Some giant planets in other systems most likely to be alone

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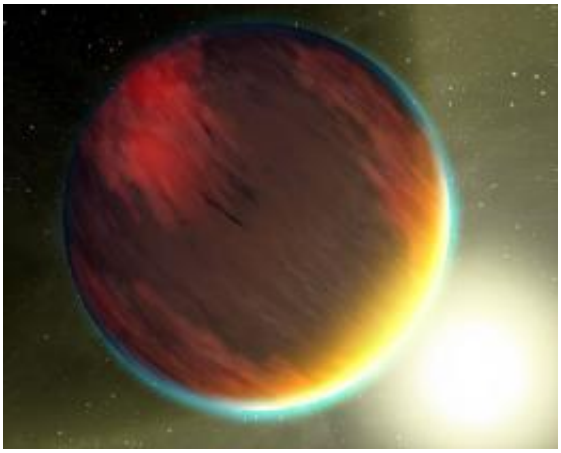

An artist's impression of a hot Jupiter planet. Image: NASA

In the search for Earth-like planets, it is helpful to look for clues and patterns that can help scientist narrow down the types of systems where potentially habitable planets are likely to be discovered. New research from a team including Carnegie's Alan Boss narrows down the search for Earth-like planets near Jupiter-like planets. Their work indicates that the early post-formation movements of hot-Jupiter planets probably disrupt the formation of Earth-like planets.

Their work is published the week of May 7 by Proceedings of the National Academy of Sciences.

The team, led by Jason Steffen of the Fermilab Center for particle Astrophysics, used data from NASA's Kepler mission to look at so-called "hot Jupiter" planets—those roughly Jupiter-sized planets with orbital periods of about three days. If a Jupiter-like planet has been discovered by a slight dimming of brightness in the star it orbits as it passes between the star and Earth, it is then possible—within certain parameters—to determine whether the hot-Jupiter has any companion planets.

Of the 63 candidate hot Jupiter systems identified by Kepler, the research team did not find any evidence for nearby companion planets. There are several possible explanations. One is that there are no companion planets for any of these hot Jupiters. Another is that the companions are too small in either size or mass to be detected using these methods. Lastly it is possible that there are companion planets, but that the configuration of their orbits makes them undetectable using these methods.

However, when expanding the search to include systems with either Neptune-like planets (known as "hot Neptunes"), or "warm Jupiters" (Jupiter-sized planets with slightly larger orbits than hot Jupiters), the team found some potential companions. Of the 222 hot Neptunes, there were two with possible companions, and of the 31 warm Jupiters, there were three with possible companions.

"The implications of these findings are that systems with Earth-like planets formed differently than systems with hot Jupiters," Boss said. "Since we believe that hot Jupiters formed farther out, and then migrated inward toward their stars, the inward migration disrupted the formation of Earth-like planets. If our sun had a hot Jupiter, we would not be here."

More information: Kepler constraints on planets near hot Jupiters, Published online before print May 7, 2012, doi:

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