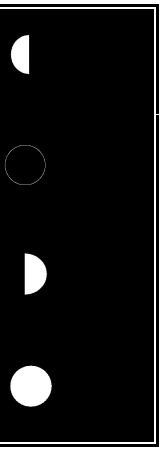
April Skies over the Pinnacles

April 2021

April's four principal phases of the moon

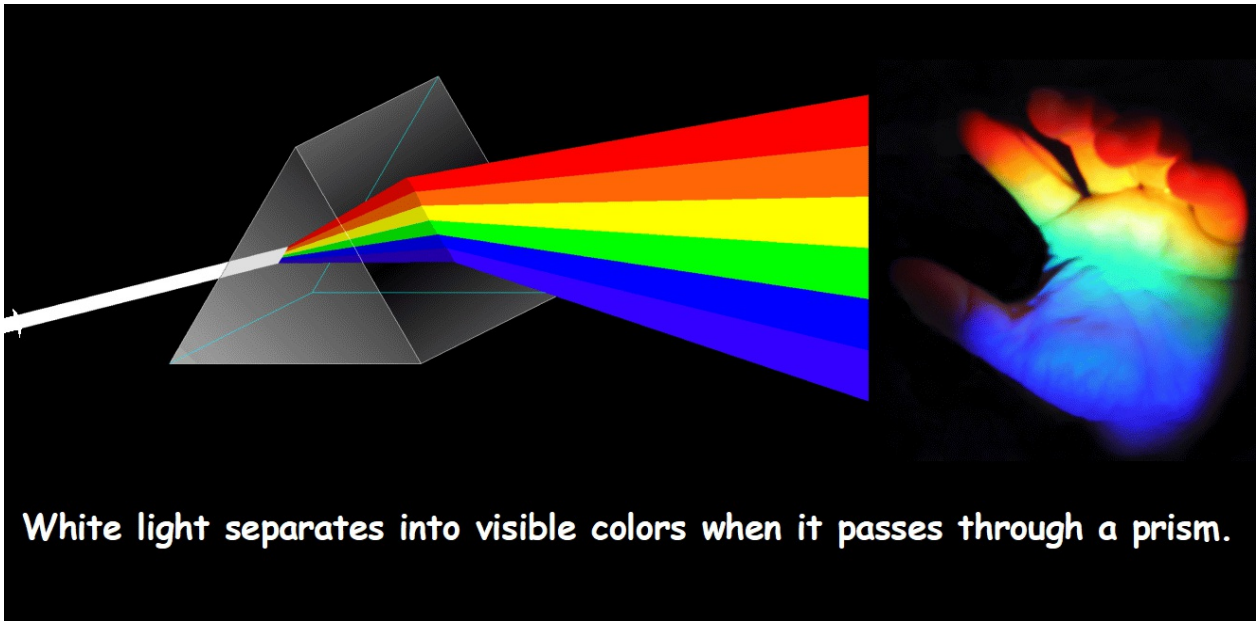
April 4	Last Quarter	
April 12	New Moon	
April 20	First Quarter	
April 27	Full Moon	

Spreading Light

The first big number that I remember committing to memory was 186,000, as in the speed of light through the vacuum of space is 186,000 miles-per-second. It seemed cool to be able to recite the figure and it helped me to visualize just how far away things in the night sky really were!

Then I discovered prisms, those thick wedge-shaped pieces of glass that you could hold in a sun beam just-so and produce a little rainbow colored patch of light on the wall or even the cat!

Ok. So how do prisms separate the white light from the Sun into the beautiful colors we see? The technical term for these prism-produced colors is a **spectrum**. (The plural of **spectrum** is **spectra**.) When white light shines at an angle through something denser than the air, like the glass in my prism, in the words of Bart Simpson, it gets bent! It bends because it is slowed down just below its normal speed. Not all of the colors slow down the same amount, so they separate into the separate colors of the spectrum. Red is 'bent' more than the blue when it passes through the prism.



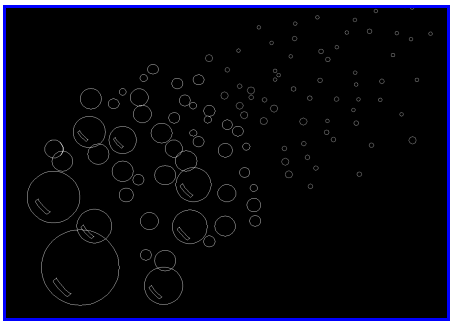
Astronomers discovered that when they carefully analyzed the spectrum of a distant star after it passed through a prism they could uncover clues about it's composition, how fast it was spinning, even how fast it was traveling through space. In fact, the astronomer Edwin Hubble is credited in discovering that the universe is expanding using the new science of **spectrography**, or analysis of stellar spectra!

No, this isn't a picture of Edwin Hubble. It's Henrietta Swan Leavitt. In 1908 Leavitt published her own findings about determining the distances to stars. Hubble used her findings on which to base his own discoveries. Leavitt wasn't given credit, until now, for revealing the basis of one of the greatest discoveries in astronomy.

The month of April is a usually tough one to observe the night sky. Daylight Savings Time (or, as I call it, Government Nuisance Time) shifts our schedule to make the sun seem to set later. Stormy weather often tears up our plans to observe the clear night sky. But we shouldn't miss some wonderful opportunities to appreciate the colorful show offered up by wind and weather.

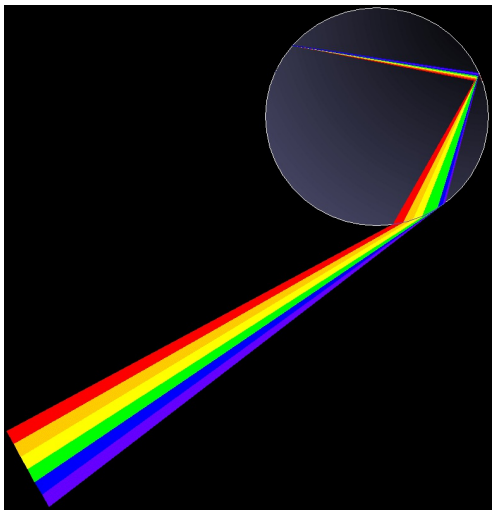
Let's Talk Rainbows!

There's a lot to know about rainbows but the most important thing is to pause and marvel at them when they appear, usually after a good rain. It's also fun and interesting to know a little about them. Before you can see a rainbow a few things must happen. **1.** The sun needs to be shining brightly and be close to the horizon. **2.** The area of sky opposite the sun must be full of raindrops: as many and as big as possible.



Usually raindrops are drawn looking like the teardrop shape on the left panel but while they are falling from the sky they form little watery balls like the illustration at the right. It turns out that this spherical shape acts like a glass prism.

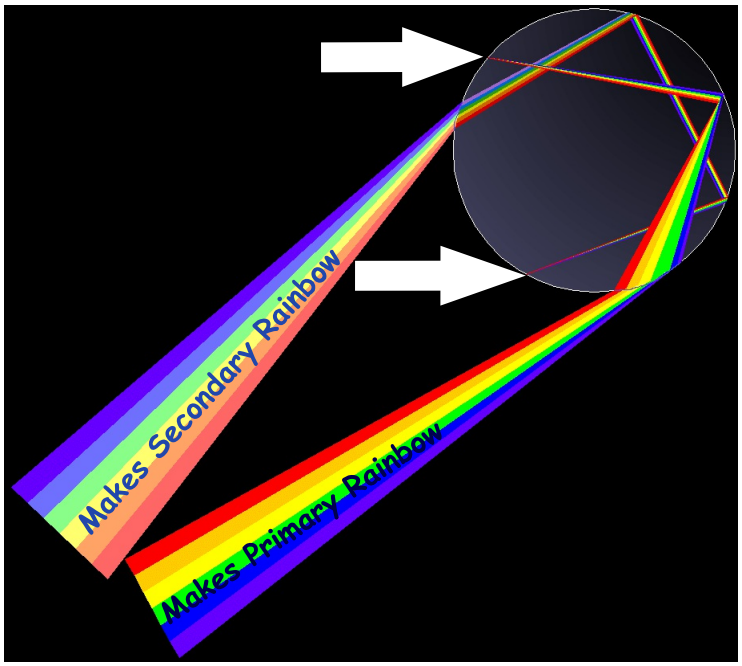
When white sunlight enters a raindrop at just the right place, seen here at the upper-right, it enters the watery droplet which is denser than the surrounding air. This causes the sunbeam to separate into its colors. Then it reflects off the *inside* of the droplet. This magnifies the color separation. Finally, the separate colors exit near the bottom of the droplet and this separates the colors even further!



Did you ever notice that the rainbow seems to follow you, even if you're moving down the road in a car? (*Drivers, let your passengers look. <u>You</u> keep driving safely!*) This is because the rainbow you are seeing is made up of parts of millions of little spectra from millions of little raindrops.

Have you ever seen a *double* rainbow? The second rainbow is seen outside the first rainbow, and is a little fainter, pictured below. Only part of each rainbow is seen in this image.

Each raindrop really makes two little spectra. The white arrows represent the white sunlight entering the raindrop. The sunbeam on top produces the primary rainbow and the sunbeam at bottom produces the secondary rainbow. The reason the secondary rainbow is fainter is because the sunbeam at the bottom has to reflect twice inside the raindrop before exiting as a spectrum. Some light is lost in each 'bounce'. This is why the colors of the secondary rainbow are reversed.

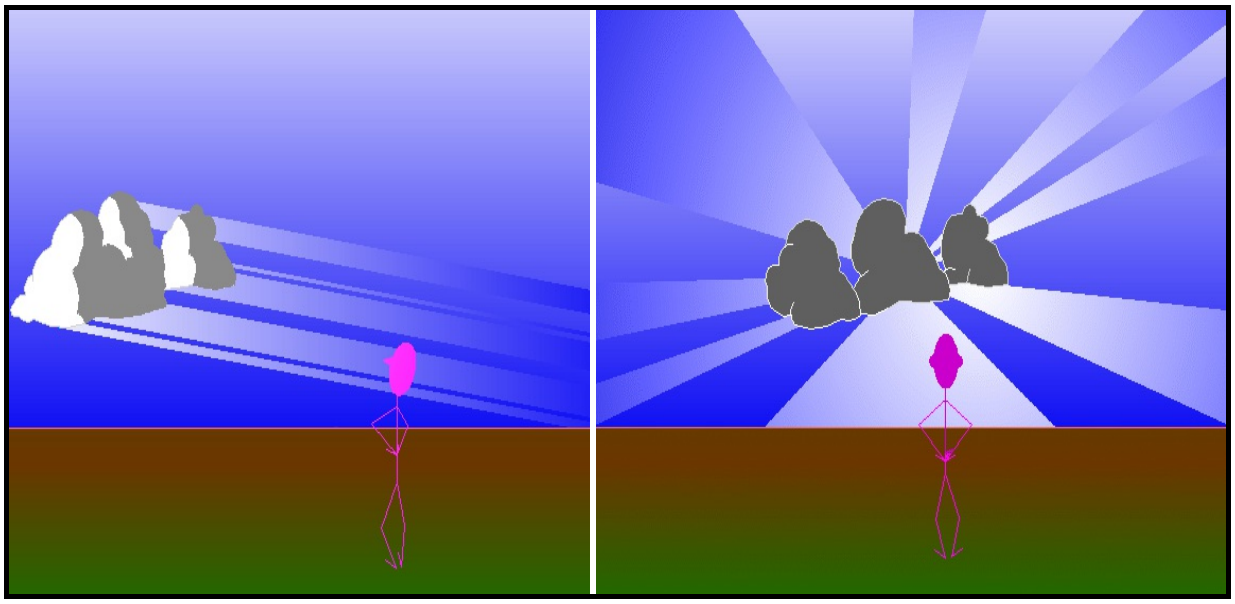


We see rainbows because pieces of the spectra from each little raindrop enter our eyes at just the right angle! When you are standing right next to your best friend, admiring a beautiful rainbow think about this: you are both having a slightly different view of the gorgeous colors. You are seeing your own separate rainbows from different sets of water droplets!

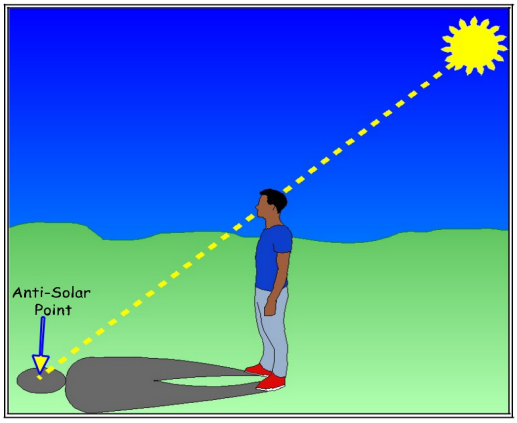
This is how we see rainbows.

Speaking of sunbeams, Have you ever noticed a spray of sunlight sneaking through a hole in a cloud? Maybe you've noticed a thick cloud in a clear sky that happens to be covering the sun like this:

It's pretty but this picture is also an illusion, something that isn't what it appears to be. The sunbeams (the scientific term is **crepuscular rays**) look like they are spreading out from the hidden sun like the spokes of a wheel. The rays are actually parallel.



The illustration on the left shows what the rays are actually doing and the illustration on the right shows what you see. Of course the bright rays are mainly fine dust particles in the air that are lit by sunlight. If these rays are intense enough to go all the way from the sun's location in the sky they can all meet up again at a point in the sky that is opposite from the sun. That's called the **anti-solar point**.

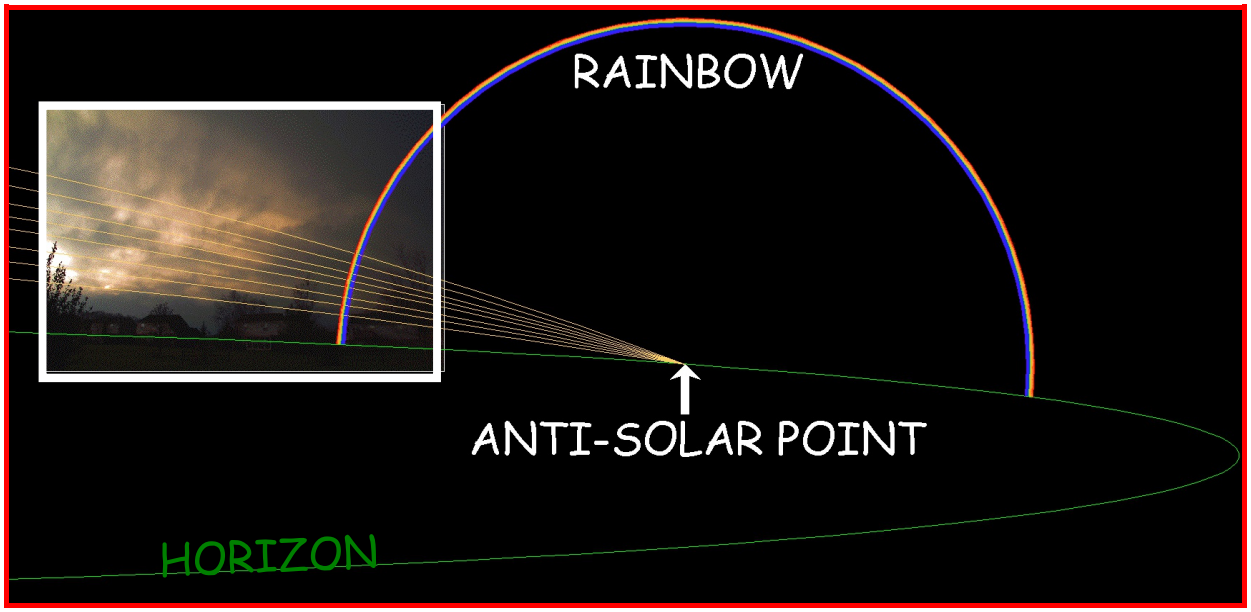


A way to visualize this is to go outside on a sunny day. The shadow of your head is at the **anti-solar point!**

In this picture the anti-solar point appears just above the house, on the horizon. Since these rays are converging they are called **anti-crepuscular rays**. The sun was at the photographer's back. Remember, these rays are actually parallel to each other!

To tie this all together, here's a picture I took a few years ago that shows **anti-crepuscular rays** that also provide the light for a partial rainbow.

Think of a rainbow like it like the rim of a wheel. The center of the wheel is at the **anti-solar point.**



In this illustration, the Sun is just setting on the western horizon so the **anti-solar point** is on the eastern horizon. Remember that a rainbow always has the **anti-solar point** at its center. If the sun is too high after a rainstorm, you may not see a rainbow at all because the **anti-solar point** is too far below the horizon.

Back to Space

One of the most interesting things to appear in March skies was the apparent close approach of the planet Mars to the beautiful cluster of newborn stars called the Pleiades. On March 6, I was able to take the picture below. The inset picture was taken in April of last year with the much brighter planet Venus.

Attractions in April

If we can successfully dodge April showers, this month offers up some interesting sights in the night sky.

April 5 If you're up before dawn, take in a very pretty sight of the Moon, Jupiter and Saturn, neatly lined up low in the southeast before the sun's glare fades the sky to blue. Look again the next day. What's changed?

April 16 Here's an easy way to learn the location of the constellation, Taurus, the Bull. Go out as soon as it's dark and find the crescent Moon, between the horns of the bull. I wonder if a similar event inspired the ancient Egyptians to invent the bull-god Apis? A statue of Apis is on the right.

April 20 Binocular alert! Get your binoculars or small telescope out and find the Moon and look below and to the right to find the "Beehive". That's a nice little cluster of stars in the constellation Cancer. This cluster is around 600 light-years away and is about as old as the Earth, 4 billion years. Other sources suggest it is younger: about 600 million years old. Another name for the "Beehive Cluster" is Praesepe. That's Latin for 'cradle'. Two planets have been identified circling stars in this cluster.

April 22 The annual Lyrid meteor shower makes a return appearance Sometimes we get a really good show of "shooting stars" from this shower, sometimes not. As always, it's best to set your alarm for about 3:30 AM, brew some coffee or heat some hot chocolate and head outside to a dark area away from lights. Dress warm! See my suggestions on viewing meteor showers in previous articles.