

Science:

The Microscope

The Atmosphere &  
Rains

Bacteria (the good!)

A. MICROSCOPE:

1. Introduction to the Microscope using the Elementary album for introduction and diagramming.

2. Please ask Learners to draw their own microscope. Make sure they list all the important parts and information, but also add things they wish a microscope could do.

3. Bring things from WINTER into the classroom to look at under the microscope. Remember to revisit this in SPRING if these same objects may look different and there will be others to consider.

4. Consider using a screen adapter for the microscope just for this work. The reaction when ALL Learners can see the same things at once is priceless.

B. The Protection of the Atmosphere:

a. Materials: long fireplace match (or kitchen safety match), cup of sand for extinguishing, hot plate on a heat-protective pad, large spoon.

b. Introduction:

- There are two kinds of heat. One kind comes from something that is burning – like fire. (light the match) or like this match that you see here. (Show and extinguish).
- Another kind of heat comes from something that is not burning itself, but which is heated and then gives off heat –

once it is heated up, it will begin to give off heat. I'm holding the spoon directly on the hot plate to heat it up.

Once the spoon is heated up, we can feel that this spoon is giving off some heat of its own. Put your hand by it, but not on it. This is not a heat that you can see – it doesn't come from a fire – it comes from something that is heated up and begins to give off heat. We call this kind of heat: radiant heat. You might also hear it referred to as dark heat.

- With the rays of the sun, the earth gets heated up and the earth begins to give off heat. The heat that the earth gives off is called radiant heat.
- We can see the rays of the sun coming down – and heating the earth. The rays coming down from the sun are short and strong. The earth gets heated up.....and once the earth starts heating up, it starts giving off radiant heat. The rays of this heat are longer and weaker – we can see how they are going up. But many of them get trapped by the atmosphere and turn back – they're not strong enough to make it back up through all the layers of the atmosphere, so they get turned back towards the earth.
- **INSTEAD OF USING AN ELEMENTARY CHART WHICH CAN BE CONFUSING, ASK FOR VOLUNTEERS. A VOLUNTEER CAN LAY IN THE MIDDLE OF THE CIRCLE. COVER HIM/HER WITH 10 BLANKETS.**

ASK THE VOLUNTEER HOW HE FEELS BEFORE THE BLANKETS AND HOW HE FEELS 5 MINUTES LATER. THE ANSWER SHOULD BE "HOT!"

- As a result of this action, our earth's atmosphere is heated up more by this radiant heat given off by the earth (OR YOUR BODY) than it is by the direct heat given off by the sun.
- If it weren't for all the blankets of the atmosphere- the blankets of air that we have wrapped around us, the earth would lose most of the heat that it gets from the sun. You can experience this change if you have the experience of hiking up a mountain.
- If using a Bunsen burner or other element, adjust actions appropriately.
- When you start off at ground level, at the base of a mountain on a warm summer day, it is like this boy here wrapped up in all these nice warm blankets – with the radiant heat of the earth beneath him. Doesn't he look comfortable? So toasty and warm? But as you go up that mountain, there are fewer and fewer layers of atmosphere.
- REMOVE THE BLANKETS. We feel it getting cooler and cooler until we get to the top of the mountain, where the blankets of atmosphere are gone and there is no radiant heat underneath us and we feel cold, even on a sunny day.
- Look at the face on this fellow – how cold he looks. This explains why it is so cold on the top of the mountain even on a warm summer day – cooler than it is at the base of the mountain.

C: Rains:

- a. 1st Demonstration: hair-dryer, metal cake pan lid or metal lid from inexpensive pot or pan or burner cover, little bit of water
- b. 2nd Demonstration: small saucepan with about ½ inch water in it, clear glass bowl with rim or lip (Pyrex) – with circumference of rim slightly larger than that of the saucepan, heat source, heat protective pad, hot-pad
  - As we discussed the other day, at ground-level where there are many blankets of air and heat cannot escape as easily, it tends to be hotter – as one goes up a mountain, it tends to get colder (indicate going up the mountain). When air is hot, it can hold a lot of moisture
- c. Demonstration 1 Sprinkle some water onto the metal pan and turn on the hair dryer. “Watch what happens.” Blow-dry the water. What happened to the water? It disappeared! It evaporates because it got carried away by the hot air. Hot air can carry so much more moisture than cold air can.
  - So if this hot air coming along down here (indicate the bottom/side of the chart) goes across a large body of water, it collects some of that moisture. As that hot air encounters the mountain, it gets pushed up and up and up. As it goes higher, as it rises, it cools off – and then what happens? It drops its moisture, because the cold air cannot hold as much moisture as the hot air can. So all the moisture that was carried by the hot air, gets dropped as rain – or if it is cold enough, as snow!
- d. Demonstration 2

- Place the pan with a little bit of water onto the heat source (set on high to make the water come to a boil). Do you see how hot the water is? We see it rise up! But as it cools off as it does when it hits this cool bowl (cover the pan with the glass bowl, upside down), water droplets begin to fall! You'll see them trickle down the edge of the bowl. We see water droplets trickle down the side of the bowl – just like when it starts to rain. That is what happens here (indicate the chart).
- It cools off as it gets higher and higher – cold air can't hold as much moisture. So here it drops the moisture on this side of the mountain (indicate). By the time the air gets all the way over to the other side of the mountain, there is no moisture left. That is why it sometimes happens that one side of the mountain can be quite green and lush – and the other side of the mountain can be quite dry; often there are deserts on this other side of the mountain.
- Perhaps you could look at a globe or in an atlas and discover places where there are mountains near a large body of water – and where the deserts are located (SOUTH AMERICA)

D. LEARNERS WILL:

- Explore The Different Types Of Cloud Formations by drawing different clouds and showing the RAIN.
- Listen to stories of how people have predicted weather by looking at the clouds and the sky, both from the historical and modern standpoints – farmers and sailors. FOR INSTANCE:

[https://www.amazon.com/First-About-Amazing-Childrens-Science/dp/0486833062/ref=sr\\_1\\_6?crd=2GR1HP2O5RRA1&keywords=children%27s+books+about+the+atmosphere&qid=1706808755&prefix=childrens+books+about+the+atmosphere%2Caps%2C112&sr=8-6](https://www.amazon.com/First-About-Amazing-Childrens-Science/dp/0486833062/ref=sr_1_6?crd=2GR1HP2O5RRA1&keywords=children%27s+books+about+the+atmosphere&qid=1706808755&prefix=childrens+books+about+the+atmosphere%2Caps%2C112&sr=8-6)

[https://www.amazon.com/Giant-Shield-Atmosphere-Childrens-Sciences/dp/154194013X/ref=sr\\_1\\_14?crd=1N6V0KM3HA5DZ&keywords=children%27s+books+about+the+earths+atmosphere&qid=1706808911&prefix=children%27s+books+about+the+earths+atmosphere%2Caps%2C76&sr=8-14](https://www.amazon.com/Giant-Shield-Atmosphere-Childrens-Sciences/dp/154194013X/ref=sr_1_14?crd=1N6V0KM3HA5DZ&keywords=children%27s+books+about+the+earths+atmosphere&qid=1706808911&prefix=children%27s+books+about+the+earths+atmosphere%2Caps%2C76&sr=8-14)

- IN THE ATELIER, use materials to create the layers of the atmosphere and NAME them!

#### Share the Story of Bacteria

1. Microbes or Bacteria – two terms we will use interchangeably – live in the hottest places on earth, the deepest places in the sea and the coldest temperatures ever recorded. SHARE A 35 PICTURE TOUR OF BACTERIA. We want to facilitate a BETTER understanding of how 99% of bacteria is GOOD for you and that the future of medicine will likely be manipulating the good bacteria inside you.
  - A. BACTERIA live within us. There are twice as many microbes or bacteria in your body as there are cells. We have 30 trillion human cells but there are probably 39 trillion bacteria

living inside us as well (SHOW THIS MATHEMATICALLY – HOW MANY MILLION CUBES WOULD THIS BE, ETC.)

- B. Bacteria is everywhere - on our skin, eyelashes and fingernails, but collectively all the bacteria in our body only weighs just a few pounds (show).
- C. And bacteria come in all shapes and sizes (show).
- D. Bacteria however are NOT PATHOGENS (define). The high majority DO NOT MAKE US SICK. Many more bacteria help us than ever cause illness.
- E. They help digest food, give us vitamins, break down chemicals and destroy the bad microbes.

2. Bacteria (Microbes) is different in different parts of the body (EXPERIMENT)

- We have come to fear microbes because of misinformation. What else do we fear due to misinformation? We might fear sharks. But seeing them is very rare. We might fear a plane crash, but the probability of a plane crash is very low. True information and SCIENCE in particular allow us to gain better information and make better choices.
- Educators should order petri/agar dishes as we will be doing 5 experiments throughout the session. This is a good resource:

<https://www.homesciencetools.com/biology/agar-petri-dishes/>

- A. Each place on our bodies has its own microbial set. Scientists and many doctors believe that this bacterium helps that specific area of the body

succeed.

**B. CREATE your experiment:**

a. Take a bacteria sample from your right hand. Take a bacteria sample from your left hand. ALWAYS put the right-hand sample at the top of the dish to keep track.

b. Label and hang and watch over the next week. Add heat to the wall if not growing.

c. AGAR DISHES should be affixed to the WALL in Reggio Documentation form. This will allow us to monitor the transformation.





C. After a week, RESEARCH why the bacteria is different, note what it looks like, note what type of bacteria it is. Write a paragraph about your hypothesis.

D. MAKE CERTAIN TO DISPOSE of the bacteria in a SAFE MANNER.

### 3. What do Microbes do?

1. Microbes have MANY different functions. Keeping you healthy, keeping disease away and some microbes in your gut even tell you what to eat. Share this article and photos: <https://www.scientificamerican.com/article/how-gut-bacteria-tell-their-hosts-what-to-eat/>

2. Bacteria help our skin as well: <https://www.nih.gov/news-events/nih-research-matters/compound-produced-bacteria-protects-skin>

3. Very cool bacteria living on the surface of our eyes: <https://www.nih.gov/news-events/news-releases/eye-microbiome-trains-immune-cells-fend-pathogens-mice>

4. There are many animals that share the same bacteria that perform certain functions. For instance, ant-eating mammals – pangolins, armadillos, anteaters, etc. – ALL have similar microbes even though they have evolved independently for 100 million years!

4. What Antibacterial agents kill bacteria? USE BACTERIA FROM NON-LIVING SOURCES (table, sink, etc.)

a. CREATE a list of antibacterial AGENTS: soap, garlic, iodine, alcohol, etc. How do antibacterial agents work? CREATE a KWL CHART and investigate this together.

b. Follow EXPERIMENT #2 here:

<https://learning-center.homesciencetools.com/article/bacteria-experiment-guide/>

c. DISPLAY ON THE WALL using Reggio style documentation to observe what is happening with different microbial agents.

d. THIS IS PURELY OBSERVATIONAL. Observe in a SOCRATIC SESSION FOR DISCUSSION.