# Planets around stars are the rule rather than the exception 

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There are more exoplanets further away from their parent stars than originally thought, according to new astrophysics research.

In a new paper appearing in the Jan. 12 edition of the journal, Nature, astrophysicist Kem Cook as part of an international collaboration, analyzed microlensing data that bridges the gap between a recent finding of planets further away from their parent stars and observations of planets extremely close to their parent star. The results point to more planetary systems resembling our solar system rather than being significantly different.

Gravitational microlensing occurs when light from a source star is bent and focused by gravity as a second object (the lens star), which passes between the source star and an observer on Earth. A planet rotating around the lens star will produce an additional deviation in the microlensing. The first gravitational microlensing observations were made by the Massive Astrophysical Compact Halo Object (MACHO) collaboration, led by Livermore scientists.

The new research also determines that a large fraction of planets have orbital distances from 0.5 to 10 sun-Earth distances. In the past, using the Doppler shift technique, most extrasolar planets found were gas giants like Jupiter and Saturn that orbited stars that were much closer to them than the sun is to Earth.

An exoplanet is a planet outside our solar system. Over the past 16 years,

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astronomers have detected more than 700 confirmed exoplanets and have started to probe the spectra and atmospheres of these worlds. While studying the properties of individual exoplanets is undeniably valuable, a much more basic question remains: how commonplace are planets in the Milky Way?

The team found that approximately 17 percent of stars host Jupiter-mass planets. However, cool-Neptunes and super-Earths are more common, occurring 52 percent and 62 percent, respectively, of the time.

Gravitationally microlensing is very rare. In fact, fewer stars than one per million undergo micolensing at any time.

The team's result is consistent with every star of the Milky Way, hosting, on average, one planet or more in an orbital distance range of 0.5 to 10 sun-Earth distances.
"Our measurements confirm that low-mass planets are very common and the number of planets increases with decreasing planet mass, in an agreement with the predictions of the core accretion scenario of planet formation," Cook said. "Planets around stars in our galaxy appear to be the rule rather than the exception."
"We used to think that the Earth might be unique in our galaxy. But now it seems that there are literally billions of planets with masses similar to Earth orbiting stars in the Milky Way," concludes Daniel Kuba, of the European Southern Observatory and co-lead author of the paper .

## Provided by DOE/Lawrence Livermore National Laboratory

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