EMBARGOED NEWS RELEASE
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UH Mānoa researchers look to the horizon of future planet searches

HONOLULU - In a paper published this week in the journal *Science*, three University of Hawaii at Mānoa researchers and their colleagues review the prospects for discovering smaller planets more like Earth, some of which may even have conditions suitable for life. Astronomers reported the first planet around another Sun-like star in 1995 and since then have found more than 200 such planets, all thought to be "gas giants" made mostly of hydrogen and helium like Jupiter and Saturn in our Solar System.

"The most successful technique for discovering planets to date spreads light from the host star into its constitutive wavelengths (colors)" said lead author Eric Gaidos, who is an associate professor in the Department of Geology & Geophysics and the NASA Astrobiology Institute at UH Mānoa. "A shift in wavelength, analogous to the change in pitch of the horn of a passing automobile, reveals any motion of the star along the line of sight. Monitoring of a star can detect periodic motion caused by the gravitational pull of any unseen, orbiting planet."

Improved techniques and the ability to monitor fainter stars now enable astronomers to discover smaller planets, particularly planets orbiting much closer to their host star than the Earth is to the Sun. New computer simulations such as those performed by Sean Raymond, co-author of the paper and NASA Postdoctoral Fellow at the University of Colorado Boulder, show how such planets could form further out and then "migrate" inwards to such orbits.

Another method now used to find planets is to observe the slight decrease in light from the star as an orbiting planet passes in front of it. This happens only for those planets whose orbits by chance are seen edge-on. Jupiter-sized planets can be found this way using telescopes on the ground, but Earth-size planets might be detected by the European CoRoT spacecraft, now in orbit, and NASA's *Kepler* spacecraft, scheduled to launch in 2009.

"These methods can sometimes be combined to estimate the density of the planet, which will tell us whether the planet is composed mostly of rock and metal, like Earth, or something else such as water ice," said Gaidos.

Computational simulations by co-author Nader Haghighipour, a planetary dynamicist at the Institute for Astronomy and the Astrobiology Institute at UH Mānoa, have shown that smaller Earth-sized planets can indeed exist in such tight planetary environments.

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According to the paper, planets orbiting much closer to a star like the Sun will be much hotter and, like Mercury and Venus in our Solar System, inhospitable to life. However, many stars are much less bright than the Sun, and planets close to them could still orbit within a "habitable zone" where surface temperatures could permit stable liquid water.

"Explaining the formation of habitable planets in such environments is a challenging task. However, our simulations have been successful in determining condition under which planets similar to Earth can form in the habitable zones of less bright stars," said Haghighipour.

Future space observatories beginning with NASA's James Webb Space Telescope have the potential to study such planets and determine whether they have atmospheres or oceans.

Added Gaidos, "The discovery of another life-bearing planet would be a scientific triumph for humanity, but the study of many lifeless, un-Earthly worlds would nevertheless tell us about how planets form, and help us appreciate the Earth all that much more".

Other researchers contributing to the paper were John Rayner of the Institute for Astronomy at UH Mānoa, Eric Agol of the University of Washington and David Latham of the Harvard-Smithsonian Center for Astrophysics.

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