

LINNEAUS AND THE BINOMIAL SYSTEM OF NOMENCLATURE

Of what use is the theory of evolution? As biologists try to catalog all life forms on the planet earth, the theory of evolution provides the information needed to understand the relationship of one organism to another. How closely related are two species? What is the closest living ancestor to humans? We try to provide the answers to these questions by assigning each life form on earth a unique name. When the overall picture of life forms on earth are observed, they are arranged by their relationships with one another. The science of naming and arranging life forms into some order is called taxonomy. There are two types of taxonomic systems: natural and artificial.

Artificial Classification

This arrangement of life forms is based on gross morphological and anatomical features. For example, if an organism is a plant, has numerous red petals, many stamens, compoundly divided green leaves with prickles on the stem, you may assume it to be a rose. Placing the plant in the rose family is pretty obvious by the artificial system of classification. However, it does have its drawbacks. For example, biologists today know the common strawberry is closely related to the rose. That relationship would not be obvious without some understanding of the evolutionary history of the rose family.

Natural Classification

In this classification system, biologists look not only at the gross morphological and anatomical features, but also its evolutionary history, including its biochemical makeup and the structure of its DNA. By doing that, it becomes obvious that strawberries are close relatives of roses.

Natural vs Artificial

Which system is best. No doubt, it is the natural system. Unfortunately, biologists don't know the evolutionary history of all life forms on earth, so they must utilize both systems of classification until more is known about the evolution of all life forms.

John Ray (1627-1705)

One of the first scientists to try to bring order to naming plants and animals was the English zoologist John Ray. Ray devised a scheme where plants and animals were characterized by flower structure, seed type, presence or absence of structures in animals, and so forth. He laid the groundwork for the person who devised the binomial system of nomenclature.

The Binomial System of Nomenclature

Organisms on earth are named or classified by biologists according to the binomial system of nomenclature, first established by Carl von Linné (1707-1778) a Swedish naturalist and physician. His name was later Latinized to Linnaeus to recognize his contributions to science. His system of arranging life forms begins by assigning every living organism two names: (1) a genus and (2) a species (thus the term "binomial"). For example, the name assigned to all dogs is *Canis domesticus*. Although there are numerous breeds, all dogs belong to the genus *Canis* and the species *domesticus*. Note

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Canis is capitalized and italicized. The species name *domesticus* may be capitalized if a proper name, but often is not. However, the specific epithet is still italicized.

Scientific Names

Scientific names remove any ambiguity in discussion of a life form. For example, *Canis domesticus* is understood by scientists in Russia, Japan, Germany, England, Argentina, and by anyone in the world as the name of a dog. Common names may be inexact or misleading. The term pin oak may mean one thing in South Florida and quite another thing in Maine. The importance of this issue may be recognized when a scientist writes a paper about a discovery in a particular organism. Unless there is some uniform name, confusion could result from the use of common names.

Linnaeus also arranged life forms in groupings to show their relations to one another. The categories of organization into which organisms are placed are called taxa.

Taxa for Humans

Humans may be placed in a series of hierarchical groupings based on their specific characteristics. The major taxa are, in order of increasing specificity:

1. Kingdom
2. Phylum
3. Class
4. Order
5. Family
6. Genus
7. Species.

Here is the classification of humans.

TAXON	HUMAN	DESCRIPTION
Kingdom	Animalia	Multicellular, eukaryotic, heterotrophic, no cell walls
Phylum	Chordata	Animals with backbones, <i>i.e.</i> fish, frogs, birds, cows
Class	Mammalia	Nurse their young via mammary glands
Order	Primates	Opposable thumbs, brachiation, stereoscopic vision
Family	Hominidae	Human-like creatures – chimpanzee, humans
Genus	<i>Homo</i>	Like
Species	<i>sapiens</i>	Wise

You may add a subspecies of sapiens. In other words, modern human is classified as *Homo sapiens sapiens* (like wise wise). This distinguishes us from *Homo sapiens neanderthalii*, *Homo sapiens pekinesis*, *Homo sapiens cro-magnon*.

The Five Kingdoms

Today, scientists differentiate five kingdoms or organisms (the broadest grouping of taxa). They are (1)Animalia (2) Plantae (3) Fungi (4) Protista (5) Monera

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KINGDOM	STRUCTURE	CELL TYPE	NUTRITION	CELL BOUNDARY
Animalia	Multicellular	±Eukaryotic	Heterotrophic	No cell walls
Plantae	Multicellular	Eukaryotic	Autotrophic, rarely some heterotrophic	Cellulose Walls
Fungi	Unicellular or multicellular	Eukaryotic	Heterotrophic, rarely some autotrophic	Chitin Walls predominant
Protista	Unicellular or †colonial	Eukaryotic	Autotrophic or Heterotrophic	Cell walls may or may not be present. When present may be composed of various materials
Monera	Unicellular	*Prokaryotic	Heterotrophic, some autotrophic	Cell walls composed of murein

±Eukaryotic -cells with membrane-bound organelles, such as a nucleus, mitochondria, endoplasmic reticulum, etc.

*Prokaryotic – cells without membrane-bound organelles – they have no nucleus.

† colonial – groups or clusters of cells that have no organized function. There is no specialization within the group of cells.

A word of caution. Many laypeople may the mistake of using the specific epithet of species as a plural form of the word specie. In biological life forms, the term “species” is both singular and plural.