

*"Long before it's in the papers"*

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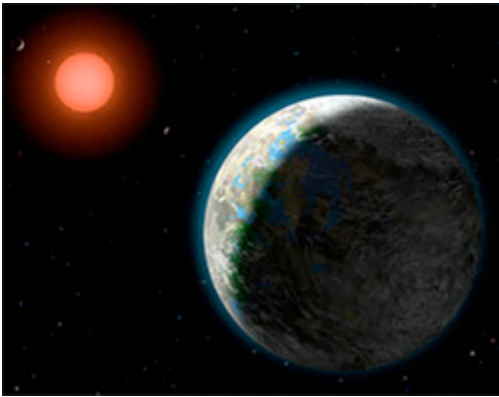
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# Candidate “habitable” planet described as most promising yet

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Courtesy of the University of California Santa Cruz  
and World Science staff

**Astronomers have identified what they describe as the most promising candidate yet for a habitable planet outside our solar system.**

**The newfound planet is in the same solar system where two others also considered possibly habitable have turned up. But one of these may be too cold and the other too hot, researchers said—while the new one seems to be right in between, so that liquid water could very well exist.**



The dimly lit zone between the light and dark side of a planet, called the "terminator," is the part considered most likely to be hospitable to life on a planet just reported discovered. Above, an artist's conception of the inner four planets of the Gliese 581 system and their host star. (Artwork by Lynette Cook)

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**“Our findings offer a very compelling case for a potentially habitable planet,” said astronomer Steven Vogt of the University of California Santa Cruz, one of the researchers. “The fact that we were able to detect this planet so quickly and so nearby tells us that planets like this must be really common... there could be tens of billions of these systems in our galaxy.”**

**The planet is believed to orbit closely by the “red dwarf” star Gliese 581. It would be in the middle of the star’s “habitable zone”—the range of distances from the star where temperatures allow for liquid water.**

**Gliese 581, located 20 light years away from Earth in the constellation Libra, has a somewhat checkered history of habitable-planet claims. Two previously detected planets in the system lie at the edges of the habitable zone, Vogt and colleagues said. One, designated planet “c,” is on the hot side of that zone; another, “d,” is on the cold side.**

**While some astronomers still think “d” may be habitable if it has a thick atmosphere that helps warm it, others are skeptical.**

**The newly discovered body is designated g.**

**“We had planets on both sides of the habitable zone—one too hot and one too cold—and now we have one in the middle that’s just right,” Vogt said.**

**To astronomers, a potentially habitable planet is one that could sustain life, not necessarily one that humans would consider a nice place to live. Habitability depends on many factors, but liquid water and an atmosphere are among the most important.**

The new findings, to be published in *The Astrophysical Journal* and posted online at the database arXiv.org, also include a report of a second new planet that brings to six the total number of planets thought to surround Gliese 581. All are calculated to have nearly circular orbits, which tend to promote stable climates since the distance from the star never changes much.

Gliese 581g, the newfound potentially habitable one, weighs the equivalent of three or four Earths and orbits its star in a brisk 37 days, meaning the year is only that long, astronomers said. Its relatively low weight for a planet suggests it's probably rocky and has enough gravity to hold on to an atmosphere, according to Vogt.

The planet is tidally locked to the star, meaning that one side is always facing the star and basking in perpetual daylight, while the side facing away from the star is in permanent darkness. One effect of this is to stabilize the planet's climates, according to Vogt. The most habitable zone on the planet's surface would be the line between shadow and light, known as the "terminator," with surface temperatures decreasing toward the dark side and increasing toward the light side.

"Any emerging life forms would have a wide range of stable climates to choose from and to evolve around, depending on their longitude," Vogt said.

The researchers estimate that the average surface temperature of the planet is between -24 and 10 degrees Fahrenheit (-31 to -12 degrees Celsius). Actual temperatures would range from blazing hot on the side facing the star to freezing cold on the dark side.

If Gliese 581g has a rocky, Earth-like composition, it would be about 1.2 to 1.4 times as wide as Earth. The surface gravity would be about the same or slightly higher than Earth's, so that a person could easily walk upright, Vogt said.

The findings are based on 11 years of observations of Gliese 581 using an instrument designed by Vogt on the Keck I Telescope at the Keck Observatory in Hawaii. The device, a spectrometer, allows precise measurements of a star's motion along the line of sight from Earth, which can reveal the presence of planets. The gravitational tug of an orbiting planet causes periodic changes in this motion. Multiple planets induce complex wobbles in the star's motion, and astronomers use sophisticated analyses to detect planets and determine their orbits and masses.

"It's really hard to detect a planet like this," Vogt said. "It took more than 200 observations with a precision of about 1.6 meters [yards] per second to detect this planet." Study collaborators also took night-to-night brightness measurements of the star to verify that measured stellar motions were caused by outside forces and not by processes within the star itself.

Given the relatively small number of stars that have been carefully monitored by planet hunters, this discovery has come surprisingly soon, Vogt said.

"If these are rare, we shouldn't have found one so quickly and so nearby," Vogt said. "The number of systems with potentially habitable planets is probably on the order of 10 or 20 percent, and when you multiply that by the hundreds of billions of stars in the Milky Way, that's a large number."