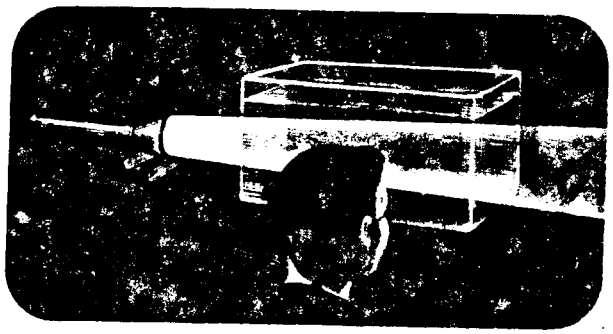
Why Is the Sky Blue?

by Harry Milgrom

■ To an astronaut in orbit above the Earth's atmosphere, the sky is black at all times, both day and night. From the ground, however, the daytime sky is bright, and often blue. Why do we see a blue sky from the ground when an astronaut sees a black sky from space? Here's how you can find out.

Seeing Colors in Soapy Water

Fill a clear plastic dish with water and set it in front of a sheet of black paper. Then darken the room and shine a flashlight through one end of the dish *(see diagram)*. Look at the beam of light from the side as it passes through the water. What color do you see?



Next, dip a bar of soap (*not* detergent) into the water, and swish it around several times. Look at the beam of the flashlight from the side. What color or colors do you see in the beam of light now? Add some more soap and see whether the colors change.

The colors you see in the soapy water give some clues to the color that we see in the sky. Like the Sun, a flashlight gives off white light that is a mixture of colors including red, orange, yellow, green, blue, and violet. The specks of soap mixed with the water stop some colors and scatter them. These scattered colors are what you see when you look at the light beam from the side.

The same thing happens when we view the sky from the Earth. The atmosphere around the Earth contains tiny particles of dust, water, smoke, and other things. These particles act like the particles of soap in the dish of water. Some colors of sunlight are scattered in the atmosphere, and others are not. From what you noticed about the colors in the soapy water, can you name the colors that seem to be scattered in the atmosphere?

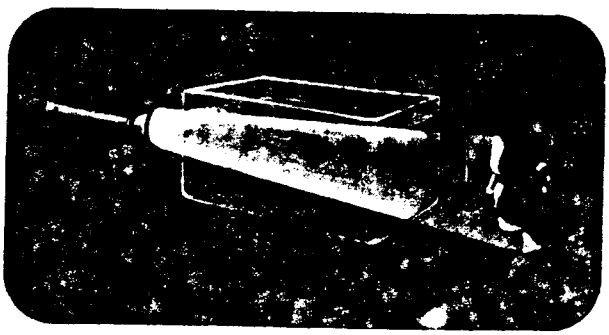
An astronaut in orbit is above nearly all of the Earth's atmosphere. He is in a region where there are very few tiny particles. This means that there is nothing to scatter the Sun's light, so the sky appears black.

Why Does the Sun Change Color?

Most of the time the Sun appears as a brilliant white disk in the sky. However, at sunrise and sunset it often looks yellow, orange, or red. To find out why, repeat the above experiment with the plastic dish, water, soap, and flashlight. This time, however, look directly at the beam of light, instead of observing it from the side *(see diagram below)*.

You will see the color of the light change as you add more and more soap. Notice what colors appear as you add the soap. In what way are these colors like the colors of the Sun?

The specks of soap in the water affect the light from the flashlight in the same way that particles in the atmosphere affect sunlight. Can you figure out why the Sun sometimes appears yellow, sometimes orange, and sometimes red? The greater the thickness of atmosphere that the Sun's light passes through, the redder its light will seem to us ■



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