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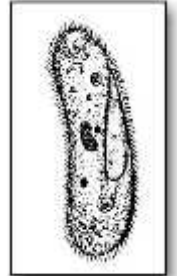
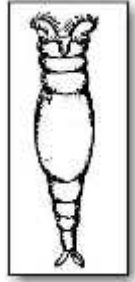
Period: \_\_\_\_\_

# Pond Water Lab

## Introduction:

### Why Study Pond Microlife?

Right, what are all those little things really good for? Well, for one thing, without bacteria no fish, no frogs, no birds, no pretty pond lilies, cat tails, or sedges would survive. Bacteria are essential because they break down dead organic material, allowing raw materials once locked up in animal and plant bodies to recycle through the pond community. The bacteria themselves, become food for protozoans such as *Paramecium* and *Vorticella*, and these organisms, in turn, feed the insects, crustaceans, and baby fish, building up food chains and creating a pond community. The green and yellow algae (diatoms) are examples of microscopic producers that convert solar energy into complex molecules that can be passed on to consumers. The same principles apply to a forest, grassland, or ocean. The simple fact is that microorganisms create the ecological foundation for life on planet earth — a foundation that supports humans and all of life!

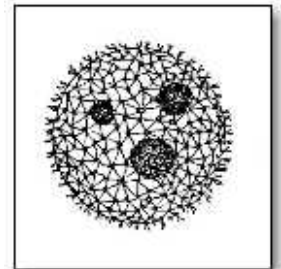


### Protists, Single Cells That Do It All

An amazing world exists just beyond the naked eye. Pond water is one place to investigate this landscape of single cells that behave as independent organisms. Biologists have named this group protists. Protists have both animal-like and plant-like characteristics.

### Stepping Stones

Protists were around long before plants and animals appeared. Fossil protists have been found in rocks dated at more than 1.8 billion years old. In fact, your local pond is a very good place to find protists very similar to those that started the lines of multicellular life — and these organisms seem relatively unchanged from that ancient time. The transition from single cell life to multicellular life is one of the most fascinating questions of modern biology. This step is exemplified by the colonial alga *Volvox*. All animal life is now thought to have evolved from a simple colonial organism that lived over 700 million years ago.



### Ancient Branching of the Tree Of Life

Protists represent some of the most diverse branches in the tree of life. The evolutionary branch leading to *Closterium* may have split from the yellow pigmented diatoms as far back as two billion years ago. The line leading to ciliated protists such as *Blepharisma* or *Stentor* probably branched even earlier. Although amoebas share the characteristics that their cell membrane is flexible, there is even a great diversity among this protist group. Evidence from molecular biology studies shows that some amoebas are much more closely related to *Euglena* than they are to the classic textbook amoeba, *Amoeba proteus*. Compared to these diverse lines of protist life, we animals are actually more closely related to our cousins, the fungi!

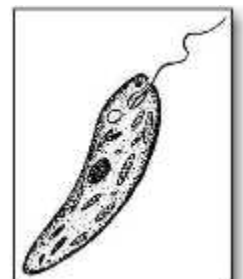
### Have a Look at How Life Works

Single-celled pond life gives us a unique chance to study the processes of life right in the living cell! A close study of *Paramecium* with a microscope allows for the observation of phagocytosis, digestion, water balance, ciliary action, cell excretion and a variety of responses to stimuli.

### Four common groups of protozoa - from Greek: proto (first), zoa (animals)

Listed below are four common groups of protozoa that you may see during this lab.

1. Ciliates – single celled, free swimming, smooth and well coordinated. Usually covered with many small hair-like projections – cilia.
2. Flagellates – single celled, jerky free swimmers. Have one or two longer hair-like projections – flagella.
3. Amoeboids – move by streaming their cytoplasm.
4. Sporozoans – parasitic protozoa that spend most or all of their life cycles in a host organism.



### Plant-like protists

Algae – single celled, but may form groups, green in color, often in filaments. Does not swim or move

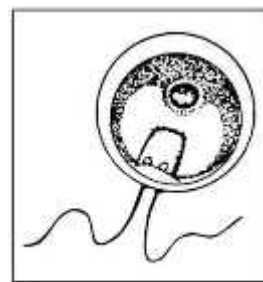
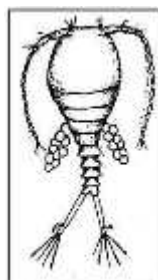
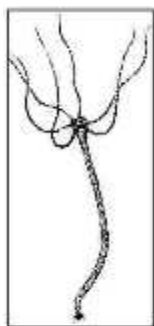
### So much more!

There is so much more to see in a single drop of pond water! This lab is just an introduction to the amazing world of protozoa and other microscopic and macroscopic organisms that can be found in ponds, lakes, and streams.

**Remember to be careful with the microscopes and follow all directions. Always start and end with the low power and use the course adjustment only under low power!**

**Procedure (Make all drawings on the drawings page!):**

- 1) Carefully observe the pond water sample in the collection jar. Look for movement and any green organisms. Organisms that are green contain the pigment chlorophyll and are probably algae.
- 2) Following the teachers directions, use the pipette to collect water from the sample jar and make a slide. **Observe your slide under low power.** Using your colored pencils, **sketch in detail** what you see.
- 3) **When directed by the teacher, switch to medium power and observe your slide.** Remember to use only the fine adjustment to focus under medium and high powers. Using your colored pencils, **sketch in detail** what you see.
- 4) **When directed by the teacher, switch to high power.** Remember to use only the fine adjustment under medium and high powers. Using your colored pencils, **sketch in detail** what you see. Also, if you lose or are unable to focus, you must switch back to low power and refocus. Always begin with low power, then medium power, and lastly high power. **Never begin with medium or high power!**
- 5) Focus on one type of algae, identify and make a **detailed sketch** of it. Make sure to include any structures and organelles that you see. You can use medium or high power – remember to follow correct procedure.
- 6) Focus on a single celled animal like organism, identify it and make a **detailed sketch** of the organism. **Make sure to include any structures, internal and external, that you see.** You can use medium or high power – remember to follow correct procedure.
- 7) Describe how the organism that you observed in #6 above moved. **Be detailed in your description.** Include any structures that the organism has and describe its movement (straight line, spins, etc.).

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**Drawings Page** – Use colored pencils to draw the organism(s) that you are viewing under the microscope. *You must SHOW DETAIL!* Use as much of the rectangle as you can for each drawing (do not draw a circle in the rectangle and then draw the organisms in the circle). At the bottom of each rectangle identify the organism(s) that you see.

<p style="text-align: center;"><b>1. Low Power</b></p>	<p style="text-align: center;"><b>2. Medium Power</b></p>
<p style="text-align: center;"><b>3. High Power</b></p>	<p style="text-align: center;"><b>4. Algae</b></p>
<p style="text-align: center;"><b>5. Animal-like organism</b></p>	<p style="text-align: center;"><b>6. One other organism of your choice!</b></p>

**Questions:**

1) Describe how the organism that you observed in #6 above moved. **Be detailed in your description.** Include any structures that the organism has and describe its movement (straight line, spins, etc.).

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2. In class we discussed the importance of the microorganisms in ecology of the pond. **DESCRIBE** the importance of microorganisms (including bacteria) and what would happen if all microorganisms would suddenly disappear from the pond. Use a separate sheet of paper if necessary.

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3. Give an example of a primary producer that we observed in the pond water. What does it do to be called a primary producer (hint – think sun)?

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4. Protists were around before the first \_\_\_\_\_ and \_\_\_\_\_. Fossil protists have been found in rocks that are \_\_\_\_\_ billion years old. Protists are \_\_\_\_\_ celled organisms that have both \_\_\_\_\_ and \_\_\_\_\_ characteristics. Protists with plant-like characteristics are called \_\_\_\_\_. Animal like protists are called protozoa – from Greek it means \_\_\_\_\_.