



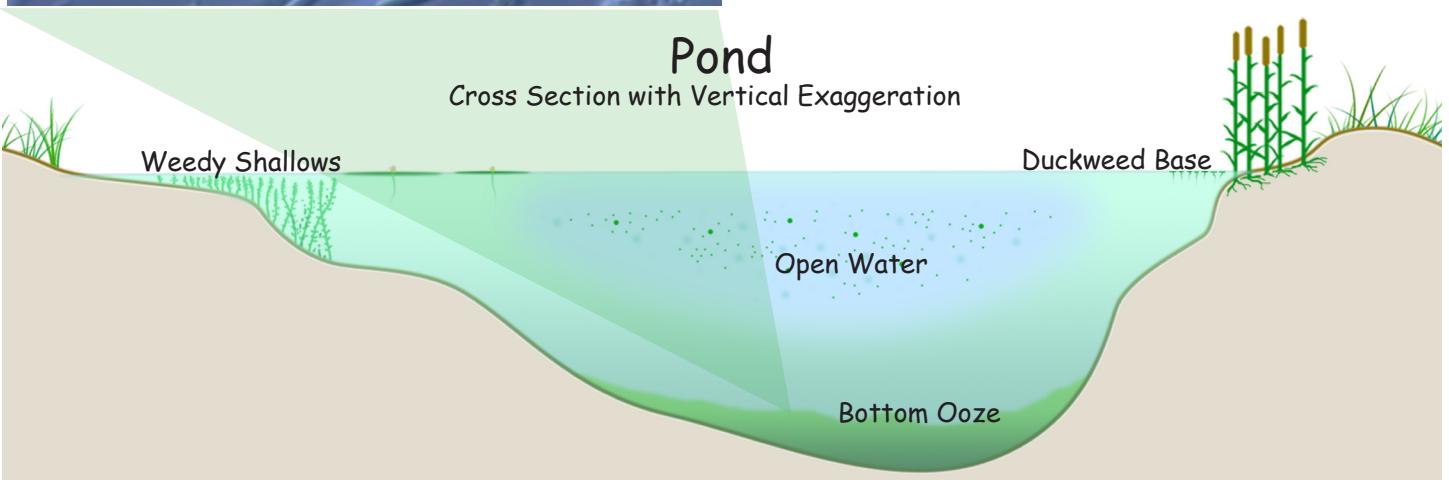
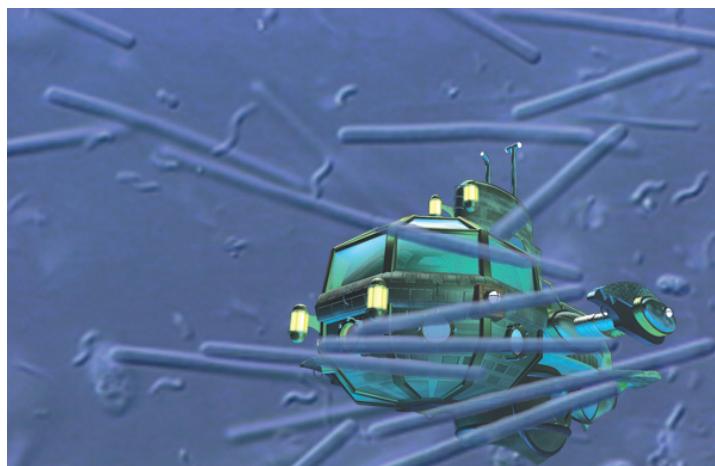
Accompanies Episode 5 of the 13-part video series

The Bacterium that Came to Dinner

Written by Eric R Russell & Bruce J Russell

In this episode...

When the Cyclops crashes into the pond bottom the crew discovers that the bottom ooze is populated by bacteria, thousands per cubic millimeter. They capture a bacterium and investigate the chemical methods it uses to decompose organic material—digestive enzymes secreted through tiny pores in its outer covering. The species they capture produces alcohol as a waste product, which the crew can use to improve the efficiency of the ship's engine.



Pond Ecology: Bottom Ooze

The Log of Captain Jonathan Adler

Day 11: 11:00 hours... We have at last made our way clear of the treacherous weedy shallows and are now making our way back toward Duckweed Base.

Our helmsman, Gyro, adjusts our course to steer clear of the pond lilies. I am concerned that there may be microscopic predators on the underside of these massive plants. I would be most pleased to avoid further adventures with predators.

12:25 hours... An alarming metallic SNAP echoes through the hull!

Gyro reports that a control cable connecting the helm to the ship's control planes has broken. The Cyclops is diving toward the pond bottom out of control!

Down, down we go, accelerating! I shout the order to brace for impact. I can only hope that we are not dashed to bits...

MS Cyclops

Vehicle Dimensions

| | |
|--------|--------|
| LENGTH | 1 mm |
| BEAM | .65 mm |

Vehicle Mission

| | |
|------------------|---------------------------|
| Maximum speed | 10 centimeters per minute |
| Maximum depth | 2.5 meters |
| Mission duration | 60 days |

The microsubmersible *Cyclops* is designed for extended exploration of freshwater ponds, streams, and wetlands. The vehicle carries a standard crew of four.

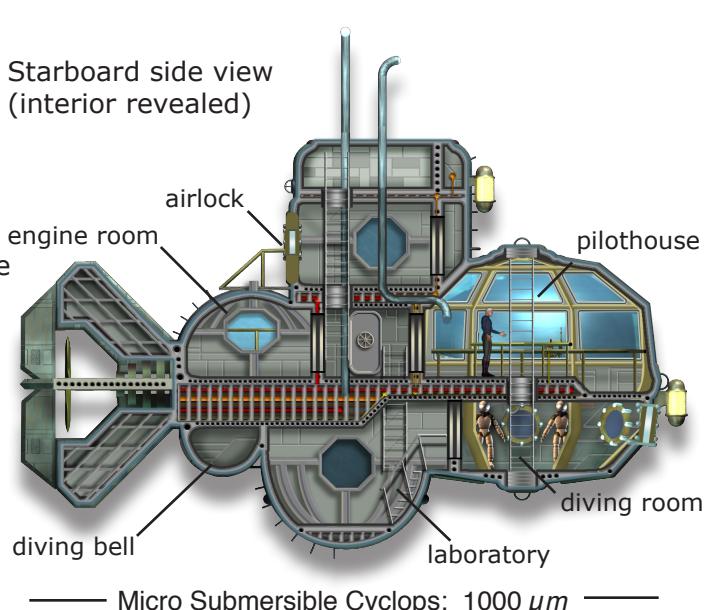
- Captain
- Ship's Naturalist
- Helmsman/Navigator
- Engine Master

There are two onboard auxiliary craft for specialized exploration: a *diving bell*, and a terrestrial *crawler/rover* (disassembled).

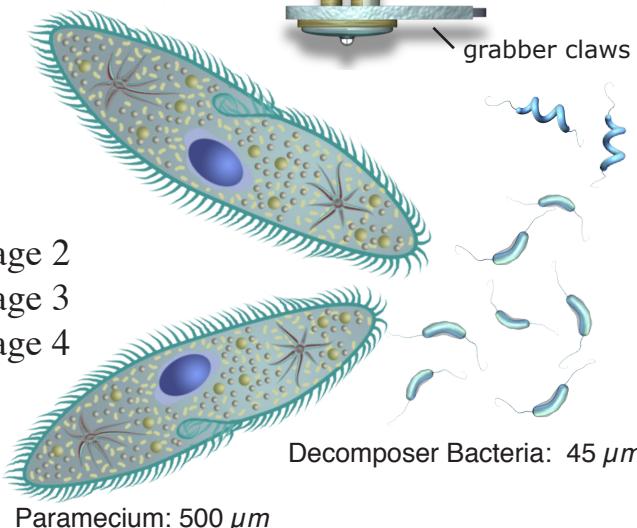
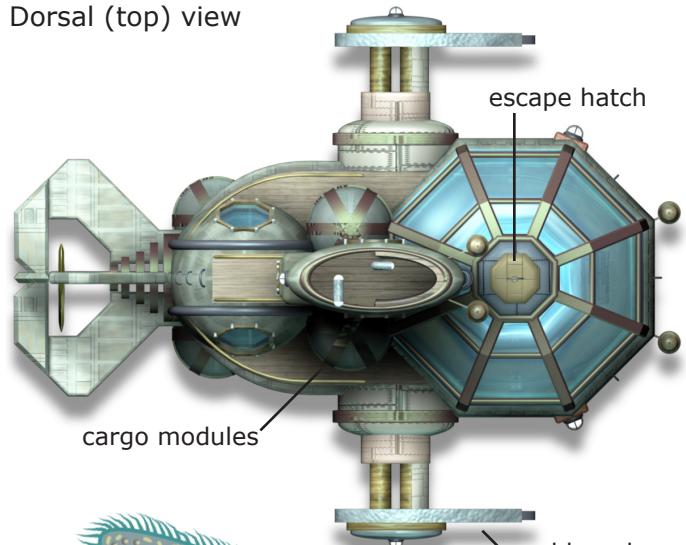
The glass enclosed pilothouse is a unique feature that allows for optimal observation of the surrounding aquatic environment.

Manipulator grabbers (claws) facilitate rapid making-fast and retrieving samples for study.

What if you were a scientist onboard the *Cyclops*? Imagine what the pond environment looks like to these micro sized explorers, only 50 microns (μm) tall. What unique problems might they encounter because of their size? How would they acquire repair materials, such as glass? Where would they find food, fuel, or oxygen?



Dorsal (top) view



Contents of this guide...

- The Cyclops Exploration Vehicle
- About the Organism
- Key to Organism

page 2

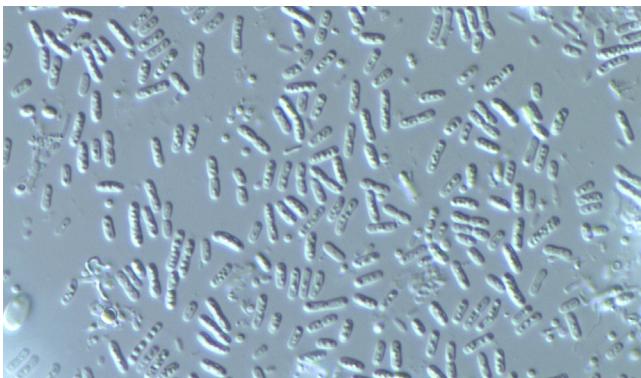
page 3

page 4

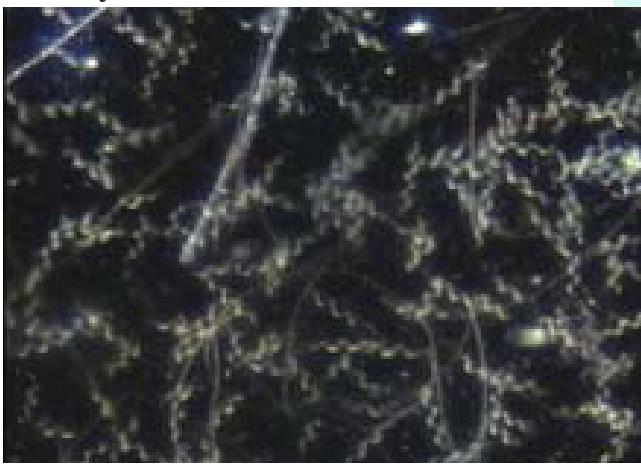
About the Organism

Pond Bacteria

The layer of loose organic material covering a pond bottom is swarming with life. This **bottom ooze** is where dead organisms are broken down and their vital elements recycled for use by living ones. This task is done by bacteria, including some of the largest and most interesting representatives of these tiny cells.

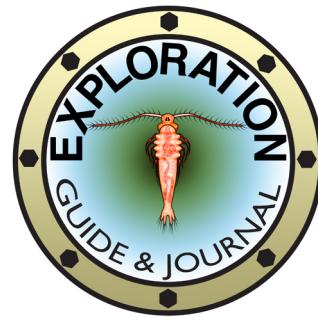


Decomposer bacteria secrete **digestive enzymes** into their environment. The enzymes process dead organic material, breaking it down into simple **building-block molecules**. Bacteria absorb these building blocks and use them for energy and building new bacterial **proteins, fats, carbohydrates** and **nucleic acids**.



Bacteria become food for bacteria-feeding protists such as *Paramecium*, beginning a **food chain** based on decomposition.

Bacteria are the most abundant and diverse organisms on Earth. They thrive in ponds and wetlands, in the soil, and in every kind of animal, plant, and fungi.



The Log of Captain Jonathan Adler

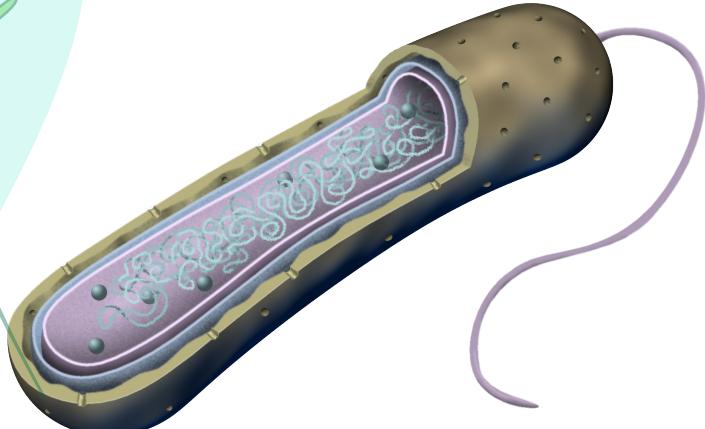
13:30 hours... Luckily, the pond bottom turns out to be softer than suspected. We survive our ungraceful landing with only minor damage. While engine master Barron begins repairs to the Cyclops, Lyra and I sample the conditions here on the bottom. The water down here, we quickly learn, is lower in oxygen than near the surface. And the carbon dioxide levels much higher. We wonder what would account for such conditions?

When we take a peek outside we see a world swarming with bacteria! As usual, Lyra insists that we bring one of these small cells onboard for closer study.

14:10 hours... The bacterium we capture appears much simpler than our previously studied microorganisms. Unlike the larger single cells we've encountered it has no nucleus, and very few internal parts.

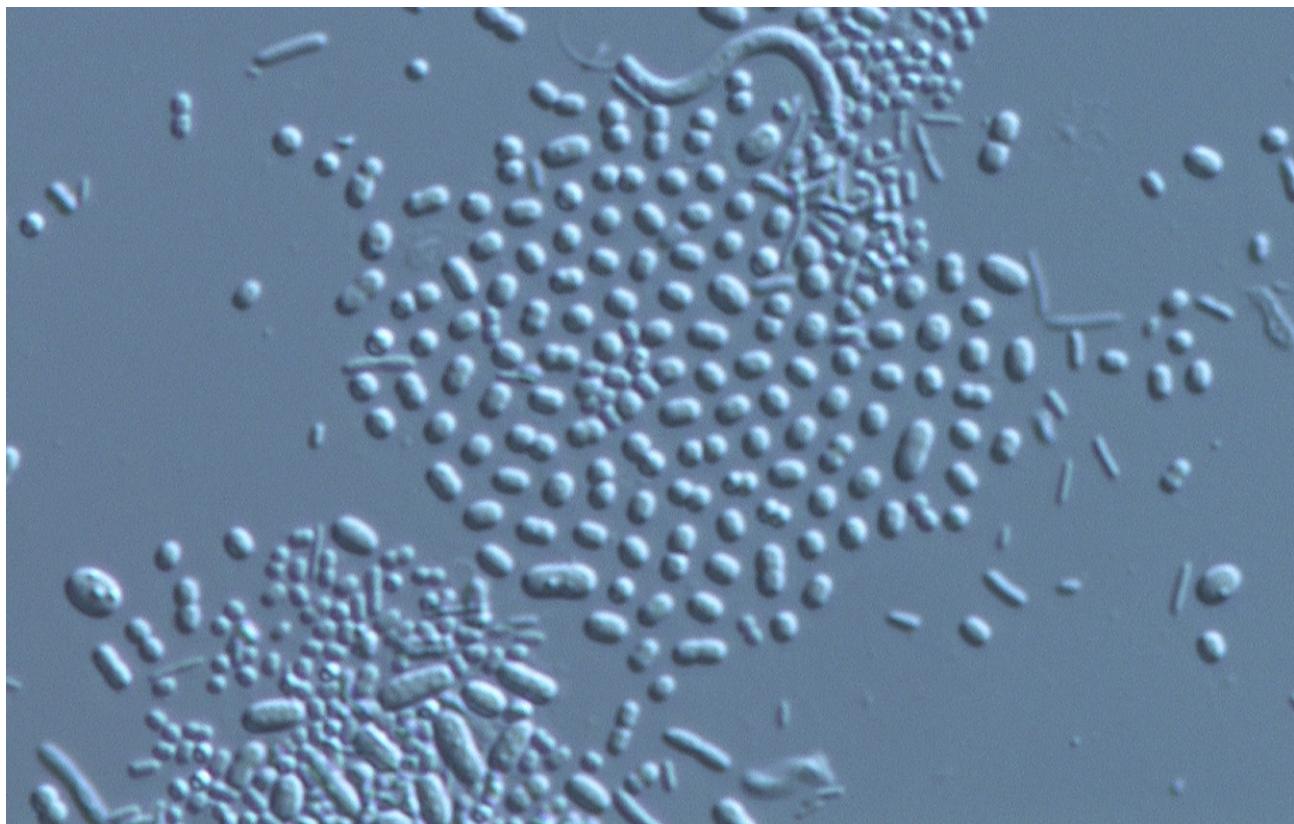
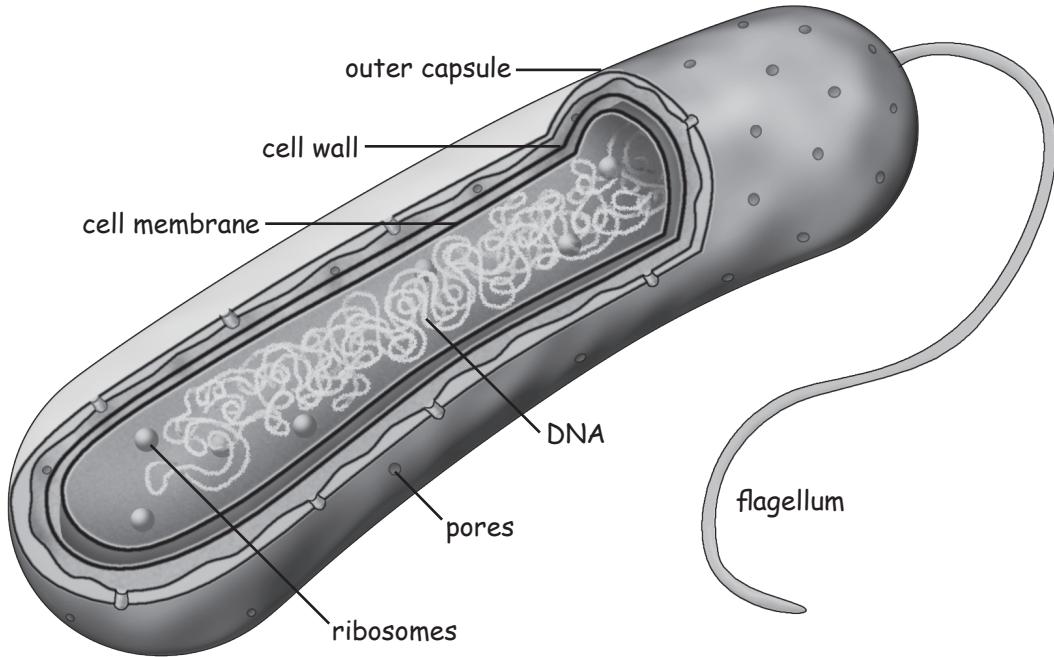
To our astonishment the bacterium has a destructive effect on our examination pool! A closer look shows that the bacterium fills the surrounding water with digestive molecules called enzymes. These enzymes react with dead plants and animals, breaking them down into molecules that the bacterium can use to build more enzymes and other molecules of life.

We conclude that bacteria provide perhaps the most important role in Life - they break down dead organisms, then become food for larger single cells. And those become food for larger organisms yet. This is the beginning of a **food chain**.



Key to Organism

Anatomy of a Bacterium



All images copyright 2015 Castle Builders Entertainment, Photography by Bruce J. Russell



**The Freshwater Adventures Volume, 13 Episodes
Copyright Castle Builders Entertainment 2015**

- Perilous Plankton**
- Photosynthetic Fauna**
- Plagued by a Predator**
- A Monster in the Shallows**
- The Bacterium that Came to Dinner**
- Voyage to the Bottom of the Food Chain**
- Quick Current Critters**
- Down the Waterfall**
- Forest Floor Explore**
- The Great Termite Kingdom**
- Province of Plant Prospectors**
- Lair of the Earthworm**
- Stromatolite Explorer (Bonus)**

www.microscopicmonsters.com

**Microscopic Monsters is produced by Castle Builders Entertainment
and is distributed for education by BioMEDIA ASSOCIATES, LLC.
info@ebimedia.com (877) 661-5355**