

CLASSIFYING ORGANISMS

Big Picture

Taxonomy is the study and practice of classifying organisms. A standardized taxonomic system is important to scientists because it facilitates discussion by providing a shared understanding of the subject matter. Two common methods of classification are the Linnaean and the phylogenetic systems. In the beginning, the Linnaean classification system, which organizes organisms into seven taxa, tended to reflect physical similarities. However, modern derivatives of the system tend to place greater emphasis on evolutionary development, as confirmed by genetic similarity. Phylogenetic classification concerns itself with such evolutionary relationships, visually expressing those relationships in phylogenetic trees and cladograms.

Key Terms

Linnaean Classification System: A system where organisms are organized into groupings based primarily on shared physical traits. The groupings are organized into a hierarchy. These groupings are kingdom, phylum, class, order, family, genus, and species.

Taxon (plural, taxa): A group of organisms in a classification system.

Kingdom: The largest and most inclusive taxa in the original Linnaean classification system.

Genus: A grouping of related species. Genus classification plays an important role in binomial nomenclature.

Species: The smallest and most exclusive grouping in the original Linnaean classification system.

Domain: A current classification grouping that ranks higher than kingdom.

Binomial Nomenclature: Formal system of naming species using two Latin words. The first is the genus name and the second a unique species name.

Phylogenetic Tree: A visual diagram that represents the evolutionary history among a group of organisms.

Cladogram: Another format that, like a phylogenetic tree, represents the evolutionary history and common ancestry among a group of organisms.

Clade: A common ancestor and its descendants.

Linnean Classification System

Carolus Linnaeus, an 18th century botanist, physician, and zoologist, developed the first modern classification system. In the **Linnaean classification system**, all organisms are placed in a ranked hierarchy. The **taxa** are, in increasing exclusiveness:

- **Kingdom:** the most inclusive taxa. Current classification systems typically identify the kingdoms Animalia, Plantae, Fungi, Protista, Archaea, and Bacteria.
- Phylum
- Class
- Order
- Family
- **Genus**
- **Species:** the most exclusive taxa. Organisms grouped together as a species have the ability to interbreed and also have similar DNA sequences and physical traits. Current classification systems identify over 2 million species.



To remember the ranking, try using mnemonic devices such as: "King Penguins Congregate On Frozen Ground Sometimes" or "Kids Playing Catch On Freeway Go Splat."

Ranking: Kingdom Phylum Class Order Family Genus Species

Many classification systems used today are derivatives of Linnaeus's.

- One major change to the Linnaean classification system is the addition of the **domain** taxon.
- Domain is more inclusive than kingdom. There are three generally agreed upon domains: Archaea, Bacteria and Eukarya. Animalia, Plantae, Fungi, and Protista kingdoms are part of the Eukarya domain.

Linnaean classification is also responsible for the **binomial nomenclature** that give organisms their formal name. Binomial names are usually written in italics with the genus name written with a capital letter.

- The binomial name uniquely identifies a species - it's similar to people having a first and last name.
- *Homo sapiens* is the binomial name for humans.
- Did you know that the scientific name for an apple is actually *Malus domestica*?

CLASSIFYING ORGANISMS CONT.

Phylogenetic Classification System

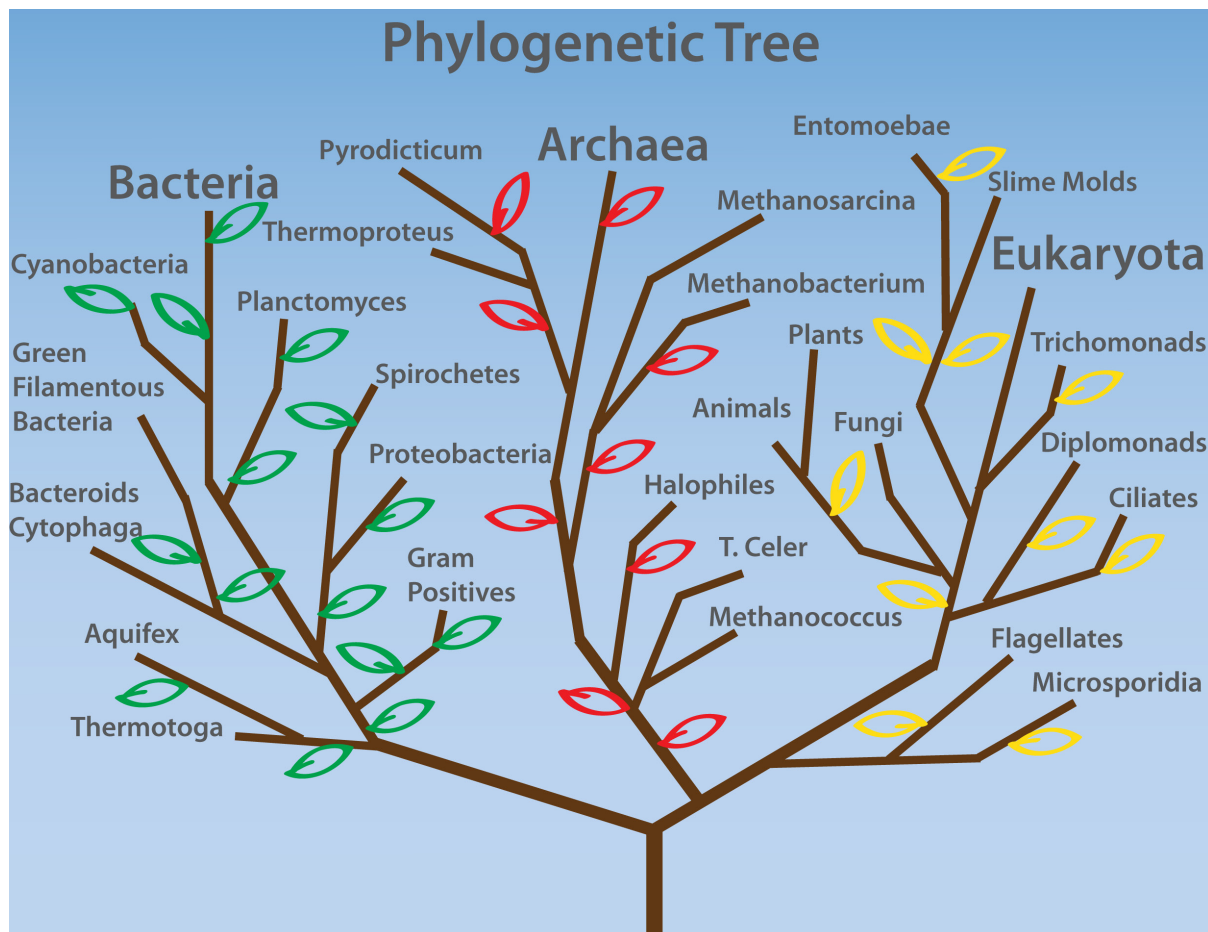


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The Linnaean system organized organisms based on physical traits. A **phylogenetic tree** looks at the evolutionary history and may reflect genetic and/or physical similarities.

A **cladogram** is another way to show the evolutionary history of a group of related organisms. It may also indicate shared characteristics among the related organisms.

The cladogram here shows that the reptile **clade** includes birds, meaning that birds evolved from reptiles.

In the Linnaean system, reptiles and birds are in separate classes, making the evolutionary relationship harder to see. A cladogram helps us see the order by which certain traits appeared in history. The oldest species, at the bottom of the cladogram, has a common trait that all other species in the cladogram share, while the newest species, at the top of the cladogram, has traits that were more recently developed and that older species do not share.

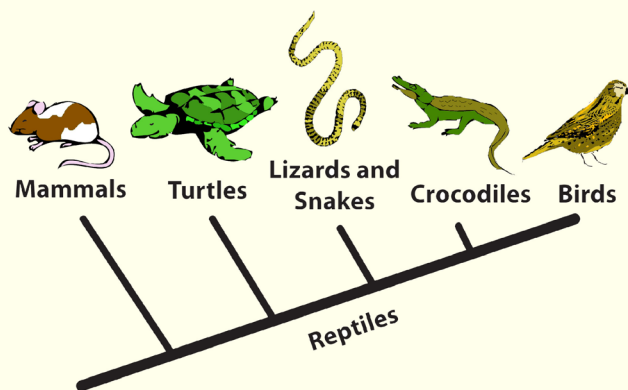


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