Blue Skies: The Answer to the Age-Old Question

Intro:

Why is the sky blue? Have you ever asked that question to be told a silly answer such as, “because the sky is the reflection of the ocean” or “because it’s your favorite color.” Although the answer is not easy to this question, we will explore it through experimentation with some common household items.

Summary:

Even though sunlight looks “white” to us, it is actually made up of all colors of the rainbow: red, orange, yellow, green, blue, indigo and violet and all colors in between. In order for sunlight to reach us, it has to pass through our atmosphere before it reaches our eyes. The atmosphere is necessary for supporting life on this planet; in addition, scattering of sunlight from the gases in the atmosphere are also responsible for our unique blue sky.

Different colors of light have different energies or wavelengths. For example, red light has a long wavelength and blue light has a short wavelength. As mentioned previously, the sunlight that passes through the Earth’s atmosphere is made up of many different colors and therefore, different energies. Earth’s atmosphere is made of gas molecules which “scatter” or break up the white light into many parts, but, not all colors of light are scattered equally.

Selective scattering (preferential scattering of one color light over the other colors) occurs when the particles are much smaller than the wavelengths of the colors. Only one color is then scattered, and the atmosphere appears to be that color. In the case of our atmosphere, shorter wavelengths (blues) are scattered much more strongly than longer wavelengths (reds). As the sunlight passes through the atmosphere, blue light preferentially scatters and becomes visible to the eye.

Historically, there are other events which have caused the sky’s color to change. These color changes result from changes in the composition of the Earth’s atmosphere. Dust particles which are blown out of the Sahara desert cause the sky to have a reddish color. Also, large volcanic eruptions and various forms of air pollution can change the color of the sky.

Materials:

- 1 Clear glass container, about the size of a pitcher or milk bottle (clear plastic can be used, too, but glass works best)
- 1 flashlight
- Water
- Long stirring spoon or wooden spoon
- Glass of 2% milk, whole milk or cream
- Hard candy (flavor of your choice)

- 1 hammer
- Water dropper or basting tool

Activity:

Make the water/milk mixture:

1. Begin by taking the glass container and fill it three quarters of the way full of water.

2. Using the basting tool or water dropper, pick some of the milk or cream up from the glass.

3. Add 4-8 drops of the milk or cream to the glass container filled with water. Note: if skim milk is the only milk available, add at least 5 additional drops.

4. Using the stirring spoon, mix the water and milk mixture well. Make sure the water is milky enough so that it is hard to see through the water. Continue adding drops of milk until the water/milk mixture appears “cloudy.”

Experiment

1. Shine the flashlight or another directed beam of white light into one side of the container. Look at the water at a 90° angle from the light beam. What color does the water appear?

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2. Now, shine the flashlight away from the container. What color does the water appear?

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3. Compare the results from steps (1) and (2). Where the colors you saw in the container the same or different? If they were different, how were they different?

4. Next, try to look through the container directly at the incoming light beam. Is there a difference in color compared to when looking from the side? (If you are having trouble seeing a color change, try to put more drops of milk into the water).

The sky is not blue everywhere. Pictures taken in outer space show the Space Shuttle against a black background. Lunar scenes portray astronauts against a black sky. The Earth, unlike the moon or space, has a protective blanket of gases, water and dust called an atmosphere. The blue color of the sky is a result of sunlight passing through and interacting with the atmosphere.