WINOGRADSKY COLUMN

A Winogradsky column is a self-contained mini ecosystem in a bottle, made using sediment, water, and easy-to-find nutrients.

It's a fun way to observe the microbial communities in the soil and to see how they change along a nutrient gradient. In a Winogradsky column, colonies of microbes visibly stratify themselves into layers based on the availability nutrients in the sediment sample, often resulting in layers in a rainbow of colors.

Here's What You'll Need:

A bucket or tub and a shovel or trowel to collect a sediment sample
A container for water
Mixing bowl
1 liter plastic bottle
Scissors
Plastic wrap
Rubber bands
Carbon source

Materials that release carbon slowly:

- Newspaper or plain paper
- Dry vegetable materials like: dried leaves, shredded hay, grass clippings, sawdust, corn starch, oatmeal
- Egg shells

Materials that release carbon more quickly:

- Washing soda/soda ash (sodium carbonate)
- Baking soda (sodium bicarbonate)
- Calcium carbonate- this can come in multiple forms, including garden lime and crushed oyster shells

Sulfur source

- Epsom salts (magnesium sulfate)
- Gypsum (calcium sulfate)- sold as a garden fertilizer.
- Plaster of Paris (calcium sulfate)
- Egg yolks (this may smell worse)

What To Do:

SAMPLE COLLECTION:

- Collect the sediment and water samples. If possible, try to collect your samples from an area where sediment and water occur together (lakes, ponds, creeks, ditches, puddles etc…) You will need about a liter of sediment. Remove any rocks, sticks from the sample.

  After you have your sediment sample, collect about a liter of water from the same area. If necessary, you can substitute rainwater or de-chlorinated tap water.

BOTTLE PREP

- If you are using a recycled bottle, remove the label and thoroughly rinse your bottle.
- Cut off the top of the bottle.
- Add about ¼ cup of the material you've chosen as your carbon source to your clean bottle
- Add about a tablespoon of the material you've chosen as your sulfur source.
- Wet your nutrients with your water sample.
- In a separate bowl, mix your sediment sample with some of the remaining water until the mixture has a milkshake consistency. Stir everything until it is well mixed.
- Pour or spoon the sediment mixture slowly to your bottle until it is about ¾ full. Pat it down as you go to avoid air bubbles.
- Pour another inch of water on top the mixture.
- Cover with plastic wrap and a rubber band. Label your column and include the date it was prepared and which carbon and sulfur source you used.
- Place your column near a sunny window or in a well-lit area.

  Now you wait and watch....(anywhere from weeks to months)

- Check the column weekly and keep a log of the changes you see.

Want To Take It Further?

You can try varying the amount of light and/or heat your column gets. Place it in a sunnier or darker window, put a lamp over it, put a paper bag over it to keep it in darkness, put it in the refrigerator, etc…

You can also try varying the nutrients: use different nutrient sources, change the amount you use, skip adding your carbon or sulfur source, vary the size of the nutrient source, add other nutrients like iron…

What's Going On?

Some of the bacteria in the sediment mixture gets the nutrients it needs by breaking down the carbon and sulfur sources you added to the column. When they do, they start a chain reaction of consumption and conversion up and down the column as the other bacteria break down compounds and recycle carbon, oxygen, hydrogen and sulfur according to their needs.

Oxygen loving bacteria will thrive near the top of the column, while those that can't tolerate it will congregate near the bottom.

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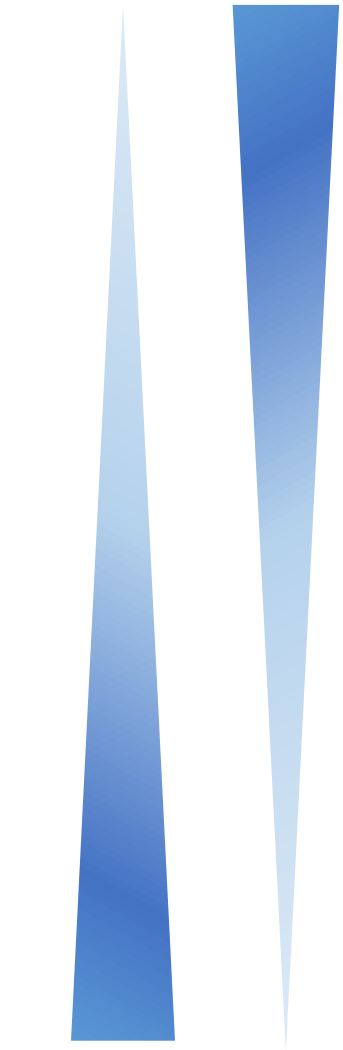
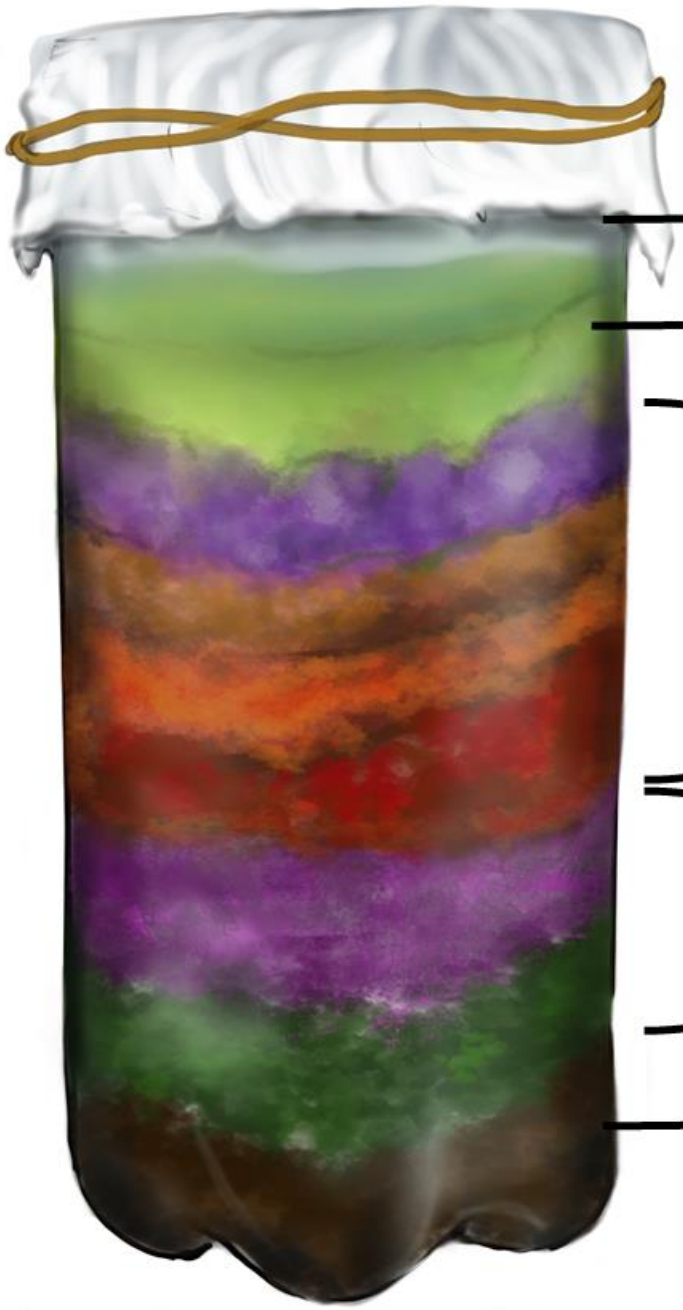
WHAT'S GROWING IN YOUR COLUMN?





air and water layers

Cyanobacteria
Uses sunlight, carbon and hydrogen to produce energy and give off oxygen.

Non-sulfur Bacteria

Species can be purple or anything from yellow to blood red., depending on the level of blue light that penetrates the soil.

Uses sunlight and carbon to produce energy

Purple and Green Sulfur Bacteria
cannot survive where there are high concentrations of oxygen.
Uses sunlight to power the conversion of sulfides (including hydrogen sulfide) into sulfur.

Sulfate Reducing Bacteria
Thrives in the absence of oxygen.
Uses sulfates to produce energy and gives off sulfides.

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