TOPIC 1.1

What are the characteristics of living things?

Key Concepts

- Living things are made of cells, take in nutrients, use energy, and produce waste.
- Living things respond to stimuli, grow, and reproduce.

Curricular Competencies

- Make observations aimed at identifying your own questions about the natural world.
- Consider Aboriginal perspectives and knowledge, other ways of knowing, and local knowledge as sources of information.
- Experience and interpret the local environment.
- Generate and introduce new or refined ideas when problem solving.

You, and most people, make distinctions between what is and is not a living thing. A tree is a living thing, but a building is not. A White Admiral butterfly, common throughout much of British Columbia, is alive, but a bulldozer is not. What is life?

Scientists usually do not try to define what "life" is. Instead, they describe features or characteristics that are shared by all living things. These characteristics of living things include their physical features, how they behave, and how they use matter and energy to support and sustain their lives.

Starting Points

Choose one, some, or all of the following to start your exploration of this topic.

1. **Identifying Preconceptions** Examine the photos on these two pages. With the members of your group, brainstorm a list of characteristics that let you separate the living things from the non-living things. Compare your list with other groups. See if you can develop a class list of characteristics of life.
2. **Questioning** Some scientists search for life in our solar system and beyond. How will they know if they have found it? What characteristics do you think they should be looking for?
3. **Processing Information** Imaginary worlds abound on TV, in movies, in books, and in comics. These worlds are populated with all kinds of creatures. Choose a character from a show or story that you know, and list the characteristics that you think make it "alive." (Special challenge: How would your thinking change for a character in a story that features zombies or vampires?)

Key Terms

There is one key term that is highlighted in bold type in this Topic:

- cell

Flip through the pages of this Topic to find this term. Add it to your class Word Wall along with its meaning. Add other terms that you think are important and want to remember.

CONCEPT 1

Living things are made of cells, take in nutrients, use energy, and produce waste.

Activity

Hands-On with a Hand Lens

Obtain a hand lens and start observing objects in the places around you. For each, record and share what you see with and without the hand lens.

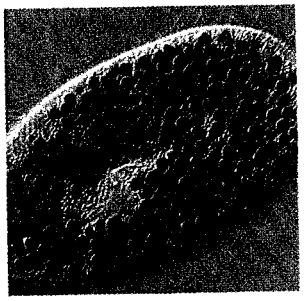
Why are ocean waves or rock formations considered to be non-living, but a bacterium and a plant are living? Throughout history, scientists have collected data and continued to define the characteristics of living things. Four of these characteristics are discussed below.

Living Things Are Made of Cells

cell the basic structural and functional unit of life

All living things are made of one or more cells. Scientists consider the **cell** to be the basic unit of life. Cells have structures that enable them to carry out life processes. Life processes include all of the chemical reactions that help a living thing obtain and use energy, break down nutrients, build molecules, and grow. Life processes also enable a living thing to copy its genetic material, repair injuries, and excrete wastes.

As shown in **Figure 1.1**, some living things are only one cell. Examples of single-celled or unicellular organisms are bacteria and some protists, such as *Euglena* and *Paramecium*. **Figure 1.1** also shows multicellular organisms, which are made up of many cells. (The word "organism" means the same thing as "living thing.") You and many other living things are multicellular organisms.



Paramecium

Pacific Dogwood

Spirit Bear

Figure 1.1 Whether they are one-celled or many-celled, the cells of all organisms carry out life processes. **What is the significance of the Spirit Bear to First Peoples? How do First Peoples use the Pacific Dogwood?**

Living Things Take in Nutrients

All living things take in nutrients. These are substances that living things need but cannot make for themselves. Most organisms get the nutrients they need by eating food. Living things such as those shown in **Figure 1.2** are consumers. They eat (consume) other organisms for food. Other kinds of living things, such as plants, are called producers, because they can produce their own food using the Sun's energy and nutrients from their surroundings.

Figure 1.2 Squirrels, sea otters, and humans are all consumers. They get their nutrients from eating food. The grass the squirrel is eating is an example of a producer.

Living Things Use Energy

All living things use energy to carry out life processes (**Figure 1.3**). Producers use the food they make as a source of energy. Consumers get energy from the food they eat. The energy in food is released through a process called cellular respiration. The energy from food is used for many purposes, such as growth, responding to changes in the environment, movement, and even sleep.

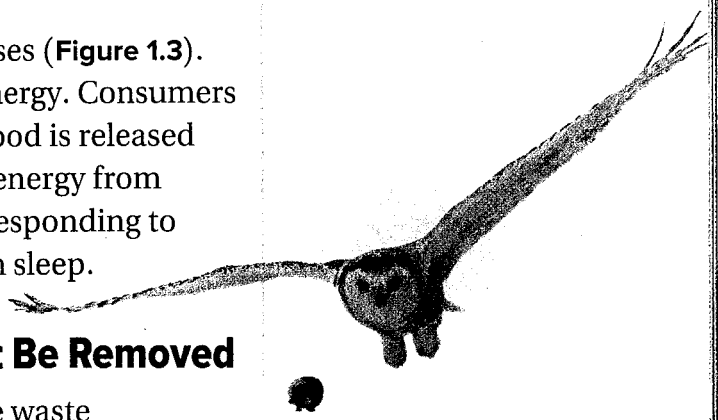


Figure 1.3 The snowy owl visits southern parts of B.C. from the Arctic in late fall and winter. Mice are among its sources of food energy. **Snowy owl is sacred to many First Peoples. What stories can you learn about snowy owl?**

Living Things Produce Waste That Must Be Removed

Through their life processes, living things produce waste substances that are harmful if they are not removed. All cells have structures that store and remove waste. Unicellular organisms have different ways to do this. For example, some waste passes naturally across the outer membrane of a cell into the surrounding environment. Other waste is expelled from the cell through a structure called a vesicle.

Multicellular organisms have structures or systems that collect and remove waste from the body. For example, humans have structures called kidneys that filter waste from the blood. The waste is removed from the body when a person urinates.

Before you leave this page . . .

1. How are unicellular and multicellular living things similar and different?
2. Why do living things need energy, and where do they get it?