

Chapter 28: Protists

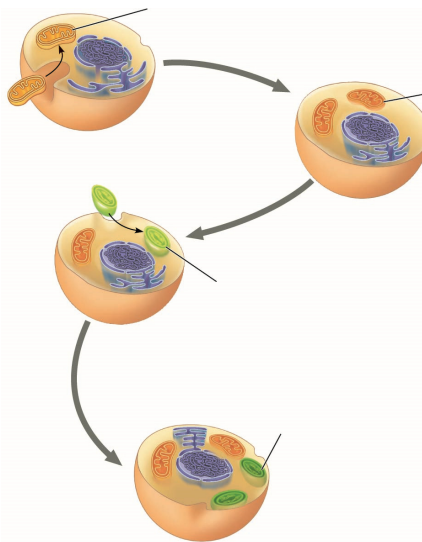
- 28.1 Describe the process of secondary endosymbiosis and explain its role in eukaryotic history.
- 28.2 Characterize the excavates.
- 28.3 Give examples of the protists classified in SAR.
- 28.4 Describe characteristics of red and green algae.
- 28.5 Identify and describe the closest eukaryotic relatives of fungi and animals.
- 28.6 Give examples of ecological roles played by protists.

In your study of biology you are likely to encounter a number of protists. It will be valuable for you to know about the basic biology of protists that you might encounter in lab or hear discussed because of the protists' impact on human health or the environment.

Study Tip You may have learned about the kingdom Protista in an earlier course, but it is no longer recognized as an official taxon because work in Protista systematics has revealed that the kingdom is polyphyletic. The former kingdom Protista has been divided into many separate kingdoms. Biologists now use the term Protista in a general, nontechnical way to refer to mostly single-celled eukaryotes that are neither plants nor animals nor fungi. As we move through this chapter, we will concentrate on some of the evolutionary events of significance and some specific protists. If your instructor covers protists in depth, be sure you make careful notes in lecture to supplement the questions we ask here.

1. What gave rise to the great diversity of protists? _____

Label the opening figure to explain how this happened.



2. In Figure 28.1, the early photosynthetic eukaryote has both plastids and mitochondria. Which organelle does the evidence show evolved first?

Concept 28.1 *Most eukaryotes are single-celled organisms*

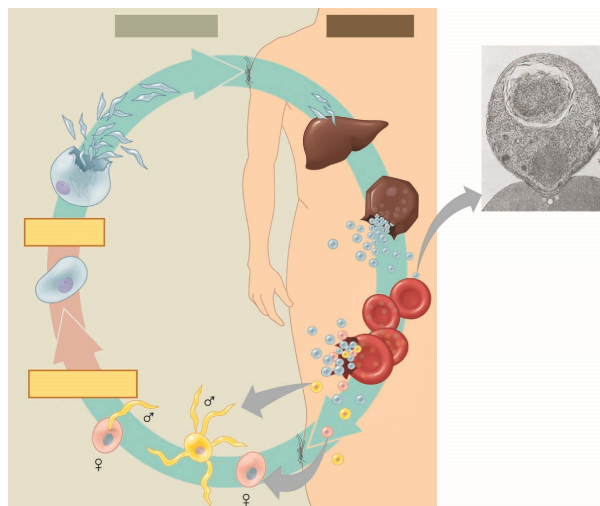
LO 28.1: Describe the process of secondary endosymbiosis and explain its role in eukaryotic history.

3. Protists vary in structure and function more than any other group of organisms. However, here are some common traits:
- All have membrane-bounded organelles, and so are _____.
 - Most are single-celled, or _____.
 - They get their food in several ways. Some contain chloroplasts and do photosynthesis, and so are considered _____. Others ingest food particles and so are _____.

Concept 28.3 *SAR is a highly diverse group of protists defined by DNA similarities*

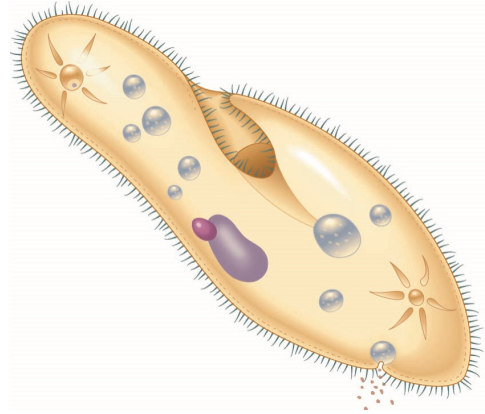
LO 28.3: Give examples of the protists classified in SAR.

4. Malaria is a leading cause human death by infectious disease. Over 220 million people in the tropics are infected each year, and 450,000 die annually. You probably recall the relationship between sickle-cell anemia, malaria, and the heterozygote advantage (Figure 23.18 in your text). Let's look now at the organism that causes malaria. It is a parasitic protist, in the genus *Plasmodium*. *Plasmodium* uses both mosquitoes and humans as alternate hosts in its complex life cycle, shown in the following figure. Number and explain eight steps in the *Plasmodium* life cycle.



5. If you study a drop of pond water, it is likely you will watch a *Paramecium* whirling about and pumping water out its contractile vacuole. Answer these questions about the ciliate *Paramecium*.

- On the image, label the macro- and micronucleus, food and contractile vacuoles, and oral groove.
- How does the *Paramecium* obtain food?
- How do food vacuoles and lysosomes help with nutrition?
- The *Paramecium* is hypertonic to its surroundings, so how does this organism maintain water balance?



Concept 28.6 *Protists play key roles in ecological communities*

LO 28.6: *Give examples of ecological roles played by protists.*

6. Describe one mutualistic relationship and one parasitic relationship involving protists.

mutualistic example

parasitic example

7. What is a key ecological role of protists in many aquatic food webs?
8. This is a large chapter with a great deal of information about many different protists. To give you an idea of some of them, here is a short list gleaned from your text. Collectively, the protists that are phototrophic are collectively known as “phytoplankton” and comprise the base of most aquatic food chains. These listed below were selected because you are likely to encounter them in some way—either in your study or as causative agents of diseases. We suggest you read about each of these.
- Giardia intestinalis* (Causes “hiker’s diarrhea”; always treat your water!)
 - Trichomonas vaginalis* (A sexually transmitted infection.)
 - Trypanosoma* sp. (Cause of sleeping sickness and Chagas’s disease.)
 - Euglena* (Very common in pond water. Tiny flagellated green cells with a red eyespot.)
 - Dinoflagellates (Blooms cause “red tides”; many are bioluminescent.)

- f. *Plasmodium* (Causative agent of malaria.)
- g. Ciliates (*Paramecium* and *Stentor* are examples; micro- and macronuclei.)
- h. *Amoeba* (Move by pseudopodia.)
- i. Diatoms (Unicellular with two-part, glass-like wall made of silica.)
- j. Brown algae (Kelp: favorite food of sea otters.)
- k. Oomycetes (Water molds and their relatives; includes causative agent of potato blight.)
- l. Red algae (Multicellular; some found at great depths; sushi wraps.)
- m. Green algae (*Chlamydomonas*, *Ulva*, *Volvox*; this group is the closest relative of land plants.)
- n. Slime molds (Not fungi! But are similar in appearance due to convergent evolution.)

Test Your Understanding Answers, p. 617

Now you should be ready to test your knowledge. Place your answers here:

1. _____ 2. _____ 3. _____ 4. _____ 5. _____ 6. _____