

The Tree of Life Evolves

Systems of classification adapt to new discoveries.

Linnaeus classified organisms into two kingdoms—animals and plants.

The only known differences among living things were the fundamental traits that separated animals from plants.

Five Kingdoms

Scientists realized there were enough differences among organisms to make 5 kingdoms:

- Monera
- Protista
- Fungi
- Plantae
- Animalia

Six Kingdoms

Recently, biologists recognized that Monera were composed of two distinct groups: Eubacteria and Archaeobacteria. The six kingdom system now includes:

Eubacteria

Archaeobacteria

Protista

Fungi

Plantae

Animalia

Changing Number of Kingdoms

Introduced	Names of Kingdoms					
1700's	Plantae					Animalia
Late 1800's	Protista			Plantae		Animalia
1950's	Monera		Protista	Fungi	Plantae	Animalia
1990's	Eubacteria	Archaeobacteria	Protista	Fungi	Plantae	Animalia

The Three-Domain System

Molecular analyses have given rise to a new taxonomic category that is now recognized by many scientists.

The **domain** is a more inclusive category than any other—larger than a kingdom.

Eukarya, which is composed of protists, fungi, plants, and animals.

Bacteria, which corresponds to the kingdom Eubacteria.

Archaea, which corresponds to the kingdom Archaeobacteria.

Modern classification is a rapidly changing science.

As new information is gained about organisms in the domains Bacteria and Archaea, they may be subdivided into additional kingdoms.

Domain Bacteria

Members of the domain Bacteria are unicellular prokaryotes.

Their cells have thick, rigid cell walls that surround a cell membrane.

Their cell walls contain peptidoglycan.

The domain Bacteria corresponds to the kingdom **Eubacteria**.

Classification of Living Things	
DOMAIN	Bacteria
KINGDOM	Eubacteria
CELL TYPE	Prokaryote
CELL STRUCTURES	Cell walls with peptidoglycan
NUMBER OF CELLS	Unicellular
MODE OF NUTRITION	Autotroph or heterotroph
EXAMPLES	<i>Streptococcus</i> , <i>Escherichia coli</i>

Domain Archaea

Members of the domain **Archaea** are unicellular prokaryotes.

They live in extreme environments.

Their cell walls lack peptidoglycan, and their cell membranes contain unusual lipids not found in any other organism.

The domain Archaea corresponds to the kingdom **Archaeobacteria.**

Classification of Living Things	
DOMAIN	Archaea
KINGDOM	Archaeobacteria
CELL TYPE	Prokaryote
CELL STRUCTURES	Cell walls without peptidoglycan
NUMBER OF CELLS	Unicellular
MODE OF NUTRITION	Autotroph or heterotroph
EXAMPLES	Methanogens, halophiles

Domain Eukarya

The domain **Eukarya** consists of organisms that have a nucleus.

This domain is organized into four kingdoms:

- Protista
- Fungi
- Plantae
- Animalia

18-3 Kingdoms and Domains → Domain Eukarya

Classification of Living Things				
DOMAIN	Eukarya			
KINGDOM	Protista	Fungi	Plantae	Animalia
CELL TYPE	Eukaryote	Eukaryote	Eukaryote	Eukaryote
CELL STRUCTURES	Cell walls of cellulose in some; some have chloroplasts	Cell walls of chitin	Cell walls of cellulose; chloroplasts	No cell walls or chloroplasts
NUMBER OF CELLS	Most unicellular; some colonial; some multicellular	Most multicellular; some unicellular	Multicellular	Multicellular
MODE OF NUTRITION	Autotroph or heterotroph	Heterotroph	Autotroph	Heterotroph
EXAMPLES	<i>Amoeba</i> , <i>Paramecium</i> , slime molds, giant kelp	Mushrooms, yeasts	Mosses, ferns, flowering plants	Sponges, worms, insects, fishes, mammals

Protista

The kingdom **Protista** is composed of eukaryotic organisms that cannot be classified as animals, plants, or fungi.

Its members display the greatest variety.

They can be unicellular or multicellular; photosynthetic or heterotrophic; and can share characteristics with plants, fungi, or animals.

Fungi

Members of the kingdom **Fungi** are heterotrophs.

Most fungi feed on dead or decaying organic matter by secreting digestive enzymes into it and absorbing small food molecules into their bodies.

They can be either multicellular (mushrooms) or unicellular (yeasts).

Plantae

Members of the kingdom **Plantae** are multicellular, photosynthetic autotrophs.

Plants are nonmotile—they cannot move from place to place.

Plants have cell walls that contain cellulose.

The plant kingdom includes cone-bearing and flowering plants as well as mosses and ferns.

Animalia

Members of the kingdom **Animalia** are multicellular and heterotrophic.

The cells of animals do not have cell walls.

Most animals can move about.

There is great diversity within the animal kingdom, and many species exist in nearly every part of the planet.

18-3 Section QUIZ

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18-3 Section QUIZ

1 Organisms whose cell walls contain peptidoglycan belong in the kingdom

a. Fungi.

b. Eubacteria.

c. Plantae.

d. Archaeobacteria.

2 Multicellular organisms with no cell walls or chloroplasts are members of the kingdom

a. Animalia.

b. Protista.

c. Plantae.

d. Fungi.

3 Organisms that have cell walls containing cellulose are found in

- a. Eubacteria and Plantae.
- b. Fungi and Plantae.
- c. Plantae and Protista.
- d. Plantae only.

18-3 Section QUIZ

4 Molecular analyses have given rise to a new taxonomic classification that includes

a. three domains.

b. seven kingdoms.

c. two domains.

d. five kingdoms.

18-3 Section QUIZ

5 Which of the following contain more than one kingdom?

a. only Archaea

b. only Bacteria

c. only Eukarya

d. both Eukarya and Archaea