Planets Around Other Stars

A Summary by Andrew Fraknoi *(Foothill College)* (June 2015)

Astronomers have now discovered planets around many other stars and more are being found all the time. As of June 2015, we have found 1928 planets around 1219 stars beyond our Solar System! (There are 484 stars so far where we have discovered *more than one* planet in the same system.)

In addition, the Kepler mission (which is searching for such planets from space) has over 3000 candidate planets, which are still being checked out! These early numbers lead experts in the field to suggest that the Milky Way Galaxy may have many billions of planets in total.

→ These are the three main ways of discovering planets around other stars:

1. **The "wiggle" method** – We detect the planet by the tiny changes it causes in its star's motion. (The star is bright; the planet is impossibly dim. So we watch the star "wiggle" as a planet orbits it and pulls it ever so slightly back and forth.)
2. **The transit method** – We find the planet when it moves across the face of its star, and the light output of the star goes down by a tiny amount (like a mini-eclipse). The Kepler mission in space used this method, with remarkable accuracy.
3. **The "seeing is believing" method** -- We take an actual picture of the planet (visible light or infrared.)

There are other ways too, including finding a hint of a planet around a young star when the disk of dust around it shows an empty space near the middle (this first made the star Fomalhaut suspicious to us.)

Some Interesting Trends in the Planets Discovered So Far

- 1330 of these planets take less than 88 days to orbit –less than the time Mercury takes to orbit the Sun in our Solar System. Many of these have masses comparable to Jupiter and astronomers therefore call them "hot Jupiters." Many orbit so close to their star that you'd get instantly french-fried. One hot Jupiter takes only 6 hours to go around, one Earth-sized planet takes 8.5 hours!!

- Bear in mind, however, these are just the sorts of planets our wiggle technique is best at finding first. What kind of planets would pull on their stars the most and make them wiggle? The ones that have considerable mass (like Jupiter) and are *close* to their stars. And, since their "years" are so short, it doesn't take long to find the whole cycle of wiggles. If "hot Jupiters" are common, it is not surprising they will be the first ones found. As the years pass, however, we are finding more planets further away from their stars. Currently, we know 238 planets that orbit farther out than Mars does in our system (take longer than 687 days to orbit their star).

- 484 stars are now known to have more than one planet orbiting them. Two stars are known to have seven planets each, two stars have 6, fifteen stars have 5 -- compare that to the eight our Sun has. As time passes, we are finding more and more stars with a family of planets surrounding them.

- The planets we had been discovering at first mostly had sizes and masses larger than Earth's, because those are easier to find. But the Kepler mission is now finding planets of smaller diameter, including a number smaller than the size of Earth (one is smaller than Mercury!)

- One intriguing question is whether "Jupiters" in Earth-like orbits could have moons that are the mass of the Earth and perhaps have atmospheres like Earth does.

For more, see: exoplanet.eu, exoplanets.org, kepler.nasa.gov, www.seti.org