Transiting planets: treasures in the sky
Among the hundreds of planets detected outside our solar system, the ones that transit their parent star are genuine Rosetta Stones for the study of exoplanets, because they can be studied in greatest detail. Indeed, their orbital parameters, mass and radius can be precisely measured, and their atmosphere can be probed during and outside eclipses, bringing strong constraints on their actual nature (Winn 2010). Within the last two decades, more than three hundred transiting exoplanets have been detected. This large harvest includes many gas giants, but also a steeply growing fraction of terrestrial planets. In parallel to this galore of detections, many projects aiming to characterize giant exoplanets have been successful, bringing notably a first glimpse at their atmospheric properties (Saager & Deming 2010).

To export the techniques developed in these pioneering studies of giant planets to terrestrial worlds is the next step to put our Earth in a galactic perspective and to search for life around other stars.

The nearby ultra-cool stars opportunity
So far, only gas planets much larger than Earth could be characterized in detail. The smallest of them is GJ1214b, a 2.7 Earth radii planet transiting a nearby M4 red dwarf (Charbonneau et al. 2009). The most powerful telescopes like the James Webb Space Telescope (JWST) or the European Extremely Large Telescope (E-ELT) should be able to study the atmosphere of Earth-size exoplanets, but only if they transit one of the nearest ultra-cool stars (Kaltenegger & Traub 2009; Snellen et al. 2013).

These stars at the extreme bottom of the main-sequence are at least two times cooler than the Sun, and have sizes similar to Jupiter’s. They are very frequent in the Galaxy. Their small mass, size, and temperature, make transits of habitable planets much more frequent and probable, and maximize the amplitude of the atmospheric signatures detectable with the transit technique.

Ultra-cool stars and planets
No existing transit survey is optimized for detecting Earth-size planets transiting the nearest ultra-cool stars. Extensive simulations show us that robotic 1m-class telescopes equipped with modern CCD cameras highly sensitive in near-IR, operating from an exquisite astronomical site, and monitoring individually nearby ultra-cool stars, should be able to probe efficiently their habitable zone for terrestrial planets.

SPECULOOS: phase I
The European Research Council has just funded through an ERC Starting Grant (2M€) the initiation of our project named SPECULOOS (Search for habitable Planets EClipting Ultra-cool Stars). This grant will make possible the installation of the first two telescopes and their operation until end-2018. Each telescope will have an aperture size of 80cm to 1m (still to be decided), and will be equipped with a 2kx2k deep-depletion CCD camera. The foreseen site of installation is ESO Paranal in the Chilean Atacama Desert, this site presenting all the qualities required by the project: excellent weather conditions, low sky brightness, and low humidity. The installation at Paranal would strongly strengthen the synergy between SPECULOOS and ESO follow-up programs.

The first light of SPECULOOS telescopes is planned for 2015. By end 2018, the survey will have monitored a significant fraction of the nearby Southern ultra-cool stars. Our plan is to make our survey data rapidly available to the community.

References
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Credit images: ESO, Antelope, NASA/SpaceCalc.