First light from extrasolar planets

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Astronomers have detected the first light from planets which orbit other stars.[1] This discovery could be called the first *direct* observation of an extrasolar planet.

In the last ten years, astronomers have detected a number of planets orbiting other stars. Until now, these extrasolar planets have been detected by indirect means. This is because they are far too small and faint compared to their star to be seen directly using standard techniques. However, the extrasolar planets can be detected indirectly.

As a planet orbits, its gravitational pull[2] causes the star to wobble slightly. This wobble can be detected on Earth by the slight Doppler shift of the starlight (the light waves are successively stretched out and then compressed as the star moves away and then toward us respectively). The Doppler shift information allows astronomers to determine the orbital period of the planet, and estimate its distance from the star and minimum mass.

In some rare cases, a planet's orbital plane happens to be nearly 'edge-on' relative to our position in space. In these cases, the planet travels directly in front of its star once each orbit. This is called a 'transit'. When the planet transits the star, it blocks a small amount of the star's light; it's essentially a miniature solar eclipse.

Astronomers have instruments precise enough to detect this tiny drop in the light from the star. So, even though we can't see the planet, we can see its 'shadow'. These transit events allow astronomers to deduce additional information about the planet such as its size. Furthermore, they provide independent confirmation that a planet really is orbiting the star.

Recently, a third independent method has confirmed the existence of two extrasolar planets. Both of these planets were already known to exist from both the Doppler-shift method and the transit method. So, in both cases, the orbital plane of these planets around their respective star is nearly edge-on relative to us.

Using the Spitzer Space Telescope, two teams of astronomers (one led by David Charbonneau and the other by Drake Deming) have independently detected infrared light from these two extrasolar planets.[3] Infrared light has a wavelength too long to be seen by human eyes. However, it is reasonable to look for extrasolar planets in the infrared part of the spectrum because the contrast between the planet and star is not as great. The star (while still far brighter than the planet) does not overwhelm the light from the planet in infrared whereas it would in visible light. Both the star and the planet emit infrared; but it is possible to use the edge-on nature of the planets' orbits to distinguish how much infrared light is coming from the planet.

Since these are transiting planets, their orbits carry them directly in front of their star (from our perspective). That means, half an orbit later, they will cross directly behind their star. When this happens, the light from the planet is blocked by the star. It is essentially the opposite of a normal transit event. The total infrared light received from the planet and star drops, since the planet no longer contributes when blocked.

The two astronomy teams found that the infrared light dropped just as expected when the planets moved behind their respective stars. This confirms that the planets are real. It is a direct observation in the sense that we are actually seeing light (infrared) from the planet itself, rather than deducing the existence of a planet by the information in the star's light.

These planets, like most extrasolar planets discovered so far, are large Jupiter-mass planets which orbit very close to their star. This is contrary to the original expectations of secular astronomers, who believe that solar systems condense from clouds of hydrogen gas and dust.[4] The secular model had been designed to explain how our solar system could form. So, other solar systems were expected to resemble ours, with small terrestrial planets like Earth and Mars orbiting close to their star, and the large Jovian planets orbiting farther out.[5]

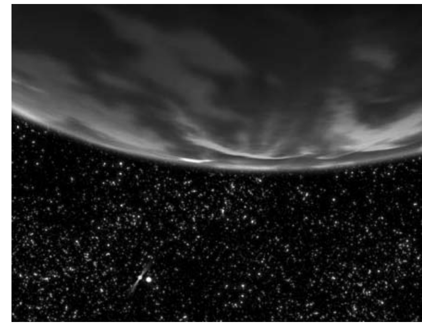

Image by NASA, Brad Hansen (UCLA), Harvey Richer (UBC), Steinn Sigurdsson (Penn State), Ingrid Stairs (UBC), and Stephen Thorsett (UCSC).

Far from confirming these secular expectations, extrasolar planets continue to support biblical creation. These very different stellar systems indicate that our solar system was designed to provide a habitable environment on planet Earth. And they continually remind us of the diversity and creativity that the Lord displayed on Day 4.

References

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