



**COLLEGE OF
EARTH, OCEAN,
AND ENVIRONMENT**

The Winogradsky Column: an enclosed self sustaining microbial system.

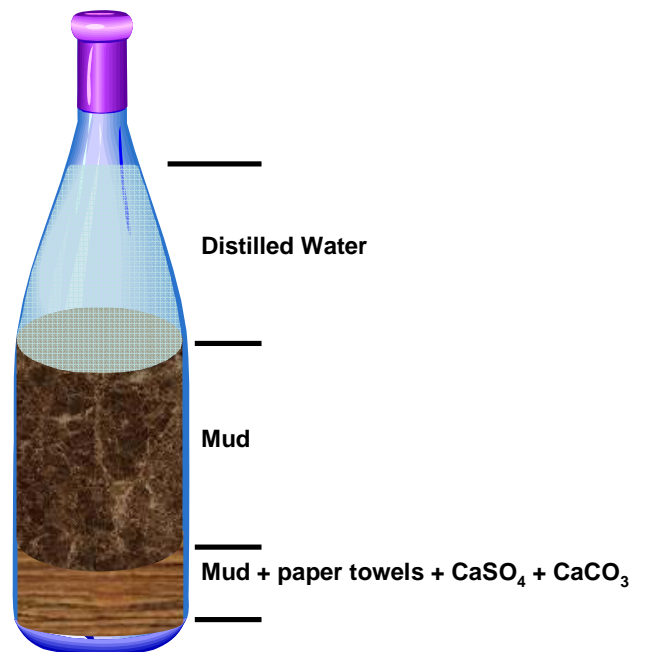
Materials:

Mud or soil
Paper towels, finely shredded
Calcium sulfate (Gypsum or plaster of paris, craft or garden stores)
Calcium carbonate (garden lime or crushed limestone, garden stores)
Clean, clear plastic bottle with cap
water
Window or lamp

Procedure:

1. Mix 2 parts paper towels to 1 part calcium sulfate and 1 part calcium carbonate in the bottom of the bottle.
2. Add mud to fill the bottle about 25% of the way up and enough water to mix all the components.
3. Add more mud in on top of the bottom layer until the bottle is ~75 % full.
4. Fill the bottle with water to just below the neck and loosely cap.
5. Place the bottle in a window that receives sunlight or by a lamp. If using a lamp, make sure that the bottle is not so close that it gets hot.
6. Growth should develop in 2-4 weeks and continue to change over 6-8 weeks before becoming stable. Add water if necessary and the column should remain stable.

Diagram of completed column:

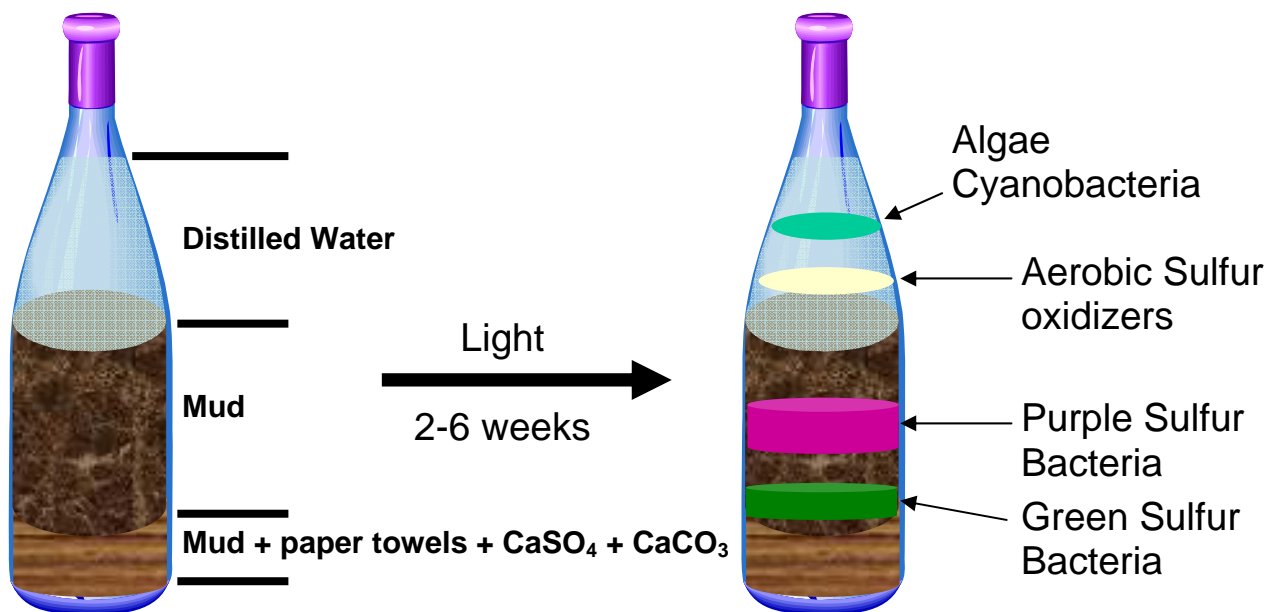


Send me questions or pictures of columns:
tehanon@udel.edu

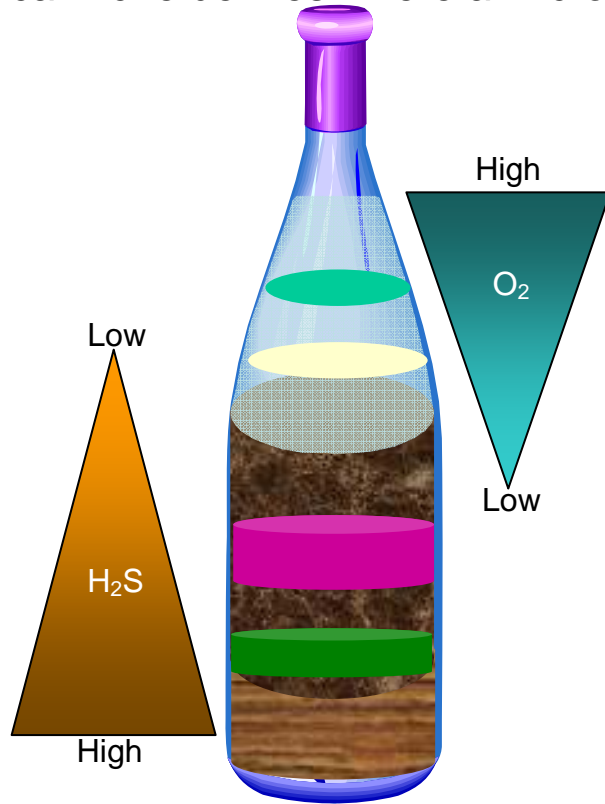
Questions/Experiments:

1. What does each of the additions provide for the column (Paper towels, CaSO_4 , CaCO_3)?
See the following diagrams.
2. Does light quality (color) affect the types of bacteria grown from a single mud? Why?
Use colored cellophane wrapped around duplicate columns made from the same mud.
2. Does adding a fertilizer change what types of bacteria grow from a single mud?
Duplicate columns, one with a small amount of garden fertilizer, one without.
3. Is light necessary?
Make a duplicate column wrapped with foil and see if anything develops.
4. Does the same mud always give the same types of bacteria? Do different muds and soils produce different bacteria? Are certain types of muds “richer” in bacteria than others?
Make multiple columns from one mud sample and make single columns from multiple mud samples.
5. What can be done further with each population?

Different microbes inhabit different areas Why does this happen??



Chemical gradients define ecological niches
 An ecological niche defines where a microbe can live



Chemical gradients are perpetuated by microbial activity:

Winogradsky columns are microcosms for microbially driven linked global elemental cycles

