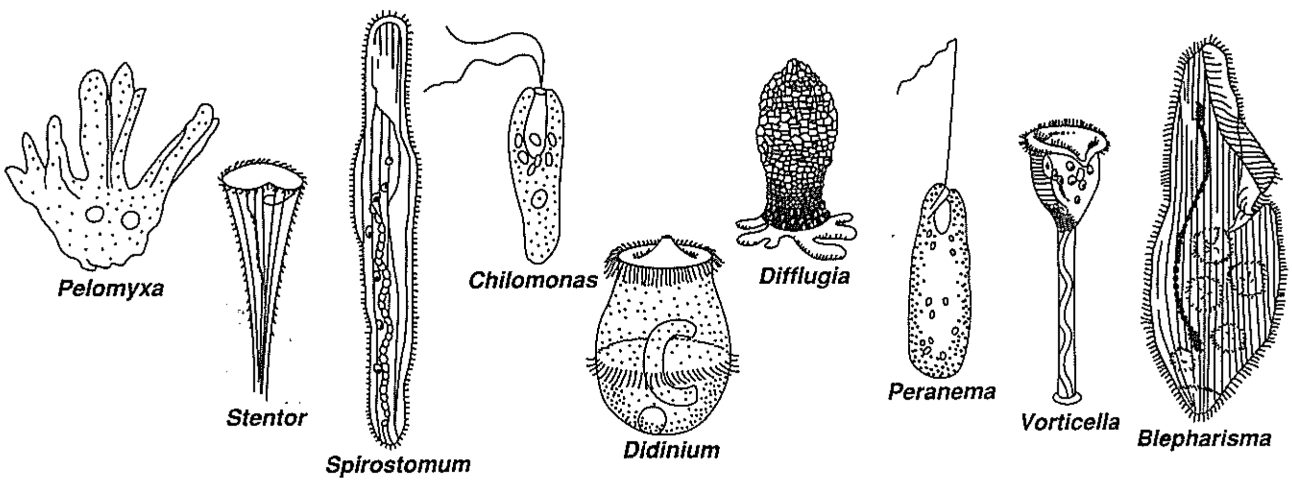
Name ____________ Class ____________ Date ____________

SKILL ACTIVITY
Classifying organisms

Arranging Protists

Protists are defined as being unicellular eukaryotic organisms. The group that falls under this definition, however, is an extremely diverse group that includes more than 115,000 species. Prior to the creation of the kingdom Protista, many species were difficult to classify because they had characteristics in common with more than one of the three kingdoms of multicellular organisms. The kingdom Protista was developed primarily to solve the problem of classifying these organisms. In this activity you will employ some of the methods used to classify such protists.

A. Look at the drawings of common freshwater protists. Use the drawings to complete the table.



Name of Protist	Method of Locomotion	Cell Shape	Other Features
1. *Blepharisma*			
2. *Chilomonas*			
3. *Didinium*			
4. *Difflugia*			
5. *Pelomyxa*			
6. *Peranema*			
7. *Spirostomum*			
8. *Stentor*			
9. *Vorticella*			

B. In this section you will construct a taxonomic key for the protists illustrated in part A. A taxonomic key is a guide to the identification of plants and animals based on certain distinguishing characteristics. Most taxonomic keys are based on pairs of opposing statements. Only one statement in each pair of statements can be true for a given organism. You must decide which statement accurately describes the organism in question. The statement you choose directs you to another pair of statements in which another choice must be made. You continue making choices until the organism is identified.

The following is a sample taxonomic key used to identify the leaves of pine trees.

1. Needles in fives. White Pine.
1. Needles in twos or threes. Go to 2.

2. Needles in twos. Go to 3.
2. Needles in threes. Go to 5.

3. Needles 13 cm long. Red Pine.
3. Needles less than 8 cm long. Go to 4.

4. Needles sharp pointed; mostly blue-green. Scotch Pine.
4. Needles sharp or dull; yellow-green. Table Mountain Pine.

Had you been given a pine leaf with 13-centimeter long needles arranged in groups of two, you would know that it came from a Red Pine.

Using the information in the table you have already completed, construct a taxonomic key to the pictured protists. Your key should be similar to the sample key above.

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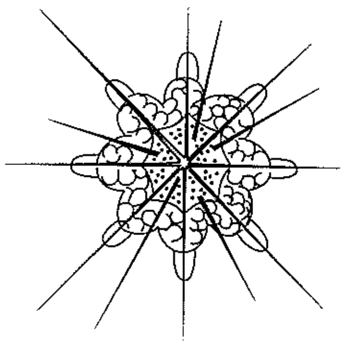
SKILL ACTIVITY
Making comparisons

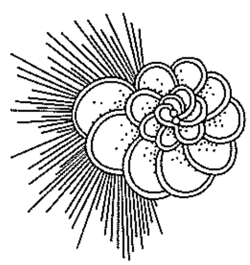
Experimental Models of Protists

Biologists can understand how organisms function by studying the structure and behavior of those organisms. They can also see how different structures within an organism help it to adapt to its environment. There are many differences between studying a drawing and studying a three-dimensional model of an organism. In this activity you will make three-dimensional models of protists and make observations using these models.

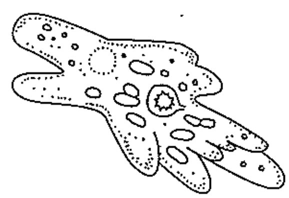
Several protists are shown in the illustration below.



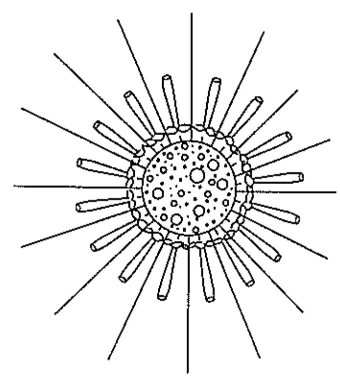
Radiolarian



Foraminiferan



Ameba



Heliozoan

Using both the diagrams and your knowledge of these organisms, create your own models of three of these protists. Use materials such as plastic foam, pipe cleaners, colored paper, and glue. Be sure to represent structures that are used for locomotion and for feeding.

Use your models and your knowledge of protists to answer the questions.

1. Compare the structures that amebas, foraminiferans, and radiolarians use for movement.

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2. Compare the structures that paramecia and amebas use to obtain food.

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3. Compare the structures that ciliates and flagellates use for locomotion.

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4. Sporozoans are internal parasites that cannot move by themselves. Explain why the ability to move may be less important for sporozoans than for ciliates and for sarcodines.

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Protists respond to a variety of internal and external stimuli, and their responses can be observed or detected. Their reactions depend upon their structures. Some observations of protist responses are described for you. For each situation, offer a possible hypothesis and suggest how this hypothesis could be tested.

5. A drop of paramecium culture was placed in water at 20°C on a microscope slide and a glass coverslip was added. The water on a portion of the slide was warmed by placing a hot needle over the coverslip. The paramecia gradually moved toward the needle.

Hypothesis: ______________________________

____

Experiment: ______________________________

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6. In a laboratory study, several large cone-shaped ciliates called stentors were fed equal concentrations of several different nutrients. In Experiment 1, the stentors were estimated to have eaten 90 euglenas. In Experiment 2, the stentors ate about 1500 bacteria. In Experiment 3, about 10 starch grains were eaten.

Hypothesis: ______________________________

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Experiment: ______________________________

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Investigating Cellular Slime Molds

One of the goals of biology research is to understand the relationships among biological systems. Summarizing information about living things provides a basis for analyzing relationships. In this activity you will summarize information about development in cellular slime molds.

The Life Cycle of Cellular Slime Molds

During most of their life cycle, cellular slime molds exist as individual ameboid cells that live in the soil. There, they move about and feed just like other free-living amebas.

When conditions become dry, the ameboid cells move toward each other and clump together, or aggregate. This forms a slug mass that looks very much like plasmodium in acellular slime molds. The sluglike mass is called a pseudoplasmodium.

The cellular slug, or pseudoplasmodium, is a uniform blob that moves over the ground. It eventually stops moving. Then a small stalk that is called a fruiting body appears. Spores that are formed in the fruiting body are blown into the wind. They later form ameboid cells in the soil, and the cycle begins again. This life cycle is shown in Figure 1.

The idea of levels of biological organization involves the relationship between cells, tissues, organs, organ systems, and individuals. Biologists study slime molds to learn how individual cells group together to form tissues and organs in animals and plants.

1. Examine Figure 1. Which part of the life cycle of the cellular slime mold is most like the tissue level of organization?

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2. Which part is most like the organ level of organization?

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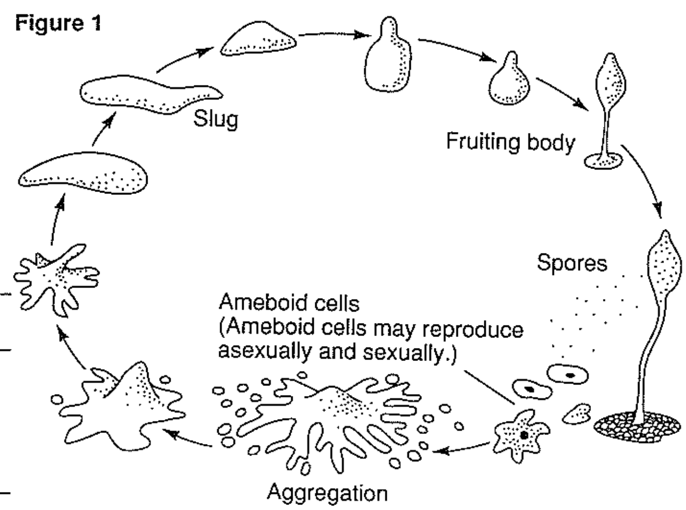
Figure 1



Communication Between Single Cells

When living as individual cells in the soil, the ameboid cells are independent of one another. They exist as individual organisms—not as parts of a single organism. But when conditions become dry, some of the ameboid cells secrete a chemical called cyclic AMP. This diffuses out into the soil. The more it diffuses, the more dilute it becomes. Other ameboid cells respond to cyclic AMP by changing their direction of movement. They move from areas where cyclic AMP is dilute to areas where it is more concentrated. It is this movement that causes the cells to stream together.

3. Explain how the secretion of cyclic AMP by a few cells could result in the formation of a slug.

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Figure 2 shows the aggregation of a cellular slime mold. The mass bears some resemblance to a river with its tributaries.

4. Pattern formation in slime molds is influenced by the response of cells to a secreted chemical. In what ways are the slime mold and river formation patterns similar?

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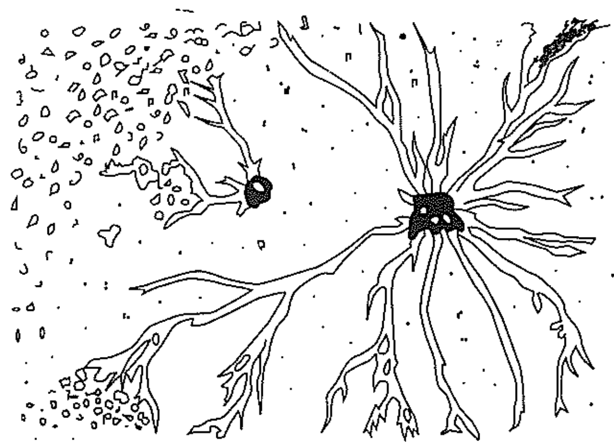
Figure 2



Differentiation in Slime Molds

Your body contains many different kinds of specialized cells. All these cells originated from one single cell, the zygote or fertilized egg. The process by which cells become more specialized is called differentiation. This process also occurs in slime molds.

Before the fruiting body appears, the cells that form the slug are basically all alike. None appears specialized. However, in order for the fruiting body to form, some cells must change, or become specialized. These specialized cells become the base, the stalk, and the cap of the fruiting body. Not only does their appearance change, but so do the functions that they carry out.

Differentiation is more complex than the formation of a slug by wandering ameboid cells. However, both processes share basic traits. Each depends on communication between cells and on changes in the activity of genes. Cells exchange information by producing and secreting substances, such as cyclic AMP. They also communicate by direct contact when a molecule on the surface of one cell triggers a response in a neighboring cell.

5. Specialized cells in animals are all descended from a single ancestor cell. How are the specialized and the nonspecialized cells of the cellular slime molds related? ____

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6. Cellular slime molds begin life as a group of separate organisms, or individuals. After congregation, they become a single multicellular individual. Describe what is meant by this statement. ____

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Substances that are released by organisms into the environment to cause a response in another organism of the same species are called pheromones. The cyclic AMP that is released by slime mold amebas is a kind of pheromone. Cyclic AMP also functions as a hormone within the bodies and cells of animals and plants. A hormone is a chemical messenger that is transmitted within an organism by the body fluids, or sap. It produces an effect on other cells and serves to regulate their growth, their physiology, or their behavior.

7. Explain the difference between pheromones and hormones. ______________________

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8. Explain why it might be easier to study differentiation in slime molds than in animals. ______________

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CHAPTER 18 — VOCABULARY REVIEW

Protists

Word Game

On the lines below, write the word or words that best fit the description on the left. When you are finished, the boxed-in letters will spell out one of the topics discussed in the chapter. Fill in that word or phrase in the space provided.

1. Long, whiplike projections that propel an organism _ _ _ _ ☐ _ _ _
2. Organism with a long cell and a pouch that contains two flagella at its front end _ _ _ _ _ ☐ _
3. Food-storage cavity that forms at the base of a paramecium's gullet _ _ _ ☐ _ _ _ _ _ _ _
4. Structure produced by acellular slime molds that contains thousands of nuclei enclosed in a single cell membrane _ _ _ _ _ ☐ _ _ _ _
5. Small nucleus found in most ciliates _ _ _ _ _ _ _ _ _ _ _ ☐
6. Series of tiny flask-shaped structures embedded in the pellicle of a paramecium _ _ _ _ _ _ _ ☐ _ _ _
7. Cells that produce cell walls rich in silicon _ _ _ _ _ ☐ _
8. Flexible, active cells that lack a cell wall, flagella, or cilia _ _ _ ☐ _ _

9. Photosynthetic flagellates whose cell walls resemble thick plates _ ☐ _ _ _ _ _ _ _ _ _ _ _ _ _

10. Cells that can appear amebalike or moldlike _ _ _ _ _   _ ☐ _ _ _

11. Structure in a paramecium through which waste materials are emptied into the environment _ ☐ _ _   _ _ _ _

12. Structure that controls the water balance in a protist _ _ _ _ _ _ _ ☐ _ _ _   _ _ _ _ _ _ _

13. Phylum name for flagellates with chloroplasts _ _ _ _ _ _ _ _ ☐ _ _ _

14. Phylum name that means fire plants _ _ _ _ _ _ _ ☐ _ _

15. Phylum name that means false foot _ _ _ _ _ _ ☐ _ _

16. Any small photosynthetic organism found in large numbers near the ocean surface _ _ _ _ ☐ _ _ _ _ _ _ _ _

17. Indentation in one side of a paramecium, in which food is collected _ _ _ _ _ ☐

18. Phylum name that means golden plants _ _ _ _ _ _ _ _ ☐ _ _ _

19. Genus name of a large ciliate _ _ _ _ _ ☐ _ _ _ _

20. Unicellular eukaryotes _ _ _ _ _ ☐ _ _

21. Short, hairlike projections that propel an organism _ ☐ _ _ _

22. Large nucleus found in most ciliates _ _ _ _ _ _ _ _ _ _ _ ☐

Model that describes how the first eukaryotic cell may have developed _ _ _ _ _ _ _ _ _ _ _ _

_ _ _ _ _ _ _ _ _ _