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Taxonomic classification divides species in a hierarchical system beginning with a domain and ending with a single species.

#### LEARNING OBJECTIVE

- Describe how taxonomic classification of organisms is accomplished and detail the levels of taxonomic classification from domain to species

#### KEY POINTS

- Categories within taxonomic classification are arranged in increasing specificity.
- The most general category in taxonomic classification is domain, which is the point of origin for all species; all species belong to one of these domains: Bacteria, Archaea, and Eukarya.
- Within each of the three domains, we find kingdoms, the second category within taxonomic classification, followed by subsequent categories that include phylum, class, order, family, genus, and species.
- At each classification category, organisms become more similar because they are more closely related.
- As scientific technology advances, changes to the taxonomic classification of many species must be altered as inaccuracies in classifications are discovered and corrected.

#### TERMS

- binomial nomenclature  
the scientific system of naming each species of organism with a Latinized name in two parts
- taxon  
any of the taxonomic categories such as phylum or subspecies
- Linnaeus  
Swedish botanist, physician and zoologist who laid the foundations for the modern scheme of nomenclature; known as the "father of modern taxonomy"



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## The Levels of Classification

**Taxonomy** (which literally means "arrangement law") is the **science** of classifying organisms to construct internationally-shared classification systems with each organism placed into more and more inclusive groupings. Think about how a grocery store is organized. One large space is divided into departments, such as produce, dairy, and meats. Then each department further divides into aisles, then each aisle into categories and brands, and then, finally, a single product. This organization from larger to smaller, more-specific categories is called a hierarchical system .



**Subspecies:** *Canus lupus familiaris*

**Species:** *Canis lupus*

**Genus:** *Canis*

**Family:** Canidae

**Order:** Carnivora

**Class:** Mammalia

**Phylum:** Chordata

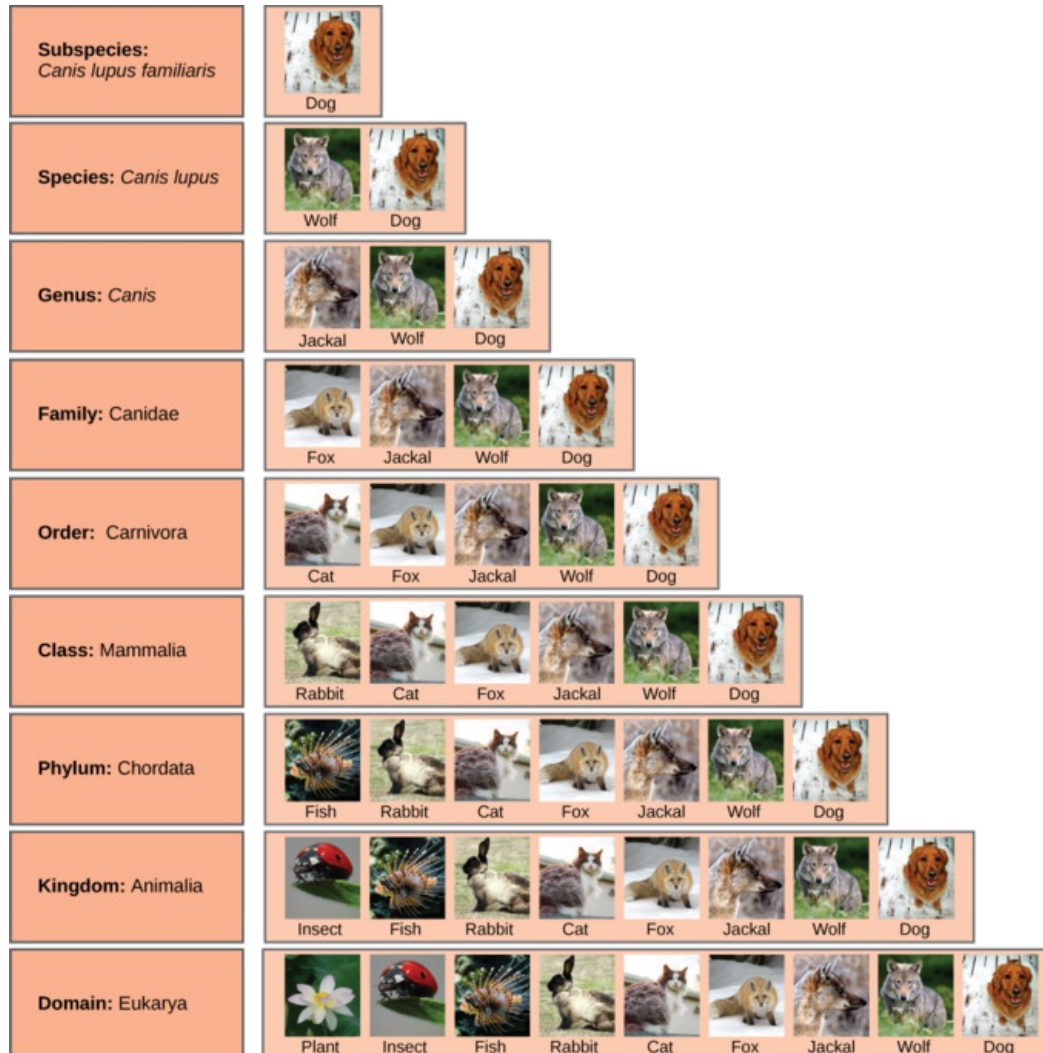
**Kingdom:** Animalia

**Domain:** Eukarya

### Hierarchical models

The taxonomic classification system uses a hierarchical model to organize living organisms into increasingly specific categories. The common dog, *Canis lupus familiaris*, is a subspecies of *Canis lupus*, which also includes the wolf and dingo.

The taxonomic classification system (also called the Linnaean system after its inventor, Carl Linnaeus, a Swedish botanist, zoologist, and physician) uses a hierarchical model. Moving from the point of origin, the groups become more specific, until one branch ends as a single species. For example, after the common beginning of all life, scientists divide organisms into three large categories called domains: Bacteria, Archaea, and Eukarya. Within each domain is a second category called a kingdom. After kingdoms, the subsequent categories of increasing specificity are: phylum, class, order, family, genus, and species .



#### Levels in taxonomic classification

At each sublevel in the taxonomic classification system, organisms become more similar. Dogs and wolves are the same species because they can breed and produce viable offspring, but they are different enough to be classified as different subspecies.

The kingdom Animalia stems from the Eukarya domain. The full name of an organism technically has eight terms. For dogs, it is: Eukarya, Animalia, Chordata, Mammalia, Carnivora, Canidae, *Canis*, and *lupus*. Notice that each name is capitalized except for species and that genus and species names are italicized. Scientists generally refer to an organism only by its genus and species, which is its two-word scientific name, in what is called binomial nomenclature. Therefore, the scientific name of the dog is *Canis lupus*. The name at each level is also called a **taxon**. In other words, dogs are in order Carnivora. Carnivora is the name of the taxon at the order level; Canidae is the taxon at the family level, and so forth. Organisms also have a common name that people typically use; in this case, dog. Note that the dog is additionally a subspecies: the "familiaris" in *Canis lupus familiaris*. Subspecies are members of the same species that are capable of mating and reproducing viable offspring, but they are considered separate subspecies due to geographic or behavioral isolation or other factors.

Dogs actually share a domain (Eukarya) with the widest diversity of organisms, including plants and butterflies. At each sublevel, the organisms become more similar because they are more closely related. Historically,

scientists classified organisms using physical characteristics, but as [DNA](#) technology developed, more precise [phylogenies](#) have been determined.

Recent [genetic](#) analysis and other advancements have found that some earlier [phylogenetic](#) classifications do not align with the evolutionary past; therefore, changes and updates must be made as new discoveries occur. Recall that phylogenetic trees are [hypotheses](#) and are modified as data becomes available. In addition, classification historically has focused on grouping organisms mainly by shared characteristics and does not necessarily illustrate how the various groups relate to each other from an evolutionary perspective. For example, despite the fact that a hippopotamus resembles a pig more than a whale, the hippopotamus may be the closest living relative to the whale.

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How have scientists been able to determine that a hippopotamus may be the closest whale relatives?



For dogs, the name Carnivora depicts which taxonomic category?



▶ KEY TERM REFERENCE

▶ SOURCES

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