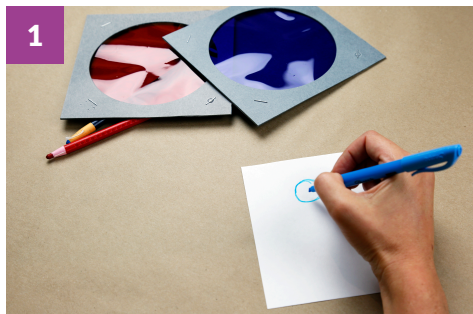




# EXPLORING THE UNIVERSE

## Filtered Light

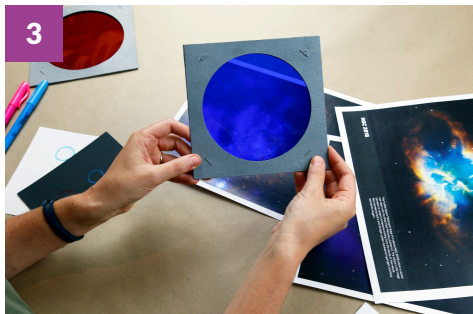
### Try this!



Draw two small circles on the white piece of paper—one with the blue marker and one with the pink marker. Then draw similar circles on the black paper using the red and blue pencils.



Try using the blue and red colored filters to look at your circles. What happens when you look through one of the filters but not the other? Do any of the circles disappear? Do any appear brighter?



Use both filters, one at a time, to investigate the space image. Do some features stand out more if you look through the blue or red filter? Which filter shows you a clearer image? How could this tool be useful to space scientists?



**Now try this!** Draw your own picture on the white or black paper! Observe your drawings with the filters. What changes do you notice? Tip: Use the markers on the white paper and the pencils on the black paper!

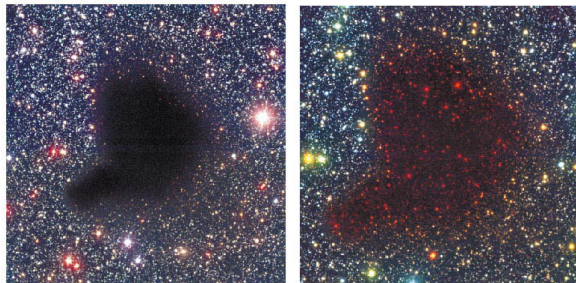
## *Astronomers use light from distant objects to make observations about the universe.*

**Filters block certain energy levels of light while allowing others to pass through.** Different colors of visible light have different levels of energy, running from lower-energy red to higher-energy purple. In this activity, the red and blue colored filters changed how those colors appeared on the white paper versus the black paper, and highlighted different elements in the space pictures. When you hold up the red filter to your eye, only red light makes it through. Red light reflects off both the pink colored marker (pink is a lighter shade of red) and the white paper, because white contains all colors. The pink color disappears because it blends in with the red light from the white paper. But background color matters! Looking at the red pencil color against the black paper actually enhances the red color, because the filter blocks all the other energy levels of light (colors) reflected off the paper and improves the visibility of the red color.



**Red, green, and blue visible light combine to make white light.**

**NASA scientists use telescopes and other instruments to capture and filter different energies of light.** Objects in the universe radiate light across all these different energies—the full *electromagnetic spectrum*. We use a combination of tools, like telescopes and spectrometers, to make observations of radio, microwave, infrared, ultraviolet, X-ray, gamma ray, and visible light.



**This dusty cloud appears dark in visible light, but looking in infrared light reveals stars shining through.**

Astronomical images collected with different tools sometimes reveal surprising results. Scientists capture and filter light to study planets, moons, stars, galaxies, nebulae, and black holes, and even to learn more about the mysterious dark energy that makes up so much of space.