

Quick Facilitation Guide

Winogradsky Column

This Quick Facilitation Guide is adapted from the American Museum of Natural History's activity "How to Make a Winogradsky Column." It provides instructions on how to make a Winogradsky Column and provides suggestions for how to make it an ongoing experiment in your library.



Credit: Space Science Institute/NCIL

Key Concepts

- Microorganisms have a wide array of conditions they can live in, ranging from anaerobic (no oxygen) to aerobic (oxygen present).
- The byproducts (such as oxygen and other gas exchanges) of some organisms can provide the conditions that other organisms require for life.
- Different microbes are adapted to different environmental conditions (such as light and nutrient availability), but their metabolism processes lead to the formation of niches for other microbes creating intersecting, cooperative ecosystems.
- NASA's Astrobiology Program (astrobiology.nasa.gov) supports cutting edge research to better understand how life formed on Earth and whether it exists beyond Earth. The search begins with understanding extreme life on Earth, such as the microorganisms that can survive in anaerobic (no oxygen) conditions!

Intended Audience

- Families or other mixed-age groups, including children as young as 10 years old with assistance from an older child, teen, or adult.
- School-aged children ages 10 and up.
- Tweens & Teens

Activity Time – 8-10 weeks

Type of Program – Facilitated hands-on

Originating Source – American Museum of Natural History

Materials

- One clear 16 oz bottle per column (if using a water or soda bottle, you will need scissors to cut the tops off)
- Permanent marker
- Shovel or trowel
- Two buckets
- Two mixing bowls
- Newspaper or plain paper (shredded)
- Scissors
- A raw egg
- Plastic wrap
- Rubber bands (one per column)
- Access to a muddy stream, pond, lake, or marsh
- Rubber boots and old clothes that can get muddy (optional)
- Data collection notebook

Simple Instructions

Preparation

1. Prepare the bottle: if using a plastic water or soda bottle, carefully cut off the top of the bottle. Draw two short lines on the bottle: one a quarter from the bottom, the other a quarter of the way from the top.
2. Cut a quarter sheet of newspaper (or plain paper) into thin strips and then again into small rectangles. **This will be a source of carbon for the microbes.**

Collection

3. Dig up mud from a pond or riverbed and fill your bucket with enough mud to fill the bottle. **Microbes live in the mud!**
4. Transfer enough mud into a mixing bowl to fill $\frac{3}{4}$ of the bottle. Add water (from the pond/river or tap water) and stir until it is the consistency of a milkshake.
5. Transfer about $\frac{1}{4}$ of the mud mixture into the other mixing bowl. Stir in a handful of the shredded newspaper and add one egg yolk. **The yolk will be a source of sulfur for the microbes.**



Credit: Space Science Institute/NCIL

Make the ecosystem

6. Shovel the yolk and newspaper mud mixture into the bottom quarter of the bottle (to the lower line). Gently tap the bottle to release air pockets as the mud settles.
7. Add the regular mud mixture to the bottle until it is about a quarter of the way from the top (to the upper line).
8. Add water, leaving an inch of air at the top.
9. Cover the pottle with plastic wrap and secure with a rubber band or tape.
10. Place your column in a well-lit location where it can be undisturbed for 8-10 weeks.



Credit: Space Science Institute/NCIL

Record your observations over time

11. As time goes on, observe various color changes as the microbes separate into their various environments. **Different colors represent different species of microorganisms.**
12. Record your observation in a journal or bulletin board display, noting colors, changes in the sediment, and any differences between multiple columns if you made more than one. Leave a magnifying glass next to the column for closer inspections and take a photo of the column each week to visually compare changes over time. Always include the photo's date and time.
13. Use online tools to identify the microbes:

<https://www.amnh.org/>

http://www.mbio.ncsu.edu/mb452/winogradsky_columns/wc.html



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