ACTIVITY 20

SINKING SLOWLY

HOW DO TINY PLANTS, WHICH NEED LIGHT, MAINTAIN THEIR POSITION IN THE WATER COLUMN IF THEY ARE HEAVIER THAN WATER? HOW DO TINY DRIFTING ANIMALS KEEP FROM SINKING TO THE BOTTOM?

SCIENCE SKILLS:
- observing
- measuring.
- inferring
- predicting

CONCEPTS:
- Phytoplankton and zooplankton have a variety of adaptations which help them remain in position in the water column.

MATH AND MECHANICAL SKILLS PRACTICED:
- measuring time
- construction of models

SAMPLE OBJECTIVES:
- Students will be able to describe strategies plankton use to maintain their position in the water.
- Students will be able to apply an understanding of form and function to the construction of a model

INTRODUCTION:

In this exercise, students will observe pictures or a film about plankton and then apply what they have learned to the construction of a model. The goal in constructing a model of phytoplankton or zooplankton is to make one that sinks most slowly. This activity is best suited to warm weather when it can be done outside as both students and floor are likely to get wet. The construction phase may be done as a homework assignment with the contest taking place at school.

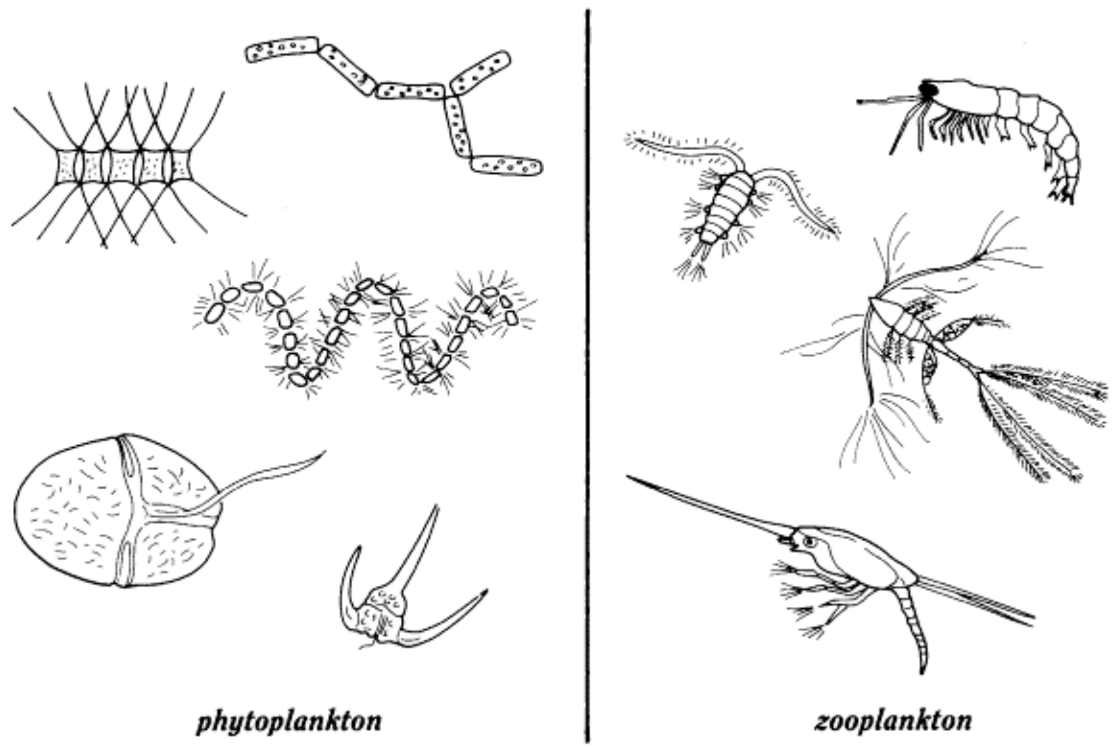
MATERIALS:
- pictures of phytoplankton and zooplankton
- movie or video on plankton if available:
- "Plankton and the Open Sea", 18 minutes, Encyclopedia Britannica "Plankton of the Sea", 12 minutes, Fleetwood Films
- "Plankton: Pastures of the Ocean", 10 minutes, Encyclopedia Britannica "Plankton: the Endless Harvest", 18 minutes, Universal Education
- live or preserved plankton if available (see Recipes for easy ways to view plankton, even without a microscope, and for sources)
- clay, plastic vials, nuts, nails, toothpicks, wire, strings, Styrofoam pieces, cooking oil, film cans, aluminum foil, coffee stirrers, straws, glue
- buckets of water

- a large aquarium or a trash can full of water
- stopwatches or digital watches which read in seconds
- (optional) small, inexpensive prizes

LESSON PLAN:

BEFORE CLASS: This is a great, messy activity. It is particularly good for a warm day when the class may be naturally restless and ready for some excitement. The best way to finish this class is with a contest so you may want to think about some possible prizes.

DURING CLASS:
METHODS: Start with observations of zooplankton and phytoplankton. Observe their shapes, projections and behaviors. Most plankton are heavier than water and tend to sink. Ask how they might stay up in the water. Make a list of the students' observations. Encourage thought about the discoveries on density from the preceding lab.



Some of the students should notice that many plankton have long projections or antennae or hairs. Have them speculate on how these would affect movement through water. Could the students run through water faster with their own arms spread out or folded up? What tactics would they use to jump into the water if they did not want to have their head go under: the giant stride which presents the maximum surface area. Conversely, if they wished to go under water when jumping in, they would present the most streamlined body shape to get as little resistance as possible. Think of a good dive. Alternately, have the students design their plankton at home and test them in the bathtub.

Now have the contest: a sink off. Have each group determine the slowest. Then have the group winners sink against each other in a big trash can of water or a very large bucket. Beware of over stressing a cheap plastic trash can which may pop a leak. If you cannot give everyone a good view, have several students help you as judges. You can time each separately, but it is more exciting if pairs of phytoplankton or zooplankton are released to "reverse race" their way down. Release them at the same time for a fair start. The SLOWEST from each pair goes into a second heat and so on until you get down to two.

Have the students analyze what they think made each of the last two models winners. Then have them vote on which they think will win the grand prize for slowest overall based on their analysis. Do the final test and distribute prizes.

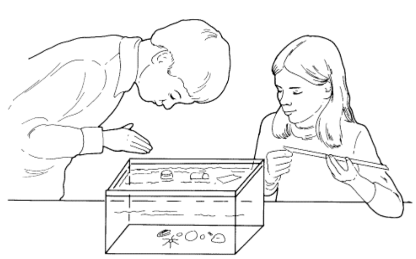
One word of caution -- beware of models that sink because they are gradually filling with water. Hold the objects under water to release them. Anything that rises before sinking, floated and then took on water is disqualified. Models must be heavier than water to start with.

RESULTS:
Something just barely heavier than water with lots of projections should win unless a student can produce a flat, pie pan shaped object that makes big swings from side to side as it descends. The slowest sinking item yet tested in the author's workshops was a piece of pre-wetted crepe paper. It drifted from side to side as it very slowly sank.

CONCLUSIONS:
The strange looking shapes found on plankton have specific functions, including helping them stay in the lighted zone of the water where they can get enough light for photosynthesis (making food using light energy).

USING YOUR CLASSROOM AQUARIUM:
It is best not to do this activity in a functioning aquarium as the models may contain toxic materials, and the fish will not enjoy the activity. If you have live zooplankton for this class, try feeding it to the fish in your aquarium when you finish.

EXTENSIONS:
1. Have the students write a poem or paragraph about what it might feel like to be a phytoplankter or zooplankter, tending to sink. Remember that zooplankton can "swim" their way up.



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Name Possible answers

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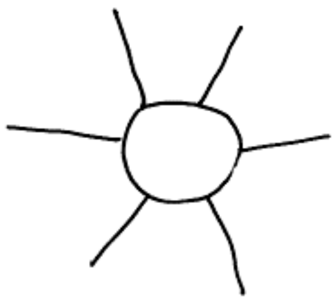
Draw a picture of the model plankton you designed.



If you did not have the slowest sinking model, compare how your model differed from the winner in terms of its shape. How would you change your design to make it sink more slowly?

No, mine was not the slowest. The winner had more projections to "catch" the water. It had more resistence or drag. Also, it was not so heavy.