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**Press release**

**Discovery of a cool super-Earth**

# Our stellar neighbourhood expands

**Astronomers from the Observatory of the University of Hamburg were involved in the discovery of a new planet. As part of an international research team led by the Institut de Ciències de l'Espai (ICE, CSIC), they have found a planet in orbit of Barnard's star. Barnard's star is a so-called red dwarf and after the Alpha-Centauri triple stellar system the second closest star to the Sun. As scientists reported in the current issue of Nature, they used astronomical observational data from about 20 years ago and combined it with new measurement data taken with the CARMENES planet-hunter spectrograph at Calar Alto/Spain among others. The astronomers found significant evidence for a super-Earth with the size of 3.2 Earth masses, orbiting the red dwarf every 233 days. The new planet is at the so-called snowline of the star and is likely to be a frozen world.**

Barnard's star is only six light-years from us and its velocity on Earth's night sky is the fastest of all stars which makes it noticeable also by hobby watchers. It is one of the least active red dwarfs known, smaller and with 7-10 billion years older than our Sun (about 4.6 billion years), and represents an ideal target to search for exoplanets.

Since 1997, several instruments gathered a large amount of measurements on the star's subtle back and forth wobble. An analysis of the data collected up to 2015 suggested the wobble might be caused by a planet with an orbital period of about 230 days.

To confirm this theory, astronomers regularly monitored Barnard's star using high-precision spectrometer such as the CARMENES planet-hunter spectrograph at the Calar Alto Observatory in Spain. The re-analysis of all 771 measurements detected a clear signal over a period of 233 days. This signal shows that Barnard's star is approaching and descending at about 1.2 meters per second in its shaking motion – which is about the speed of a person's gait. This was the first time that this type of exoplanet could be discovered with the so-called radial velocity method.

This discovery brought in the work of many scientists worldwide. "In Hamburg, we helped to redefine the mass of Barnard's star. Only then the measured speed of 1.2 meters per second can be used to determine the mass of the newly discovered planet," Andreas Schweitzer adds, co-author of the Hamburg Observatory of the University of Hamburg.

The newly discovered planet is called Barnard's star b (or GJ 699 b). It is a super-Earth, a large extrasolar planet with more than three times the mass of the Earth. He orbits his cool red home star near the so-called snow line – an orbit where water remains frozen. Therefore, in the absence of an

atmosphere, the temperature is about -150 ° C, making the presence of liquid water on its surface unlikely.

"The discovery of a planet in our immediate neighborhood is a great motivation to continue to search for exoplanets surrounding neighboring stars and one day actually find a planet on which life would be possible," explains Andreas Schweitzer.

**Original publication**

*I. Ribas, M. Tuomi, A. Reiners, R. P. Butler, J. C. Morales, M. Perger, S. Dreizler, C. Rodríguez-López, J. I. González Hernández, A. Rosich, F. Feng, T. Trifonov, S. S. Vogt, J. A. Caballero, A. Hatzes, E. Herrero, S. V. Jeffers, M. Lafarga, F. Murgas, R. P. Nelson, E. Rodríguez, J. B. P. Strachan, L. Tal-Or, J. Teske, B. Toledo-Padrón, M. Zechmeister, A. Quirrenbach, P. J. Amado, M. Azzaro, V. J. S. Béjar, J. R. Barnes, Z. M. Berdiñas, J. Burt, G. Coleman, M. Cortés-Contreras, J. Crane, S. G. Engle, E. F. Guinan, C. A. Haswell, Th. Henning, B. Holden, J. Jenkins, H. R. A. Jones, A. Kaminski, M. Kiraga, M. Kürster, M. H. Lee, M. J. López-González, D. Montes, J. Morin, A. Ofir, E. Pallé, R. Rebolo, S. Reffert, A. Schweitzer, W. Seifert, S. A. Shectman, D. Staab, R. A. Street, A. Suárez Mascareño, Y. Tsapras, S. X. Wang, G. Anglada-Escudé,* **A super-Earth planet candidate orbiting at the snow-line of Barnard's star**, Nature (2018).

https://www.nature.com/articles/s41586-018-0677-y

**The radial velocity method**

Precision spectrometers measuring the Doppler effect were used for the researches. The Doppler effect is a temporal compression or elongation of a signal with changes in the distance between transmitter and receiver. In everyday life, one knows the phenomenon that an approaching car sounds different than a departing vehicle. Now, if a stellar object moves away from the earth, the observed light becomes slightly less energetic and therefore redder. The light becomes energy-rich and blue as the star moves towards the Earth.

**For more information**

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