

# Evolution of Species

## Key Words

**evolution:** the process by which living things change over time

## KEY IDEAS

Over time, single-celled organisms have evolved into multicellular living things. As a result of natural selection, groups of living things can change so much that they become new species.

**Evolution.** Over a long period of time, a species of living things can change into a different species. **Evolution** (ehv-uh-LOO-shuhn) is the process by which living things change over time.

Life on earth has evolved from the earliest one-celled organisms into the many different multicellular organisms around us today. The first living things appeared on earth about 3.8 billion years ago. They were single cells that could not make their own food. Instead they took in organic chemicals from their surroundings to get energy. They lacked cell organelles.

Sometime between 3 and 3.8 billion years ago, some of the early organisms evolved ways to make their own food through photosynthesis. These cells may have been the first photosynthetic bacteria.

Later, single cells with complex organelles and membranes evolved. This was an important step, for it led to the type of cell found in modern plants and animals. Between 3 billion and 1 billion years ago, various species of single-celled organisms evolved. Some of them began to live in groups or colonies. Species of multicellular organisms appeared on the earth less than 1 billion years ago.



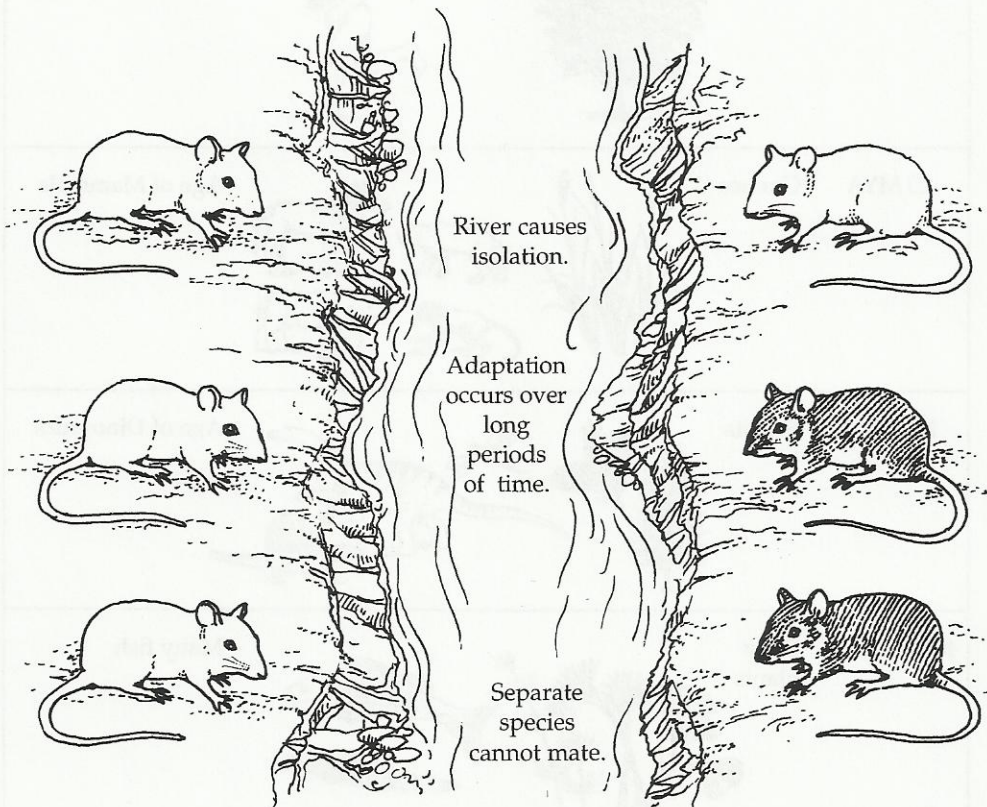
1. What is evolution? \_\_\_\_\_

**Evolution of Species.** New species continue to evolve today. One way in which a new species can evolve is through separation of groups within one species. The groups may be isolated by barriers such as an ocean, a mountain range, or other physical features.

Once the organisms of a species are isolated, each group adapts to its own environment. If the traits don't vary too much, organisms from the two groups might still be able to mate and produce offspring. They are still the

same species. But as more time passes and variations between the groups become greater, the two groups become more different. They can no longer mate and produce young. They have developed into two new species. This concept is shown in Fig. 14-1.

Fig. 14-1



Natural selection causes living things to change over time. Darwin's finches changed as they adapted to their islands. Because each group of birds lived on a separate island, they did not mate. Instead, the birds on each island changed in different ways as they adapted. In time, the finches became different species.

Darwin showed how groups of animals could adapt to their environment. He used the finch example and others to explain that all living things evolved from earlier species.

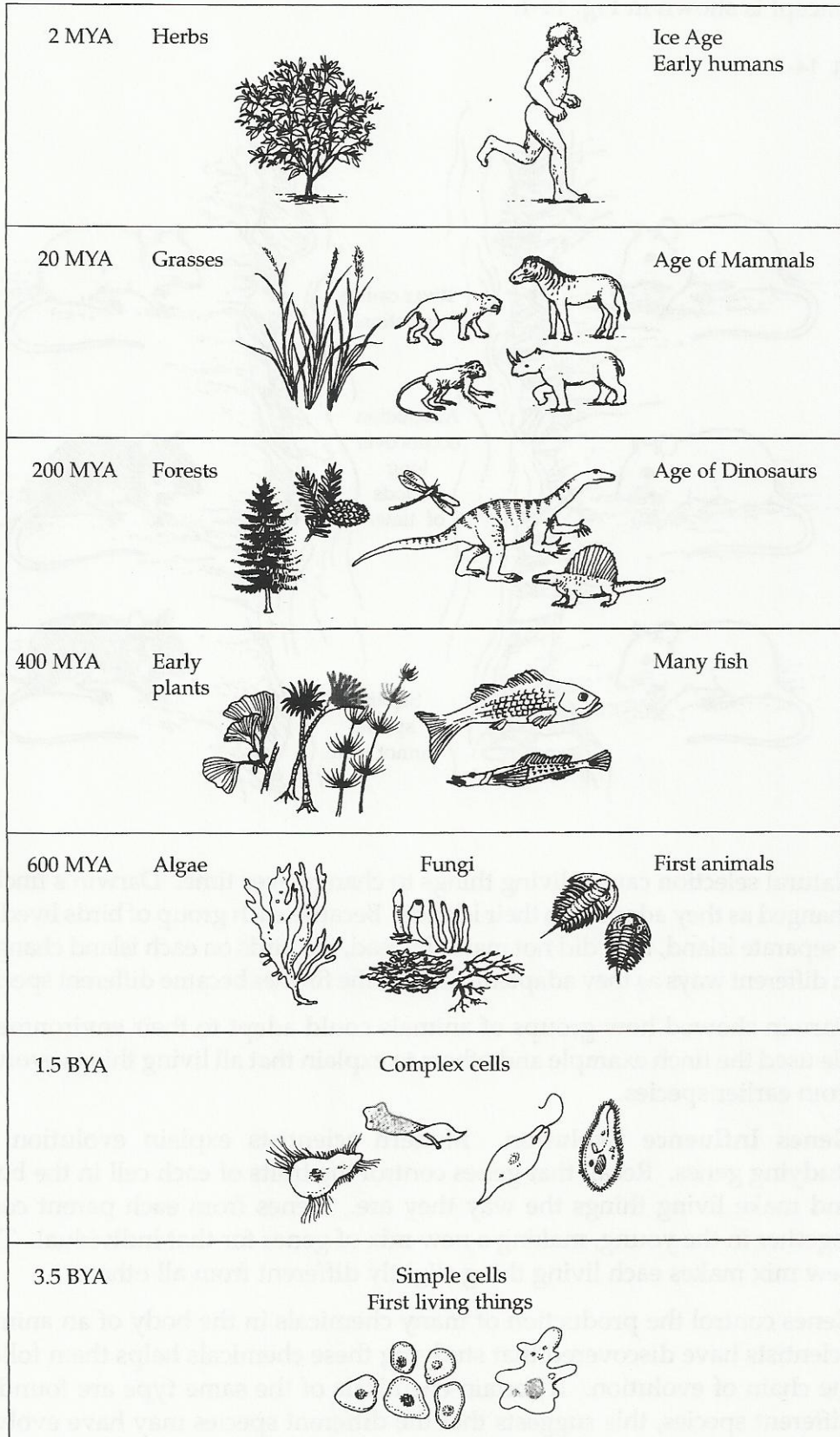
**Genes Influence Evolution.** Modern scientists explain evolution by studying genes. Recall that genes control the traits of each cell in the body and make living things the way they are. Genes from each parent come together in the young, making a new mix of genes for that individual. This new mix makes each living thing slightly different from all others.

Genes control the production of many chemicals in the body of an animal. Scientists have discovered that studying these chemicals helps them follow the chain of evolution. If certain chemicals of the same type are found in different species, this suggests that the different species may have evolved from the same species.

# TAKE ANOTHER LOOK

A summary of how organisms have changed over time is shown in Fig. 14-2.

Fig. 14-2



MYA = million years ago

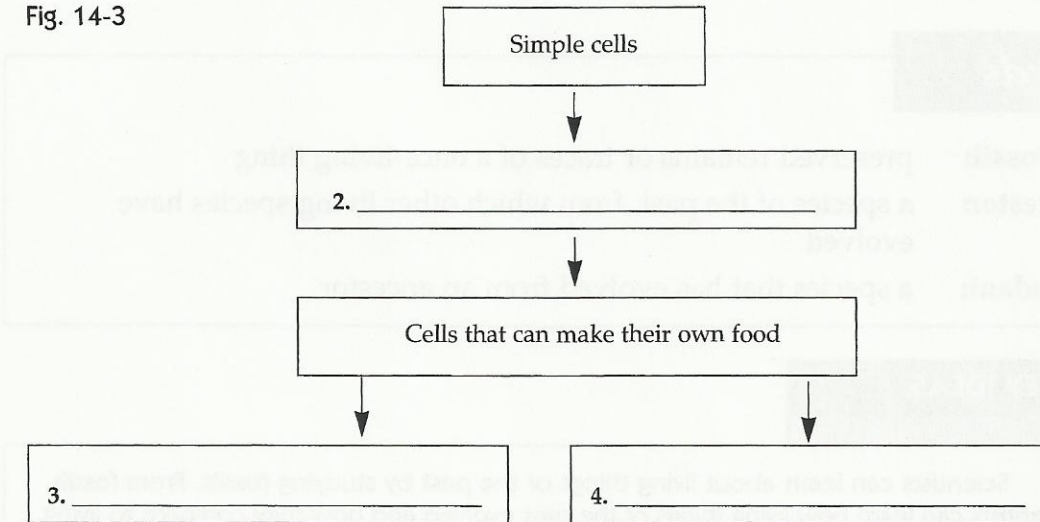
BYA = billion years ago

## Check Your Understanding

Complete the concept map shown in Fig. 14-3. Use the following terms:

*bacteria plants complex cells*

Fig. 14-3



5. Why does a group of living things change over time?

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6. What was one of the most important steps in the evolution of early living things? \_\_\_\_\_

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7. Explain how a new species can evolve from an older, existing species.

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