BIO 102

GENERAL BIOLOGY II

Lecture Guide Part 1

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INTRODUCTION TO TAXONOMY

Many Biologists spend their lives grouping animals according to shared characteristics. These groupings reflect the order found in living systems that is a natural consequence of shared evolutionary processes. Often, the work of these Biologists involve describing new species and placing them into their proper relationships with other species.

~1.4 million species of animals have been identified by Biologists.

Early taxonomic system was based on the proposal of Carolus Linnaeus (1753)- which assigns species name to organisms based on physical and structural similarities. So, Biologists group animals according to their evolutionary relationships as revealed by ordered patterns in their sharing of homologous features and this is called the "natural system" of classification.

SYSTEMATICS & TAXONOMY

Systematics is the study of the identification, taxonomy and nomenclature of organisms, including the classification of living things with regard to their natural relationships and the study of variation and the evolution of taxa.

Taxonomy is the classification of organisms in an ordered system that indicates natural or evolutionary relationships. Organisms (animals) are thus organized into groups (taxa) based on degree of evolutionary relatedness.

Taxa are ranked to denote increasing inclusiveness as follows: species, genus, family, order, class, phylum, and kingdom. All of these ranks can be subdivided to signify taxa that are intermediate between them.

Animal systematics has Four (4) major goals:

(1) to identify all species of animals;
(2) to evaluate evolutionary relationships among species;
(3) to group/classify animal species in a hierarchy of taxonomic groups (taxa; singular= taxon) that conveys evolutionary relationships; and
(4) To assign scientific names

NOMENCLATURE

Common names are sometimes used to refer to organisms, but they are not officially defined and they do not reflect evolutionary relationships. Also, many animals in different species may share the same common name in different communities. Common names are generally not capitalized (except as required grammatically). Examples: tiger shark, timber wolf, daisy, puffball fungus.

Modern Taxonomy is now based on evolutionary relationships. Taxonomists study:

Structural similarities
Chromosomal structure (karyotypes)
Reproductive potential
Biochemical similarities
Comparing DNA and amino acids
Embryology/development
Breeding behavior
Geographic distribution

NOMENCLATURE

Nomenclature is the assignment of a distinctive name to each species. The current system uses Binomial nomenclature where species of organisms are given 2 names (scientific name). The first name designating the Genus to which the species belongs followed by a species epithet. The genus, which is a group of similar species, begins with a capital letter, while the species designation begins with a lowercase letter, and the entire scientific name is italicized or underlined because it is derived from Latin. Thus, the scientific name of humans is written *Homo sapiens*.

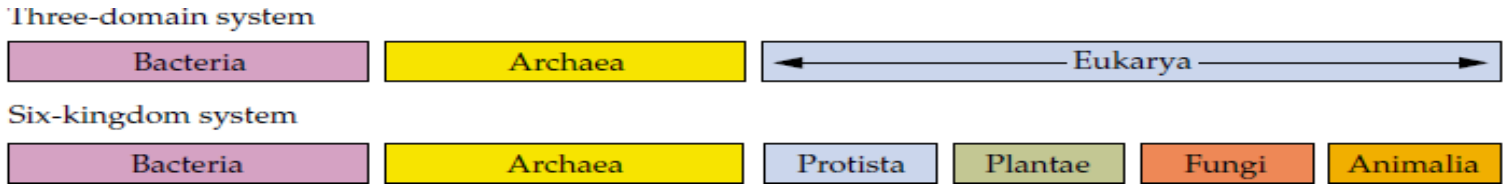
Abbreviation- *Homo sapiens = H. sapiens*

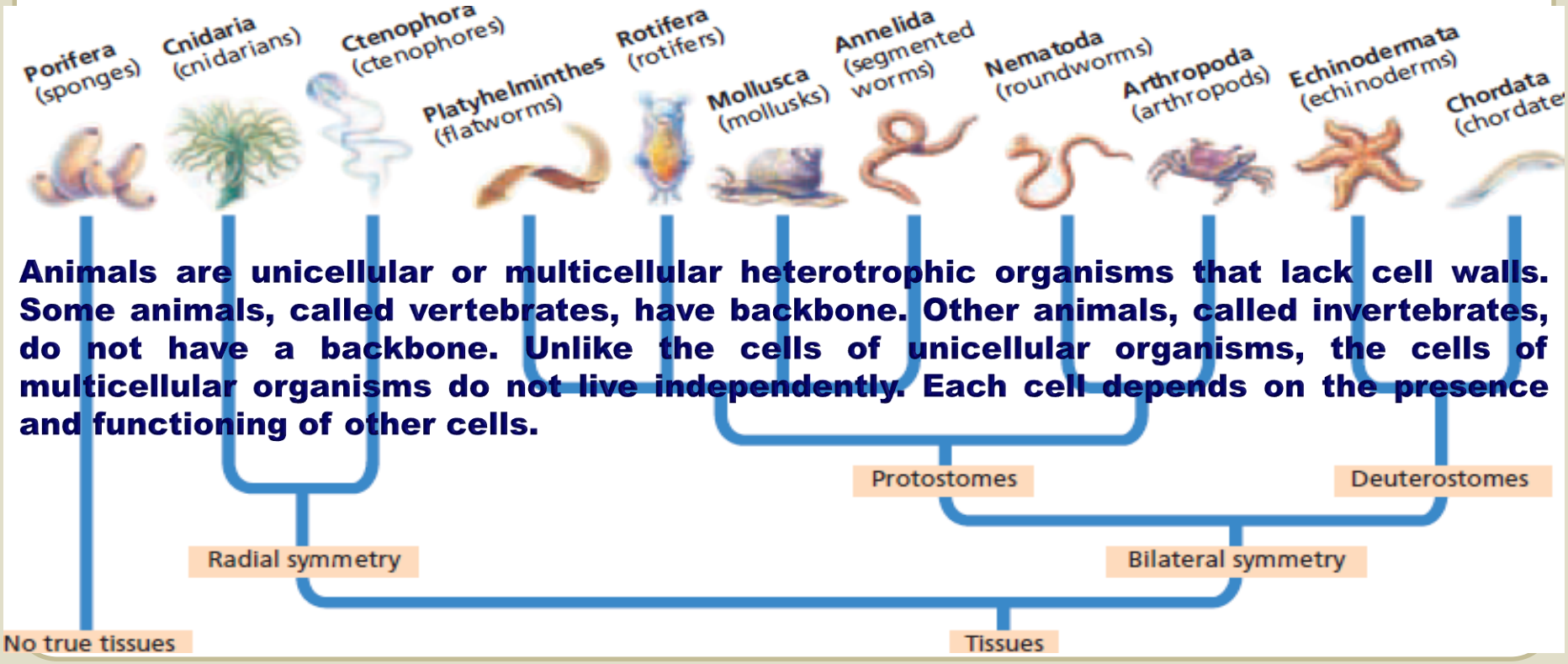
If *Hirudo medicinalis* is mentioned together with *Homo sapiens* in the same document, neither should be abbreviated.

The binomial system of nomenclature brings order to a chaotic world of common names. In the binomial system of nomenclature, no two kinds of animals have the same binomial name.

TAXONOMIC GROUP & BODY PLAN

Generally, livings organisms are classified into three domains and six Kingdoms as outlined below





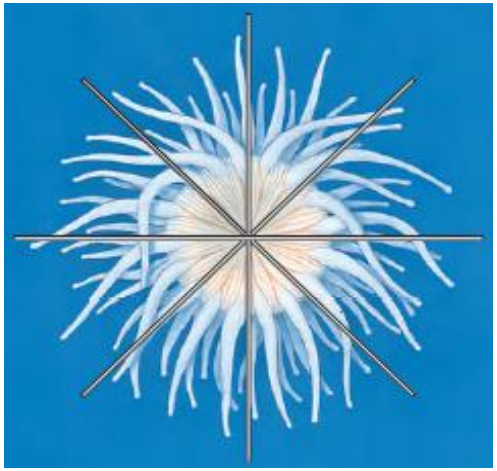
Animals are unicellular or multicellular heterotrophic organisms that lack cell walls. Some animals, called vertebrates, have backbone. Other animals, called invertebrates, do not have a backbone. Unlike the cells of unicellular organisms, the cells of multicellular organisms do not live independently. Each cell depends on the presence and functioning of other cells.

BODY PLAN & SYMMETRY

One of the most strikingly ordered series of changes in evolution is reflected in body plans in the animal kingdom and the protists. A body plan describes an animal's shape, symmetry and internal organization. Sponges (Porifera) have the simplest body plan of all animals. They are asymmetrical, which means that they do not display symmetry. Symmetry is a body arrangement in which parts that lie on opposite sides of an axis are identical.

There are two divisions of symmetry:

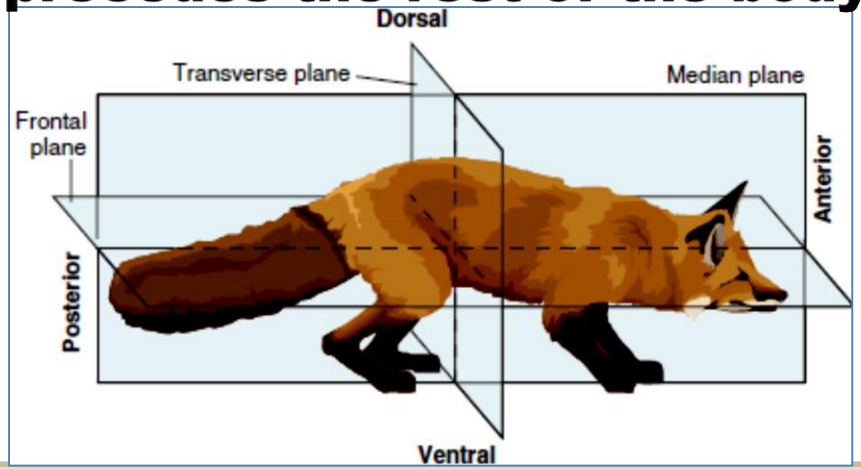
1) Radial symmetry: This is a body plan in which the parts are organized in a circle around an axis. It applies to forms that can be divided into similar halves by more than two planes passing through the longitudinal axis. The two phyla that are primarily radial (Cnidaria and Ctenophora), are called the Radiata.



BODY PLAN & SYMMETRY

2) **Bilateral symmetry**: Animals in this group can be divided into two mirrored portions- right and left halves. They have two similar halves on either side of a central plane. Most animals have a dorsal (back) and ventral (abdomen) side, an anterior (towards the head) and posterior (towards the tail) end.

Bilaterally symmetrical animals tend to exhibit **cephalization** (the concentration of sensory and brain structures in the anterior end of the animal). As a cephalized animal moves through its environment, the anterior end precedes the rest of the body.



ASSIGNMENT

List 10 organisms indicating their common names as well as their scientific names