

MOON-FORMING REGION SEEN AROUND EXOPLANET FOR THE FIRST TIME

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Rare find: Among over 4,400 exoplanets discovered so far, none had a circumplanetary disc. | Photo Credit: [DOTTEDHIPPO;iStockphoto](#)

Scientists for the first time have spotted a moon-forming region around a planet beyond our solar system - a Jupiter-like world surrounded by a disc of gas and dust massive enough that it could spawn three moons the size of the one orbiting Earth.

The researchers used the ALMA observatory in Chile's Atacama desert to detect the disc of swirling material accumulating around one of two newborn planets seen orbiting a young star called PDS 70, located a relatively close 370 light years from Earth. A light year is the distance light travels in a year, about 9.5 trillion km.

It is called a circumplanetary disc, and it is from these that moons are born. The discovery, the researchers said, offers a deeper understanding about the formation of planets and moons.

More than 4,400 planets have been discovered outside our solar system, called exoplanets. No circumplanetary discs had been found until now because all the known exoplanets resided in "mature" – fully developed – solar systems, except the two infant gas planets orbiting PDS 70.

The study was published in the *Astrophysical Journal Letters*.

In our solar system, the impressive rings of Saturn, a planet around which more than 80 moons orbit, represent a relic of a primordial moon-forming disc, said study co-author Stefano Facchini of the European Southern Observatory.

The orange-coloured star PDS 70, roughly the same mass as our Sun, is about 5 million years old – a blink of the eye in cosmic time. The two planets are even younger. Both planets are similar (although larger) to Jupiter, a gas giant. It was around one of the two planets, called PDS 70c, that a moon-forming disc was observed. Researchers have now confirmed initial evidence of a disc around this planet.

Both planets are "still in their youth," Facchini said, and are at a dynamic stage in which they are still acquiring their atmospheres. PDS 70c orbits its star at 33 times the distance of the Earth from the sun, similar to the planet Neptune in our solar system. Benisty said there are possible additional so-far undetected planets in the system.

Stars burst to life within clouds of interstellar gas and dust scattered throughout galaxies. Leftover material spinning around a new star then coalesces into planets, and circumplanetary discs surrounding some planets similarly yield moons.

The dominant mechanism thought to underpin planet formation is called "core accretion," said study co-author Richard Teague of the Harvard-Smithsonian Center for Astrophysics.

"In this scenario, small dust grains, coated in ice, gradually grow to larger and larger sizes through successive collisions with other grains. This continues until the grains have grown to a size of a planetary core, at which point the young planet has a strong enough gravitational

potential to accrete gas which will form its atmosphere," Teague said.

Some nascent planets attract a disc of material around them, with the same process that gives rise to planets around a star leading to the formation of moons around planets.

The disc around PDS 70c, with a diameter about equal to the distance of the Earth to the sun, possesses enough mass to produce up to three moons the size of Earth's moon. It is unclear how many will form, if any.

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This study was completed before the emergence of the Delta variant of SARS-CoV-2 now dominating in the U.K.

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