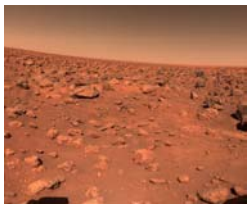


Mars 3

Scattering of Light

Introduction

With the activities relating to the Law of Reflection, we can better understand how radar can provide information about so many different things especially in regard to the elevation of planetary surfaces, the reflectivity, and the roughness of these surfaces.

Radar is a useful tool in planetary astronomy because it has an all-weather imaging capability. Radar "sees" through fog, clouds, rain, and other atmospheric conditions that visible light cannot pass through.

When radar creates an electromagnetic energy pulse, it is focused by an antenna and transmitted through the atmosphere. Objects in the path of the electromagnetic pulse, called targets, scatter the electromagnetic energy. Some of the energy is scattered back toward the antenna. The larger the target, the stronger the scattered signal.

Objective: To observe the effects of light scattering by "targets" or particles, similar to scattering of radar in the atmosphere.

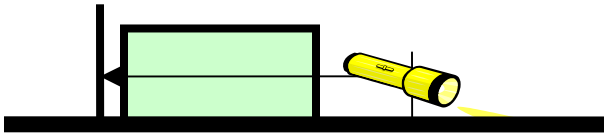
Note: Activity works best in a darkened room.

Materials

Large clear glass container filled with water (A small rectangular aquarium is ideal)
Skim milk
Whole milk
Flashlight or laser
Sheet of black construction paper
Piece of cardboard with a small pinhole in center (to be used with flashlight)

Procedure – Part I

1. Set up the activity shown in the illustration.



2. Put the container of water in front of the black construction paper.
3. Put the piece of cardboard in front of the container and line the flashlight's beam through the pinhole in the cardboard. Make sure the flashlight is touching the cardboard. You want to direct the beam of light through the hole. (You do not have to use the cardboard if you are using a laser beam.
3. Observe the light emerging on the opposite side of the glass.
4. Slowly add a few drops of skim milk to the water, taking note of the shape of the beam of light with the addition of milk and the amount of light making it all the way through the water.
5. Continue adding drops of milk at intervals and observing the amount of light making its way through the water.

Questions:

1. What did you observe when the light beam was directed through the clear water?

_____

2. Did the amount of light change with each addition of milk? Explain your answer.

_____

Procedure – Part II

1. Set up the activity for Part II in the same way as Part I.
2. Follow the same steps, but add whole milk instead.

Questions:

1. What did you observe when the light beam was directed through the clear water?

_____

2. Did the amount of light change with each addition of milk? Explain your answer.

_____

Conclusion

1. With the addition of milk, the light coming into the glass is scattered in many directions. This makes is difficult for the light to go all the way through the glass. Do you agree with this observation? _____

2. Did you obtain the same results for scattering of light for skim milk that you did for whole milk?_____. If so, explain your answer. (You may need to research the difference between skim milk and whole milk to help with this answer).

_____

3. Give a brief explanation of scattering of light.

_____

4. Using the activity of adding milk to water to demonstrate the scattering of light. Explain what happens to radar when the electromagnetic energy comes in contact with a target in the atmosphere.

_____