

Classification of Living Things

Biology is defined as the study of living things and their interactions with the environment. There are 7 characteristics that distinguish living things from non-living things:

GRIMNER:

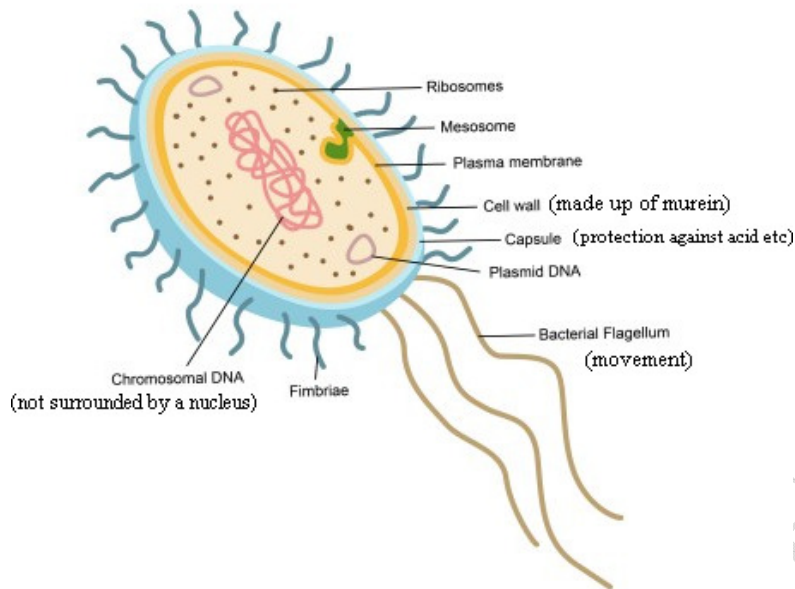
- √ Growth
- √ Respiration (release of energy from respiration to carry out life processes)
- √ Irritability (respond to changes in the environment)
- √ Movement
- √ Nutrition
- √ Excretion
- √ Reproduction

The study of classifying and placing organisms into groups is called **TAXONOMY**. Each group has its own unique set of features that help us to classify them. Species that are obviously similar are placed together into groups called **Genus**. For example, humans belong to the genus *Homo* and the species *sapien*. Similar genus can be grouped into **Families** and so on and so forth. Each group of organism has its own set of features that make them distinguishable. All living things can be grouped right down to the species level. The following chart is an example of the classification of *Homo sapiens* i.e Humans. (see **Figure 1**)

There are 2 types of Classification, **Artificial Classification**: which uses observable characteristics such as size, colour shape, no of appendages to classify organisms while **Natural Classification**: groups organisms who share common features and contribute to their evolutionary lineage. This type is the most widely used classification system in biology (KINGDOM, PHYLUM, CLASS, ORDER FAMILY, GENUS, SPECIES).

Living organisms are diverse and a classification system of 5 kingdoms is used today. The 5 kingdoms include Prokaryotes, Protocists, Fungi, Plants and Animals. Viruses are difficult to classify since they do not have a true nuclear structure and it is only when they infect a host, can they exhibit some of the characteristics of life e.g. reproduction etc. (see **Figure 2**)

STRUCTURE OF A BACTERIAL CELL



Prokaryotes: (DNA not enclosed in a nucleus)

These organisms are commonly called bacteria. They occupy varying environments including; soil, air, water. Some can even be found in extreme environments including temperatures of 78°C and freezing ice etc. They are considered the most ancient group of organisms and are considered the smallest organisms with a cellular structure. They are usually unicellular and have **no** nucleus, **no** mitochondria and **no** chloroplasts. They however possess a cell wall. They play a vital role in the decay of dead plants and animals and release the nutrients back to the environment. e.g Nitrogen fixing bacteria. Some can cause diseases such as cholera and Tuberculosis.

Eukaryotes: (DNA enclosed within a nucleus)

Protoctists:

These are simple organisms which mainly live in water. The group includes; Algae and Protozoa.

*Algae: can be found in marine, freshwater and damp places on land. They make their own food via photosynthesis i.e **AUTOTROPHIC**. They may be unicellular or multicellular e.g Seaweeds. They have structures like stem, roots and leaves but are much simpler than plants hence they are classified as Protoctists. (see **Figure 3**)*

*Protozoa: e.g amoeba, they are animal like, may be unicellular and do not photosynthesize but obtain food by feeding on other organisms. (see **Figure 4**)*

Fungi:

Fungi are similar to plants, however they do **NOT** have chlorophyll and do **NOT** photosynthesise. Instead, they feed heterotrophically; on organic material, dead plants and animals. They range in size from unicellular yeast to large multicellular toadstools. They digest their food outside the body using enzymes to make it soluble and then absorb the food. Fungi reproduce by producing spores both sexually as well as asexually and are wind dispersed. They are important to man since they are used in making antibiotics, fermentation in alcoholic beverages, meat tenderizers. Examples include: moulds, yeasts, mushrooms and toadstools. (see **Figure 5**)

Plants:

Almost all plants are green because they some of the cells contain chloroplasts which contains chlorophyll, the pigment for photosynthesis. They are unicellular or multicellular, have cell walls, chlorophyll and feed by photosynthesis. **Non flowering or Gymnosperms** plants e.g Mosses, liverworts, ferns and conifers (pine) which contain seeds within cones as well as **Angiosperms** or **flowering** plants are considered in this group.

Angiosperm: Flowering Plants

Flowering plants have true flowers and produces seeds. The seeds grow inside a fruit which developed from and ovary, inside the flower. They are characteristic for having roots, stems and leaves. They have xylem and phloem and reproduce by seeds. They are two groups of flowering plants; Monocotlydons and Dicotyledons. Monocotlydons have one seed leaf and parallel venation e.g corn (Zae mays) while Dicotyledons have two seed leaves with net like branched venation e.g Hibiscus.

Animals:

The animal kingdom contains multicellular, hetertrophic organisms which are grouped into six phyla: (see **Figure 6**). Animals do not photosynthesize and do not have chlorophyll. They eat other living organisms and are able to move in order to find food. They do **NOT** have cell walls as in plants.

INVERTEBRATES: (no backbone)

Cnidaria: are corals, jelly fish and sea anemones. They live in water due to their soft bodies that would dry out quickly if they were on land. They have ring tentacles surrounding a mouth only one opening to their digestive system. (see **figure 7**).

Platelmintes: are characteristic flat worms e.g Tapeworm

Mollusca: they consist of snails, squids and octopuses. They are unsegmented animals with their ventral surface modified to have a muscular foot for movement and propulsion.

Some possess a shell to retreat into e.g. snails while others e.g. the squid and slug, the shell is absent. (see **Figure 8**)

Annelids: These are usually round worms, whose bodies are made up of ring-like segments, they possess no legs but have bristles about their body for locomotion. Most live in water or moist soils. e.g. earthworms (see **Figure 9**)

Arthropods: they dominate life on earth and consist of crustaceans, millipedes, centipedes, arachnids and insects. They possess a waterproof exoskeleton (outer skeleton of chitin) and jointed limbs, which allows them to live on land. E.g.

CRUSTACEAN; arthropod with more than 4 pairs of jointed legs, not millipede or centipede, and breathe through gills

ARACHNIDA; 4 pairs of jointed legs that breathe through gills called book Lungs

INSECTA; arthropods with 3 pairs of jointed legs, 2 pairs of wings and breathe through trachea

VERTEBRATES: (backbone)

CHORDATA; Most are vertebrates i.e. animals that have a backbone. These include fishes, amphibians, reptiles, birds and mammals.

Fishes: All fishes live in water possess scaly skins with a vertebral column, have fins and breathe through gills.

Amphibians: live most of their adult life on land but go back to the water to breed. They have thin moist scale-less skin, lay larva, eggs in water. Juvenile breathe through gills however, adults develop lungs for breathing.

Reptiles: they are vertebrates with scaly skin and lay eggs with a rubbery shell which are waterproof.

Birds: they are vertebrates with feathers, forelimbs become wings, lay eggs in hard shells, are homeothermic and possess a beak.

Mammals: are vertebrates and possess hair. Have placenta, young are fed milk from mammary glands, are homeothermic. The heart has four chambers, have a diaphragm, possess different types of teeth as well as a well-developed brain.

Binomial Nomenclature (NAMING SPECIES)

Carl Linnaeus was a Swedish scientist in the eighteenth century who first grouped organisms together in a natural classification. Organisms were organized into closely related groups. The binomial system was used to classify organisms. It is the naming of each species with a biological name. Each biological name consists of two parts: Genus and Species. The first letter of the first word starts with a capital letter while the second starts with a common letter. The word (i.e. genus) can be shortened e.g. *Escherichia Coli* to *E. Coli*. This classification can be used to classify living organisms since there may be more than one common name for the same organism. Every known species has a place in this classification. It starts with the major groups of general features and is broken down into more specific items or features. (refer to **Figure 2 *Homo sapien***)

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Definitions:

Species

- species** ▶ A species is defined as 'a group of individuals of common ancestry that closely resemble each other and are normally capable of interbreeding to produce fertile offspring'. This means that they have similar characteristics and are capable of mating with each other.
- speciation** ▶ The process by which species are formed is called speciation and this occurs when groups of a population become isolated in some way. For example some individuals of a species may get separated from the rest such as by an ocean, mountain or desert. This is known as geographical isolation.
- geographical isolation** ▶ They may have to feed on different materials, and may be subjected to different environmental conditions compared with the rest of species. After a while, they may evolve to look and behave very differently from the rest of the species. If they came back together again they may not be able to reproduce with them. This is called reproductive isolation. The two groups may be physically able to reproduce, but have different courting behaviours and a completely different mating season. They are thus never able to mate with each other and produce offspring. So they will be considered different species.
- reproductive isolation** ▶ Sometimes, closely related species interbreed to produce infertile offspring. A cross between a horse and a donkey produces a mule, which is infertile and cannot make other mules. The horse and donkey are separate species, though closely related.
- Each species has its own special structural, behavioural and ecological characteristics.
- Within a species though, individuals may look very different, but can interbreed.
- breeds** ▶
- In animals, these are called breeds. For example, there are many different breeds of dogs, which vary in size, shape, hairiness and so on. However, despite differences in appearance, they can interbreed and all belong to the same species.
- varieties** ▶
- In plants these variations of the species are called varieties. For example, there are many different varieties of corn. The different varieties of plants differ in many ways but pollination between them is possible.
 - In humans, there are physical differences in colour, hair type and body structure. The different groups are called races. They can still interbreed so all the races belong to the species *Homo sapiens*.

Figure 1:

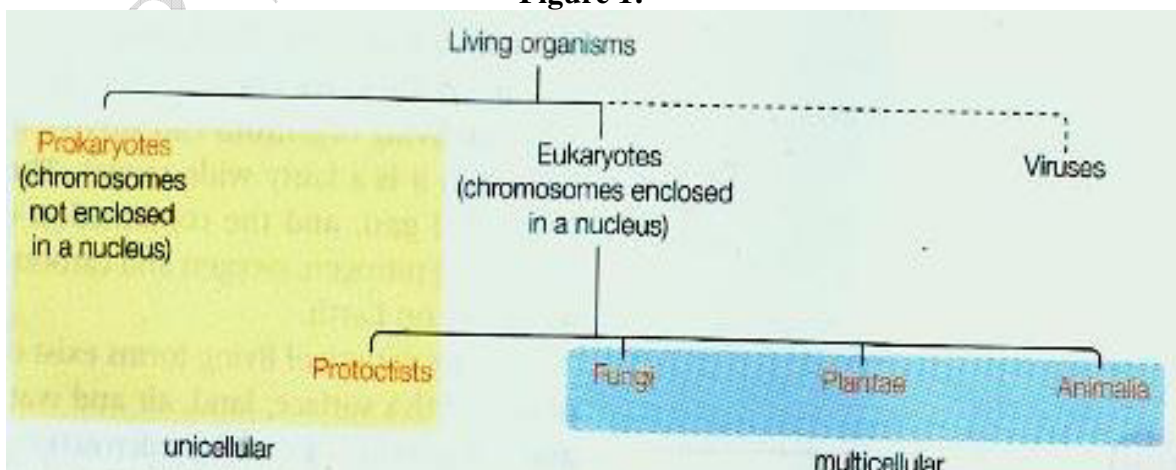


Figure 2:

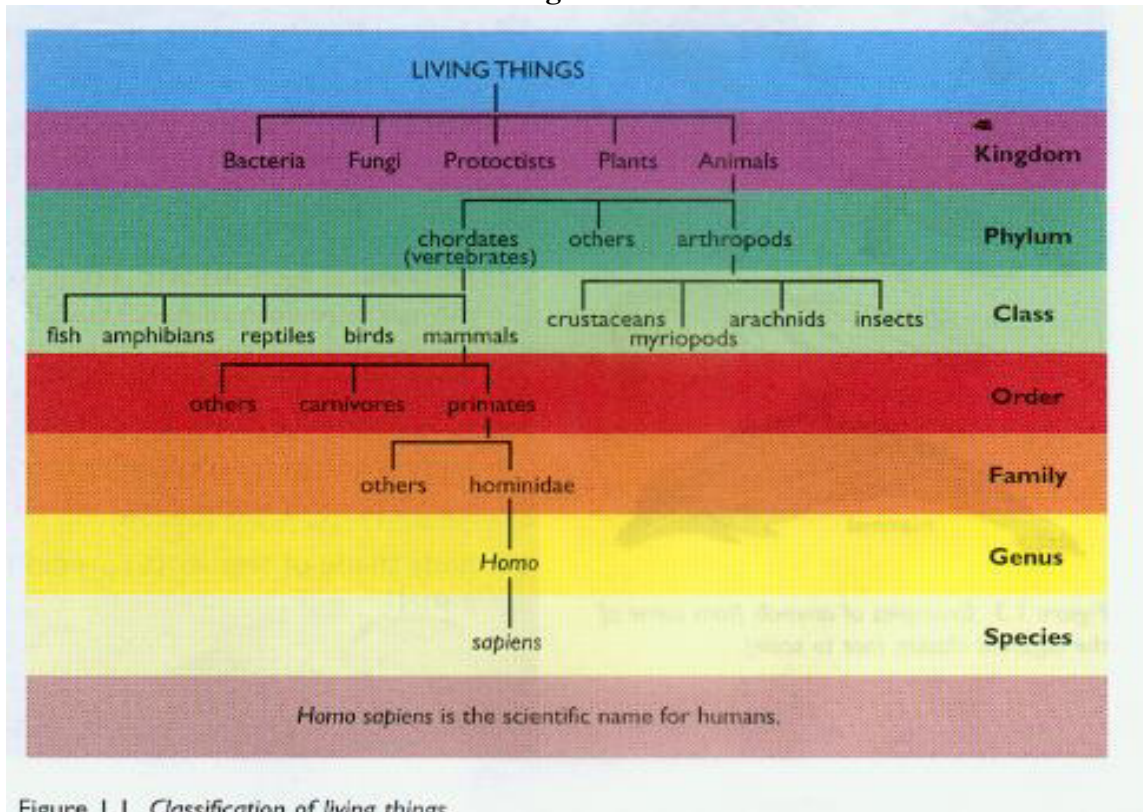


Figure 1.1 Classification of living things

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Figure 3:



Figure 4:

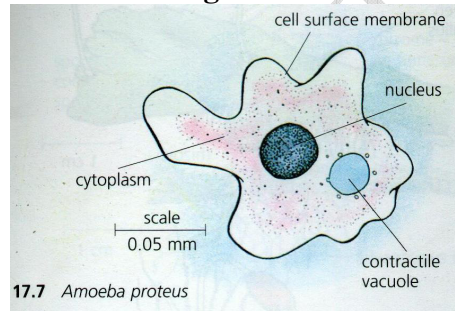


Figure 5:

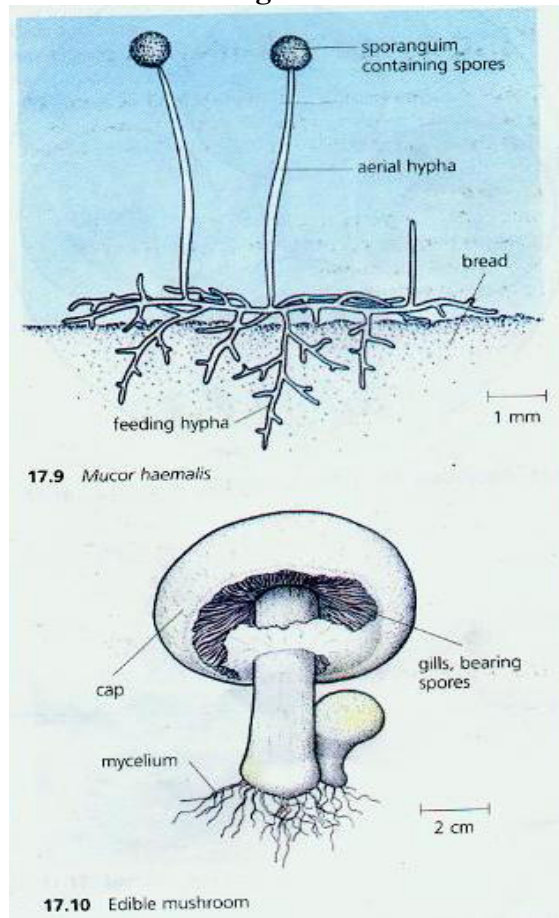


Figure 6:

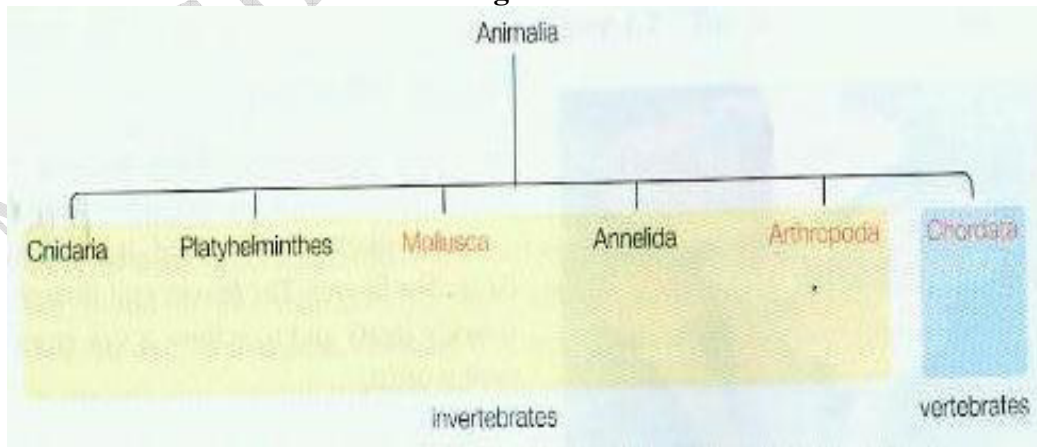


Figure 7:

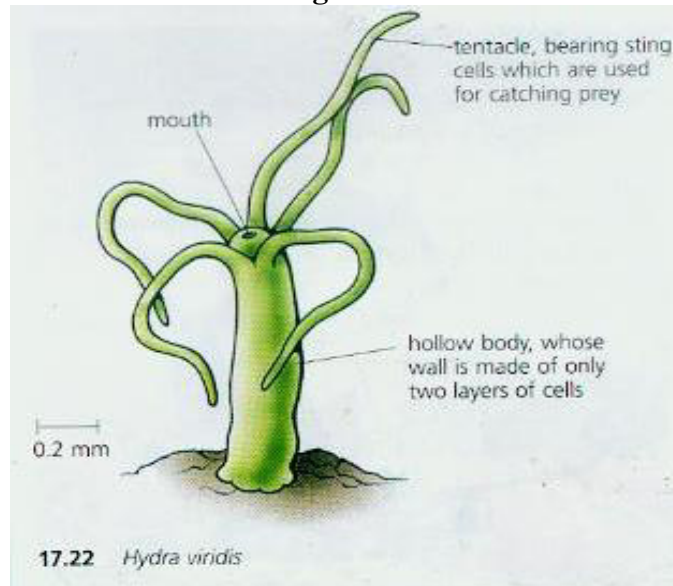


Figure 8:

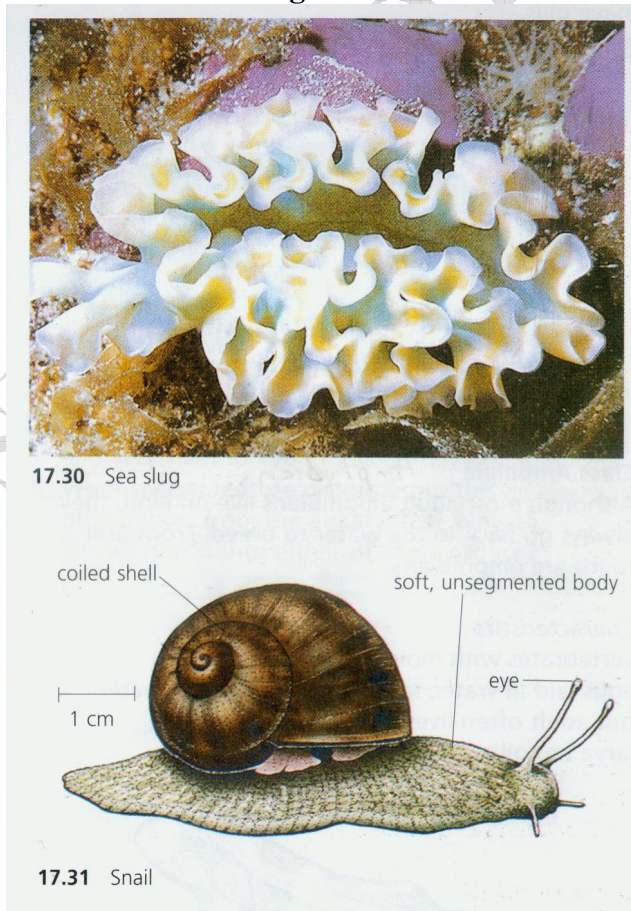
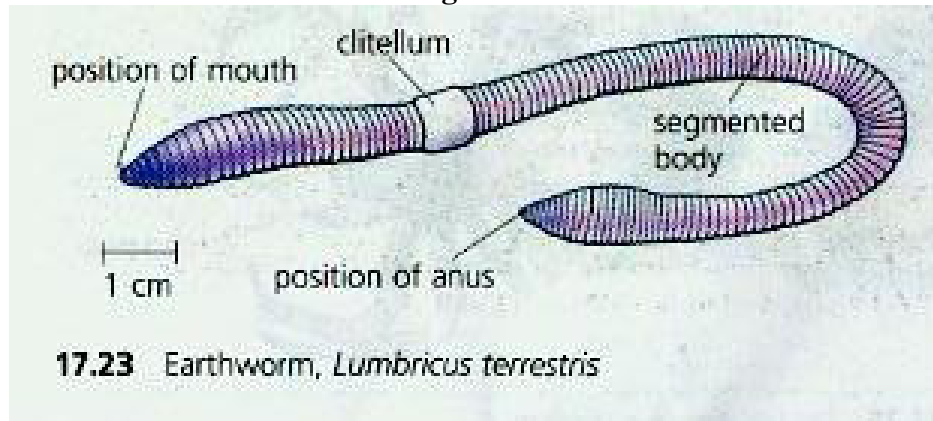


Figure 9:



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