

Protists

Some are so tiny that they cannot be seen without a microscope. Others grow many meters long. Some are poisonous. And some provide food for people.

What are they? The organisms described above are protists. A **protist** is a member of the kingdom Protista. Protists differ from other living things in many ways. Look at **Figure 1** to see a variety of protists.

What You Will Learn

- Describe the characteristics of protists.
- Describe four ways that protists get food.
- Describe three ways that protists reproduce.

Vocabulary

protist parasite
heterotroph host

READING STRATEGY

Discussion Read this section silently. Write down questions that you have about this section. Discuss your questions in a small group.

protist an organism that belongs to the kingdom Protista

General Characteristics

Protists are very diverse and have few traits in common. Most protists are single-celled organisms, but some are made of many cells, and others live in colonies. Some protists produce their own food, and some eat other organisms or decaying matter. Some protists can control their own movement, and others cannot. However, protists do share a few characteristics. For example, all protists are *eukaryotic* (yoo KAR ee AHT ik), which means that their cells each have a nucleus.

Members of the kingdom Protista are related more by how they differ from members of other kingdoms than by how they are similar to other protists. Protists are less complex than other eukaryotic organisms are. For example, unlike fungi, plants, and animals, protists do not have specialized tissues. Because protists are so diverse, some scientists think that kingdom Protista should be broken up into several kingdoms. Scientists are still revising the classification of protists.

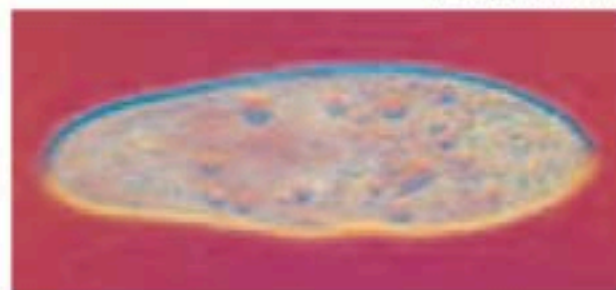
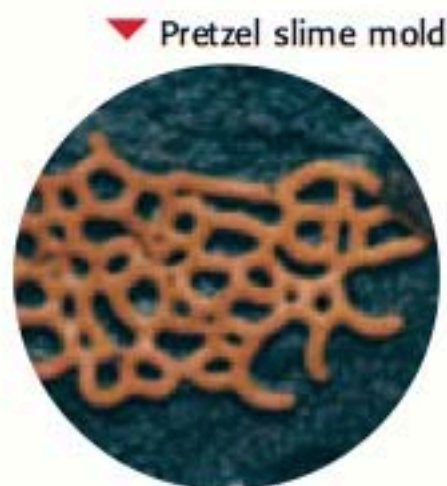
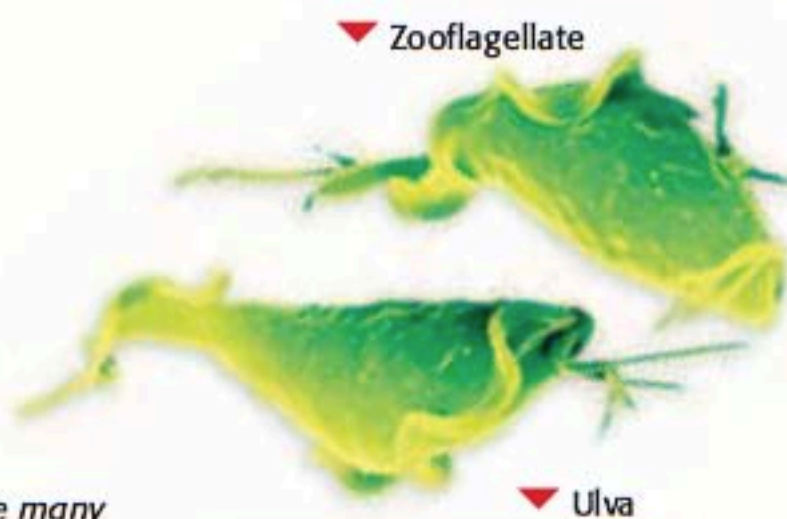


Figure 1 Protists have many different shapes.

Protists and Food

Protists get food in many ways. Some protists can make their own food. Other protists eat other organisms, parts or products of other organisms, or the remains of other organisms. Some protists use more than one method of getting food.

Producing Food

Some protists are *producers*. Like green plants, these protists make their own food. Protist producers have special structures called *chloroplasts* (KLAWR uh PLASTS) in their cells. These structures capture energy from the sun. Protists use this energy to produce food in a process called *photosynthesis* (FOHT oh SIN thuh sis). Plants use this same process to make their own food.

✓ Reading Check How do protist producers get their food? (See the Appendix for answers to Reading Checks.)

Finding Food

Some protists must get food from their environment. These protists are heterotrophs (HET uhr oh TROHFS). **Heterotrophs** are organisms that cannot make their own food. These organisms eat other organisms, parts or products of other organisms, or the remains of other organisms.

Many protist heterotrophs eat small living organisms, such as bacteria, yeast, or other protists. The way that these heterotrophs get food is similar to how many animals get food. Some protist heterotrophs are decomposers. *Decomposers* get energy by breaking down dead organic matter. Some protists get energy in more than one way. For example, slime molds, such as the one in **Figure 2**, get energy by engulfing both small organisms and particles of organic matter.

Some protist heterotrophs are parasites. A **parasite** invades another organism to get the nutrients that it needs. An organism that a parasite invades is called a **host**. Parasites cause harm to their host. Parasitic protists may invade fungi, plants, or animals. During the mid-1800s, a parasitic protist wiped out most of the potatoes in Ireland. Without potatoes to eat, many people died of starvation. Today, people know how to protect crops from many such protists.

Figure 2 Slime molds get energy from small organisms and particles of organic matter.

SCHOOL to HOME

Food for Thought

With your family, review how producers, consumers, decomposers, and parasites get energy. Think of organisms that live near your home and that get their food in these different ways. Then, make a poster to display your examples. Be sure that the poster describes each way of getting food.

ACTiViTy

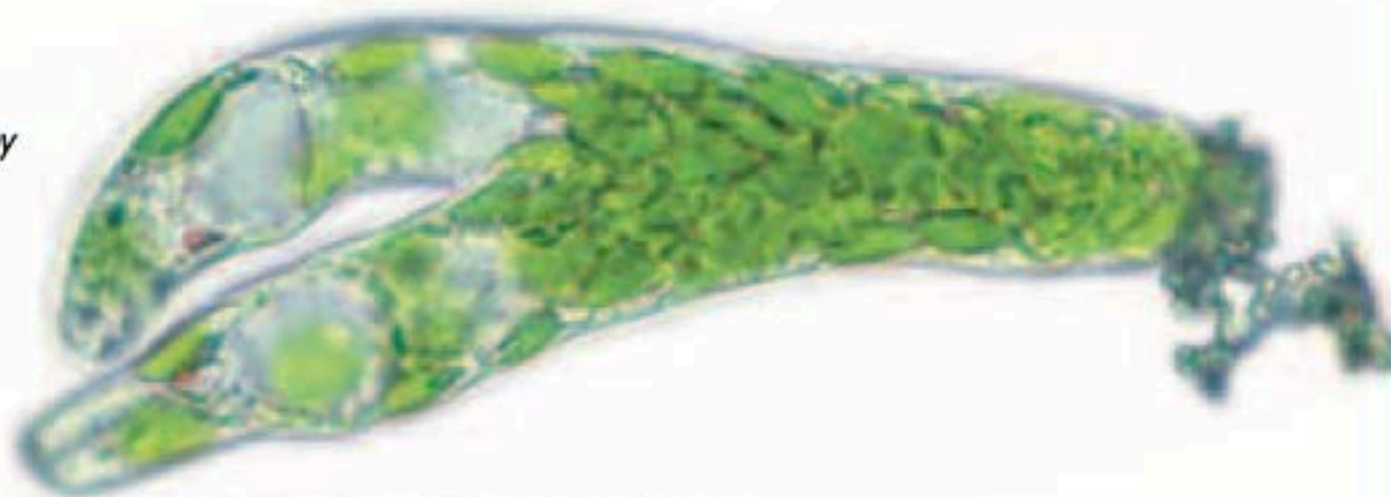
heterotroph an organism that gets food by eating other organisms or their byproducts and that cannot make organic compounds from inorganic materials

parasite an organism that feeds on an organism of another species (the host) and that usually harms the host; the host never benefits from the presence of the parasite

host an organism from which a parasite takes food or shelter



Figure 3 Members of the genus *Euglena* reproduce by dividing lengthwise during fission.




Producing More Protists

Like all living things, protists reproduce. Protists reproduce in several ways. Some protists reproduce asexually, and some reproduce sexually. Some protists even reproduce asexually at one stage in their life cycle and sexually at another stage.

Asexual Reproduction

Most protists reproduce asexually. In asexual reproduction, the offspring come from just one parent. These offspring are identical to the parent. **Figure 3** shows a member of the genus *Euglena* reproducing asexually by fission. In *binary fission*, a single-celled protist divides into two cells. In some cases, single-celled protists use *multiple fission* to make more than two offspring from one parent. Each new cell is a single-celled protist.

 **Reading Check** What are two ways that protists can reproduce asexually by fission?

Sexual Reproduction

Some protists can reproduce sexually. Sexual reproduction requires two parents. Members of the genus *Paramecium* (PAR uh MEE see uhm) sometimes reproduce sexually by a process called *conjugation*. During conjugation, two individuals join together and exchange genetic material by using a small, second nucleus. Then, they divide to produce four protists that have new combinations of genetic material. **Figure 4** shows two paramecia in the process of conjugation.

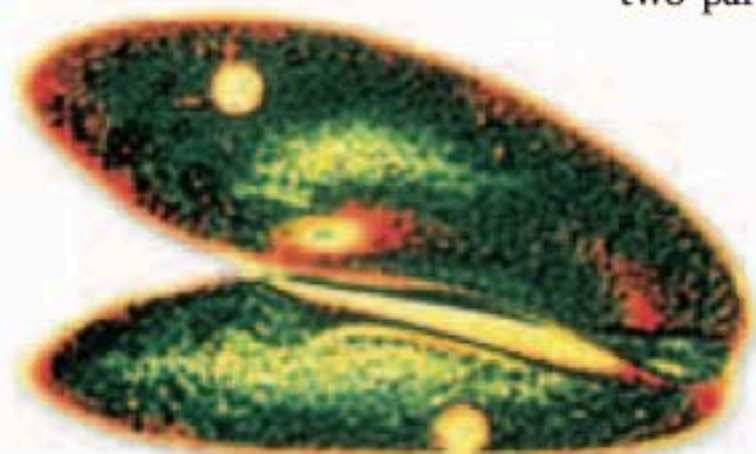
Many protists can reproduce asexually and sexually. In some protist producers, the kind of reproduction alternates by generation. For example, a parent will reproduce asexually, and its offspring will reproduce sexually. Other protists reproduce asexually until environmental conditions become stressful, such as when there is little food or water. When conditions are stressful, these protists will use sexual reproduction until conditions improve.

MATH PRACTICE

Pairs of Paramecia

Suppose that three pairs of protists from the genus *Paramecium* are conjugating at one time. Each pair successfully results in four protists that have new combinations of genetic material. Then, the new individuals pair up for another successful round of conjugation. How many protists will there be after this round of conjugation?

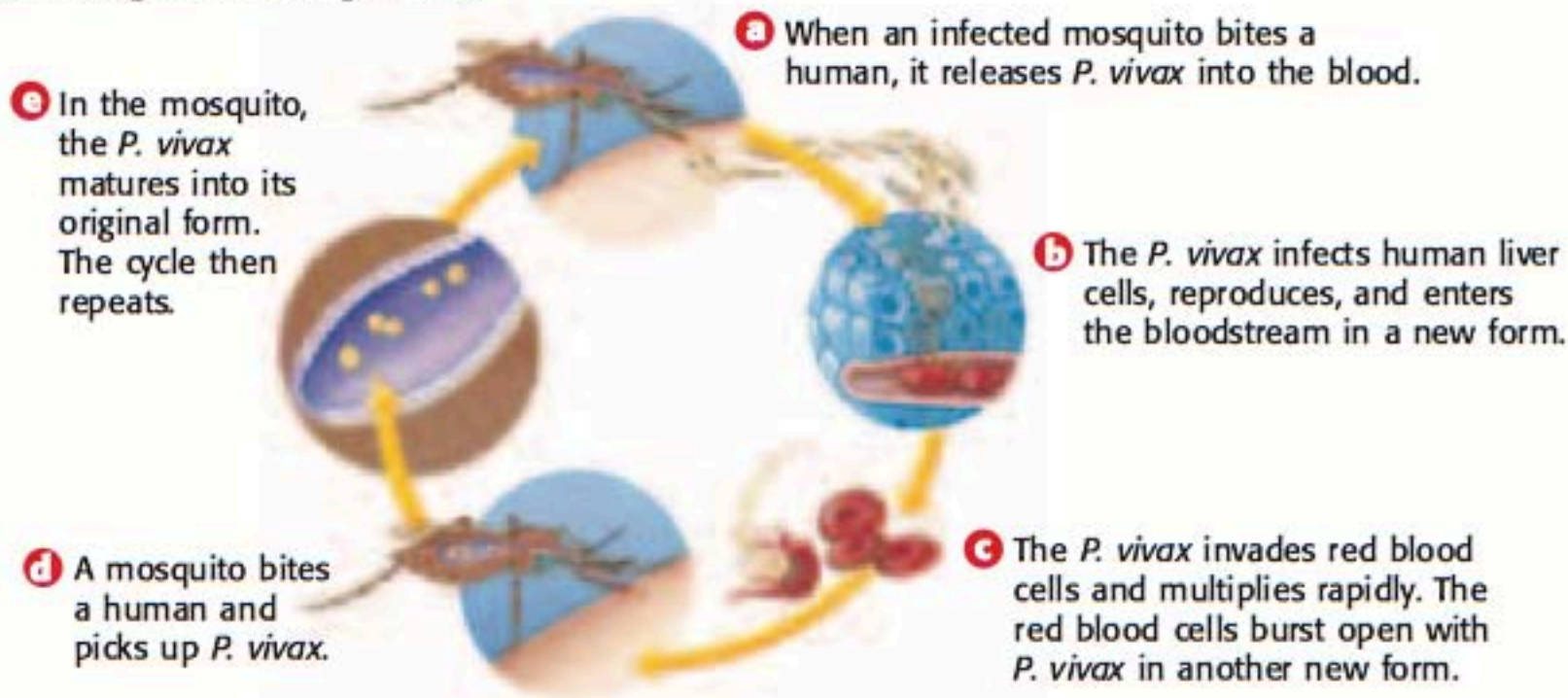
Figure 4 Members of the genus *Paramecium* can reproduce by conjugation, a type of sexual reproduction.



Reproductive Cycles

Some protists have complex reproductive cycles. These protists may change forms many times. **Figure 5** shows the life cycle of *Plasmodium vivax* (plaz MOH dee uhm VIE vaks), the protist that causes the disease malaria. *P. vivax* depends on both humans and mosquitoes to reproduce.

Figure 5 *P. vivax* infects both humans and mosquitoes as it reproduces.



SECTION Review

Summary

- Protists are a diverse group of single-celled and many-celled organisms.
- Protists are grouped in their own kingdom because they differ from other organisms in many ways.
- Protists get food by producing it or by getting it from their environment.
- Some protists reproduce asexually, some reproduce sexually, and some reproduce both asexually and sexually.

Using Key Terms

1. Use the following terms in the same sentence: *parasite* and *host*.
2. In your own words, write a definition for each of the following terms: *protist* and *heterotroph*.

Understanding Key Ideas

3. What is one way that protists differ from plants and animals?
 - a. Protists are eukaryotic.
 - b. All protists have many cells.
 - c. Protists do not have specialized tissues.
 - d. Protists are not eukaryotic.
4. Name a characteristic shared by all protists.
5. Name three ways that protists can differ from each other.
6. Describe four ways that protists get food.
7. Describe three ways that protists reproduce.

Math Skills

8. If seven individuals of the genus *Euglena* reproduce at one time, how many individuals result?

Critical Thinking

9. **Identifying Relationships** How is conjugation similar to fission?
10. **Applying Concepts** The spread of malaria depends on both human and mosquito hosts. Use this fact to think of a way to stop the spread of malaria.

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