*NATURE* | NEWS

# White dwarf acts as cosmic magnifying glass

**Planet-hunting telescope sees long-predicted gravitational lensing of star in binary system by its companion.**

**Elizabeth Gibney**

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**Self-lensing star system**

The effects of gravitational lensing from a passage of a white dwarf star, simulated on an image of the Sun.

*Eric Agol and NASA/SDO HMI science teams*

Astronomers have observed a white dwarf acting as a magnifying glass for another, Sun-like star that it is orbiting. The binary star system, 808 parsecs (2,600 light years) away from Earth in the constellation Lyra, was previously classified as a possible exoplanet system.

Using data from NASA's Kepler spacecraft, physicists Ethan Kruse and Eric Agol of the University of Washington in Seattle observed an increase of just 0.1% in the larger star's brightness every 88 days, lasting for 5 hours. They say that the effect is the result of an orbiting white dwarf — a dense, compact, burnt-out star whose gravitational effects act as a magnifying glass every time it crosses the line of sight between its companion star and Earth. Kruse and Agol publish their findings in *Science*[1] today.

Massive bodies are known to distort space-time and bend the path of light travelling past them. The phenomenon, called gravitational lensing, was first predicted by Albert Einstein in 1915. The body acts as a lens and can cause viewers to see multiple images of objects behind it. For objects that appear very small because they are so far from the viewer, such as the Sun-like star, the multiple images cannot be distinguished, but astronomers expect to see the effects of lensing as an increase in the star's overall brightness.

The 'self-lensing' effect in a binary system was predicted in 1971 by Douglas Hube and Clement Leibovitz[2], then both at the University of Alberta, who showed that it might be possible to detect a compact object as it amplified the light of a companion star when it transited in front of it. Two years later Swiss astronomer André Maeder calculated how this would apply specifically to white dwarfs[3]. But the phenomenon had not been seen until now. "It was not till Kepler was launched that we had a telescope capable of finding such tiny changes," says Kruse.

The system, officially named Kepler Object of Interest (KOI) 3278, was originally classed as a candidate exoplanet because Kepler also

saw a regular dimming in its light that could be explained by an orbiting planet passing in front of it. In fact, the dimming happens when the white dwarf, which gives out light of its own, passes behind its much larger companion, say the authors.

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## Clarifications

**Clarified:** An earlier version of this article reported the assertion, made in Kruse and Agol's paper, that Maeder had been the first one to predict the phenomenon of self-lensing binaries. After publication, however, the authors became aware of the earlier work by Hube and Leibovitz. This article has now been amended to reflect that fact.

## References

1. Kruse, E. & Agol, E. *Science* **344**, 275–277 (2014).
2. Hube, D. & Leibovitz, C. *Astron. & Astrophys.* **15**, 251–255, (1971).
3. Maeder, A. *Astron. Astrophys.* **26**, 215 (1973).