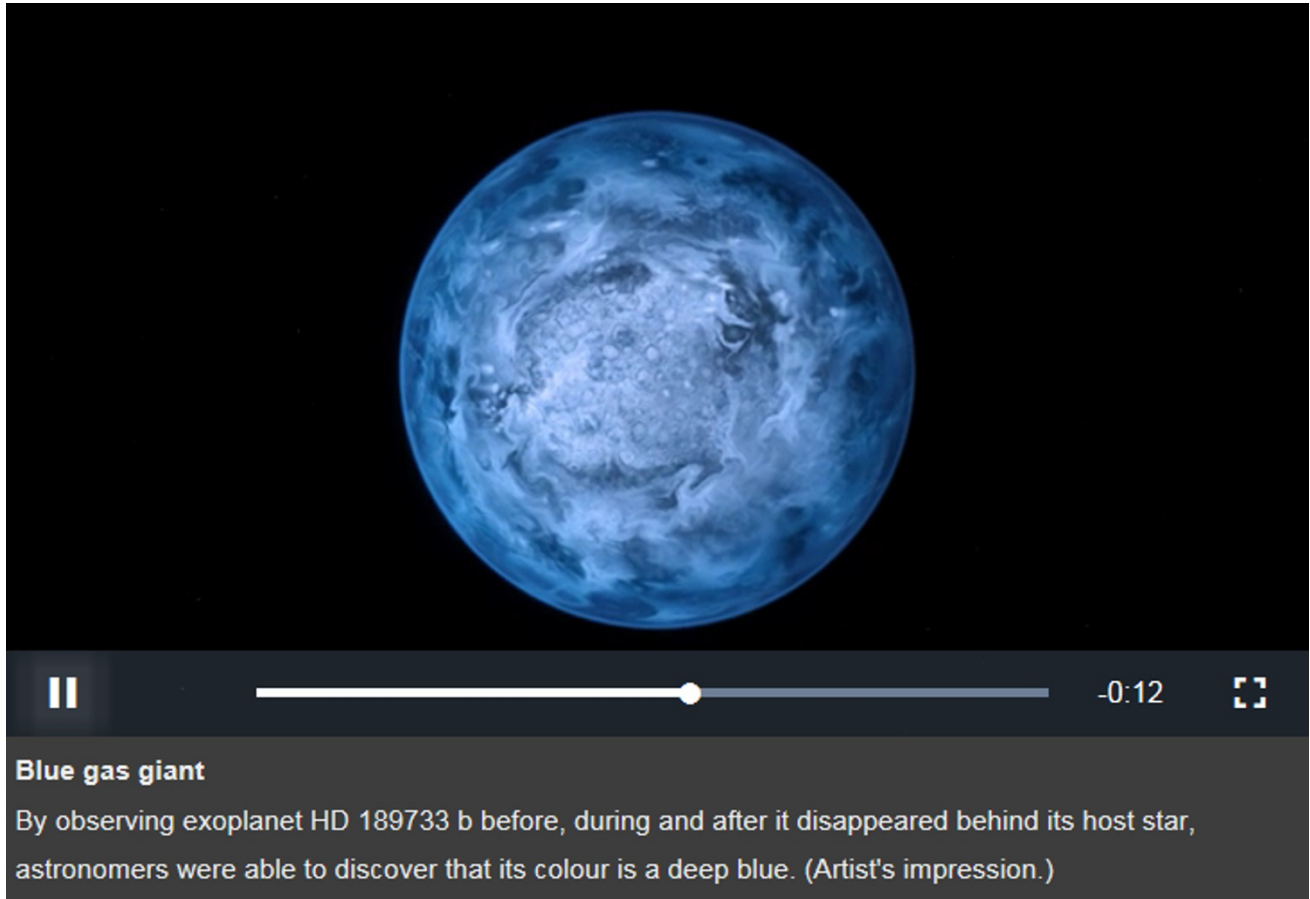


# First distant planet to be seen in colour is blue

Hubble Space Telescope measures visible light from an exoplanet.

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A navy-blue world orbiting a faraway star is the first exoplanet to have its colour directly measured.

Discovered in 2005, HD 189733 b is one of the best-studied planets outside the Solar System, orbiting a star about 19 parsecs away in the Vulpecula, or Fox, constellation. Previous efforts to observe the planet focused on the infrared light it emits — invisible to the human eye.

Last December, astrophysicist Tom Evans at the University of Oxford, UK, and his colleagues used the Hubble Space Telescope to observe the planet and its host star. Hubble's optical resolution is not high enough to actually 'see' the planet as a dot of light separate from its star, so instead, the telescope receives light from both objects that mix into a single point source. To isolate the light contribution of the planet, Evans and his colleagues waited for the planet to move behind the star during its orbit, so that its light would be blocked, and looked for changes in light colour.

A spectrograph on board the Hubble monitored light coming from the source, in wavelengths ranging from yellow to ultraviolet. During the eclipse, the amount of observed blue light decreased, whereas other colours remained unaffected. This indicated that the light reflected by the planet's atmosphere, blocked by the star in the eclipse, is blue. The team reports its findings in the 1 August issue of *Astrophysical Journal Letters*<sup>1</sup>.

"This is the first time this has been done for optical wavelengths," said Alan Boss, an astrophysicist at the Carnegie Institution for Science in Washington DC. "It's a technical tour de force." The amount of visible light bouncing off a planet is typically small compared to light fluctuations in a star, making planets difficult to distinguish. Fortunately, HD 189733 b is large relative to other exoplanets — and well illuminated.

### Not-so-pale blue dot

Although the planet seems to be the shade of a deep ocean, it is unlikely to host liquid water. The exoplanet is a giant ball of gas, similar to Jupiter, and was previously often painted brown and red in artists' impressions.

The blue colour may come from clouds laden with reflective particles that contain silicon — essentially raindrops of molten glass. Evidence for this idea dates to 2007, when Hubble observed the planet passing in front of its star. Light from the star seemed to be passing through a haze of particles<sup>2</sup>.

"Our best theory points to a layer of clouds deep in the planet's atmosphere," says Evans. Clouds at high altitudes would simply reflect every colour back into space, making the planet look white. Light bouncing off clouds lower in the atmosphere might pass through a layer of sodium that would selectively absorb red light but allow blue light to escape.

But clouds are not the only possible explanation for the blue hue. Jonathan Fortney, an astrophysicist at the University of California, Santa Cruz says that the planet's colour "seems consistent with the scattering of light by hydrogen molecules in the atmosphere".

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### References

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1. Evans, T. M. *et al. Astrophys. J.* in the press (2013).
2. Pont, F. *et al. Mon. Not. R. Astron. Soc.* **385**, 109–118 (2008).