

Ask an Astronomer

Question: "Do other solar systems exist?"

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Until very recently, we didn't know of any solar systems besides our own. Because planets don't shine by their own light but merely reflect light from their host suns, the much smaller planets appear very much dimmer than the stars they orbit. These planets are lost in the star's glare and can't be seen directly.

If we can't see them, how do we even know other planets exist outside our own solar system?

Well, planets, like all other objects in the Universe, exert a gravitational tug on other objects nearby. In a solar system, a planet tugs on its host star, and this tugging causes the star to wobble slightly as the planet orbits it. Astronomers use powerful instruments and telescopes to monitor nearby stars for possible wobbles.

To be more exact, imagine the star and its orbiting planet as a very lopsided dumbbell. The two objects orbit around the balance point of the dumbbell, which is very close to the star since the star is far heavier. The planet orbits the balance point in a wide circle and the star in a much tighter circle. As the star moves toward our line of sight on its tight circle, the wavelength of the light coming at us becomes compressed (shifted to the blue). As the star moves away from us on its circle, the wavelength of the light gets stretched out (shifted to the red). The blue-shifting and red-shifting of the light caused by the star's wobble is known as the Doppler Effect.

So, even though we can't view the planet directly, we can detect this Doppler Effect in the star and reveal the presence of the planet itself. Using this technique, astronomers have detected planets around many dozens of nearby stars.

For "Ask an Astronomer" this is Davy Kirkpatrick at the Infrared Processing and Analysis Center at the California Institute of Technology.