Using Wobbly Stars to Discover New Planets

Recently, researchers demonstrated how they could use measurements of a star's wobble to study planets a bit more like the Earth. They studied a star called HD 3167 and its two orbiting planets. The planets had been discovered by NASA's Kepler spacecraft using another technique, based on the decrease in brightness of the star as the planets travel ("transit") in front of them and block some of their light. So astronomers knew the planets were there and they had some information about the planet, but didn't know the planets' masses.

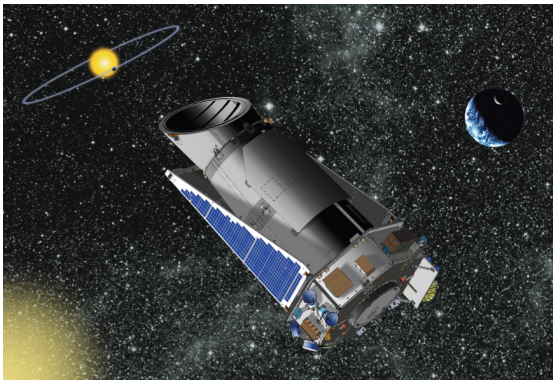

Figure 1. Artist's Rendition of the Kepler Space Telescope. The Kepler space telescope was launched in 2009 with the goal of discovering planets far outside of our solar system. *Credit: Wikimedia Commons*

Using measurements of how much HD 3167 wobbles, scientists provided the first mass measurements for these planets, and even discovered a third one not noticed in the Kepler data! The newly discovered third planet causes a wobble on HD 3167 of only about 2 m/s: twenty five times less than the strength of the signal astronomers used to discover the planet around 51 Peg 22 years earlier, but still about 20 times larger than the signal we would see from a planet just like Earth around a distant star like the sun.

By combining different techniques—the star's wobble to measure the mass of the planet and transits to measure the planet's size—astronomers can learn a lot about planets orbiting distant stars. The authors were able to estimate the surface temperature of these planets and even the likely composition of their atmospheres. With each passing year, astronomers improve their capabilities for discovering, measuring the properties of, and estimating the conditions on more and more planets in our galaxy. Soon, we may be able to identify what planets are most likely to be suitable for life like the kind we know from Earth.

Reference

Christiansen, Jessie L., Andrew Vanderburg, Jennifer Burt, B. J. Fulton, Konstantin Batygin, Björn Benneke, and John M. Brewer et al. 2017. "Three'S Company: An Additional Non-Transiting Super-Earth In The Bright HD 3167 System, And Masses For All Three Planets". *The Astronomical Journal* 154 (3): 122. doi:10.3847/1538-3881/aa832d.

BiteScientist Profiles

Nathan Sanders is an astrophysicist and statistician working in industry. His astronomical research focused on core-collapse supernovae, the explosive deaths of the most massive stars in the universe. Like the science in this bite, those explosions rely on laws of physics at scales unlike anything we experience day to day on Earth. In his free time, Nathan enjoys hiking, gardening, and analyzing volumetric flow data from municipal combined sewer systems.

Shannon Morey teaches physics at Abbott Lawrence Academy in Lawrence, Massachusetts. She is a 2015 Knowles Teacher Initiative Fellow and the 2022 MA STEM Teacher of the Year. In her free time she enjoys spinning, cooking, and yarn crafts. She also loves to travel for fun and to learn more about the world. She is pictured here on Isabela Island in the Gálapagos Islands as part of a Knowles Teacher Initiative professional development.