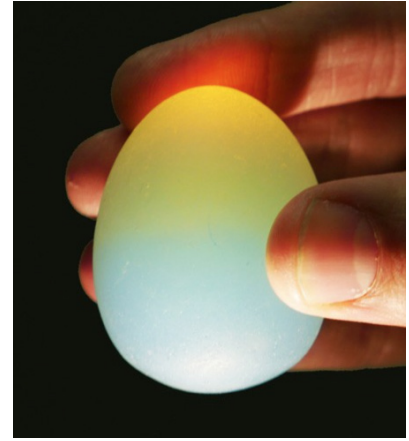


# Sunset Egg

P2-1000

## Contents:

1 Sunset Egg

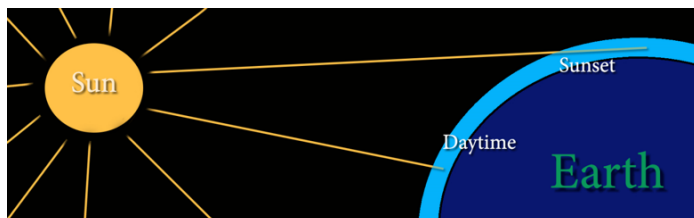


## Teacher's Background Knowledge

The Sunset Egg is a fun and effective demonstration on the science of light. The egg is made of opalescent glass, although it contains no opal. This refers to the egg's property of looking different colors at different viewing angles.

The Sunset Egg responds differently to light based on its wavelength. The sky does the same thing. This process is called Scattering of Light (Rayleigh Scattering) and in Scattering, shorter wavelengths are scattered more often. When light hits the egg sideways the blue light gets scattered more than the red and yellow, thus the egg looks blue. But when light passes through the egg the blue light gets scattered away and the remaining light is yellow and red. Looking through the long end of the egg or using multiple eggs can also increase the effect.

The sunset effect of a red sky or yellow sun is seen for the same reason in the sky as in the egg. During sunset, the light has to pass through a lot of sky and that journey causes the blue light to get scattered out sideways leaving red light behind. In the case of the sky, the light is being scattered on air molecules, mostly oxygen and nitrogen, but also dust and other particulates. In the case of the egg, the light is being scattered on fine dye particles inside of the egg.



The egg is like a little piece of the sky, and it looks like one for the right reason. When the light passes through a small bit of it, the egg or sky looks blue, but when light passes through a lot of it, the egg or sky looks yellow.

A similar effect can be achieved by using an aquarium full of water with a little coffee creamer. When light passes through the aquarium it gets scattered by the coffee creamer particles. But blue light gets scattered more frequently, making the aquarium look blue over all. However, the light that passes through has less blue in it and so it looks orange. This causes a sunset effect.

## Introduction to the Demonstration/Activity

When you receive the egg it is ready to go, but might have a sheen of white dust. This can be washed off somewhat, but it is helpful to dribble oil over it and then wipe it off. This will give the egg a smooth surface and improve the demonstration that follows. The reason the cooking oil smooths out the glass egg is because oil and glass have nearly the same index of refraction; they bend light the same amount.

To use the egg hold it in one hand and close your hand around it. The egg will appear quite blue. Now hold it up to a source of white light, such as overhead lights. The egg will appear quite yellow. What's going on?

## Getting Familiar/Experimenting

Take the egg in hand and hold it up to light. How many different colors can you get it to make? It might be helpful to use a cell phone flash light.



## Observations and Taking Data

Describe the all colors you see and write instructions on how to get these various colors.

Color: \_\_\_\_\_ How to get this color:

Color: \_\_\_\_\_ How to get this color:

Color: \_\_\_\_\_ How to get this color:

## Sample Results (for teacher)

1. Light blue when the egg is held sideways to a source of light.
2. Dark blue when very little light is allowed to pass through the egg (ie a cupped hand around the egg, looking at the tip).
3. Yellow when the egg is held up to a light source and the source is viewed through the egg.
4. Red when the light is passing thickly through the egg or multiple eggs are used.

## Conclusions

Ask your teacher to explain the cause of the blue sky during daytime and the orange sky during sunset.

Now it is your turn, explain how this egg can serve as a model for the blue sky. What are your conclusions regarding how well this egg imitates the daytime and sunset sky?

## References & Further Reading

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## Bio/About the Author

James Lincoln teaches Physics in Southern California and has won several science video contests and worked on various projects in the past few years. James has consulted on TV's "The Big Bang Theory" and WebTV's "This vs. That" and the UCLA Physics Video Project.