# BioMEDIA ASSOCIATES LLC
# HIDDEN BIODIVERSITY Series
## *Ciliates*

Study Guide
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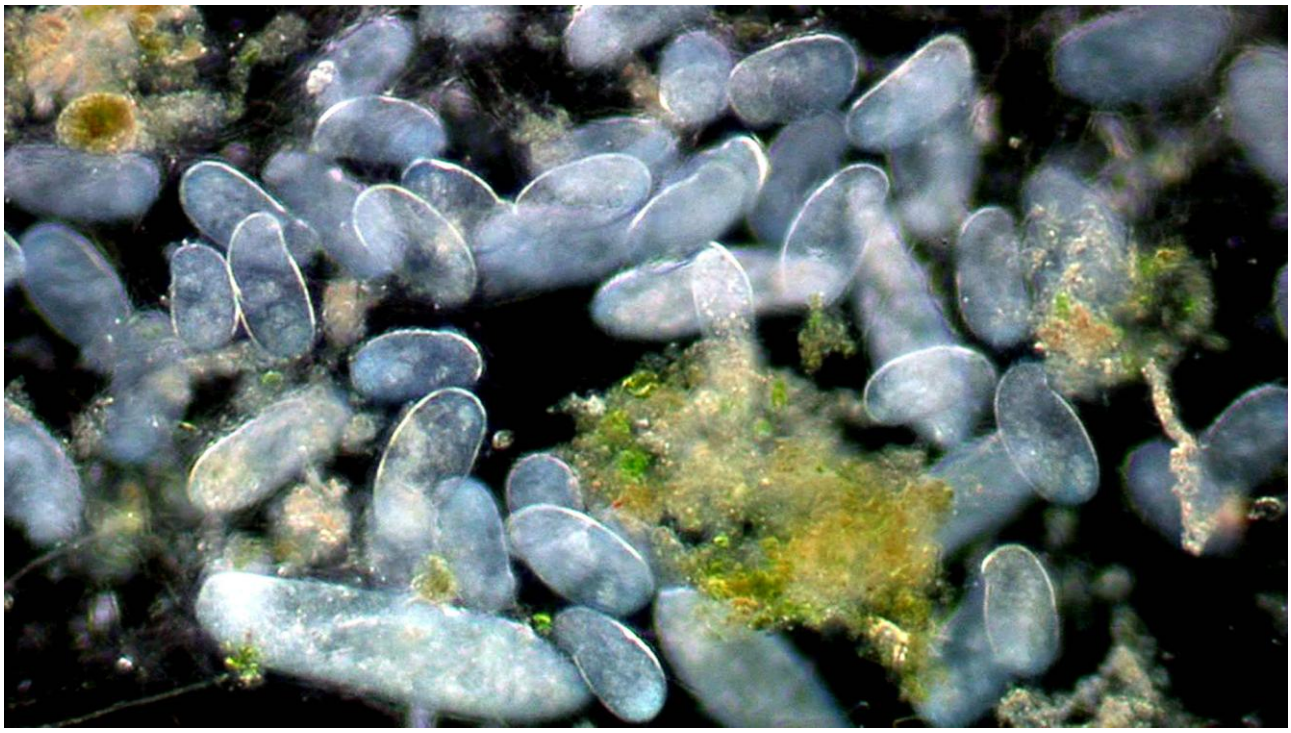
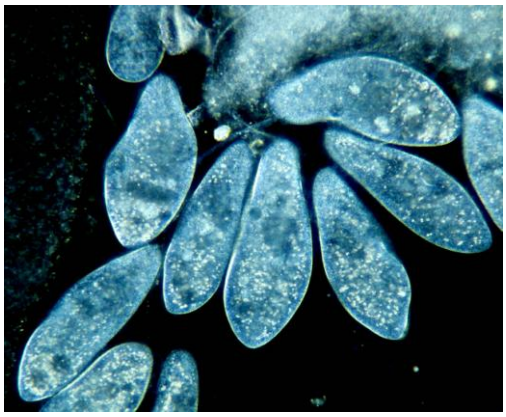
Supplement to Video Program

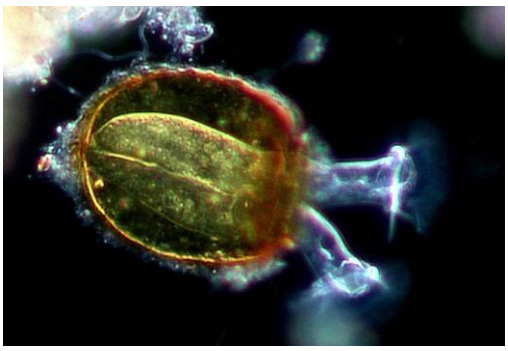
Ciliates are single-celled organisms included within the large group of protozoa. They are considered the most complex protozoans. Their most defining morphological characteristic is the possession of cilia, tiny hairs that cover the cell surface to a greater or lesser extent. The location and abundance of cilia serve to classify the ciliates in ten different classes, each with special characteristics.

Ciliates may have a wide variety of forms, evolved as part of their adaptation or specialization to the environment.

There are ciliates, such as *Paramecium*, with a more or less elongated shape and having their entire surface covered with cilia. But others, e.g., *Stentor*, are trumpet-shaped with the cilia located only at the top.



And there are even ciliates with a stalk or peduncle on which the cell is located, as is the case *Vorticella*.

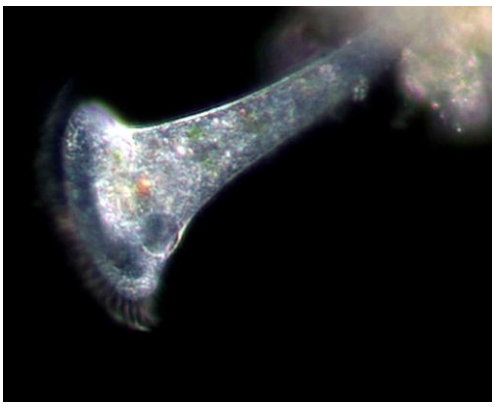


These three ciliates have bare and solitary cells, but there are others, such as *Platycola*, living always in pairs inside a shell secreted by themselves.

This huge diversity of elongated, rounded, trumpet-shaped or bell-shaped, with shell or without it, makes the presence of cilia the observable morphological characteristic that allows us to identify any microorganisms as belonging to the group of ciliates.

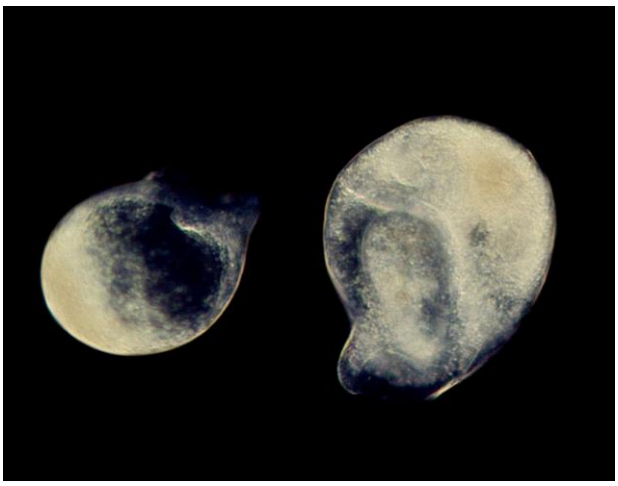
**Some questions:**
Why ciliates have a great diversity of shapes? Why do you think some ciliates live into a shell? What are the two main characteristics that define a Ciliate?

Ciliates are heterotrophic organisms. They are not capable of photosynthesis. That forces them to feed on the organic matter produced by other organisms. Thus, within the group of ciliates appear predatory species (which feed on other organisms) and scavengers and detritivores (feeding on the remains of organic matter in the water).



Most ciliates are filtering species and feed on tiny organisms (such as bacteria) or tiny particles of food. To do this they move their cilia and create streams that draw other microorganisms or food particles from the water to its "mouth " called *cytostome*.

But there are some hunting species capable to actively pursue their prey and hunt them. In some instances these hunters can capture prey as big as themselves and swallow them whole because of the elasticity of their cell membranes.



Whatever the strategy, ingested food is enclosed in vesicles that are called *digestive vacuoles*. And that's where digestion goes on. Some species of ciliates have established symbiotic relationships with unicellular algae called *zooxanthellae*. In this arrangement we can see the tiny green or yellow algae inside the ciliate cell. The algae provide the ciliate some needed nutrients and in return remain protected within the cell.

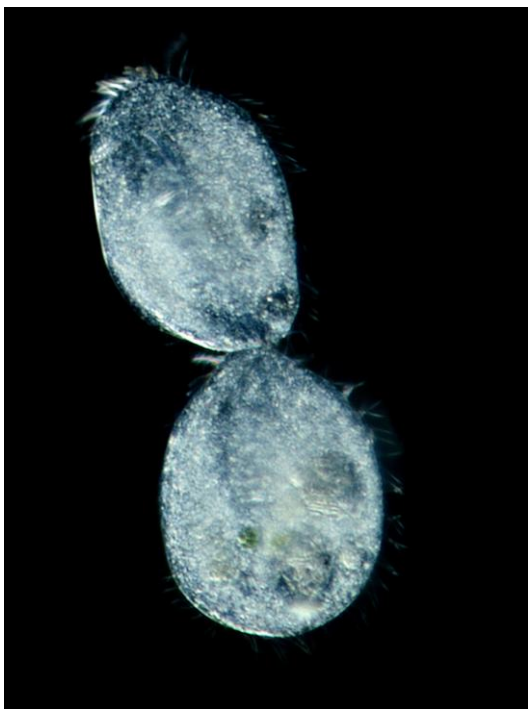
**Some questions:**

Why ciliates are heterotrophic organisms? Do you know what the opposite of heterotrophic concept is? How could a ciliated swallow another as big as itself? What group of ciliates do you think is larger, hunters or filterers? Why? How do filtering ciliates attract food? How would you define the concept of symbiosis?

When environmental conditions are right, when food is in abundance and temperature is optimal, ciliates reproduce. Most species do it using a strategy called *binary fission* or *bipartition*, i.e., in the same way the cells of our body do.

Through this strategy the cell divides into two halves, so that the result is the creation of two cells (called daughter cells) virtually identical to the original cell and that from the very instant that are separated are able to perform a completely independent and autonomous life.

During the division process all cell structures are duplicated, which requires a huge consumption of energy. In species with zooxanthellae symbionts, algae inside the cell are also divided, so that it makes fission even more complex.

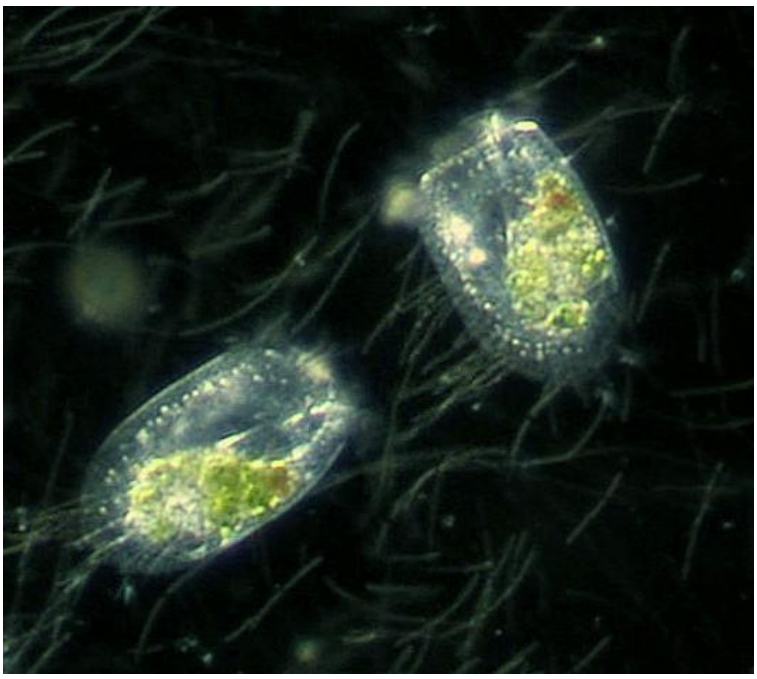


There are exceptions. Some species whose asexual reproduction is not done by bipartition, but by other strategies, such as budding, strobilation or palintomy, have much less importance within the group.

**Some questions:**

Which is the name of the most widespread asexual reproduction strategy among ciliates ?
Why do you think that they only reproduce if food is abundant? Do ciliates have any period of development such as in the case of insect larvae or the offspring of birds and mammals? Why?

Ciliates inhabit almost all aquatic ecosystems on the planet, even into the soil (if the humidity is high enough). So, you may find them in the remaining ponds after the rains, lagoons and freshwater lakes, lagoons of salt water, rivers, sea and even the forest soil moisture. In those places ciliates play an extremely important role, since they constitute a genuine filter that eliminates a huge amount of bacteria and organic matter from the water. For this reason we can consider that ciliates are among the most important natural water purifiers. Besides their role of purifiers they also play the role of prey. Many larger organisms feed on them, such as rotifers, some worms, and larvae of many aquatic insects. They are, therefore, at the lower levels of aquatic ecosystems, whose health largely depends on them.



**Some questions:**
Why do always ciliates live in water or in areas with high humidity? Do you think you can find ciliates at the sand of deserts? And what about the sand of the beach? Why? What do you think would happen in a pond if ciliates do not devour the bacteria?

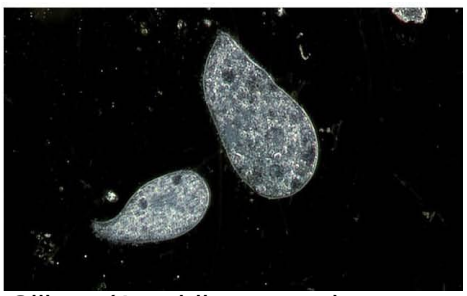
Common Frog *(Pelophylax perezi)*

Song Thrush *(Turdus philomelos)* and Blackbird *(Turdus merula)*

Ciliate *(Colpidium* sp.*)*

Ciliate *(Paramecium* sp.*)*

Ciliate *(Vorticella* sp.*)*



Ciliate *(Amphileptus* sp.*)*

Ciliate *(Spirostomum* sp.*)*

Ciliate *(Stentor* sp.*)*

Ciliate *(Urostyla* sp.*)*

Ciliate *(Trachelium* sp.*)*

Notes