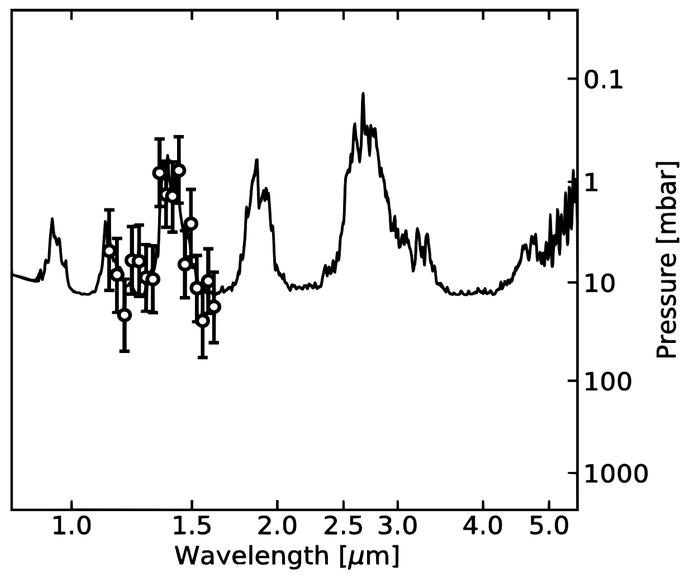
Glimpsing Exoplanet Atmospheres with *Hubble*

The *Hubble* Space Telescope (HST) has been NASA's workhorse orbital observatory for three decades. Able to observe astronomical phenomena in the ultraviolet, optical, and infrared bands, *Hubble* has touched nearly every area of observational astrophysics. HST is named for Edwin Hubble, who confirmed Georges Lemaître's prediction that the universe is expanding. As it happens, the Hubble Space Telescope has been indispensable in measuring the rate of the expansion of the universe (the Hubble Constant, H_0), as well as the so-called "Hubble Tension", a discrepancy between space-based determinations of the Hubble Constant from HST and Gaia and those measured from the Cosmic Microwave Background.

Hubble has also been instrumental in exoplanet astrophysics. Although *Hubble* has been used to discover exoplanets, it has truly shined as one of our best facilities for detailed characterization of exoplanets, especially their atmospheres. As the planet passes in front of the star, it blocks the star's light, causing the star to appear dimmer as viewed by *Hubble*. However, some of the star's light filters through the planet's atmosphere, being selectively absorbed by gases like water vapor or carbon dioxide. By passing the starlight through a spectroscope, we split the light up into its constituent wavelengths, the same way you see a rainbow coming out of a prism. Different gases absorb different amounts of light at different wavelengths, so by measuring the planet's transit at different wavelengths, we see the spectrum of the planet's atmosphere, and can determine what gases are present there.

On this poster, *Hubble* is depicted observing an exoplanet transit, where the planet crosses in front of the disk of its host star. By using Hubble's instruments like the Wide Field Camera 3 (WFC3), we can use exoplanet transits to identify the components of a planet's atmosphere.



Hubble measurements of the exoplanet K2-18b's atmosphere revealing the spectral signature of water vapor.[1]

[1] *Adapted from Benneke et al. 2019 DOI: 10.3847/2041-8213/ab59dc*

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