

Planets that have no stars: New class of planets discovered

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This artist's conception illustrates a Jupiter-like planet alone in the dark of space, floating freely without a parent star. Astronomers recently uncovered evidence for 10 such lone worlds, thought to have been "booted," or ejected, from developing solar systems. Image credit: NASA/JPL-Caltech

(PhysOrg.com) -- University of Notre Dame astronomer David Bennett is co-author of a new paper describing the discovery of a new class of planets -- dark, isolated Jupiter-mass bodies floating alone in space, far from any host star. Bennett and the team of astronomers involved in the discovery believe that the planets were most likely ejected from developing planetary systems.

The study is described in a paper appearing in the May 19th issue of the journal *Nature*.

The discovery stems from an analysis of observations of the central bulge of the [Milky Way galaxy](#) taken in 2006 and 2007 by a joint Japan-New Zealand survey. This analysis provides evidence of what appear to be 10 free-floating [planets](#) roughly the mass of Jupiter. Bennett explains the likely origin of these isolated planets, "Our results suggest that [planetary systems](#) often become unstable, with planets being kicked out from their places of birth by close encounters with other planets".

This discovery not only confirms that free-floating planets exist in space, but also indicates that they are quite common. Free-floating planets are very hard to detect, so the fact that the survey found up to 10 implies that there are many more that are not detected. The team of scientists that made the discovery estimates that there are about twice as many free-floating Jupiter-mass planets as stars. This implies that free-floating planets are likely to be least as common as planets, like ours, that orbit stars.

"Our survey is like a population census — we sampled a portion of the galaxy and, based on these data, can estimate overall numbers in the galaxy," Bennett said. "The survey is not sensitive to planets less massive than Jupiter and Saturn, but theories suggest that lower-mass planets like Earth should be ejected from their stars more often and are thus more common than free-floating Jupiters." Some scientists have even suggested that free-floating Earth-mass planets could be warm enough to host life, due to the greenhouse effect of a large amount of Hydrogen in their atmospheres. NASA's planned WFIRST mission will use the microlensing method to reveal how many free-floating Earth-mass planets inhabit the Milky Way galaxy.

The survey that revealed the planets is called the Microlensing Observations in Astrophysics (MOA). A 1.8-meter (5.9-foot) telescope at Mt. John University Observatory in New Zealand is used to regularly scan the stars at the center of the Milky Way galaxy for what are referred to as "gravitational microlensing events."

Bennett is a pioneer in the gravitational microlensing method, which takes advantage of the fact that light is bent as the rays pass close to a massive object, like a star. The gravity from the mass of the foreground planet warps surrounding space and acts like a giant magnifying glass. As predicted by Albert Einstein and later confirmed, this phenomena causes an apparent brightening of the light from a background "source" star. The effect is seen only if the astronomer's telescope lies in almost perfect alignment with the source star and the lens star. The primary challenge of the microlensing method is the precise alignments needed for the planetary microlensing signals are quite rare and brief, lasting less than two days.

[Astronomers](#) are also able to detect planets orbiting stars if the light from the background star is warped by both the planet and its [host star](#).

Bennett and the team of scientists found about 10 short microlensing events, indicating planets of roughly Jupiter's mass. The team said that it can't rule out the possibility that some of the planets may be in very distant orbits about stars, but previous observations by other groups suggests that Jupiter-mass planets in such distant orbits are rare. Future observations by the Hubble Space Telescope should detect many of these host stars, if they exist.

"If free-floating planets formed like stars, then we would have expected to see only one or two of them in our survey instead of 10," Bennett said.

Provided by University of Notre Dame

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