The Six Kingdoms

In order to begin to understand nature, a system must be created to organize the seemingly endless array of organisms. This issue, which has been the topic of many proposals, debates, and disputes among naturalists for centuries, has yet to be completely resolved. Nevertheless, a few methods for classifying organisms have been established that pay attention to the morphological characteristics (or physical features) of different groups and their evolutionary history. Both classification methods are used to determine the relationships between organisms. ●

Universal Names

There are two types of names for organisms. The common name is the one most people use, but common names can vary from one region to another. The scientific name, derived from Latin, allows any researcher in the world to refer to a specific organism without the possibility of confusing one species with another.

The scientific name of the great white shark is *Carcharodon carcharias.*

Amazon river dolphin, pink dolphin, *boto,* and *bufeo* are common names given to a single animal: *Inia geoffrensis.*

BINOMIAL NOMENCLATURE

By convention, scientific names are generally Latin words; they are written in italics.

Inia geoffrensis

The first word is the genus, and its initial letter is always capitalized.

The second word is a qualifier, and together with the first word it indicates the species.

34

The approximate number of phyla into which the animal kingdom is divided. The mollusk phylum alone (which includes snails, octopuses, and clams) has about 90,000 species.

Classifying Life

At one time, all living things were formally classified into two kingdoms, animal and plant. Today the most widely accepted classification divides organisms into six kingdoms, although a few alternative systems have been proposed and are under discussion.

1 ANIMALIA (ANIMALS)

Multicellular organisms. Their cells are eukaryotic and do not have a cell wall. In general, they are able to move under their own power.

1.5 million

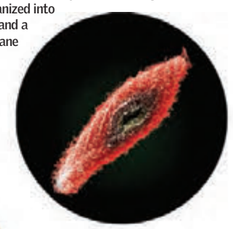
The number of species that have been described by science. It might represent only 5% of all the species in the world.

2 PLANTAE (PLANTS)

Multicellular organisms. Their cells are eukaryotic, and they have a cell wall. Using a pigment called chlorophyll, they capture energy from sunlight and use it to produce and store their food.

3 PROTISTA (PROTOZOA)

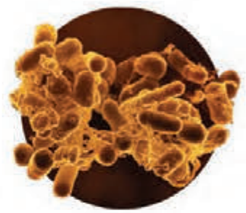
Unicellular and multicellular eukaryotic organisms that are not part of any other kingdom of life. They include euglenoids, dinoflagellates, fungi, and other eukaryotic microorganisms. (In a eukaryote, the cell's genetic material is organized into chromosomes, and a nuclear membrane separates it from the rest of the cell.)



Paramecium sonneborni Magnified 1,500 times.

4 EUBACTERIA

Unicellular organisms. They are prokaryotes—that is, they have relatively primitive cells. In prokaryotes, genetic material is not surrounded by a nuclear membrane (as it is in eukaryotes); it is instead inside a cytoplasmic compartment.



Colony of Escherichia coli Each bacterium is about 100 times smaller than the thickness of a human hair. These bacteria cause various human diseases, such as salmonella.

5 FUNGI

Eukaryotic organisms. Traditionally, fungi were included in the plant kingdom, but they now constitute their own group. One of their characteristics is that they form spores. Their cellular structure is very different from that of plants.

Hierarchical Order

Organisms are classified into a system in which some groups are placed within larger groups. For example, domains are divided into kingdoms, which in turn are divided into phyla. Phyla are divided into subphyla and so forth down to the level of species.

An Example: The Classification of Human Beings

Domain:	Eukarya (organisms whose cells contain linear DNA, a cytoskeleton, a nuclear membrane, and other internal membranes).
Kingdom:	Animalia (multicellular orga-nisms that ingest their food).
Phylum:	Chordata (animals that at some time in their life cycle have a hollow dorsal nerve cord and pharyngeal gill slits).
Subphylum:	Vertebrata (animals that have a nerve cord enclosed in a vertebral column).
Superclass:	Tetrapoda (land animals with four limbs).
Class:	Mammalia (the young are nourished with milk from mammary glands; the skin has fur; they are warm-blooded).
Order:	Primates (they have fingers and flat nails, a poor sense of smell, and arboreal habits—or at least their ancestors did).
Family:	Hominidae (bipedal and flat faced, with frontal vision and color vision).
Genus:	Homo (communicates by means of a language). Above, the skulls of three species of the genus Homo are shown.
Species:	Homo sapiens (have a prominent chin, little body hair, and a high forehead).

Homo neanderthalensis

Homo erectus

Homo sapiens

A NEW CLASSIFICATION

The best way of classifying organisms continues to be debated. A new category that has been proposed—the domain—lies above the level of kingdoms. According to this classification scheme, there are three domains (two for prokaryotes and one for eukaryotes), which in turn are divided into kingdoms.

Determining Kinship

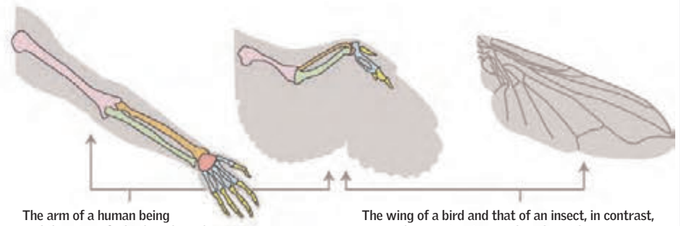
Through the study of evolution, it is possible to determine the relatedness and common ancestry of organisms that look very different.

Homologous Structures

They can be equivalent structures (such as the wings of a bat and the wings of a bird) or different structures (such as the wing of a bird and the arm of a human). Nevertheless, they have a common origin and thus denote a degree of kinship.

Analogous Structures

Although these structures appear to be similar or equivalent, a careful analysis will show that they have independent origins (such as the wing of a bird and the wing of an insect). They are simply the result of similar adaptations by organisms to a given environment.



The arm of a human being and the wing of a bird are homologous structures. Even though they are different, they have a common origin.

The wing of a bird and that of an insect, in contrast, are analogous structures. They do not have a common origin; however, each represents a similar adaptive strategy—in this case the ability to fly.

Although they are different, birds and humans are more closely related than birds and insects.