

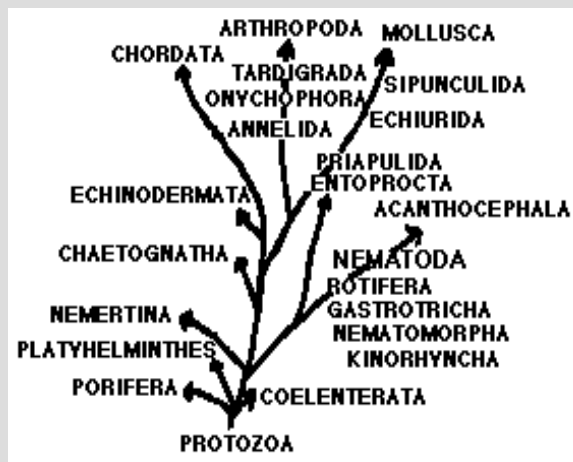
BioScience II

An Advanced Biology Course Manual

Unit 1: Biodiversity: Life Functions and Taxonomy

1.4 – 1.6

Taxonomy



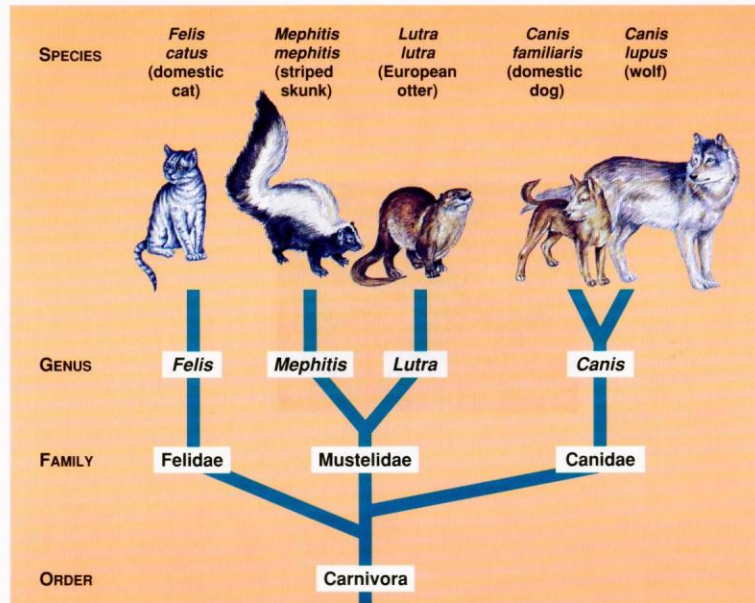
A. Taxonomy (definition) - defined as the bioscience that deals with the study of classification of organisms; involves describing traits and characteristics of organisms to place organisms into standardized categories or groups; involves assigning scientific names to organisms that are recognized internationally

1. **classification and evolution** (relationship) - the groupings or categorization of species reflects the evolutionary relationships among species; species display degrees of similarities based on their common ancestry and evolutionary history; the identification of similarities based on evolutionary relationships forms the basis for classification

a. **systematics**
(definition) - defined as the study of the kinds of organisms or the diversity of organisms and the relationships among them; related to classification in that evolutionary relationships form basis for taxonomic groupings

b. **phylogeny**
(definition) - term that describes the evolutionary history of an organism or group of organisms; taxonomic groups share common evolutionary histories

Figure 25.8 The connection between classification and phylogeny



B. **Basis for Classification** (comment) - taxonomists determine names for organisms and place them into classification categories based on their structure, their biochemistry, and their genetic makeup

1. **structural similarities** (description) - refers to internal and external features of an organism that make up its anatomy; organisms that share similar anatomy from a common evolutionary ancestry are named and classified into the same categories or groups depending on the degree of shared similarities

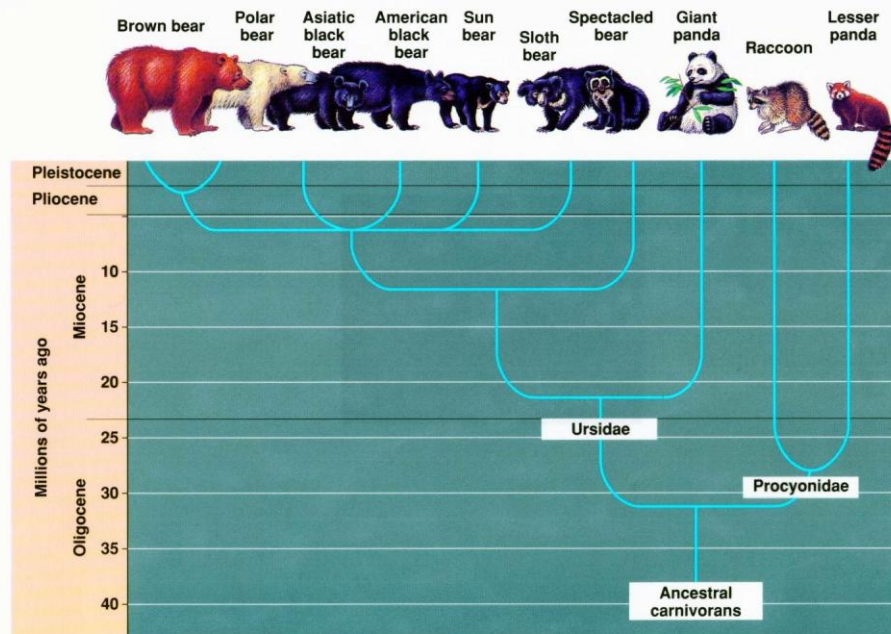
2. biochemical similarities

(description) - refers to the organic compounds that make up the molecular structure of an organism; these compounds include the **proteins and enzymes**; organisms that share similar protein and enzyme structure from a common evolutionary ancestry are named and classified into the same categories or groups depending on the degree of shared similarities

a. genetic similarities

(description) - refers to the structure of **chromosomes, genes, and the DNA** that determines all aspects of an organism; organisms that share similarities in chromosomes, genes, and DNA structure from a common evolutionary ancestry are named and classified into the same categories depending on the **degree of shared similarities**

Figure 25.11 A phylogenetic tree based on systematics



C. **Linnean Classification System** (description) - refers to the categories or groups used by taxonomists to name and identify organisms; based on the scientific work of Carl Linnaeus (also known as Karl von Linne') who first published a classification scheme in *Systema Natura* (1758) using a series of categories or groups

1. **taxon** (definition) - defined as one category or level of classification in the Linnean system; the ***taxa*** used today include the Kingdom, Phylum, Class, Order, Family, Genus, and Species

a. **Kingdom** (taxon) - refers to the broadest or most general category of classification that includes organisms with the least numbers of similarities (eg. all animals)

b. **Phylum** (taxon) - refers to the classification category that forms subdivisions of a Kingdom

c. **Class** (taxon) - refers to the classification category that forms subdivisions of a Phylum

d. **Order** (taxon) - refers to the classification category that forms subdivisions of a Class

e. **Family** (taxon) - refers to the classification category that forms subdivisions of an Order

f. **Genus** (taxon) - refers to the classification category that forms subdivisions of a Family

g. **species** (taxon) - refers to the classification category that forms subdivisions of a Genus

- * includes organisms with the most similarities that form a reproductively isolated biological group or individuals of the "same" organism

2. **binomial nomenclature** (definition) - defined as the **scientific name** of an organism formed by using a two name combination; the two names are the **Genus** name followed by the **species** name; names used are usually in Latin

a. **scientific name versus common name**
(comment) - the scientific name using the Genus and species of an organism is an **internationally** established and **recognized** name that does **not vary**; the scientific name is the **standardized** name for a given organism; the common names for organisms vary with geographic location and culture; common names are not standard or used in biology because they vary from place to place

Felis concolor

- mountain lion
- puma
- polecat
- cougar
- jaguar
- vermin



Rana pipiens

- leopard frog
- grass frog
- meadow frog



3. **other taxa** (description) - there are additional levels useful to further categorize organisms and identify relationships; used to "fine tune" the classification system; involves use of prefixes such as "**super**" (eg. superclass is a grouping of Classes); "**sub**" (eg. subphylum is a subdivision of a Phylum but above a Class); and "**infra**" (eg. infraclass would be a level below a subclass but above an Order)

Example: Taxonomy for Human

- Kingdom.....Animal
- Phylum.....Chordate
- Subphylum.....Vertebrate
- Superclass.....Tetrapod (land-based vertebrates)
- Class.....Mammal
- Subclass.....Theria (mammals that bear live young)
- Infraclass.....Eutheria (mammals with placenta)
- Order.....Primate
- Family.....Hominidae
- Genus.....Homo
- species.....sapiens
- subspecies.....sapiens

Kingdom Eubacteria

- **includes bacteria & cyanobacteria**

Kingdom Archaeobacteria

- **includes extremophile bacteria**

Kingdom Protist

- **includes algae, protozoa, slime molds**

Kingdom Fungus

- **includes mushrooms, yeast, molds, mildews..**

Kingdom Plant

- **includes bryophytes (mosses), pteridophytes (ferns), gymnosperms (conifers), angiosperms (flowering plants & trees)**

Kingdom Animal

- **includes porifera (sponges), cnidarians (colenterates), flatworms, nematodes (roundworms), annelids, mollusks, arthropods, echinoderms, chordates & vertebrates**