

## Unit 2 Life Science: Part I

- Chapter 3 The Study of Life
- Chapter 4 Cells and Life
- Chapter 5 The Kingdoms of Life
- Chapter 6 The Animal Kingdom
- Chapter 7 The Plant Kingdom
- Chapter 8 Genetics: The Code of Life
- Chapter 9 Evolution



*A small waterfall is a favorite place for this grizzly bear to catch fish. Scientists learn about grizzly bears and other animals mostly by observing them where they live.*

Use the photo and chart to answer the following questions.

1. What things in the photo would be of most interest to a botanist?
2. What things in the photo would be of most interest to a zoologist?
3. What part of the photo might interest an ecologist the most?

Life Scientists	What They Study
Botanists	Plants
Zoologists	Animals
Ecologists	Interactions between organisms and their environment



*This bat has a built-in radar system to hunt for insects in total darkness. What other skills do you think bats and other living things need to survive?*

### Learning Objectives

- Define five important fields in biology.
- Describe what an organism is.
- Explain the five main characteristics of life.
- Give examples of how an organism responds to its environment.
- Compare the life spans of different organisms.
- LAB ACTIVITY: Observe how behavior can be learned.
- SCIENCE IN YOUR LIFE: Plan a garden that will bloom from spring through fall.

## Words to Know

<b>organism</b>	any living thing or once-living thing
<b>biology</b>	the study of all organisms on Earth, including plants and animals
<b>botany</b>	the study of plant life
<b>zoology</b>	the study of animal life
<b>genetics</b>	the study of how living things pass along certain features of themselves to their offspring
<b>microbiology</b>	the study of organisms too small to be seen with the eye alone
<b>ecology</b>	the study of interactions between organisms and their environment
<b>characteristic</b>	a quality or feature of a person or thing
<b>waste</b>	the part of food that an organism does not need after it uses the food for energy
<b>reproduce</b>	to make more of one's own kind of organism
<b>environment</b>	everything that surrounds you
<b>life span</b>	the amount of time an organism is likely to live

## 3-1

# A Home for Life

## Words to Know

<b>organism</b>	any living thing or once-living thing
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### Remember

The Earth is about 93 million miles (150 million kilometers) from the sun.

The Earth is *exactly* the right distance from the sun for us and for all other life on the planet. If the Earth were just 5 percent closer to the sun, the heat would be too great. The oceans would dry up. Life could not exist. If the Earth were just 5 percent farther away from the sun, the whole planet would be completely covered with ice. Life could not exist.

Lucky for us, the Earth is well set up for life. The temperature is right. There is plenty of water. We can breathe the air.

## The Variety of Living Things

The Earth is filled with life. Your schoolyard alone is home to millions of plants, animals, and other living things.

A living thing is called an **organism**. Something that once was alive is also called an organism. The study of all the organisms on Earth, including plants and animals, is called **biology**, or life science.

Differences in the sizes and shapes of organisms can be great. The blue whale is about 90 feet (27 meters) long. The adult weighs over 200,000 pounds (90,000 kilograms). This equals almost 23 elephants put together. Giant redwood trees grow to be 300 feet (90 meters) tall. Their trunks can be more than 15 feet (4.5 meters) thick. Millions of living things are so small you cannot see them.

✓ **What is the study of all the organisms on Earth?**

### Dividing Up Life Science

Life science is a very big field of study. It is divided into a number of smaller fields. There are five important ones. Most life scientists choose only one of these fields to work in.

**Botany** is the study of plant life. **Zoology** is the study of animal life. **Genetics** is the study of how living things pass along certain features of themselves to their offspring. **Microbiology** is the study of organisms too small to be seen with the eye alone. **Ecology** is the study of interactions between organisms and their environment.

✓ **What are the five major fields of life science, or biology?**

### Lesson Review

1. What would happen if the Earth were closer to or farther from the sun?
2. In what ways do organisms differ from one another?
3. What do people study in microbiology?
4. **CRITICAL THINKING** About how many times longer is a blue whale than a person? Use Figure 3-1.

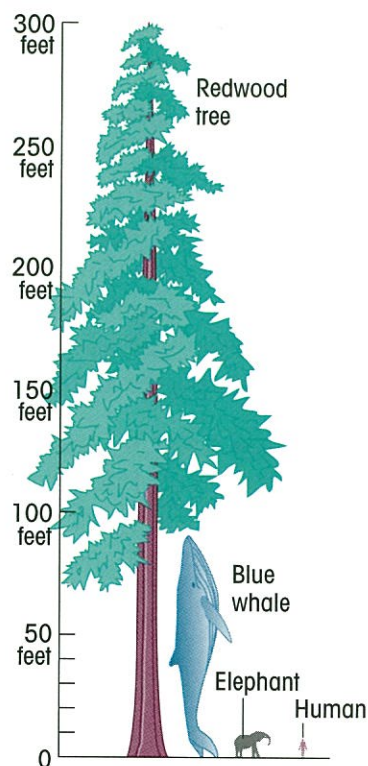


Figure 3-1 *The sizes of different organisms vary.*

## On the Cutting Edge

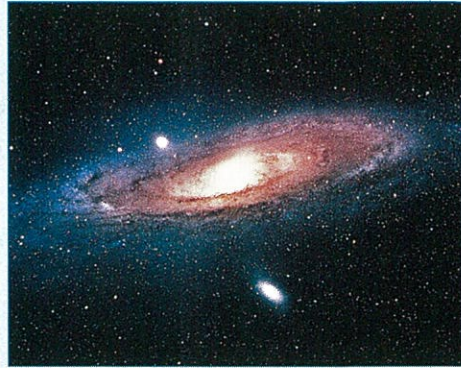
### IS THERE LIFE ON OTHER PLANETS?

SETI stands for Search for Extraterrestrial Intelligence. The SETI league is made up of scientists who believe there may be life on other planets. Presently the SETI league has two projects: Project Argus and Project Phoenix. Both projects use powerful telescopes to search the skies for radio waves.

Project Argus's telescopes search the whole sky. Project Phoenix's telescopes search only around nearby stars that are like the sun. Scientists hope that somewhere beyond the Earth, intelligent beings are sending out messages. The radio telescopes may pick up these messages.

At first, most people thought SETI was a foolish idea. Today many scientists suspect that there may be life on other planets. The universe is so huge, and other planets and solar systems have been detected.

**CRITICAL THINKING** What might scientists think if a telescope picked up a radio signal from outer space?



*Some scientists search for life on planets in the Andromeda galaxy. It is one of the closest galaxies to the Milky Way galaxy.*

## 3-2

## What Is Life?

### Words to Know

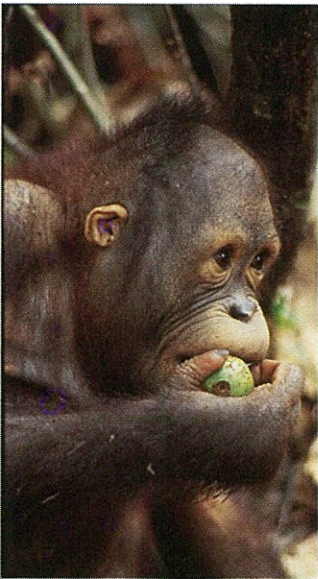
**characteristic** a quality or feature of a person or thing

**waste** the part of food that an organism does not need after it uses the food for energy

**reproduce** to make more of one's own kind of organism

**environment** everything that surrounds you

**life span** the amount of time an organism is likely to live



*All animals, such as this orangutan, need to eat to survive.*

### The Characteristics of Life

A **characteristic** is a quality or feature of a person or thing. Characteristics make one living thing different from another. A few of your characteristics include your hair color, height, shape, and personality type.

All living things share at least five important characteristics. Humans share these characteristics with blue whales, weeds, mushrooms, and every other organism on Earth. All living things have these characteristics:

1. They get and use food for energy.
2. They move.
3. They grow.
4. They reproduce.
5. They respond to their environment.

✓ **What important characteristics do all organisms share?**



### Safety Alert

Many plants have poisonous parts. This is the plant's defense against being eaten. Some plants are poisonous to eat. Others are poisonous to touch. The oil on the shiny, three-pointed leaves of poison ivy can cause a skin rash. Wash your body and clothes right away if you come in contact with it. Use rubbing alcohol on your skin, and see a doctor if a rash develops.

## Getting and Using Food

How long would you last without food and water? You might be able to live without food for a few weeks. However, you could not go without water for even four days. All living things must have food and water.

Plants make their own food. They take in water from the ground and carbon dioxide from the air. The sun's energy is used to change water and carbon dioxide into sugar. This sugar is stored in the plant as food. When the plant needs energy, it breaks down this stored food.

Some animals eat plants. Some animals eat other animals for food. Still other animals eat both plants and animals.

The food must be broken down for the organism to use it. Certain parts of the organism and chemicals that the organism produces break down the food. After using the food for energy, the animal must get rid of **waste**. Waste is the part of food that an organism does not need after it uses the food for energy.



### How do plants and animals get and use food?

## Moving

Animals must be able to move. They need to find food. They must be able to move away from danger. They also need to be able to find mates. Different animals move in different ways. Some fly, others walk or run, and still others swim. Plants also move. Their movements, though, are smaller and harder to notice.

Put a green plant in a room with one window. Within a day or two, the plant's leaves will be facing the window. After several days, the whole plant will probably lean toward the window. Plants always move in the direction of sunlight. That is because plants use sunlight to make their own food.



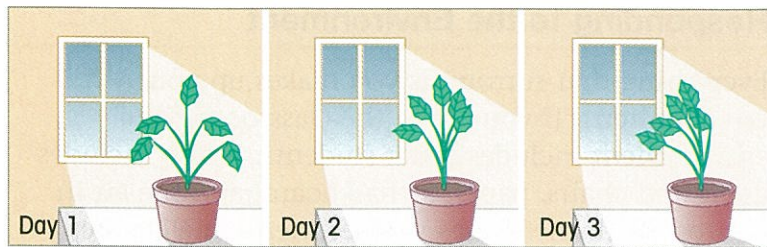


Figure 3-2 *Plants move toward sunlight.*

### ✓ Why do animals and plants move?

#### Growing

All living things grow. After a certain size is reached, most organisms stop growing. People stop growing taller when they are between 15 and 20 years old. Some trees grow for hundreds of years before reaching their full height.

### ✓ Which living things grow?

#### Reproducing

All organisms can **reproduce** themselves. This means they are able to make more of their own kind of organism. When a cat has kittens, she has reproduced. When a human has a baby, she has reproduced.

Most animals and plants come from two parents. This is called *sexual reproduction*. Many plants, using sexual reproduction, produce seeds. These seeds fall to the Earth or are carried by wind, water, or animals to a good place to grow.

Smaller organisms often have only one parent. The organism makes a copy of itself, then divides in half. This is called *asexual reproduction*. Some plants and a few animals can also reproduce asexually. New life may grow from a bud or a part of the parent, like a cutting from a leaf or the eye from a potato.

### ✓ What are the two main ways organisms reproduce?

#### Science Fact



The world's largest organism may be a giant underground fungus. It was discovered in the woods on the Wisconsin-Michigan border in 1992. It covers over 37 acres, weighs over 100 tons, and is still growing.

## Responding to the Environment

Everything that surrounds you makes up your **environment**. If you are in the classroom, your environment includes other students. It also includes desks and chairs, paper, a chalkboard, and the air in the room. All the things you see, hear, smell, taste, or feel around you are parts of the environment.

To respond means to react to things in the environment. If a friend grabs your arm, you will respond. You may pull away. You may turn around. You may do any number of things.

All living things respond to their environment. Zebras respond to the sight or smell of lions by running for safety. Garden plants respond to heavy watering by growing deep roots.

✓ What does it mean to respond?

### A Closer Look

#### HATCHING TEMPERATURES

Newly hatched green turtles leave their nests on the beach and head for the sea. Whether they are male or female depends on how warm their nest was.

Cooler nests (less than 82°F, or 27.7°C) produce males. Warmer nests (greater than 85°F, or 29.4°C) produce females. Nests with in-between temperatures produce both males and females.

Different beaches have different general temperatures. Some beaches produce mostly male turtles. Some produce mostly female turtles. Scientists are working on ways to protect these beaches. That way, there will always be enough green turtles of both sexes.

**CRITICAL THINKING** Suppose all or most of the beaches that produce female turtles are destroyed. How would this affect the number of green turtles?



*A green turtle hatchling heads for the sea.*

## How Long Do Organisms Live?

All living things die. However, different organisms have different life spans. A **life span** is the amount of time an organism is likely to live. A mayfly lives its entire adult life in one day. Most small dogs live for about 14 years. The white pine tree lives for almost 500 years. The bristlecone pine tree lives up to 5,000 years.

In the United States, the average human life span is now about 76 years. Earlier this century, the average life span was about 65 years. Progress in medical science and nutrition has helped to lengthen the human life span. Scientists hope that new discoveries will help them find a way to slow down aging. Perhaps by the year 2200, the average life span will be nearly 100 years!

✓ How are the life spans of organisms different?

### Lesson Review

1. Name two characteristics for each of these living things:
  - tree
  - fish
  - dog
  - flower
  - cow
  - worm
2. What is included in your environment?
3. What two things have helped to lengthen the average human life span?
4. **CRITICAL THINKING** A computer is an amazing thing. Why is it not a living thing?



## LAB ACTIVITY

### Observing Learning

#### BACKGROUND

Some of the ways that you respond to your environment are learned. For example, suppose you are raking leaves on a windy day. You quickly learn that it is better to rake with the wind instead of against it. Sometimes, people and other animals learn by trial and error. That means learning by practicing and correcting mistakes.

#### PURPOSE

You will find out if response time can be improved with practice.

#### MATERIALS

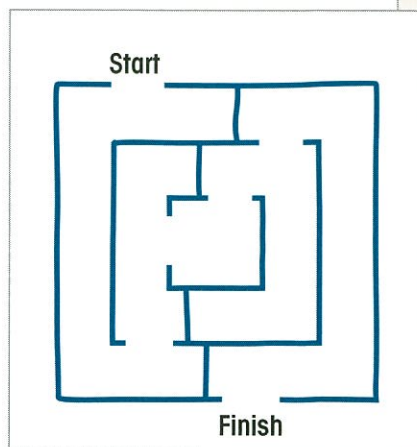
construction paper, pencil, marker, watch or clock with second hand

#### WHAT TO DO

1. Copy the chart to the right.
2. Copy the maze onto the construction paper.
3. Give your maze to a partner.
4. Time how long your partner takes to move a finger along a path from start to finish. Record the number of minutes and seconds in the chart.
5. Repeat Step 4 three more times.

#### DRAW CONCLUSIONS

- How long did your partner take to go through the maze each time?
- Did the times increase or decrease?
- What do you think caused the differences in times?



*Here is a maze you can try.*

Number of Tries	Amount of Time
1	
2	
3	
4	

## SCIENCE IN YOUR LIFE

### Plan a Flower Garden

You know that plants respond to sunlight by growing and turning toward the light. The flowers of plants also respond to light.

The blooming, or flowering, of many kinds of plants depends on the lengths of days and nights. Some plants bloom only when days are shorter than the nights. These plants are called short-day plants. Short-day plants flower in spring or fall.

Long-day plants bloom when days are longer than the nights. Long-day plants flower during summer.

Some plants do not respond at all to changes in day length. They flower after several days or weeks of growing. These plants have a long flowering season.

Flower growers can control the flowering time of some plants. For example, mums are short-day plants. They usually bloom in fall, when the days are shorter than the nights. In summer, growers can cover the mums each afternoon. This makes their days shorter than their nights and causes them to bloom.

**Use the table, which shows when certain flowers bloom, to answer the questions.**

1. What flowers bloom in summer?
2. When do tulips and pansies bloom?
3. Make a map of a small garden. Use symbols to show the location of different flowers in your garden. Make your garden bloom from spring through fall.



*Mums are normally short-day plants. They bloom in fall.*

Flower	Season It Blooms
Tulip	Spring
Pansy	Spring
Poppy	Summer
Iris	Summer
Carnation	Summer
Mum	Fall
Goldenrod	Fall

#### Critical Thinking

Suppose a garden included tulips, pansies, and goldenrod. Would the garden have flowers from spring through fall? Explain.

**Summary**

Biology, or life science, is the study of organisms.

**Lesson 3.1**

Biology is broken down into five smaller fields of study. They are botany, zoology, genetics, microbiology, and ecology.

**Lesson 3.2**

All organisms share five important characteristics. All organisms get and use food, move, grow, reproduce, and respond to their environments.

**Vocabulary Review**

Match each definition with a term from the list.

biology

genetics

microbiology

ecology

waste

reproduce

environment

life span

1. To make more of one's own kind
2. The study of how life's features are passed on to offspring
3. The number of years a type of living thing is likely to live
4. Everything that surrounds you
5. The study of all living things
6. The study of living things that you cannot see with your eye alone
7. The part of food that an organism does not need after it uses the food for energy
8. The study of interactions between organisms and their environment

## Chapter Quiz

Write your answers on a separate sheet of paper.

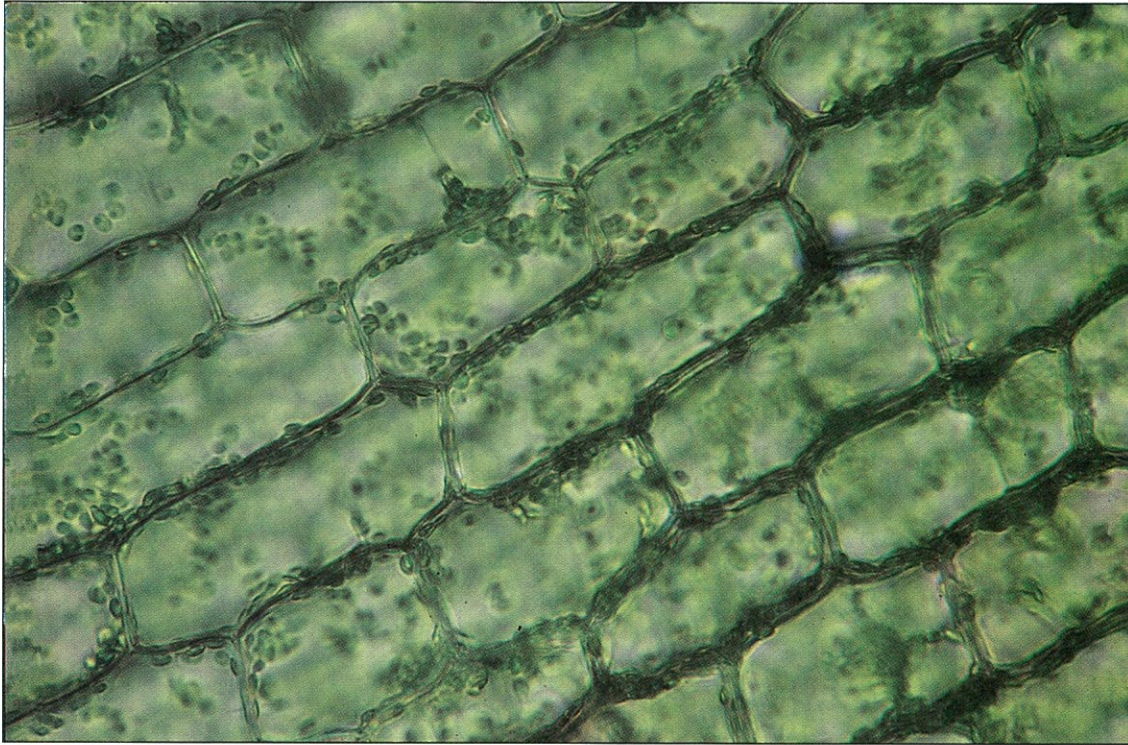
1. Which of the following are organisms: dog, robot, dead fly, pencil? Explain how you know.
2. What would you study if you took a course in zoology?
3. What field of biology is the study of plants?
4. What five characteristics do you share with every other living thing?
5. What do plants use to make their own food?
6. What are three reasons animals must be able to move?
7. Why must plants be able to move?
8. Why are seeds important for a plant?
9. What are ten things in your environment?
10. Do all organisms have the same life spans? Give an example to explain your answer.

### Test Tip

Some questions ask for a certain number of items, such as five characteristics or three reasons. Be sure to give the correct number of items in your answers.

### Research Project

Research the kinds of organisms that live in the deep ocean, especially near features called hot-water vents. Write a report on how these organisms are able to survive in such a harsh environment. Include in your report a description of the environment and drawings of the organisms.



*The boxlike objects in the picture might remind you of bricks in a wall. However, these objects are all alive. They make up things you see everyday. What do you think they are? Use the color as a clue.*

### Learning Objectives

- Explain how Robert Hooke discovered the cell.
- Compare cells, atoms, molecules, and elements.
- Describe the parts of a cell.
- Explain how cells get energy and use it.
- Compare and contrast plant cells and animal cells.
- Describe DNA and its function.
- LAB ACTIVITY: Make models of plant and animal cells.
- ON-THE-JOB SCIENCE: Compare normal cells and cancer cells.