

Major Discovery: New Planet Could Harbor Water and Life

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An Earth-like planet spotted outside our solar system is the first found that could support liquid water and harbor life, scientists announced today.

Liquid water is a key ingredient for life as we know it. The newfound planet is located at the "Goldilocks" distance—not too close and not too far from its star to keep water on its surface from freezing or vaporizing away.



And while astronomers are not yet able to look for signs of biology on the planet, the discovery is a milestone in planet detection and the search for extraterrestrial life, one with the potential to profoundly change our outlook on the universe.

"The goal is to find life on a planet like the Earth around a star like the Sun. This is a step in that direction," said study leader Stephane Udry of the Geneva Observatory in Switzerland. "Each time you go one step forward you are very happy."



The new planet is about 50 percent bigger than Earth and about five times more massive. The new "super-Earth" is called Gliese 581 C, after its star, Gliese 581, a diminutive red dwarf star located 20.5 light-years away that is about one-third as massive as the Sun.

Smallest to date

Gliese 581 C is the smallest extrasolar planet, or "exoplanet," discovered to date. It is located about 15 times closer to its star than Earth is to the Sun; one year on the planet is equal to 13 Earth days. Because red dwarfs, also known as M dwarfs, are about 50 times dimmer than the Sun and much cooler, their planets can orbit much closer to them while still remaining within their habitable zones, the spherical region around a star within which a planet's temperature can sustain liquid water on its surface.

Because it lies within its star's habitable zone and is relatively close to Earth, Gliese 581 C could be a very important target for future space missions dedicated to the search for extraterrestrial life, said study team member Xavier Delfosse of Grenoble University in France.

"On the treasure map of the universe, one would be tempted to mark this planet with an X," Delfosse said.

Two other planets are known to inhabit the red dwarf system. One is a 15 Earth-mass "hot-Jupiter" gas planet discovered by the same team two years ago, which orbits even closer to its star than does Gliese 581 C. Another is an 8 Earth-mass planet discovered at the same time as Gliese 581 C, but which lies outside its star's habitable zone.

Possible waterworld

Computer models predict Gliese 581 C is either a rocky planet like Earth or a waterworld covered entirely by oceans.

"We have estimated that the mean temperature of this super-Earth lies between 0 and 40 degrees Celsius [32 to 104 degrees Fahrenheit], and water would thus be liquid," Udry said.

The scientists discovered the new world using the HARP instrument on the European Southern Observatory 3.6 meter telescope in La Silla, Chile. They employed the so-called radial velocity, or "wobble," technique, in which the size and mass of a planet are determined based on small perturbations it induces in its parent star's orbit via gravity.

Udry said there was a fair amount of time between the calculation of Gliese 581 C's size and the realization it was within its star's habitable zone. "That came at the end," Udry said.

When it did hit him, Udry knew he would be spending time fielding phone calls from the media. "You right away think about the journalists who will like it very much," he told *SPACE.com*.

More to come

David Charbonneau, an astronomer at the Harvard-Smithsonian Center for Astrophysics (CfA) who was not involved in the study, said the new finding is an "absolutely fantastic discovery."

"It means there probably are many more such planets out there," Charbonneau said in a telephone interview. Whether Gliese 581 C harbors life is still unknown, but "it satisfies for the first time a key requirement."

Charbonneau also praised the team's technical skills. "The wobble induced on the star by each of these planets is really tiny—it's just a few meters a second. That means their measurement precision is exquisite," he said.

David Latham, another astronomer at Harvard-Smithsonian CfA, echoed other scientists' praise of the discovery but said the next step is to find a similar world where the orbit of the habitable planet carries it between Earth and its parent star. This will allow scientists to observe it using the transit technique, whereby the small dimming of starlight caused by the planet's passage across the face of its sun can be used to calculate its size.

Only then can scientists determine for certain whether the world is rocky or covered by water, Latham said.

Alan Boss, a planetary theorist at the Carnegie Institution of Washington, said the new planet's potential for liquid water made it "fascinating." Gliese 581 C "is the closest planet to another Earth that has been found to date. I hope the SETI folks are listening," Boss said.

Seth Shostak, a senior astronomer at the SETI institute, said the Gliese 581 system has in fact been looked at twice before for signs of intelligent life. The first time was in 1995 using the Parkes Radio Telescope in Australia; the second time occurred in 1997 using the 140-foot telescope in Greenbank, West Virginia. Both times revealed nothing.

"It has been looked at twice, but that doesn't mean we shouldn't look at it again," Shostak said. "And indeed we should because this is the best candidate the extrasolar planet guys have come up with yet."

Shostak said he was "jazzed" by the discovery. "This is pointing to something that in the past has only been an assumption, namely that Earth-sized worlds are not rare," he said. "We know of only two [planets in the habitable zone]. We know this one and we know our own. But two is better than one."

Shostak said the Gliese 581 system will likely be looked at again over a much wider range of the radio spectrum when the new Allen Telescope Array begins operations this summer.

"You could say it's going to the head of the class," he said.