**Winogradsky Columns**

***Materials:***

* Large container
* Tall plastic bottle
* An egg
* Stick of chalk and/or Tums antacid
* Paper (optional: scissors to help with cutting)
* Funnel
* Stick (to push material through the funnel)
* Soil
* Tap water
* Mixing spoon

***Procedure:***

1. Mix half of your soil with an equal amount of water in the large container.
2. Add 1 cup of shredded paper. Rip the paper into small pieces (~1 cm) or else it will be hard to put the material through the funnel.
   1. Mix up the dirt and paper well.
3. Add 1 egg to the mixture. Save the shell for the next step.
4. Put eggshell in the ziploc bag with the chalk and crush them to very small pieces. Add to the mixture in the large container.
5. If needed, add more water to make this mixture into a milkshake consistency.
6. Mix everything, and pour through the funnel into the plastic bottle until the bottle is about half full.
   1. Add extra water and swirl the container to get the rest of the dirt out.
   2. Use a stick to scrape contents off the sides of the plastic bottle and pack this mixture firmly in the bottle.
7. On top of the soil mix, fill the bottle most of the way up (85% full) with the rest of your soil.
   1. ***Do not*** mix this in with the rest of the contents.
8. Add ~1 inch of water on top and close the bottle. Don’t mix it in further with the rest of the contents.
   1. Loosen it once in a while to prevent gas buildup.
9. Place this bottle in a sunny window. In the meantime, hypothesize what you’ll observe as time passes on.
10. As your Winogradsky column changes, record weekly observations of what you see over time.
    1. If you can, take pictures too.
11. Once you’ve observed sufficient bacterial growth (6 to 8 weeks), draw conclusions of what happened.
    1. Did you observe color changes over time? If so, where did it start and how does the color change over time throughout the column? What colors did you see? How did the changes you saw relate to your initial predictions? If they differed, why?
    2. Which bacterial types could these colors signify? Draw conclusions based on color, location in the column, perceived aerobicity. Discuss the diversity of bacteria you found and how that could relate to the natural environment.
    3. Natural environments don’t have the same ingredients we used lying around, like paper and chalk, so what do you think exists in the natural environment to make up for these added ingredients?
12. Look at this video explaining what happened over time in your Winogradsky column: https://www.youtube.com/watch?v=2CB2l41XJD8
    1. Only watch this video once the experiment is over, or else it will ruin the fun. If you don’t understand what is happening throughout the experiment that is okay because you are learning.
    2. How did your predictions and conclusions fare to the video’s explanation?
    3. You may have witnessed things which weren’t included in this video. That’s okay; do some research online of what that could mean.