

Activity 1

Why Do Stars Twinkle and Planets Do Not?

Have you ever sung the words “Twinkle, twinkle little star. How I wonder what you are...?” That is a fun song to sing and an interesting question to ask. What is a star? And why does it appear to twinkle?

Stars are actually huge suns (just like our sun) that are very, very far away so they look like dots of light in the night’s sky. And just like our sun, stars are gas factories. They turn a gas called hydrogen into helium. Helium is the gas used to fill balloons so that they float in the air. This process of turning hydrogen into helium is called **fusion**. Fusion produces a large amount of heat and energy. The energy in a star creates a steady stream of light, but in order for your eye to see it, it has to travel a really long distance and go through Earth’s **atmosphere**. The atmosphere is the layers of air surrounding the Earth.



The Earth’s atmosphere as seen from space.

The more energy a star has, the brighter it will appear in the sky. Imagine you have two flashlights, one with a new, unused battery and one with a very weak battery. When you turn on the two flashlights, which one do you think will have a brighter light? The flashlight with the new battery will shine more brightly than the flashlight with the weak battery. This is because the new battery has more energy and causes the light to be brighter. The flashlight with the weaker battery does not have as much energy.

The light from this flashlight will be less bright. It is the same way with stars. Some stars produce more energy than others.

Now imagine that you take your flashlights outside on a dark night. If you shine your flashlights on an object that is close to you, the object will seem really bright. If you shine your flashlights at an object really far from you, the light that hits the far object isn’t as bright as the light that hits the close object. The flashlight with the stronger battery will produce more light farther away than the weak battery flashlight, but both will be dimmer the farther away they shine. Distance makes a difference.

Have you noticed that when you stand outside on a clear night and look up at the sky, the stars seem to twinkle while the visible planets in our solar system do not? Neither stars nor planets twinkle. The twinkling you see in stars has to do with the amount of energy a star produces, the star’s distance from the Earth, *and* the Earth’s



A star seen without the interference of Earth’s atmosphere will not twinkle.

atmosphere. When we look at photographs of stars taken by the Hubble Telescope, we see that stars create a steady stream of light that is not jumping around.

The planets in our solar system do not create their own light (like stars); they reflect light from our sun. Planets are also closer to our Earth and so they seem brighter than distant stars. The twinkling then that you see when you look at the night's sky is really caused by distance (stars are much farther away than planets) and the amount of light (reflected by planets or produced by stars) entering Earth's atmosphere.

Let's do an activity to help you understand.

You will need:

- A flashlight
- A flat piece of foil: half smooth/half wrinkled

You will do:

1. Place the foil on the floor or on a flat surface.
2. Shine the flashlight closely on the smooth half of the foil.
3. Observe the light that you see reflected.
4. Stand farther back and do this again.
5. Record your observations in the chart provided.
6. Now shine the light closely on the wrinkled half of the foil.
7. Observe the light that you see reflected.
8. Stand farther back and do this again.
9. Record your observations in the chart provided.



Foil Example

What I observed with the smooth foil	What I observed with the wrinkled foil

Why do you think you saw what you did? _____

What did you observe about the light hitting the wrinkled foil? _____

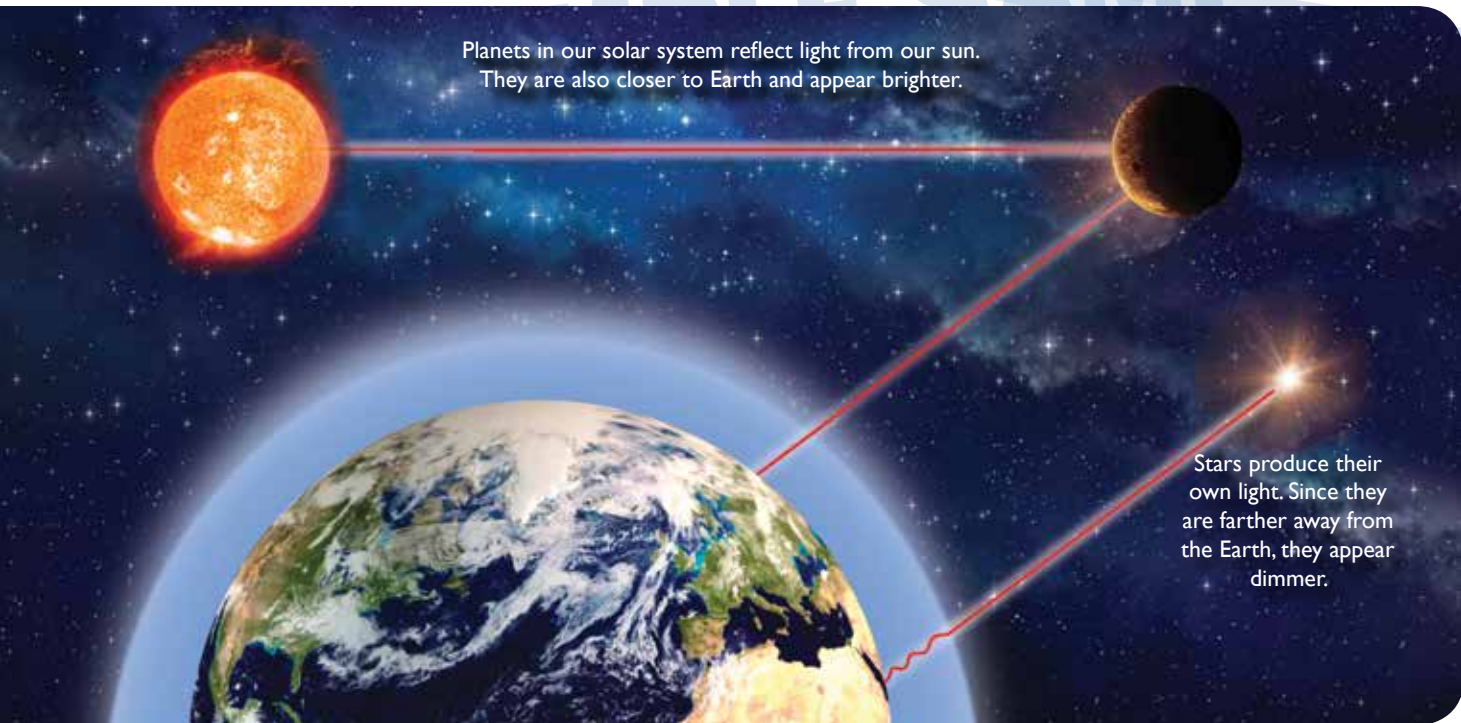
How is it different than the light you observed on the smooth foil? _____

Discussion

In this activity, the wrinkled foil was used to represent Earth's atmosphere. The smooth foil showed you what would happen if the air in the atmosphere were not moving. You should have seen a fairly direct and clear reflection of light at close and far distances. In science, we call this example a **control**. Of course, we do know that the air in our atmosphere is always moving. This is one reason we experience different weather patterns. In science, we call the wrinkled foil a **variable** because it is different (varies) from our control, which does not change.

You should have seen areas of light that reflected back and “twinkled” more the farther you stood back from the foil. Since the wrinkled foil represents the moving air that makes up Earth's atmosphere, the light hitting the “moving” air was bounced around. The farther back you stood, the more the light should have appeared to “twinkle.”





Light from both the planets and the stars travels through space to the layers of air surrounding the Earth. The many layers of air around the Earth have different temperatures and are moving. When the smaller, distant light from the stars reaches the Earth's atmosphere, the light bends. When the light bends, it appears to jump around and "twinkle." Scientists call this **stellar scintillation**. Because they are closer than a star's light, planets do not seem to "twinkle."

Can you think of another object in the night sky that reflects the sun's light? It's so close and bright that sometimes you can see it during the day. It's our Moon! We see the Moon as a large, clear object in the sky because it is so close to Earth. The principle is the same for our Moon as for the planets in our solar system.

The next time someone asks you if you see a twinkling star, you can explain that stars actually produce a steady stream of light and only appear to twinkle as their light hits the atmosphere around the Earth.



A full Moon reflecting the sun's light toward Earth



I give this activity stars!

Color the stars to show how much you enjoyed this activity.

Activity 5

COMPLETED

date _____

Build a Model Solar System

In this activity, you will create a model of our solar system that can be displayed.



The 8 planets in our solar system (not to scale).

You will need:

- Balloons
- Paper Plate
- Notecards
- Markers
- Measuring Tape
- String
- Scissors
- Tape

You will do:

1. Look at the chart to see which balloon represents which planet.
2. As you blow up each balloon, measure the distance across the diameter of the balloon at its widest point. Tie the balloon closed when the diameter is close to the number on the chart.
3. Use a paper plate to make a ring that will fit around the balloon representing Saturn.
4. Label your planets using a notecard for each.
5. Tape a string to each balloon, and hang them from the ceiling using tape. Make sure you hang the balloons in the correct order.

Planet the Balloon Represents	Balloon to Use	Approximate Diameter of Inflated Balloon
Mercury	small black	1 inch
Venus	small orange	2 1/2 inches
Earth	small blue	3 inches
Mars	small red	1½ inches
Jupiter	large orange	24 inches
Saturn	large red	20 inches
Uranus	medium light blue	8 inches
Neptune	medium dark blue	7½ inches

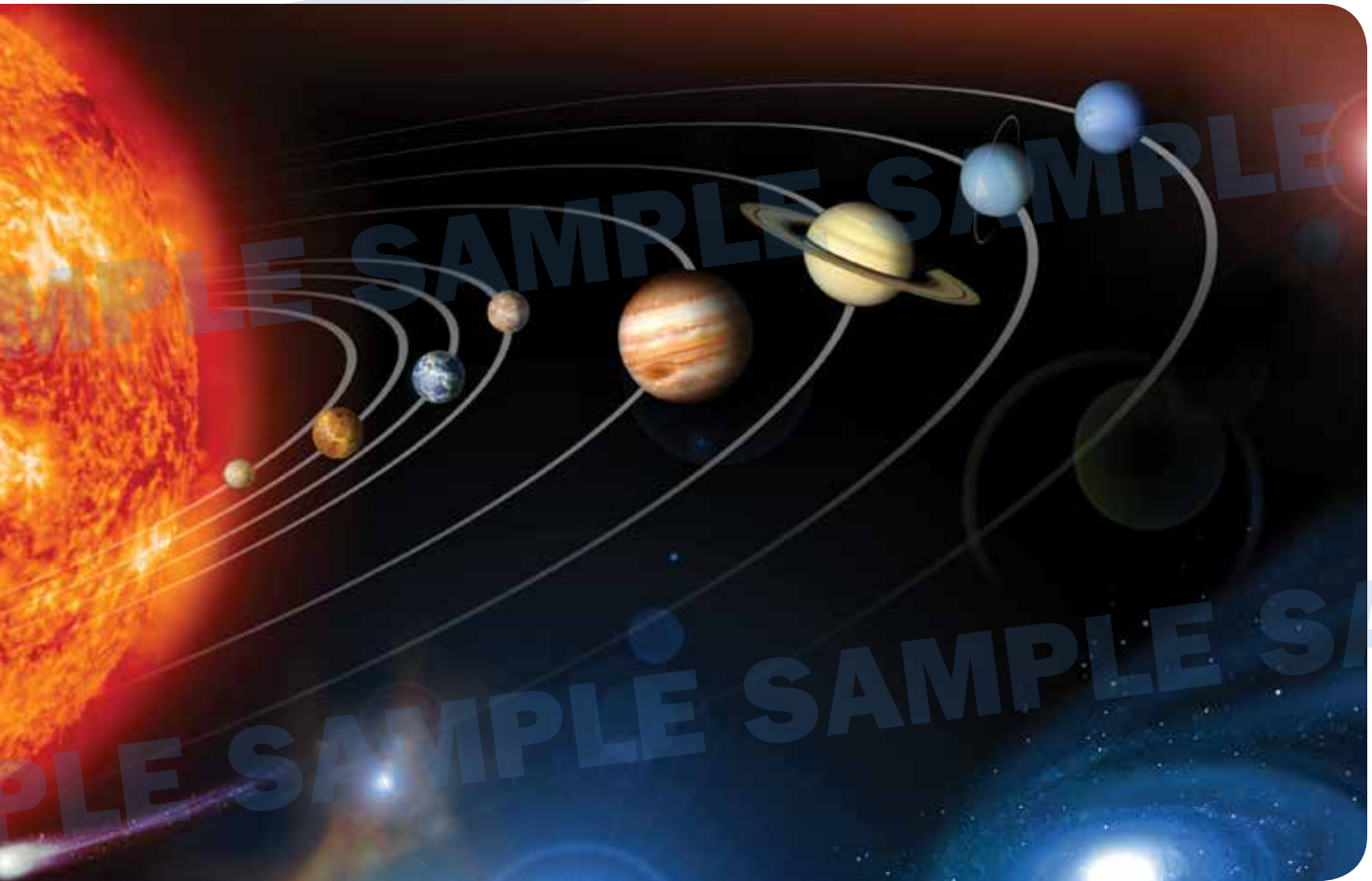
Your solar system model is now complete. Great job!

NOTE:

If you decide to include the sun, have your student measure 300 inches in order to recognize that the sun's diameter is far larger than any of the planets' diameters.



Paste a photograph of your solar system here.



Discussion

Scientists use models to show a concept. The model of the solar system you built was not to scale, which means that the size of the sun and planets, as well as their distance from each other, were not exact. They do, however, provide an excellent model for you to display and share with family and friends.



I give this activity ____ stars!

Color the stars to show how much you enjoyed this activity.