

Interactions Within Communities

As You Read

What You'll Learn

- **Describe** how organisms obtain energy for life.
- **Explain** how organisms interact.
- **Recognize** that every organism occupies a niche.

Vocabulary

producer	commensalism
consumer	parasitism
symbiosis	niche
mutualism	

Why It's Important

How organisms obtain food and meet other needs is critical for their survival.

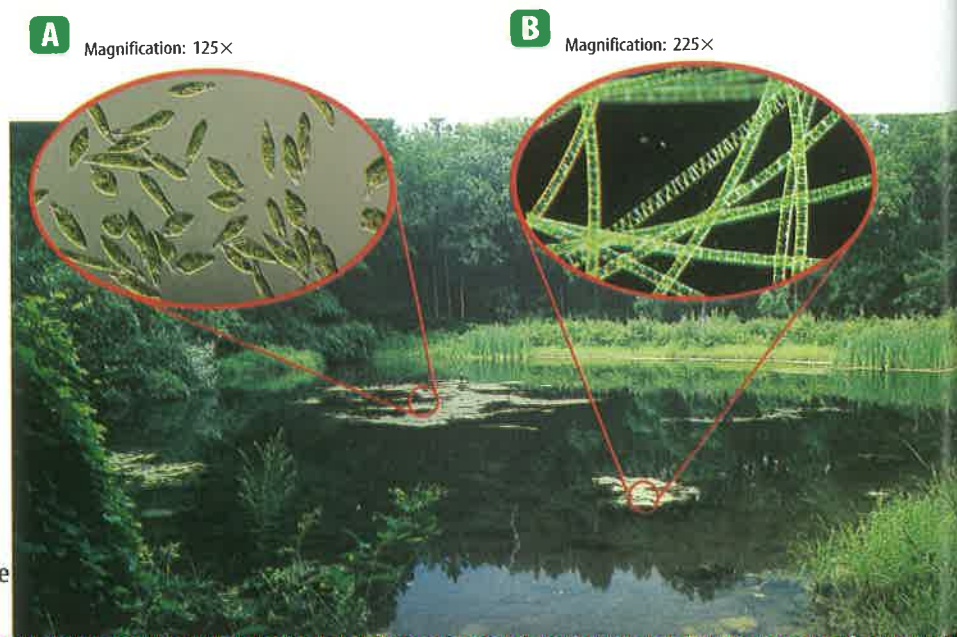
Obtaining Energy

Just as a car engine needs a constant supply of gasoline, living organisms need a constant supply of energy. The energy that fuels most life on Earth comes from the Sun. Some organisms use the Sun's energy to create energy-rich molecules through the process of photosynthesis. The energy-rich molecules, usually sugars, serve as food. They are made up of different combinations of carbon, hydrogen, and oxygen atoms. Energy is stored in the chemical bonds that hold the atoms of these molecules together. When the molecules break apart—for example, during digestion—the energy in the chemical bonds is released to fuel life processes.

Producers Organisms that use an outside energy source like the Sun to make energy-rich molecules are called **producers**. Most producers contain chlorophyll (KLOR uh fihl), a chemical that is required for photosynthesis. As shown in **Figure 12**, green plants are producers. Some producers do not contain chlorophyll and do not use energy from the Sun. Instead, they make energy-rich molecules through a process called chemosynthesis (kee moh SIHN tuh sus). These organisms can be found near volcanic vents on the ocean floor. Inorganic molecules in the water provide the energy source for chemosynthesis.

Figure 12

Green plants, including the grasses that surround this pond, are producers. The pond also contains many other producers, including microscopic organisms like **A** *Euglena* and **B** simple plantlike organisms called algae.



A Magnification: 125×

B Magnification: 225×

Consumers

Herbivores



Carnivores



Omnivores



Decomposers



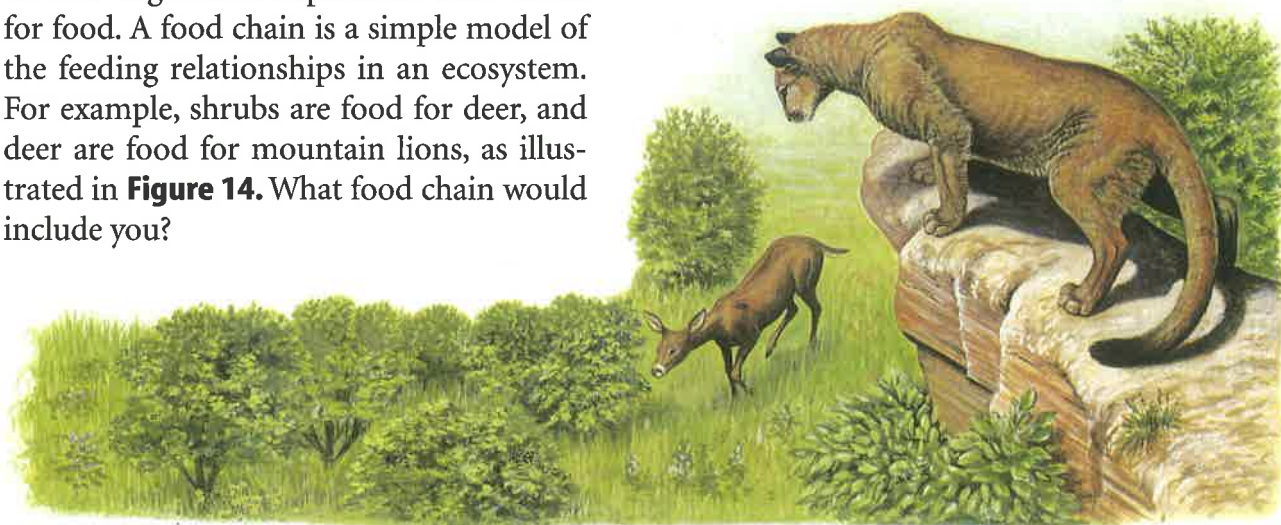
Figure 13

Four categories of consumers are shown. What kind of consumer is a cactus wren? A mushroom?

Consumers Organisms that cannot make their own energy-rich molecules are called **consumers**. Consumers obtain energy by eating other organisms. **Figure 13** shows the four general categories of consumers. Herbivores are the vegetarians of the world. They include rabbits, deer, and other plant eaters. Carnivores are animals that eat other animals. Frogs and spiders are carnivores that eat insects. Omnivores, including pigs and humans, eat mostly plants and animals. Decomposers, including fungi, bacteria, and earthworms, consume wastes and dead organisms. Decomposers help recycle once-living matter by breaking it down into simple, energy-rich substances. These substances might serve as food for decomposers, be absorbed by plant roots, or be consumed by other organisms.

 **Reading Check** How are producers different from consumers?

Food Chains Ecology includes the study of how organisms depend on each other for food. A food chain is a simple model of the feeding relationships in an ecosystem. For example, shrubs are food for deer, and deer are food for mountain lions, as illustrated in **Figure 14**. What food chain would include you?



Chemistry INTEGRATION

Glucose is a nutrient molecule produced during photosynthesis. Look up the chemical structure of glucose and draw it in your Science Journal.

Figure 14

Food chains illustrate how consumers obtain energy from other organisms in an ecosystem.

Symbiotic Relationships

Figure 15
Many examples of symbiotic relationships exist in nature.

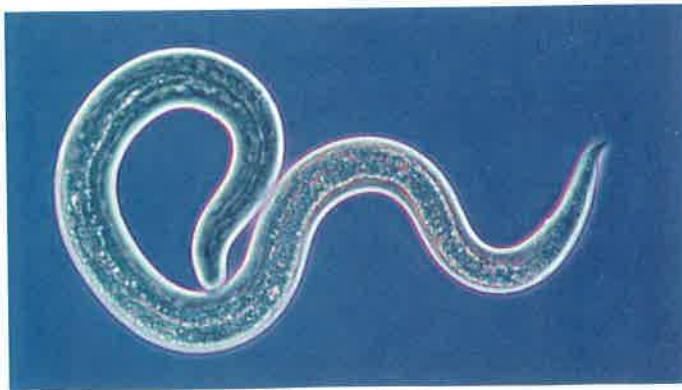


A Lichens are a result of mutualism.

B Clown fish and sea anemones have a commensal relationship.



Magnification: 128×



C Some roundworms are parasites that rob nutrients from their hosts.

Not all relationships among organisms involve food. Many organisms live together and share resources in other ways. Any close relationship between species is called **symbiosis**.

Mutualism You may have noticed crusty lichens growing on fences, trees, or rocks. Lichens, like those shown in **Figure 15A**, are made up of an alga or a cyanobacterium that lives within the tissues of a fungus. Through photosynthesis, the cyanobacterium or alga supplies energy to itself and the fungus. The fungus provides a protected space in which the cyanobacterium or alga can live. Both organisms benefit from this association. A symbiotic relationship in which both species benefit is called **mutualism** (MYEW chuh wuh lih zum).

Commensalism If you've ever visited a marine aquarium, you might have seen the ocean organisms shown in **Figure 15B**. The creature with gently waving, tubelike tentacles is a sea anemone. The tentacles contain a mild poison. Anemones use their tentacles to capture shrimp, fish, and other small animals to eat. The striped clown fish can swim among the tentacles without being harmed. The anemone's tentacles protect the clown fish from predators. In this relationship, the clown fish benefits but the sea anemone is not helped or hurt. A symbiotic relationship in which one organism benefits and the other is not affected is called **commensalism** (kuh MEN suh lih zum).

Parasitism Pet cats or dogs sometimes have to be treated for worms. Roundworms, like the one shown in **Figure 15C**, are com-

mon in puppies. This roundworm attaches itself to the inside of the puppy's intestine and feeds on nutrients in the puppy's blood. The puppy may have abdominal pain, bloating, and diarrhea. If the infection is severe, the puppy might die. A symbiotic relationship in which one organism benefits but the other is harmed is called **parasitism** (PER uh suh tih zum).

Niches

One habitat might contain hundreds or even thousands of species. Look at the rotting log habitat shown in **Figure 16**. A rotting log in a forest can be home to many species of insects, including termites that eat decaying wood and ants that feed on the termites. Other species that live on or under the rotting log include millipedes, centipedes, spiders, and worms. You might think that competition for resources would make it impossible for so many species to live in the same habitat. However, each species has different requirements for its survival. As a result, each species has its own niche (NIHCH). A **niche** refers to how an organism survives, how it obtains food and shelter, how it finds a mate and cares for its young, and how it avoids danger.

Reading Check *Why does each species have its own niche?*

Special adaptations that improve survival are often part of an organism's niche. Milkweed plants contain a poison that prevents many insects from feeding on them. Monarch butterfly caterpillars have an adaptation that allows them to eat milkweed. Monarchs can take advantage of a food resource that other species cannot use. Milkweed poison also helps protect monarchs from predators. When the caterpillars eat milkweed, they become slightly poisonous. Birds avoid eating monarchs because they learn that the caterpillars and adult butterflies have an awful taste and can make them sick.



Health

INTEGRATION

The poison in milkweed is similar to the drug digitalis. Small amounts of digitalis are used to treat heart ailments in humans, but it is poisonous in large doses. Look up digitalis and explain in your Science Journal how it affects the human body.

Figure 16

Different adaptations enable each species living in this rotting log to have its own niche.

- A** Termites eat wood. They make tunnels inside the log.
- B** Millipedes feed on plant matter and find shelter beneath the log.
- C** Wolf spiders capture insects living in and around the log.





Figure 17
The alligator is a predator.
The turtle is its prey.

Predator and Prey When you think of survival in the wild, you might imagine an antelope running away from a lion. An organism's niche includes how it avoids being eaten and how it finds or captures its food. Predators, like the one shown in **Figure 17**, are consumers that capture and eat other consumers. The prey is the organism that is captured by the predator. The presence of predators usually increases the number of different species that can live in an ecosystem. Predators limit the size of prey populations. As a result, food and other resources are less likely to become scarce, and competition between species is reduced.

Cooperation Individual organisms often cooperate in ways that improve survival. For example, a white-tailed deer that detects the presence of wolves or coyotes will alert the other deer in the herd. Many insects, such as ants and honeybees, live in social groups. Different individuals perform different tasks required for the survival of the entire nest. Soldier ants protect workers that go out of the nest to gather food. Worker ants feed and care for ant larvae that hatch from eggs laid by the queen. These cooperative actions improve survival and are a part of the species' niche.

Section 3 Assessment

1. Explain why all consumers ultimately depend on producers for food.
2. Draw a food chain that models the feeding relationships of three species in a community. Choose a food chain other than the one shown in **Figure 14**.
3. Make up two imaginary organisms that have a mutualistic relationship. Give them names and explain how they benefit from the association.
4. What is the difference between a habitat and a niche?
5. **Think Critically** A parasite can obtain food only from a host organism. Most parasites weaken but do not kill their hosts. Why?

Skill Builder Activities

6. **Manipulating Variables and Controls** You are sure that Animal A benefits from a relationship with Plant B, but you are not sure if Plant B benefits, is harmed, or is unaffected by the relationship. Design an experiment to compare how well Plant B grows on its own and when Animal A is present. **For more help, refer to the Science Skill Handbook.**
7. **Using Graphics Software** Use graphics software to make three different food chains. Represent each organism with a shape that resembles it. For example, you could use a leaf shape to represent a plant. Label each shape. **For more help, refer to the Technology Skill Handbook.**