Viewing the Center of the Milky Way

When you observe the night sky with your eyes, most of the sky will appear dark. This is because there are giant dust clouds in space that block **visible light** (the light we can see with our eyes). Luckily for scientists, visible light isn't the only kind of light there is! Other wavelengths, outside of the visible portion of the spectrum, can be used to “see through” the dust clouds!

When light from stars is absorbed by a cloud of dust, it is called **dust extinction.** Dust extinctions prevent light from reaching our eyes (or our telescopes), so images look black. The good news is that the dust absorbs some wavelengths but not others. **Figure 1** shows a dust extinction that absorbs short wavelengths, but not long wavelengths. But not all dust is the same. Some dust will absorb longer wavelengths and not shorter ones. This suggests that to fully “see” the night sky, we need to observe it over and over using different wavelengths of light, and then put the images all together. While it might seem inconvenient that we can’t see through all parts of dust clouds all at once (and most of the time, it is!), it can also be a good thing.

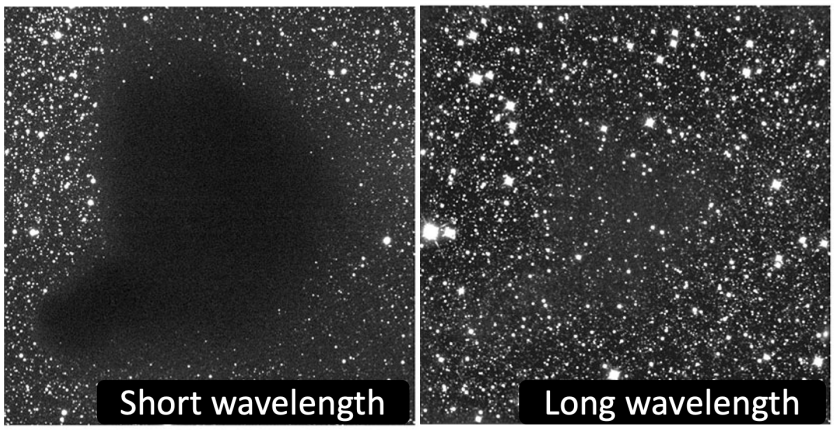

Figure 1. Looking at a Dust Cloud Using Two Different Wavelengths of Light. This is a great example of how dust clouds can appear completely dark at certain wavelengths of light, but not in others. The image on the left was taken using a short wavelength of light, and the dust extinction is clearly there. The image on the right was taken using a longer wavelength and the dust extinction isn’t there! The longer wavelength lets us “see through” the dust! *Source:* Adapted from ESO.

Think about our home galaxy, the Milky Way. Do you have an image in your head of what it looks like? A sort of swirly thing with a few arms that branch off? Well, the truth is, we don’t know as much about the Milky Way as we’d like because our solar system is *inside* the Milky Way, which makes it very hard to observe. For example, we have no way to know what the galaxy looks like from the top down. We don’t even know how many spiral arms the Milky Way has! But we are learning more every day thanks to, you guessed it, dust extinctions!

Dr. Cara Battersby at the University of Connecticut observes dust extinctions at different wavelengths to figure out which clouds are in front of which stars and which are behind them. For example, **Figure 2** shows a cloud called “The Brick” near the center of our galaxy. This cloud of dust is very dark compared to the surrounding light, which suggests that it is between us and the stars emitting that light.

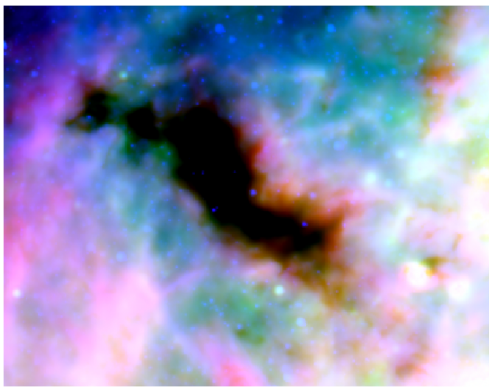

Figure 2. A Dusty Glimpse of “The Brick.” This image was made using three different wavelengths of infrared light. The cloud is clearly blocking the light, which suggests that it is between us and the bright stars emitting all the infrared light. *Source:* Compiled from public domain H. Perry Hatchfield.

Just like that, we know a little bit more about the structure of the galaxy. Unfortunately, cool dust clouds in space aren’t the only kind of clouds that absorb light—good old fashioned Earth clouds interact with light, too. The clouds of water in Earth’s atmosphere make it really hard to do these kinds of experiments from the ground. Instead, we have to use telescopes orbiting space, like the Spitzer Space Telescope or the Herschel Space Observatory. Dr. Battersby is carefully examining clouds all across the center of our galaxy to create an accurate 3-dimensional map of the Milky Way’s center. Her work could change the way we think about, and picture, our home galaxy.

Reference

Battersby, Cara, John Bally, James M. Jackson, Adam Ginsburg, Yancy L. Shirley, Wayne Schlingman, and Jason Glenn. “An Infrared through Radio Study of the Properties and Evolution of IRDC Clumps.” *The Astrophysical Journal* 721, no. 1 (September 20, 2010): 222–50. https://doi.org/10.1088/0004-637X/721/1/222.

BiteScientist Profiles

H Perry Hatchfield is a physics graduate student at the University of Connecticut. His research is focused on star formation, specifically observing the sites of star formation in the Milky Way using radio telescopes, as well as running computer simulations to test theories of star formation in the Milky Way’s galactic center.

Shannon Morey teaches physics at Abbott Lawrence Academy in Lawrence, Massachusetts. She is a 2015 Knowles Teacher Initiative Fellow and the 2022 MA STEM Teacher of the Year. In her free time she enjoys spinning, cooking, and yarn crafts. She also loves to travel for fun and to learn more about the world. She is pictured here on Isabela Island in the Gálapagos Islands as part of a Knowles Teacher Initiative professional development.