Learning From Solar Eclipses

Astrophysicists helped prove Einstein's theory of general relativity during the 1919 total solar eclipse! The darkened sky allowed observers to see stars near the sun, which revealed that their apparent positions were different than at night. This demonstrated that gravity causes space and time to curve around it, as we saw the sun bend light from distant stars.

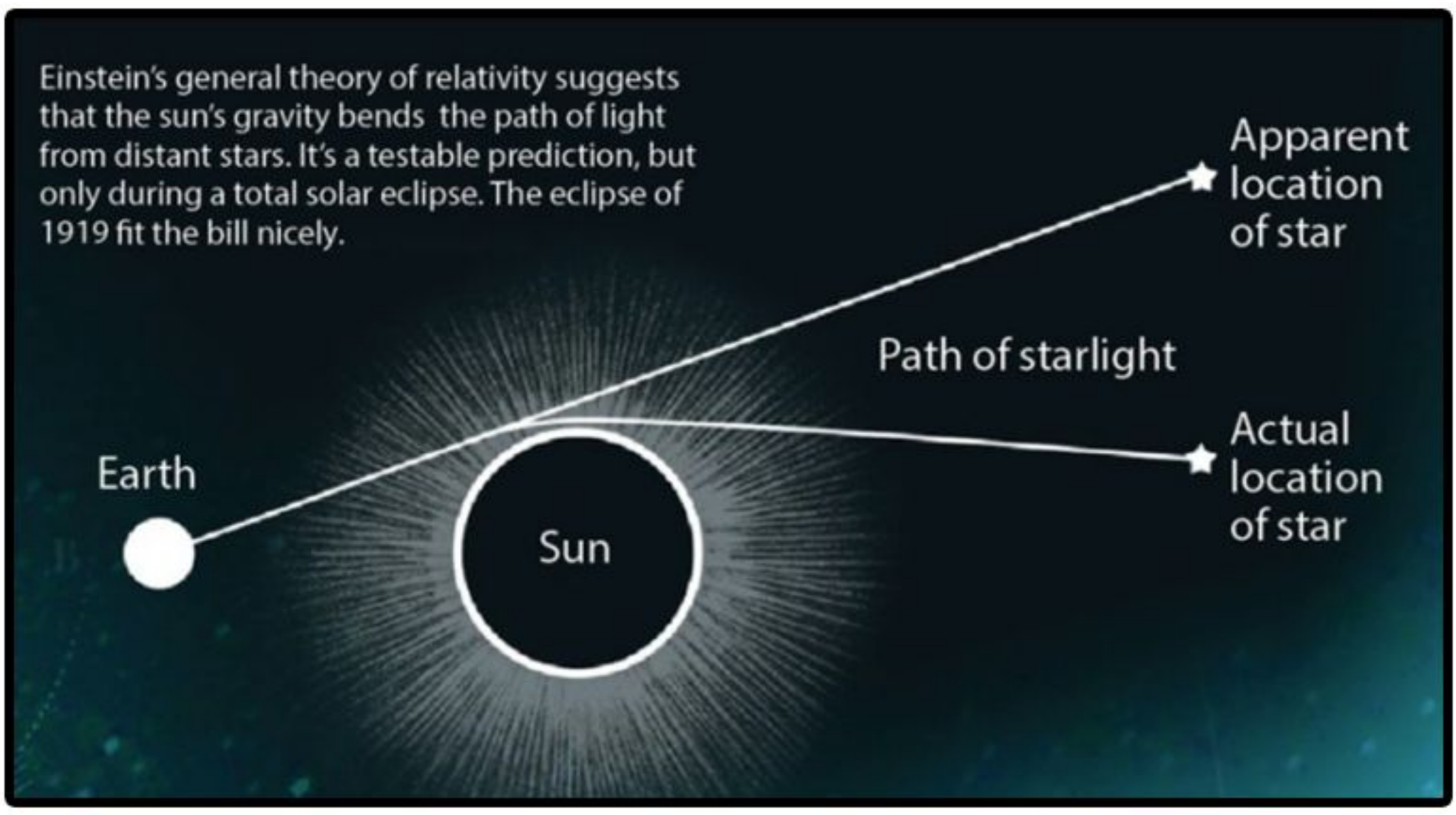
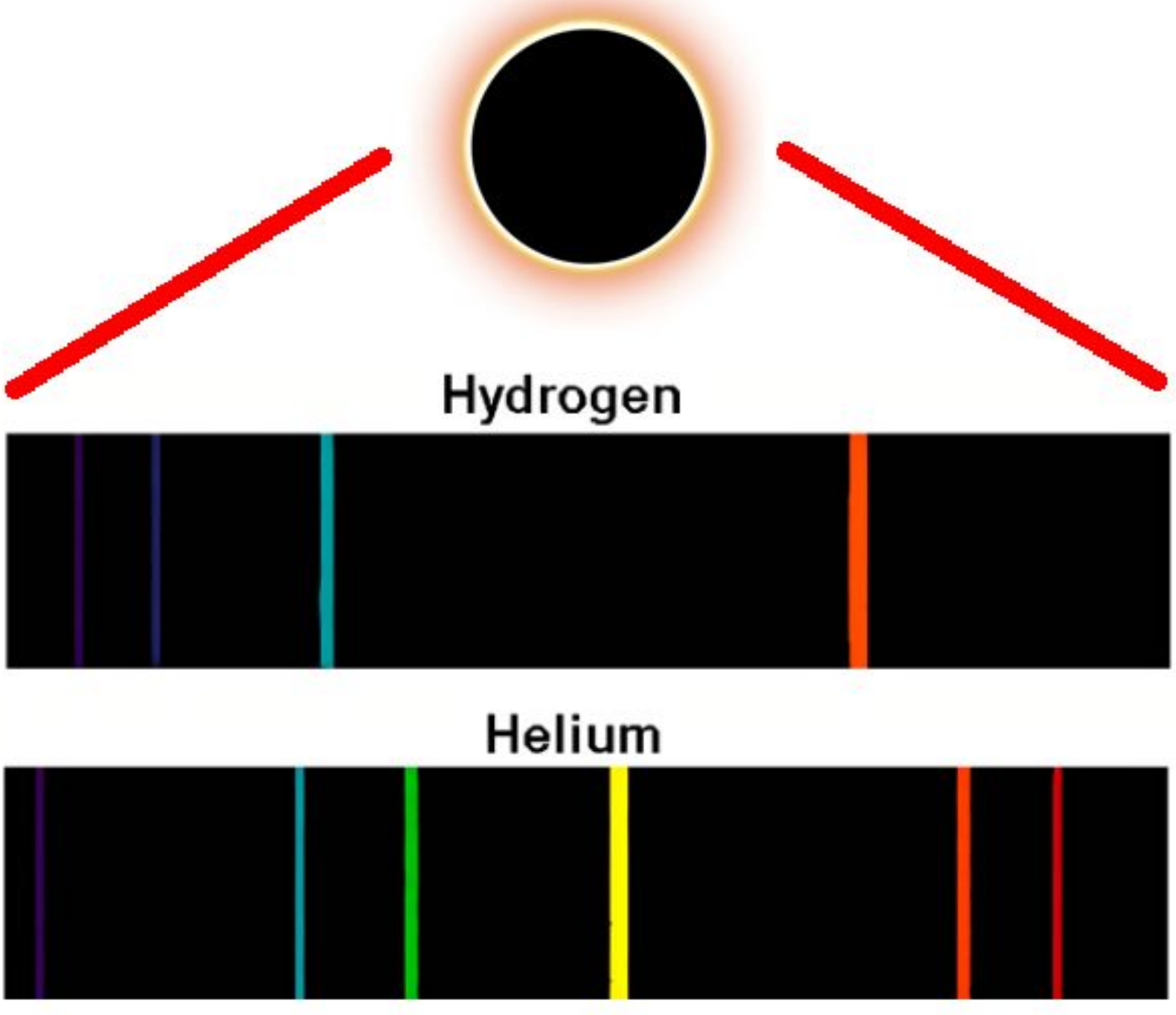


Image from earthsky.org

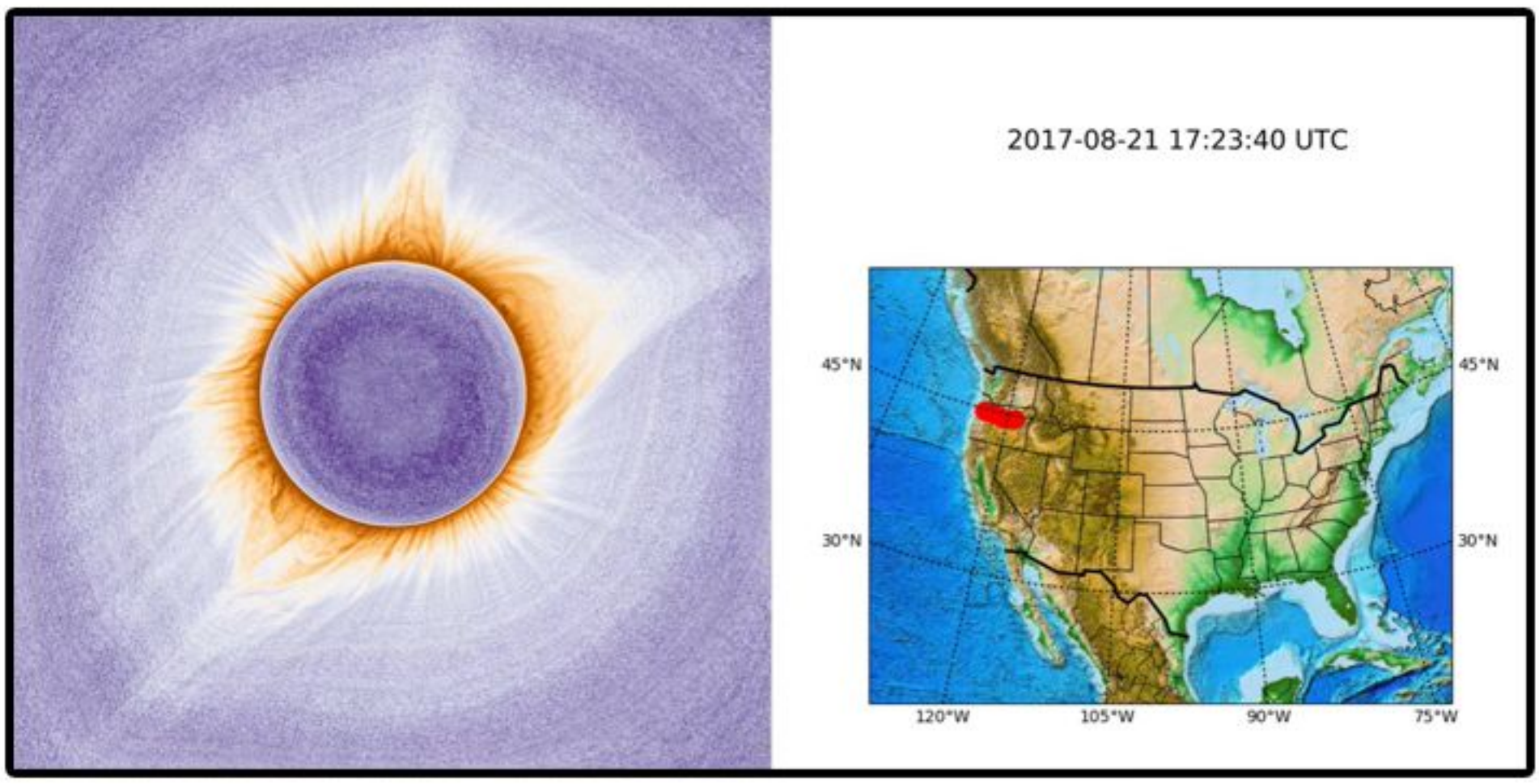
Space and time can warp, bend, and twist on a cosmic scale, but we have only a few ways to observe this from our planet.

Helium was first discovered during the 1868 total solar eclipse by French astronomer Pierre Jules César Janssen and English astronomer Joseph Norman Lockyer at about the same time, but sources are split on who to give credit to. Both used a spectroscope, a new (at the time) tool that separates light into individual colors based on their wavelengths. By analyzing the spectrum of light emitted by the sun during the eclipse, they both identified a bright yellow spectral line emanating from the sun's chromosphere. This line corresponded to helium, which had never been observed on Earth before.



The sun's corona, its outermost atmosphere, is usually hidden due to the sun's bright surface. However, it becomes visible during a total solar eclipse. This is a rare chance to study the corona's motion and behavior, and to address the mysteries of solar jets and plumes. Today, NASA is mobilizing 100 people to take and upload high-quality images of the eclipse in 50 different exposures across the path of totality to calculate the density of plasma as it leaves through solar wind.

Look up the Eclipse Megamovie project for more information!



A frame from the 2017 Eclipse Megamovie, UC Berkeley

Since the 19th and 20th centuries, observatories, universities, and scientific societies have frequently organized expeditions to observe solar eclipses. These typically involve finding the best possible viewing location along the path of totality and setting up large, high-quality telescopes, astrophotography equipment, and other instruments. Eclipse expeditions have led to even more discoveries, like advancements in our understanding of the sun's structure and Earth's magnetic field.

1900 total solar eclipse expedition, Wadesboro, NC

"Paddlers" by Samuel Scudder, from "The Winnipeg Country: Or, Roughing It with an Eclipse Party," 1886