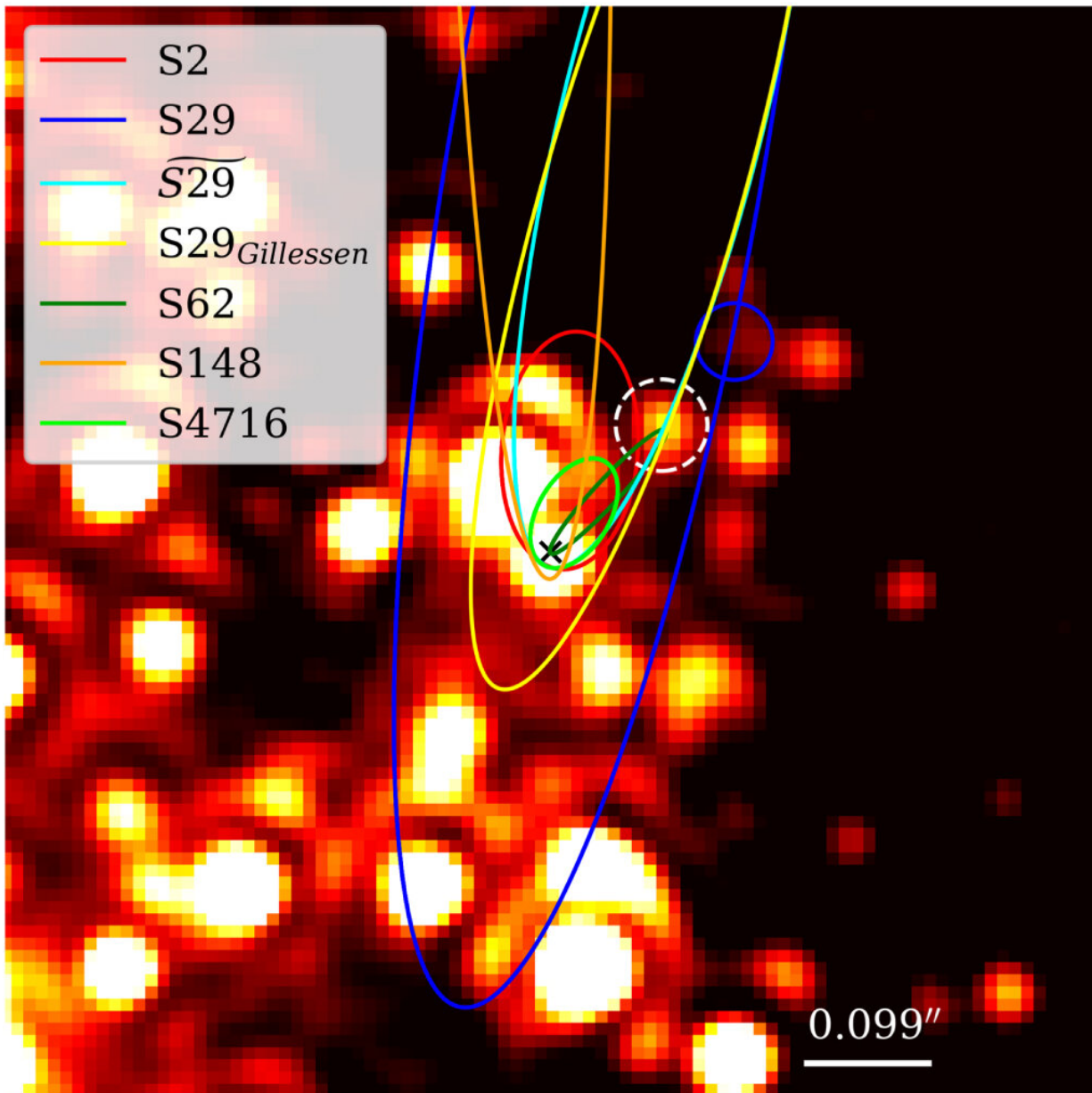


8,000 kilometers per second: Star with the shortest orbital period around black hole discovered

July 5 2022

2019.30



The K-band view of the GC observed with NIRC2 (Keck) in 2019.30. This image is high-pass filtered and shows the position of several S stars close to Sgr A*, which is indicated by a black cross. The star in the white dashed circle shows a K-band magnitude of 16.3 mag, while the star in the blue circle is 17.0 mag faint. Both K-band magnitudes are consistent with the reported values for S62 by Peißker et al. (2020a) and those for S29 by Gillessen et al. (2017) and Peißker et al. (2021b). Here north is up and east is to the left. Credit: *The Astrophysical*

Researchers at the University of Cologne and Masaryk University in Brno (Czech Republic) have discovered the fastest known star, which travels around a black hole in record time. The star, S4716, orbits Sagittarius A*, the black hole in the center of our Milky Way, in four years and reaches a speed of around 8,000 kilometers per second. S4716 comes as close as 100 AU (astronomical unit) to the black hole—a small distance by astronomical standards. One AU corresponds to 149,597,870 kilometers. The study has been published in *The Astrophysical Journal*.

In the vicinity of the black hole at the center of our galaxy is a densely packed [cluster of stars](#). This cluster, called S cluster, is home to well over a hundred stars that differ in their brightness and mass. S stars move particularly fast. "One prominent member, S2, behaves like a large person sitting in front of you in a movie theater: it blocks your view of what's important," said Dr. Florian Peissker, lead author of the new study. "The view into the center of our galaxy is therefore often obscured by S2. However, in brief moments we can observe the surroundings of the central black hole."

By means of continuously refining methods of analysis, together with observations covering almost twenty years, the scientist now identified without a doubt a star that travels around the central supermassive black hole in just four years. A total of five telescopes observed the star, with four of these five being combined into one [large telescope](#) to allow even more accurate and detailed observations. "For a star to be in a stable orbit so close and fast in the vicinity of a supermassive black hole was completely unexpected and marks the limit that can be observed with traditional telescopes," said Peissker.

Moreover, the discovery sheds new light on the origin and evolution of the orbit of fast-moving stars in the heart of the Milky Way. "The short-period, compact orbit of S4716 is quite puzzling," Michael Zajaček, an astrophysicist at Masaryk University in Brno who was involved in the study, said. "Stars cannot form so easily near the black hole. S4716 had to move inwards, for example by approaching other stars and objects in the S cluster, which caused its [orbit](#) to shrink significantly."

More information: Florian Peißker et al, Observation of S4716—a Star with a 4 yr Orbit around Sgr A*, *The Astrophysical Journal* (2022). [DOI: 10.3847/1538-4357/ac752f](https://doi.org/10.3847/1538-4357/ac752f)

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