



# 15. CLASSIFICATION AND EVOLUTION

## OBJECTIVES

1. Illustrate the principles of classification and some of the processes of evolution.
2. Learn how to use the phylogenetic tree to show the evolutionary relationships among organisms.

## INTRODUCTION

Humans classify almost everything, including each other. This habit can be quite useful. For example, when talking about a car someone might describe it as a 4-door sedan with a fuel injected V-8 engine. A knowledgeable listener who has not seen the car will still have a good idea of what it is like because of certain characteristics it shares with other familiar cars. Humans have been classifying plants and animals for a lot longer than they have been classifying cars, but the principle is much the same. In fact, one of the central problems in biology is the classification of organisms on the basis of shared characteristics.

As an example, biologists classify all organisms with a backbone as “vertebrates.” In this case the backbone is a characteristic that defines the group. If, in addition to a backbone, an organism has gills and fins it is a fish, a sub-category of the vertebrates. This fish can be further assigned to smaller and smaller categories down to the level of the species. The classification of organisms in this way aids the biologist by bringing order to what would otherwise be a

bewildering diversity of species. (There are probably several million species - of which about one million have been named and classified.) The field devoted to the classification of organisms is called **taxonomy**.

The modern taxonomic system was devised by **Carolus Linnaeus** (1707-1778). It is a **hierarchical** system since organisms are grouped into ever more inclusive categories from species up to kingdom. Table 15.1 illustrates how four species are classified using this taxonomic system. (Note that it is standard practice to *italicize* the genus and species names.)

In the 18th century most scientists believed that the Earth and all the organisms on it had been created suddenly in their present form as recently as 4004 BC. According to this view, Linnaeus’ system of classification was simply a useful means of cataloging the diversity of life. Some scientists went further, suggesting that taxonomy provided insight into the Creator’s mind (“Natural Theology”).

This view of taxonomy changed dramatically when **Charles Darwin** published *On The Origin of Species* in 1859. In his book Darwin presented convincing evidence that life had evolved through the process of **natural selection**. The evidence gathered by Darwin, and thousands of other biologist since then, indicates that all organisms are descended from a common ancestor. In the almost unimaginable span of time since the first organisms arose (about 3.5 billion years) life has gradually diversified into the myriad forms we see today.

**Table 15.1**  
**Modern Taxonomic System**

KINGDOM	Animalia			Plantae
PHYLUM	Chordata			Angiospermophyta
CLASS	Mammalia			Monocotyledoneae
ORDER	Primate	Carnivora	Insecta	Liliales
FAMILY	Hominidae	Canidae	Hymenoptera	Liliaceae
GENUS	<i>Homo</i>	<i>Canis</i>	<i>Apis</i>	<i>Alium</i>
SPECIES	<i>sapiens</i> (human)	<i>lupus</i> (wolf)	<i>mellifera</i> (honeybee)	<i>sativum</i> (garlic)