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PRESS RELEASE

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Discovery of a planet around an ultra-cool star

An international team including astronomers from the UNIGE has discovered, for the second time, an Earth-sized planet around an ultra-cool red dwarf, a class of star that is very common but very difficult to detect.

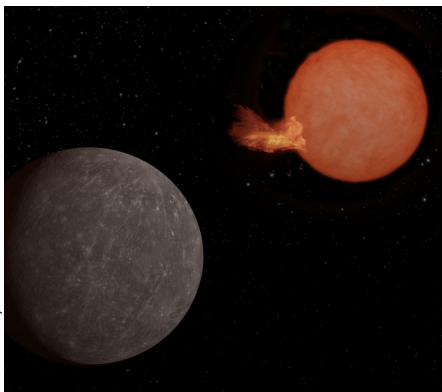
An international team of astronomers - including members of the NCCR PlanetS, the University of Geneva (UNIGE) and the University of Bern (UNIBE) - has discovered, for only the second time, an Earth-sized exoplanet (SPECULOOS-3 b) around an ultra-cool Red Dwarf star. Red dwarfs account for 70% of the stars in our galaxy. The small size and lower luminosity of these stars make it easier to analyse any planets in orbit. These planetary systems are of particular interest to astronomers working on the question of life in the Universe, especially those at the UNIGE's Life in the Universe research Center. The discovery of SPECULOOS-3 b is published today in the journal *Nature Astronomy*.

The SPECULOOS-3 b exoplanet is about 55 light years from Earth (which is relatively close) and is practically the same size as the blue planet. The comparison ends there, as the newcomer orbits its star in just 17 hours, and the days and nights may never end. In fact, the planet is probably locked in by tidal effects, so that the same side, called the day side, always faces the star, just like the Moon does for the Earth. The night side, on the other hand, is locked in endless darkness.

Despite these “few” differences from our Earth, this type of planet is of particular interest to astronomers, and in particular those at the Life in the Universe research Center (LUC). «SPECULOOS-3 b orbits a red dwarf star, confirms Émeline Bolmont, assistant professor in the astronomy department at the UNIGE, director of the LUC and co-author of the study. The small size of these stars makes it easier to detect small Earth-sized planets around them, and above all to observe any planetary atmospheres. Numerous studies show that life could develop on planets orbiting red dwarfs. They are therefore ideal candidates for us».

Countless Red Dwarfs all around us

More than 70% of the stars in the Milky Way are M dwarfs, also known as red dwarfs. These stars are cool and faint compared with our Sun, but they live for a very long time. Stars like our Sun burn for around 10 billion years before transforming into red giants that devour any planets that are too close. M dwarfs burn for 100 billion years or more, perhaps providing an anchor for life and an even longer window for its development.



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Artist's concept of the exoplanet SPECULOOS-3 b orbiting its ultra-cool red dwarf star. The planet is as big as the Earth, while its star is slightly larger than Jupiter, but much more massive.

High resolution pictures

With an average temperature of around 2600°C, the star SPECULOOS-3 is several thousand degrees cooler than our Sun (5500°C). Detecting such a star - not to mention a planet orbiting it - is a feat in itself, given that it is more than a thousand times less luminous than the Sun. SPECULOOS-3 belongs to the subclass of ultra-cool stars, the darkest and longest-lived. When the universe becomes icy and dark, these stars will be the last to burn.

The SPECULOOS project

As these ultra-cool stars are very faint, their planetary population is largely unexplored today. The SPECULOOS (Search for Planets Eclipsing Ultra-cool Stars) project, led by Michael Gillon from the University of Liège in Belgium, is designed to change this. Ultra-cool dwarf stars are scattered across the sky, so they have to be observed one by one, over a period of weeks, to have a good chance of detecting transiting planets. To do this, you need a dedicated network of professional telescopes. This is the SPECULOOS concept.

Among the telescopes in this network, the SAINT-EX robotic telescope has been funded in part by the Universities of Geneva and Bern, the two host institutions of the PlanetS National Centre of Competence in Research (NCCR), which has also made a financial contribution to the project. In addition to SAINT-EX, SPECULOOS has partnerships with the universities of Cambridge, Birmingham, the Massachusetts Institute of Technology and ETH Zürich.

An exo-Earth?

Because of its very short orbit, the SPECULOOS-3 b planet receives almost 16 times more energy per second from its star than the Earth does from the Sun. It is literally bombarded with high-energy radiation. The planet is therefore not in the star's habitable zone (the place where liquid water can exist on the surface of a planet), unlike certain planets in another ultra-cool red dwarf, TRAPPIST-1, whose system was discovered in 2015 by the TRAPPIST telescope.

Although too close to its star to have liquid water, SPECULOOS-3 b is nonetheless of interest to astronomers. «This planet is an ideal target for the James Webb Space Telescope (JWST), and is even better than the TRAPPIST-1 planets, confirms Émeline Bolmont. The JWST should be able to determine whether the planet has been able to retain an atmosphere despite its proximity to its star. If we find one on this highly irradiated planet, it gives us good hope that one also exists on the planets in TRAPPIST-1's habitable zone».

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