The Night Sky By Eric Erickson

Offered Title: Color My Universe

I have discussed gravitational waves and radio waves recently, and as tools they are essential, especially gravitational waves now that they have been detected. We can now probe more deeply into the mystery of our universe. This week I will dance with the waves that gave us astronomy, visible light.

Ancient astronomers used it, it's how most of us are able to get around, find our keys, smart phones, glasses. Visible light makes our universe visible to us. Visible light is part of the electromagnetic spectrum, with a wavelength range from 380 to 750 nanometers. On a good day, humans can muster seeing in the 390 – 700 nanometer range. This range of wavelengths gives our universe color, a rainbow of colors. They are, in descending wavelength, and some of you reading this already know, red, orange, yellow, green, blue, indigo, and violet. The venerable acronym I learned as a kid to help me remember is Roy G. Biv.

Thirteenth century scholar Friar Roger Bacon proposed a link between the colors in a rainbow and those coming from sunlight through cut glass. Four hundred years later, Sir Isaac Newton described this phenomenon in his book Opticks and used the term spectrum, meaning apparition, to describe this series of colors. Jump forward another two hundred years and we get the Young-Helmholtz theory of color vision. It describes our eyes as having three color receptors, for red, blue, and green. Sound familiar? Virtually all television and display technology today is based on RBG. Most sensors used in astrophotography use RBG technology.

Astrophotography provides us with the beauty of structure and color of our universe. Studying visible light as a spectrum, in spectroscopy, gives us additional information about what we see. Turns out the colors can tell us about the makeup of things that emit light. In the eighteenth century John Herschel, William Talbot, and Joseph von Fraunhofer used spectroscopy to show that elements (atoms and molecules) could be identified in glowing/burning material. Fraunhofer also developed the diffraction grating spectroscope and identified dark lines in the Sun's spectra. He thought they were caused by light absorption. They are called…you guessed it, Fraunhofer lines. It's never simple and easy, because light absorption also tells us things about the object under study.

Fraunhofer lines in the Sun's spectrum were studied by Gustav Kirchoff and Robert Bunsen (yes, of Bunsen Burner fame) and they discovered these lines corresponded with emission lines for specific elements. This was a big find. They determined that as elements cooled in the Sun's atmosphere they absorbed light energy from the same element's light emission. This helped them identify specific elements in the atmosphere of our Sun.

Spectroscopy is widely used to identify elements in the atmosphere of stars, and in other energetic objects, helping astronomers and astrophysicists better understand their nature.

What's in the Sky?

Get up early on the 19th to see a waning Moon get tight with Jupiter and Spica.