

Winogradsky Column
(a column used to grow bacteria with vertical gradients of oxygen and sulfur)

Materials (per group):

- clear plastic 16-oz. bottles without labels
- one large plastic container with which to collect mud
- smaller plastic container in which to mix the nutrients and mud
- shovel
- aluminum foil
- mortar and pestle
- sharpie to label plastic bottles
- newspaper
- hardboiled egg yolks
- stick of chalk
- scissors
- half a cup of sawdust (opt)
- half a cup of grass clippings (opt)
- half a cup of oatmeal (opt)

Procedure:

1. Walk to the pond. Collect about 6 cups of wet mud per person (avoid rocks or sticks). Also fill 2 bottles with pond water.
2. Sign up with Miss K. the research question your group chooses to explore.
 - a. Do bacterial populations vary within the column with changes in light?
 - b. Do bacterial populations vary within the column with changes in the amount of source sulfur added?
 - c. Do bacterial populations vary within the column with changes in the amount of source carbon added?
 - d. Do bacterial populations vary within the column with changes in the type of carbon source added?
 - e. Do bacterial populations vary within the column with changes in the mud source?
3. Place one cup of mud into a plastic container. Add some water and mix until the mud is the consistency of a melting milkshake.
4. Cut the top of the plastic bottle off – you may use this as a funnel.
5. Add ½ a sheet of thinly shredded newspaper as a source of carbon.
6. Add one tablespoon of hardboiled egg yolk as a source of calcium sulfur.
7. Grind half a stick of chalk, using the mortar and pestle, until the chalk is a fine powder. Add 1 tsp. of the powder to the mud slurry as a source of calcium carbonate.
8. Stir the mixture until it is homogeneous. Then use the funnel to add the mud mixture to the empty soda bottle. Tap the bottle after EACH addition to get air bubbles out of the column. Stop adding the mud when it comes to about 4 cm from the top.
9. Add pond water to the top, leaving 2 cm at the top.
10. Cover the top with plastic wrap and a rubber band. Label this column with your names, the period, and the words, “positive control”. Place in the bottom shelf of the light cart.
11. Design a procedure to test the question you have chosen against the control column using your remaining bottles and mud. You must include a negative control (for instance with the sulfur group, the negative control column would have no added egg). Please run the procedures by Miss K. before you begin.
12. Make sure your procedures (including the ones for the positive control and the ones to test your question) are written in your field notebook.
13. In 3-6 weeks, stratifications will appear on the columns. At this time you will begin to record the data.