

## Chapter 6-6: The Five Kingdoms

In 1969, Robert H. Whittaker of Cornell University proposed a classification system that was made up of five kingdoms. The previous classification scheme used to identify plants and animals did not include certain organisms such as bacteria and mushrooms.

Whittaker's five-kingdom classification is based on two principal criteria: whether an organism is unicellular (single-celled) or multicellular (many-celled); and the type of nutrition that is practiced by the organism (photosynthesis, ingestion, or absorption). Whittaker's system has been widely accepted by the scientific community, and we will describe it in this plate.

As you look over the plate, you will notice that it contains a single large diagram that's divided into five sections that represent the five kingdoms. Organisms typifying each kingdom are shown.

At the base of Whittaker's five-kingdom system is the **Kingdom Monera (A)**. This kingdom contains a number of modern bacteria, cyanobacteria, and ancient bacteria called archaebacteria. Collectively, they are known as **monerans (A<sub>1</sub>)**. All of these organisms are prokaryotes, which means that they are single-celled and lack distinct nuclei and membrane-bound organelles. Bacteria are the most diverse and abundant organisms on Earth. They occupy a wide array of habitats and some are photosynthetic, while others are nonphotosynthetic. Cyanobacteria, once called blue-green algae because their chlorophyll is located in their membranes and not chloroplasts, are in this group. Most of the organisms in this kingdom are decomposers.

According to the Whittaker system, the monerans evolved to give rise to members of the **Kingdom Protista (B)**, which contains **protists (B<sub>1</sub>)**. Protists include the protozoa, single-celled algae, and slime molds; all of which are eukaryotes. The cells of protists have distinct nuclei and membrane-bound organelles, and most are unicellular. Heterotrophic and photosynthetic organisms exist in this kingdom and certain of them, such as slime molds, share characteristics with plants, protozoa, and fungi. Many of these organisms are producers in marine and freshwater environments, and there are some parasitic protists.

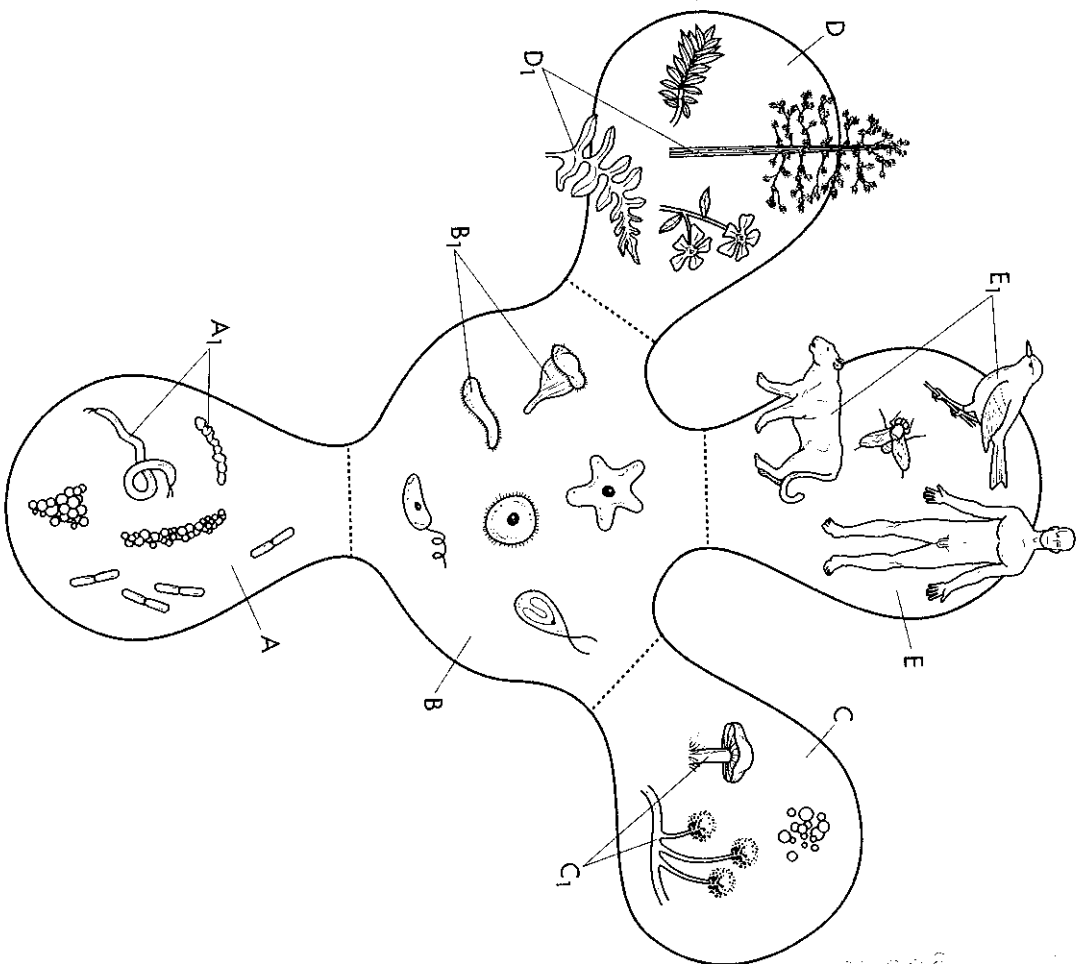
We have seen two of the kingdoms of the Whittaker system. Note that the kingdoms seem to be becoming increasingly complex. We will now look at the remaining three kingdoms. Continue your coloring as you read the paragraphs below.

In the Whittaker system, three kingdoms arose from the protists. The first is the **Kingdom Fungi (C)**, which contains **molds and yeasts (C<sub>1</sub>)**. These organisms are eukaryotic, heterotrophic, and usually multicellular; unicellular yeasts being one exception. Most of these organisms are decomposers, but some are parasites that coexist with animals and plants.

To the left, you can see the fourth kingdom, the **Kingdom Plantae (D)**, which includes the **plants (D<sub>1</sub>)**. According to the system, plants evolved from protists. All plants are eukaryotic and multicellular, and all are adapted for photosynthesis. During their development, these organisms pass through distinct developmental stages, and display alternation of generations (discussed in chapter 7). Almost the entire ecosystem depends on plants as the primary producers of oxygen. Also included in the Kingdom Plantae are mosses, ferns, seed-bearing plants, and flowering plants.

In the center of the plate is the final kingdom, the **Kingdom Animalia (E)**, which contains the wide variety of **animals (E<sub>1</sub>)**, all of which are eukaryotic. They are multicellular and heterotrophic, and most move by muscular contraction and respond to stimuli with specialized nervous tissue. One noble member of this kingdom is the human being.

As we complete this plate, you should be aware that there are exceptions to many of the general characteristics of each kingdom. For example most, but not all, animals move, and most, but not all, have complex organ systems.



The Five Kingdoms

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|--------------------------------|--|-------------------------------|
| ○ Kingdom Monera .....A        | ○ Protists .....B <sub>1</sub>         | ○ Plants .....D <sub>1</sub>  |
| ○ Monerans .....A <sub>1</sub> | ○ Kingdom Fungi .....C                 | ○ Kingdom Animalia .....E     |
| ○ Kingdom Protista .....B      | ○ Molds and Yeasts .....C <sub>1</sub> | ○ Animals .....E <sub>1</sub> |
| ○ Kingdom Plantae .....D       |  |                               |

### 6.6 The Five Kingdoms

- On what two principle criteria is Whittaker's five kingdom classification based?
- What forms the base of Whittaker's five kingdom system?
- Of what does the moneran kingdom consist?
- Are monerans prokaryotes or eukaryotes?
- Most of the members of the moneran kingdom are:
- According to the Whittaker system, into what kingdom did the monerans evolve?
- What do protists include?
- Are protists prokaryotes or eukaryotes?
- What three kingdoms arose from the protists?
- What is the exception to the multicellularity of Fungi?
- Although some are parasites, most fungi are:
- Describe characteristics of plants.
- What are included in the plant kingdom?
- Why does the entire ecosystem depend on plants?
- Describe characteristics of animals.
- Are there exceptions to many of the general characteristics of each kingdom?