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ASTRONOMY

BIZARRE GIANT PLANET COULD REWRITE THE RULES OF SOLAR SYSTEMS

A true giant among dwarfs has been discovered, challenging theories about how planets form

A new paper published in *Science* reveals the discovery of a rare planet seemingly far too big for the star it orbits. The findings challenge everything we know about how planets and solar systems form – as well as how scientists model them.

“An object like the one we discovered is likely extremely rare, so detecting it has been really exciting,” said Megan Delamer, an astronomy graduate student at Penn State, USA, and co-author of the paper. “Our current theories of planet formation have trouble accounting for what we’re seeing.”

The newly identified giant planet is 13 times as massive as Earth, with a similar mass to the ice giant Neptune. What’s strange is that the ultracool star it’s orbiting (named LHS 3154) is nine times less massive than our Sun. That makes the mass

BELOW An artist’s impression of the planet so big that it challenges scientists’ current thinking, in the foreground, and its star (LHS 3154), in the background



ratio of the planet to its star more than 100 times that of Earth to the Sun.

The discovery marks the first time that scientists have found such a big planet orbiting such a small star. In fact, ultracool stars are famously the coldest and least massive stars in the Universe.

Existing scientific theories posit that stars form from vast clouds of dust and gas. When that process is finished, the remaining matter in the disc orbiting the star develops into planets. But LHS 3154 doesn’t have enough mass (and not enough matter in its disc) to make a planet as massive as this, according to existing theories – forcing scientists to re-examine their ideas.

In fact, according to the scientists’ calculations, the dust-to-mass and dust-to-gas ratios around the developing star would need to have been



“Star LHS 3154 doesn’t have enough mass to make a planet as massive as this, according to existing theories”

ABOVE The mass ratio of Earth to the Sun is more than 100 times smaller than that of the newly discovered planet to its star

10 times higher than the model shows for the planet to be so massive.

The team discovered the unusual pair of bodies while searching for planets with liquid water on the surface, making them potentially habitable for life.

Such planets are easier to find when they’re orbiting ultracool stars. That’s because they need to be relatively close to their star to be warm enough for any water present to remain liquid. This proximity generates a signal that’s more detectable to the astronomical spectrograph used to search for them.

“Think about it like the star is a campfire,” said Suvrath Mahadevan, Professor of Astronomy and Astrophysics at Penn State and co-author of the paper. “The more the fire cools down, the closer you need to get to that fire to stay warm. The same is true for planets.”

“If a planet has a close enough orbit to its ultracool star, we can detect it by seeing a very subtle change in the colour of the star’s spectra, or light, as it’s tugged on by an orbiting planet,” he added.