UNIVERSITÉ DE GENÈVE

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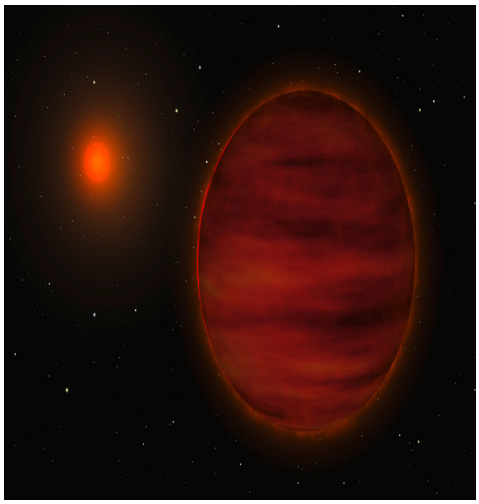
A stellar object 10 times denser than gold

The Universe still contains many mysteries that scientists are trying to discover every day. An international team of astronomers led by Dan Bayliss of the Observatory at the University of Geneva (UNIGE) and member of PRN PlanetS discovered a brown dwarf, an object that is neither a star nor a planet, with a density never seen before. A first to read in the *APJ Journal*.

10 times denser than gold! The measured density of brown dwarf EPIC201702477b is the highest ever measured for an object other than stellar remnants (for example, white dwarfs and neutron stars). But what is a brown dwarf ? It is an object that is insufficiently massive for thermonuclear reactions of hydrogen to be set off and to be considered a star, while being more massive than a giant planet. Astronomers estimate the mass of brown dwarfs to be between 13 to 80 times the mass of Jupiter.



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Most brown dwarfs «float» in space like stars because they were formed in the same manner as stars, that is to say through the gravitational collapse of a cloud of gas. As they produce very little light, it is difficult to observe them and even more difficult to determine their characteristics such as their mass and their radius and consequently their density. Only theoretical models are able to estimate this.

There are, however, some rare instances where a brown dwarf orbits a star like a planet. In these cases, it is possible to determine their mass thanks to the radial velocities method (used by Michel Mayor and Didier Queloz to discover the first exoplanet), and measure its diameter if it passes in front of its star causing a mini eclipse (called transit). These brown dwarfs are rare and it is still difficult to explain how these massive objects are formed.

By measuring the mass of an object discovered by the Kepler satellite as it triggered a transit, Dan Bayliss and his team from UNIGE's Science Faculty and PRN PlanetS realized that it was a brown dwarf 80 times more massive than Jupiter, namely just at the border between brown dwarfs and stars. According to Kepler's data, this object is roughly the same size as Earth which makes it the object with the densest non-stellar remnants known to date, about 190kg per dm3, which is 10 times denser than gold!

EPIC201702477b is a very interesting discovery, as it allows researchers to better constrain the formation models of brown dwarfs, and to confirm the mass limit to which a star lights up.

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