



**Science, Engineering,
Technology & Math**

Microbial Art

What do you see?



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Class Structure

Week #1:

- What is microbiology?
- What is a microbe?
 - 5 Microbe Fast Facts
- Petri dishes
- Getting familiar with equipment

Week #2:

- Gathering bacteria
- Identifying bacteria types

Week #3:

- Gathering bacteria
- Learning how to manipulate the bacteria for art.
- Art research

Week #4:

- Gathering bacteria
- Making agar

Week #5:

- Painting with bacteria
- Gather materials and information for Science Summit
- Work on tri-folds

Week #6:

- Painting with bacteria

Week #7:

- Make sure everything is set for Science Summit!
- **SCIENCE SUMMIT!**

Week #1: Introduction

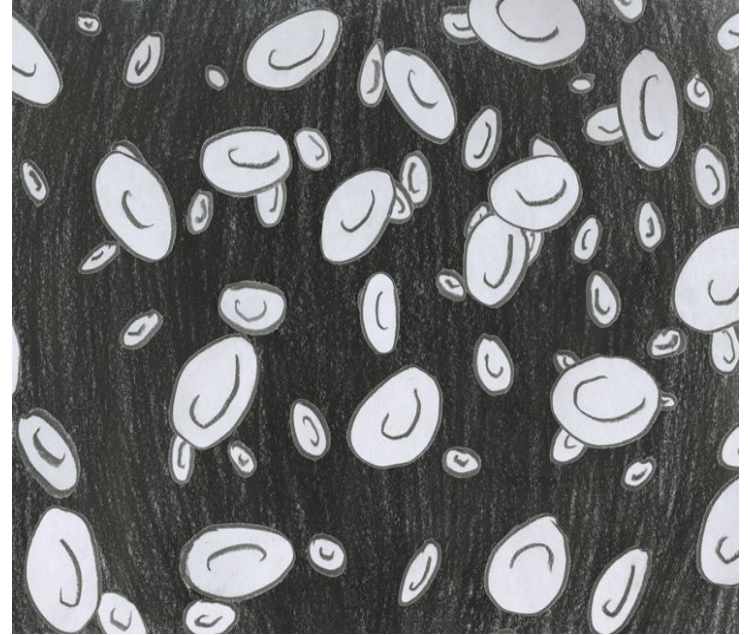
- What is microbiology?
- What is a microbe?
 - 5 Microbe Fast Facts
- Petri dishes
- Getting familiar with equipment

So...WHAT IS MICROBIOLOGY?

Good question!

Microbiology is the study of microscopic organisms, such as bacteria, viruses, archaea, fungi and protozoa.

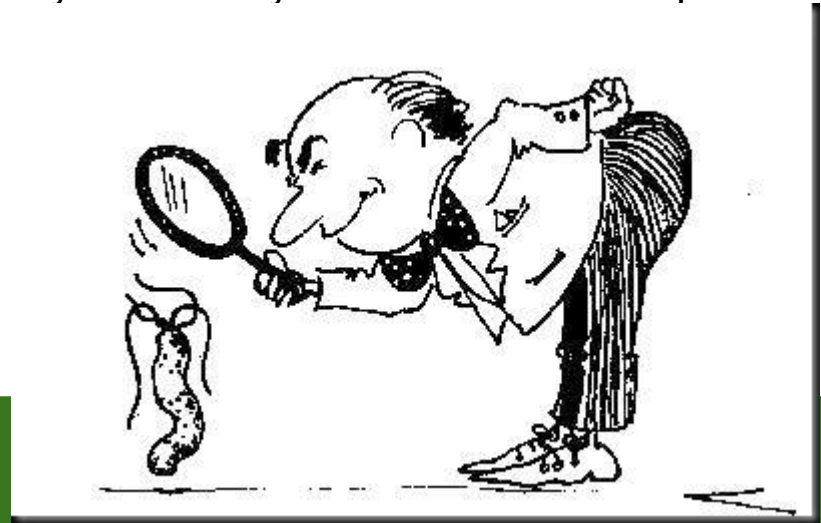
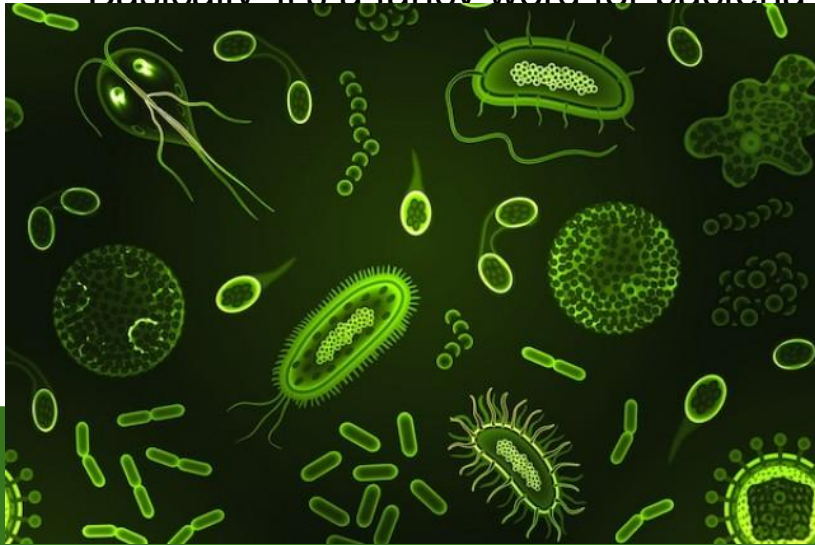
In other words, it's what scientists study when they want to find out how bacteria affects us!



WHAT IS A MICROBE?

Microbe (n): a microorganism, especially a bacterium causing disease or fermentation.

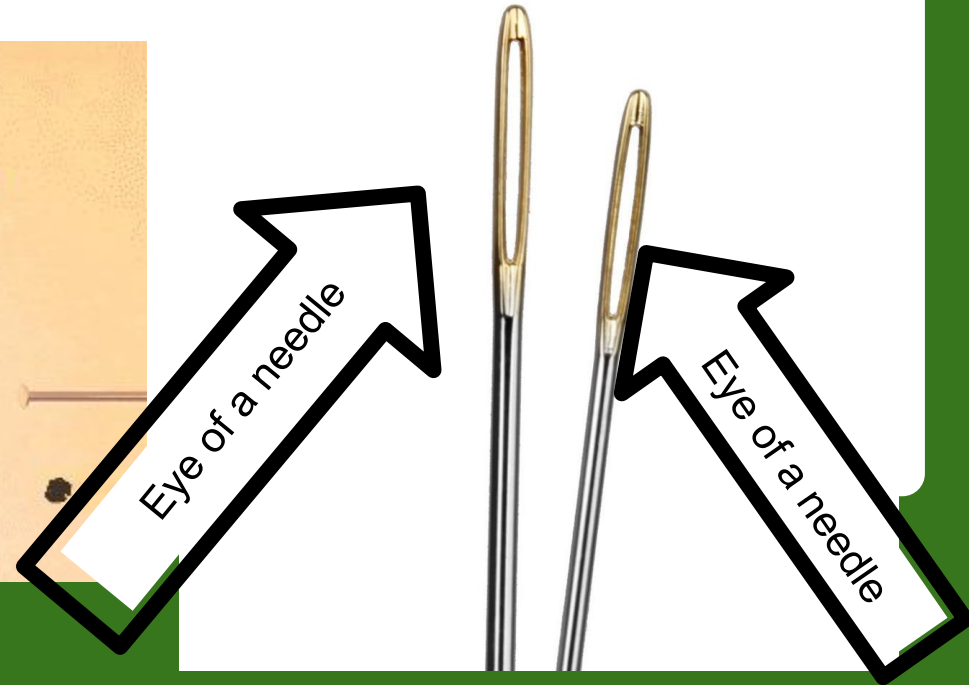
Basically it's a fancy word for bacteria that you can only see with a microscope.



And now...

***5 MICROBE FAST FACTS
THAT WILL BLOW YOUR MIND!***

FACT #1: Microbes are single-cell organisms so tiny that millions can fit into the eye of a needle.

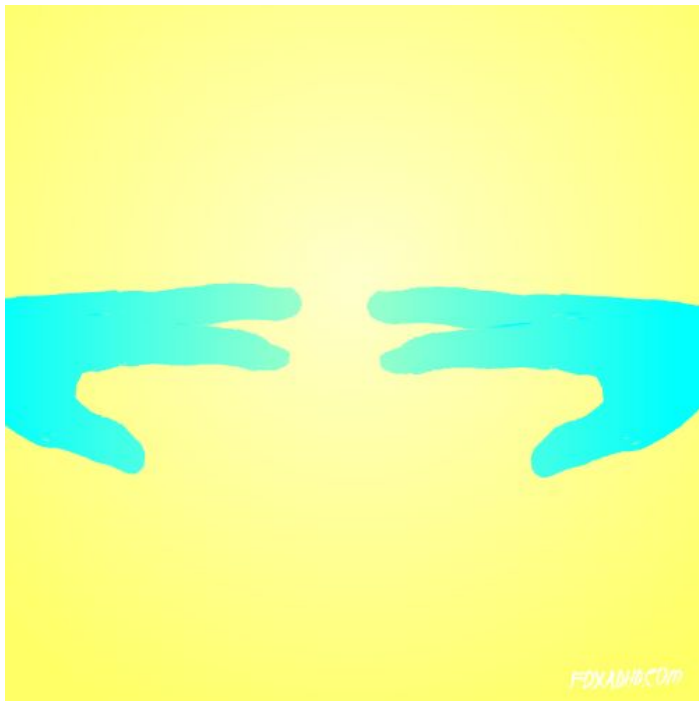


FACT #2: Without microbes, we couldn't eat or breathe. Without us, they'd probably be just fine.



We couldn't digest food without them—animals couldn't, either. Without microbes, plants couldn't grow, garbage wouldn't decay and there would be a lot less oxygen to breathe.





FACT #3: There are more microbes on a person's hand than there are people on the entire planet!

FACT #4: Microbes are responsible for creating foods such as wine, cheese, vinegar, yogurt, and sauerkraut.



FACT #5: While most microbes are harmless to humans, a small fraction are capable of causing diseases and are responsible for millions of human and animal deaths throughout the centuries. These disease-causing microbes are the ones we call "germs."





While you are watching, see if you can answer these questions:

What is spontaneous generation?

Who proved that all life comes from other life?

VOCABULARY

aerobic respiration: Respiration that requires oxygen.

anaerobic respiration: Respiration that does not require oxygen.

bacteria: A unicellular microorganism with no nucleus.

colony: A visible cluster of bacteria.

eukaryotic: A cell that has a nucleus.

fission: One cell divides into two, which is how bacteria reproduce.

photosynthesis: Converting light energy into chemical energy to fuel an organism's activities.

prokaryotic: A cell that lacks a nucleus.

(https://www.teachengineering.org/activities/view/nyu_bacteria_activity1)

CAREER CONNECTIONS

Getting a degree in microbiology could land you a job as a:

- Microbiologist
- Food technologist
- Research scientist
- Forensic scientist
- Biomedical scientist
- Pharmacologist
- The next Bill Nye the Science Guy...



Week #2: Gathering and identifying bacteria

- Have the kids pick one part of the room that they would like to swab for their petri dish. No boundaries!
- Teach them to carefully rub their swab on the petri dish, especially not to crack the agar at the bottom of the dish.
- Tape the dish closed and label them carefully. Leave them in a warm place in your building and let them sit for a few days (or weeks!).
- Let the kids use the internet to learn more about different types of bacteria and what they look like.
 - http://www.sciencebuddies.org/science-fair-projects/project_ideas/MicroBio_Interpreting_Plates.shtml
 - http://www.biology4kids.com/files/micro_bacteria.html
- If you would like to, you can have the kids draw a picture (with colors) of their petri dishes, drawing arrows to identify the different types of bacteria.

Week #3: Art

- Continue to swab and grow bacteria. You will need it for next week!
- Also, if you're working on the Science Summit, work on your tri fold during the last half of class.
 - I split the group into five different groups, each working on a different section for the boards. This was easier and it allowed them to really know their stuff before the actual event.
- Allow the kids some time to determine what they would like to draw on their petri dishes.
 - Draw out their sketch on a piece of paper. This will make it easier for them to draw on their petri dish, especially because they will not be able to see what they are drawing on their petri dish.
 - Ask them to use colors and make it scaled to the size of the petri dish.
 - Give them time to research a famous painting, person, or thing, if they would like to replicate it for their painting.

Week #4: Gathering bacteria and making agar

- Continue to swab and grow bacteria. You will need it for next week!
- If you would like, follow the agar recipe on the next page. You can also buy some on Amazon.
- Make the agar with them, to prepare their petri dishes for the next week.
- Check on previously made bacteria and talk about what it looks like. How will they use their bacteria for their painting? Will it change colors? Will it even be useful? What can they swab this week for their painting?

AGAR RECIPE

- ½ teaspoon of beef stock powder
- ¼ cup of water
- 1 teaspoon of sugar
- 1 teaspoon of gelatin
- Saucepan for boiling mixture

What to do:

1. Pour the water into the saucepan and bring to the boil.
2. Add beef stock powder, sugar and gelatin to the boiling water and stir for a minute until all the ingredients have dissolved.
3. Cool your new agar mixture slightly for 10 minutes. The mixture needs to be still hot to avoid the gelatin setting in the saucepan and to prevent contamination from bacteria in the air. The conditions are far from sterile, but you want to avoid as much contamination as possible.

Week #5-6: Painting with bacteria

- This is the week!
- Watch the TEDX video (on the next page) with the kids. Allow them to see how this scientist used bacteria, agar, flame, and patience to make her own art!
- Make and gather your materials.
 - I used paper clips that were manipulated into long sticks with a tiny circle at the top for the main tool that they would use. Make sure there is nothing too sharp at the top.
 - Use a candle to sterilize the tool.
 - Gather old petri dishes and new dishes together and have the kids sit in their own space.
- Make sure to act fast! If they are too slow, new bacteria will grow on their dishes, possibly ruining their art.
- Again, continue to work on your tri fold for Science Summit (if applicable).

***“Bacteria are Beautiful”
Maria Peñil Cobo
TEDx Columbia College
Chicago***

***This is where I got most of
my ideas from. This artist
is amazing and has paved
the way for microbial art
and instruction.***



HOW TO PAINT WITH BACTERIA

- Make a tool.
 - I used paper clips and manipulated them into a long stick and a round loop at the top. You could probably use a paint brush, although it wouldn't be sterile for long.
- Use a candle for sterilization.
- Working quickly, gather desired bacteria from old petri dish, closing the lid when gathered.
- Open the new petri dish, beginning to paint in desired manner.
- Close new petri dish quickly.
- Sterilize the tool using the candle.
- Gather more bacteria. Close the dish.
- Continue to paint.
- Repeat until new petri dish is filled and student is satisfied.
- The petri dish should be taped closed (not glued yet) and placed in a warm area.
- Be sure to check on the petri dishes frequently, so as to not overgrow the design.

Week #7: SCIENCE SUMMIT!

- Make sure tri fold and presentation are finished and ready!
- Using Gorilla Glue, seal the petri dishes shut. This will allow for easy transport, but, most importantly, the glue won't allow the bacteria to grow any more than it already has.

Materials & Supplies

- Petri Dishes
 - Amazon is the best place to buy them!
- Agar
 - Can also buy on Amazon, but the recipes are included.
- Gorilla glue (Epoxy with the brush)
- Gloves (non-latex)
- Cotton swabs
- Candle/source of fire
- Paper clips (to convert into tools for painting)

Pro Tips by Lauren Levorsen

- Don't get too into the names of bacteria. It's too intense for their liking, and not truly necessary for the experiment.
- Buy the petri dishes that already have agar in them. It's easier for your first experiments. If you would like to make your own after that, you can!
- Let the petri dishes for bacteria growth sit in a warm place for many days (even weeks, if you'd like). The colors will change, and there will be more to work with!
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Resources:

- <http://www.nature.com/subjects/microbiology>
- <http://www.microbeworld.org/what-is-a-microbe>
- <https://www.youtube.com/watch?v=Dlbh6024R1c>
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