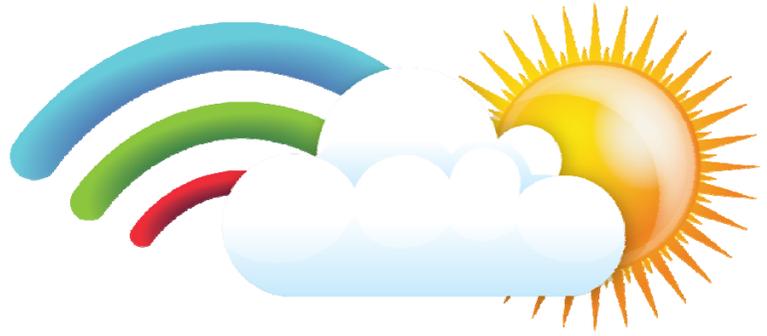


## Blue Sky and Rainbows

*Tell me why the stars do shine,  
Tell me why the ivy twines,  
Tell me why the sky's so blue,  
And then I'll tell you just why I love you.  
Song "Tell Me Why"*



The Earth is known as the Blue Planet because of its color when viewed from space by our astronauts. We enjoy sunny days when the sky is blue but it seems to be a "mystery" why the sky and atmosphere appear blue. But it's really a matter of how the human eye works and how light interacts with air molecules in the atmosphere. Remember that humans can see visible light, those wavelengths between 400 nanometers and 700 nanometers. Visible light is divided into colors also by wavelength and this is called the color spectrum. The blue range that includes violet has the shortest wavelengths of any visible light.

When light interacts with any kind of molecules, its energy can be absorbed, reflected or scattered. Light is scattered when it hits gases in the atmosphere. The amount of light that is scattered is related to the size of the particle compared to the wavelength of the light falling on the particle. Since blue and violet have the shortest wavelength they are scattered the most by molecules of gases in the atmosphere. Because of this scattering there is more of the blue wavelength in the atmosphere than any other. The human eye has cones dedicated to receiving blue wavelength, so we see the sky as blue without noticing the traces of purple.

Another "mystery" of nature is how rainbows are formed. Rainbows are seen only after it rains and the atmosphere contains water droplets. Sunlight enters the water droplets, is bent by the droplet and is reflected out of the droplet. The different colors are bent by an amount related to their wavelength so the result is a spectrum like that produced by a prism.

A rainbow always appears as the same kind of arc in the sky. The red part of the rainbow is always at  $42^\circ$  to the line of the horizon and the blue-violet part of the rainbow is always at  $40^\circ$  with the other colors of the spectrum in between. These angles are related to the wavelength of each color. Most people have never noticed that the sun is always behind them when they face a rainbow.