

CONCEPT 1

A micro-organism is an organism that can only be seen with a microscope.

Activity

Reflecting on Micro-organisms

Each of the living things in **Figure 1.15** is a micro-organism. Record at least five observations and five questions that occur to you as you compare these photos.



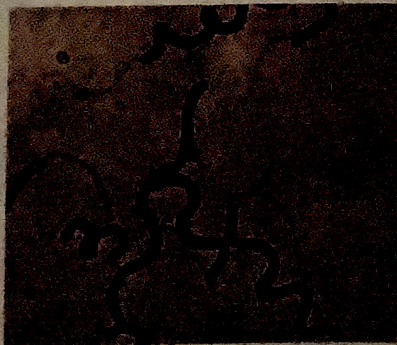
micro-organisms any organisms small enough to need a microscope to be seen

microbes common-language short form for micro-organisms

One thing that the organisms in **Figure 1.15** have in common is that they are too small to see with the unaided eye. Anything that is smaller than 1 mm requires technology such as a microscope to see clearly. **Micro-organisms** are all smaller than 1 mm, so they can only be seen with a microscope. For example, each bacterium in **Figure 1.15** has a length of about 1 μm . This means that thousands of them could fit in an area the size of the period at the end of this sentence. The phytoplankton are even smaller, with a length of only 0.1 μm . The *Euglena* is a bit larger, with a length of about 10 μm .

Micro-organisms, or **microbes** for short, live in every place you can possibly imagine. They live inside and on other living things. Many live freely in the air, in large and small bodies of water, and even in small puddles. No matter where you travel in the world—along sandy beaches, in coastal and inland forests, into the mountains, across prairie grasslands, in the freezing Arctic, and in dry, hot deserts—there are microbes.

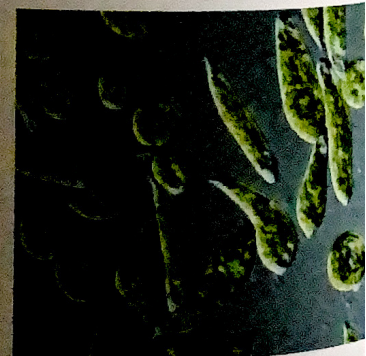
Figure 1.15 These single-celled organisms are found in various ecosystems, some on land and some in the water.



Spirillum volutans; Bacteria;
LM Magnification: 1000x



Various Species of Phytoplankton;
Magnification: Unknown



Euglena gracilis; Protist;
LM Magnification: 200x

The Importance of Microbes

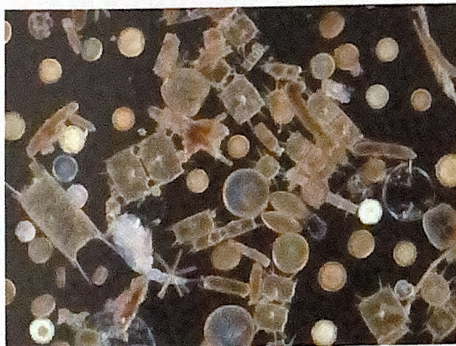
Microbes have important roles in ecosystems. **Figure 1.16** shows how bacteria and phytoplankton are important to other living things in an ecosystem.



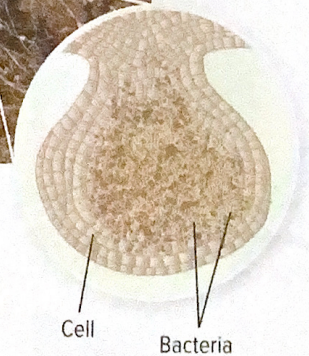
Many types of bacteria are decomposers. They break down (decompose) dead or waste materials such as rotting wood, dead animals, and animal wastes. The action of decomposers returns nutrients to the soil. Plants and other organisms use these nutrients to grow and carry out their life processes.

Figure 1.16 Forests and other environments could not function without the action of decomposer microbes.

For example, nitrogen is a nutrient that plants and other organisms need. Nitrogen gas makes up about 78 percent of the atmosphere, but it is in a form that plants cannot use. Certain kinds of bacteria make nitrogen available to plants. The bacteria live and grow on the roots of plants such as peas, beans, and alfalfa. As part of their own life processes, the bacteria change nitrogen into a form that the plants are able to use. This usable nitrogen is transferred to other organisms when they eat the plants.



In oceans and lakes, phytoplankton are the main producers. These microbes have chloroplasts, so they carry out photosynthesis. As well, phytoplankton produce about 50 percent of the oxygen in the atmosphere.



Before you leave this page . . .

1. Explain why a microscope is needed to see micro-organisms.
2. You read about roles that bacteria and phytoplankton play in ecosystems. Suggest two other roles that you think microbes play in ecosystems.

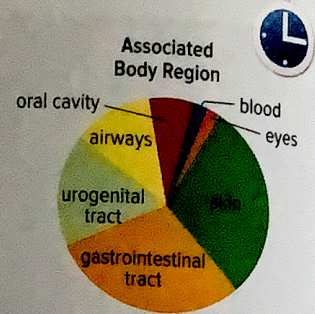
CONCEPT 2

Humans have both negative and positive interactions with microbes.

Activity

Microbes on the Move

The pie chart shows results of an experiment in which microbe samples were collected from surfaces in the New York City subway system. The pie chart shows the sources of the microbes collected. What questions do you have about these data? What would be your next step in the process of scientific inquiry?



Negative Interactions with Microbes

Under favourable conditions, phytoplankton can reproduce very quickly. They form huge, colourful masses called red tides. The red-tide microbes produce toxins that make shellfish such as clams poisonous. First Peoples know to observe the behaviour of coastal animals during red tides. Animals avoiding clams is a sign that they are unsafe to eat. Elders along the coast observe that red tide is becoming more common now than in the past (Figure 1.17).

Red-tide microbes are examples of **pathogens**—microbes that can make people sick. You may have heard of bacteria such as *E. Coli*, *Listeria*, and *Botulism*. These pathogens can cause food poisoning, which can lead to vomiting, diarrhea, and fever.

Causing sickness is not our only negative interaction with microbes. For example, bacteria and other microbes such as

mould cause food to spoil. Mould can also cause wood to rot, which can affect the structural stability of homes and other buildings that are made with wood.

Figure 1.17 First Peoples along the Pacific coast have created clam gardens for millennia. These beach-extending structures are a sustainable source of food and have served as places for Elders to share knowledge and teach skills to the young.






pathogens micro-organisms that can cause disease



Positive Interactions with Microbes

There are more than 400 types of bacteria in your intestine right now, but they are not making you sick. These bacteria help keep you healthy and are a natural part of your digestive system. Some help you digest food, and some help prevent infection. Certain bacteria in your large intestine help you absorb the nutrient vitamin K, which helps your blood clot properly. **Table 1.3** lists more examples of the positive interactions humans have with microbes.

Table 1.3 Some Positive Interactions With Microbes

Interaction	Examples	
Food production	Bacteria are used to make foods such as cheese, yogurt, pickles, soy sauce, and chocolate.	
Medicine production	Bacteria are used to make antibiotics and the insulin that people with diabetes need.	
Agricultural production	Bacteria are used to genetically modify crops so that they are better protected against insects or disease. Scientists also continue to study the importance of bacteria in soil and for the health of crops.	
Waste management	More than 300 species of bacteria are used in water treatment plants to decompose wastes.	
Disaster recovery	Bacteria can be used to help clean up oil spills and areas contaminated by chemical spills or radioactive waste.	

Before you leave this page . . .

1. Make a T-chart to list the positive and negative interactions between humans and microbes.
2. Some medicines people take to treat an infection also kill bacteria that are naturally found in the intestines. Why is this a concern?