

## 18.3 Building the Tree of Life

### Lesson Objectives

-  Name the six kingdoms of life as they are currently identified.
-  Explain what the tree of life represents.

### Lesson Summary

**Changing Ideas About Kingdoms** As biologists learned more about the natural world, they realized that Linnaeus's two kingdoms, Animalia and Plantae, did not represent all life.

- ▶ Researchers found that microorganisms were very different from plants and animals. They were placed in their own kingdom, called Protista.
- ▶ Then, yeast, molds, and mushrooms were separated from plants and placed in their own kingdom, called Fungi.
- ▶ Because bacteria lack nuclei, mitochondria, and chloroplasts, they were separated from Protista and placed in another new kingdom, called Monera.
- ▶ In the 1990s, kingdom Monera was divided into two kingdoms: Eubacteria and Archaeobacteria. The six-kingdom system of classification includes the kingdoms Eubacteria, Archaeobacteria, Protista, Fungi, Plantae, and Animalia.
- ▶ Genetic analysis revealed that two prokaryotic groups are even more different from each other, and from Eukaryotes, than previously thought. This discovery led to the creation of a new taxon, called the domain. The **domain** is a larger, more inclusive category than a kingdom. The three domain system consists of: Bacteria, Archaea, and Eukarya.
- ▶ Domain Bacteria corresponds to the kingdom Eubacteria. Domain Archaea corresponds to the kingdom Archaeobacteria. Domain Eukarya corresponds to kingdoms Fungi, Plantae, Animalia, and "Protista."
- ▶ Quotations are used for the old kingdom Protista to signify that it is not a valid clade.

**The Tree of All Life** The tree of life shows current hypotheses regarding evolutionary relationships among taxa within the three domains of life.

- ▶ The domain **Bacteria** includes unicellular organisms without a nucleus. They have cell walls containing a substance called peptidoglycan.
- ▶ The domain **Archaea** also includes unicellular organisms without a nucleus. These organisms have cell walls that do not contain peptidoglycan.
- ▶ The domain **Eukarya** includes the four remaining kingdoms: "Protista," Fungi, Plantae, and Animalia. All members of the domain Eukarya have cells with a nucleus.
  - Most members of the kingdom "Protista," are unicellular organisms. Some Protista are photosynthetic; others are heterotrophs.
  - Most members of the kingdom Fungi are multicellular, and all members of this kingdom are heterotrophs with cell walls containing chitin.
  - All members of the kingdom Plantae are multicellular and photosynthetic. Most plants cannot move about, and their cells have cell walls.
  - All members of the kingdom Animalia are multicellular heterotrophs. Most animals can move about, and their cells lack cell walls.

## Changing Ideas About Kingdoms

1. What fundamental traits did Linnaeus use to separate plants from animals?

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2. What types of organisms were first placed in the kingdom Protista?

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3. What types of organisms were placed into the kingdom Fungi?

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4. Why did scientists place bacteria in their own kingdom, the Monera?

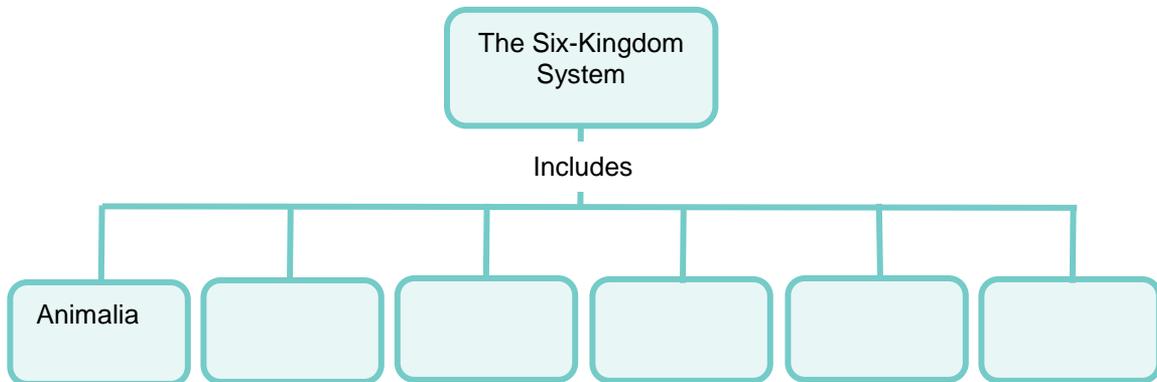
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5. What two kingdoms was kingdom Monera separated into?

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6. Complete the concept map.



7. What is a domain?

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8. What did genomic analysis reveal about the two prokaryotic groups?

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## The Tree of All Life

9. Complete the chart below.

Classification of Living Things		
Domain	Kingdom	Examples
	Eubacteria	<i>Salmonella typhimurium</i>
Archaea		<i>Sulfolobus archaea</i>
	“Protista”	
		mushrooms, yeasts
	Plantae	
		Sponges, worms, insects, fishes, mammals

Match the kingdom with the description that applies to members of that kingdom.

**Kingdom**

- \_\_\_\_\_ 10. “Protista”
- \_\_\_\_\_ 11. Fungi
- \_\_\_\_\_ 12. Plantae
- \_\_\_\_\_ 13. Animalia

**Description**

- A. They feed on dead or decaying organic matter.
- B. They have no cell walls and they move about.
- C. They are a “catchall” group of eukaryotes.
- D. They include mosses and ferns.

**Apply the Big idea**

14. What characteristics led camels to be classified in the same domain, kingdom, phylum, and class as dogs?

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