


# 1-3 Studying Life

Deep in the skull of a British teenager, an invisible invader eats away at brain tissue until it resembles a sponge. In a Costa Rican rain forest, a chameleon crawls past a bright red tree frog whose blue legs look like a pair of blue jeans, while a toucan uses its rainbow-colored bill to slice into a wild avocado. These scenes all involve biology—the study of life. (The Greek word *bios* means “life,” and *-logy* means “study of.”) **Biology** is the science that employs the scientific method to study living things.

The scientific study of life has never been more exciting than it is today. Why? Think about headline news stories you may have heard about over the last couple of years—and even over the last couple of days. Hantavirus crops up in Southwestern states. Dengue fever threatens the Gulf Coast. Mice, sheep, and even dogs have been cloned. Genetically-engineered crop plants are designed to resist insect pests. The stories behind these and many other headlines come from the study of living things.

## Characteristics of Living Things

Are the firefly and the fire in **Figure 1-14** alive? They are both giving off energy. Describing what makes something alive is not easy. No single characteristic is enough to describe a living thing. Also, some nonliving things share one or more traits with living things. Mechanical toys, automobiles, and clouds move around, for example, whereas mushrooms and trees live their lives in one spot. Other things, such as viruses, exist at the border between organisms and nonliving things.

Despite these difficulties, it is possible to describe what most living things have in common.  **Living things share the following characteristics:**

- Living things are made up of units called cells.
- Living things reproduce.
- Living things are based on a universal genetic code.
- Living things grow and develop.
- Living things obtain and use materials and energy.
- Living things respond to their environment.
- Living things maintain a stable internal environment.
- Taken as a group, living things change over time.

**Figure 1-14** A Colorado firefly beetle (top) has all of the characteristics of living things. Even though fire (bottom) uses materials and can grow as living things do, fire is not alive because it does not have other characteristics of living things.

## Guide for Reading

### Key Concepts

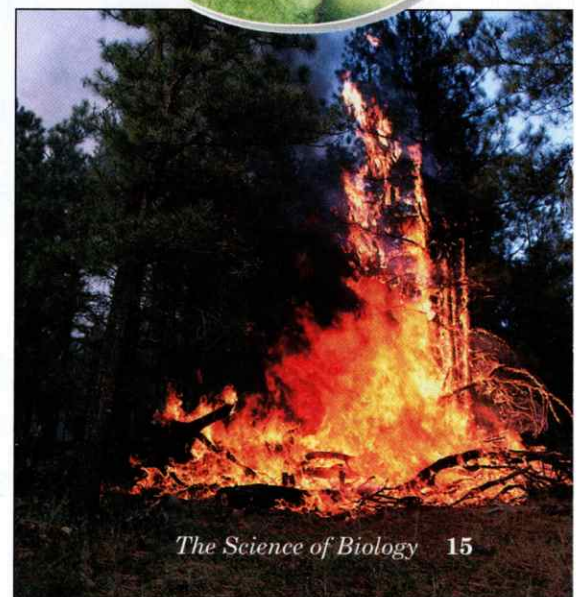
- What are some characteristics of living things?
- How can life be studied at different levels?

### Vocabulary

biology  
cell  
homeostasis  
sexual reproduction  
asexual reproduction  
metabolism  
stimulus

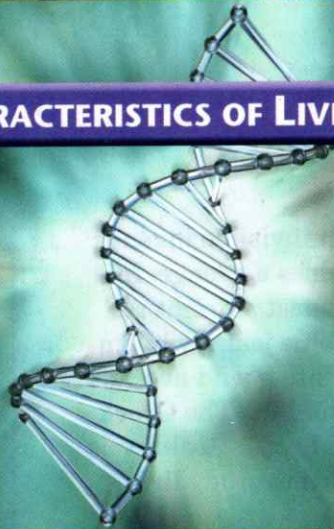
### Reading Strategy:

**Summarizing** As you read, make a list of the properties of living things. Write one sentence describing each property.



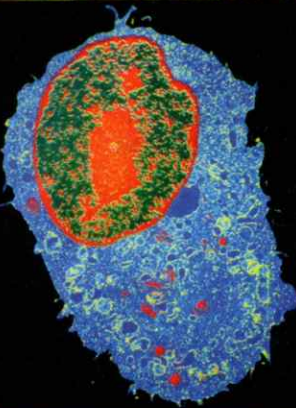
## FIGURE 1-15 THE CHARACTERISTICS OF LIVING THINGS

All living things share certain characteristics as is evident in this redwood forest.



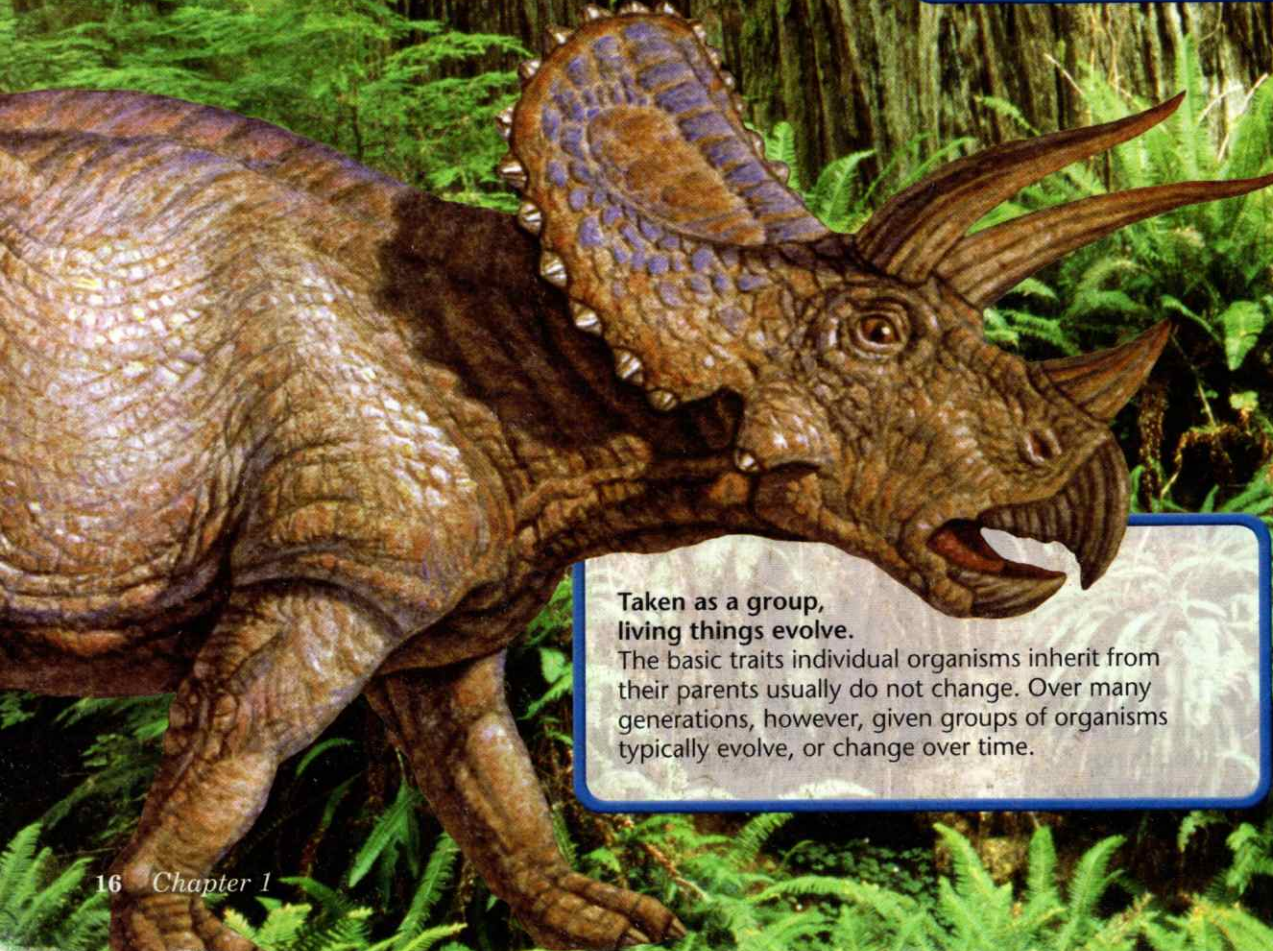
Living things are based on a **universal genetic code**.

All organisms store the complex information they need to live, grow, and reproduce in a genetic code written in a molecule called DNA.



Living things are made up of **cells**. A cell is the smallest unit of an organism that can be considered alive.

Living things maintain a **stable internal environment**. Although conditions outside an organism may change dramatically, most organisms need to keep conditions inside their bodies as constant as possible. This process is called **homeostasis**.



Taken as a **group**, living things **evolve**.

The basic traits individual organisms inherit from their parents usually do not change. Over many generations, however, given groups of organisms typically evolve, or change over time.



**Living things grow and develop.** Every organism has a particular pattern of growth and development. During development, a single fertilized egg divides again and again. As these cells divide, they undergo differentiation, which means that the cells begin to look different from one another and to perform different functions.



**Living things respond to their environment.**

Organisms detect and respond to **stimuli** from their environment. A stimulus is a signal to which an organism responds.

**Living things reproduce.** All organisms reproduce, which means that they produce new organisms. Most plants and animals, including this black bear, engage in sexual reproduction. In **sexual reproduction**, cells from two different parents unite to form the first cell of the new organism. Other organisms reproduce using **asexual reproduction**, in which a single parent produces offspring that are identical to itself.

**Living things obtain and use material and energy.**

All organisms, including this Pacific salamander, must take in materials and energy to grow, develop, and reproduce. The combination of chemical reactions through which an organism builds up or breaks down materials is called **metabolism**.

