICATION

- **Classification** means identify similarities and arrangement of plants and animals according to their systematic division into groups or classes and different plants and animals into different groups or classes.
- **Taxonomy**, may thus be defined as the science of classification of organisms into categories, and organized them according to their similarities.
- A taxonomic category was **first proposed by Linnaeus**. Each level or categories termed taxon (plural-taxa). Taxonomic categories show its evolutionary relationship with other groups of organisms. The lowermost category is species.
- The taxonomic categories are.
- **Species** - population of individuals or group of population interbreed freely and produce fertile offspring.
- **Genus** – group of relate species which resemble one another in certain correlated characters.
- **Family** - contains one or more related genera. All the genera of a family have some common features or correlated characters.
- **Order** - includes one or more related families.
- **Class** - made of one or more relates order.
- **Phylum/division** - phylum is used for animals while division is used for plants. A division or phylum is formed of one or more classes. The various phyla belong to their respective kingdoms.

The various phyla belong to their respective kingdoms



❖ A simplified system of naming organisms called **BINOMIAL NOMENCLATURE**.

It was proposed by the Swedish biologist, **Carolus Linnaeus** (1707-1778). **Binomial nomenclature** simply means two-name system of naming. The name of every category of organism has two parts, that of the genus followed by that of species. The generic name is written with a capital letter and the specific name with a small letter. e.g. *Homo sapiens* is the scientific name of modern man, *Mangifera indica* is the botanical name of mango.

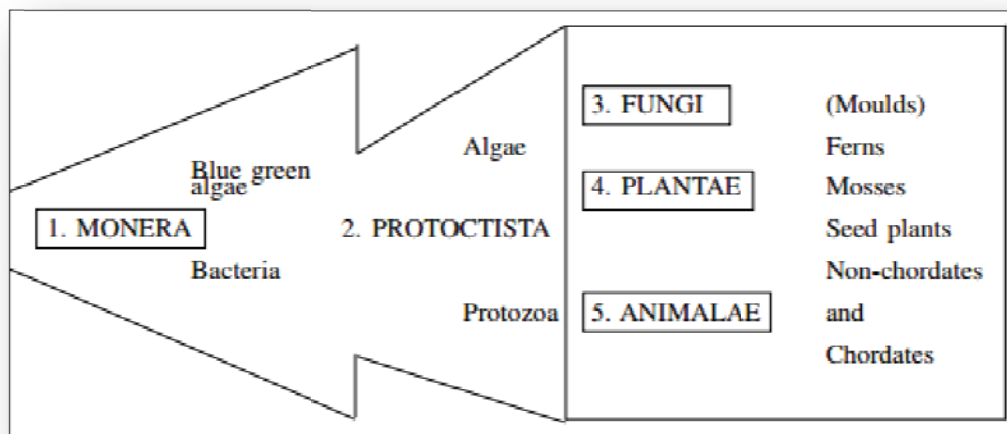
DIFFERENCES BETWEEN PROKARYOTES AND EUKARYOTES

CHARACTERISTICS	PROKARYOTES	EUKARYOTES
Size	0.1-10 μm	10 - 100 μm (greater volume)
Genetic material	Circular DNA, no linear DNA, no histones associated with DNA, nucleoid form, no nuclear membrane	Histone present on which DNA molecule wrapped, well defined chromosomes, nuclear membrane present
Site of nuclear material	DNA in cytoplasm	DNA inside distinct nucleus
Organelles	No membrane bound organelles	Mitochondria, Golgi body, lysosomes present in the cell
Cell wall	Always present, Contains peptidoglycan	None (animals) or made of cellulose/chitin (plants and fungi)

Respiration	By mesosomes	By mitochondria
Reproduction	Mostly asexual e.g. bacteria and cyanobacteria	Asexual and sexual e. g. Protoctista, fungi, plants, animals

Five kingdom classifications are proposed by **R. H Whittaker** in 1969, which is based on; complexity of cell structure (prokaryotes and eukaryotes), complexity of organisms (unicellular and multi-cellular), mode of nutrition, lifestyle and phylogenetic

Name of kingdom	Nature of nucleus	Whether unicells or multicells	Kind of nutrition
1. Monera (Blue green algae and bacteria)	Prokaryotic	Unicellular	Diverse type of nutrition
1. Protoctista (Algae and Protozoa)	Eukaryotic	Unicellular	Diverse kind of nutrition
1. Fungi (Molds, etc.)	Eukaryotic	Multicellular	Saprophytic (feed on dead, decaying matter)
1. Plantae (All green plants)	Eukaryotic	Multicellular	Autotrophic (Synthesize food by photosynthesis)
1. Animalae	Eukaryotic	Multicellular	Heterotrophic (Depend on others for food)



Test Yourself

1. Write the concept of Darwin's Theory of Natural Selection.
2. Give a schematic diagram of the five Kingdom classifications.
3. State the criteria on which the five kingdom classification is based.