

# ESA's Euclid captures the Milky Way's crowded heart

## In brief

The largest and most detailed photo ever made of our Milky Way galaxy's centre in visible light is revealed today by the European Space Agency's Euclid mission. Packed with more than 60 million stars, this image opens the door for scientists to confirm the existence of any exoplanet found in this region and measure its mass using tiny changes in starlight over time.

## In-depth

For just one day, our [dark Universe detective, Euclid](#), turned its gaze towards the light: the extremely bright inner region of our Milky Way galaxy, known as the [galactic bulge](#). This special request came from astronomers who were after what Euclid does best: capturing huge areas of the sky in crisp detail.

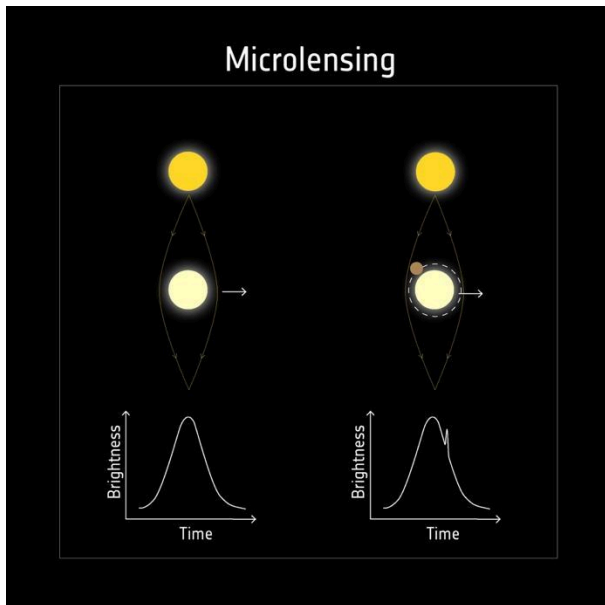
Designed to [observe billions of faraway galaxies](#), the space telescope's visible light camera is sensitive enough to tell apart individual stars in our super-crowded galactic bulge, without being blinded. This rare ability is crucial for what scientists want to use this image for: studying planets around other stars using a special technique called [microlensing](#). But before diving into that, let's first take a closer look at this awe-inspiring image itself.

On 23 March 2025, Euclid captured this enormous photo in just about 26 hours. It's a mosaic of nine 'pointings' from its visible light camera [1], [with each pointing covering a patch of the sky larger than the full Moon](#).

For comparison, Euclid's sharpness and sensitivity in visible light is similar to the [NASA/ESA Hubble Space Telescope's](#) wide field camera. But each pointing that Euclid captures in a few hours spans an area 270 times larger than Hubble's field of view. To observe the same Euclid mosaic, the [Keck Observatory](#) would need around 2000 hours. Euclid is faster, and able to capture details from fainter stars that would be otherwise missed when observing from the ground. This single mosaic also encompasses the entire region that the upcoming [Roman](#) space telescope will monitor for planet hunting.

Euclid captured more than 60 million stars in this photo, along with nebulas and star clusters. This crowded region of our galaxy is the perfect place for astronomers to search for exoplanets with [microlensing](#).

## Finding exoplanets with gravitational microlensing



Microlensing is a form of [gravitational lensing](#). While Euclid mostly uses lensing to explore massive faraway objects, such as clusters of galaxies, this new image of the galactic centre helps scientists to study lenses on the smallest scales – caused by stars and exoplanets in our own galaxy.

Microlensing relies on the chance alignment of two stars with an observer. As one star crosses in front of another, the nearer star acts like a cosmic magnifying glass, bending and brightening the background star's light. If a planet orbits the nearer star, its gravity also bends this light, in a slightly uneven way. This tiny additional change in brightness is how the presence of a planet is revealed.

“To catch microlensing, you need to observe parts of the sky that are crowded with stars, such as close to the centre of our galaxy,” explains Jean-Philippe Beaulieu of the Institut d’Astrophysique de Paris in France, and the University of Tasmania in Australia. Jean-Philippe was the original instigator of Euclid’s galactic bulge survey, and he co-led the exoplanet working group of the [Euclid Consortium](#).

“During the last twenty years, [almost 300 exoplanets](#) have been discovered using this technique, all with ground-based telescopes and all towards the centre of our galaxy. This image from Euclid includes 51 known planetary systems – and it will assist in studying many more that will be found,” he adds.

### **Measuring planet masses with Euclid**

To catch a microlensing event, a telescope would need to study a star for over twenty days. This is needed to see the unevenness of the light being bent, as the planet orbits around its host star. So, in Euclid’s one day of observation, no new events can be found. But what makes this image so special is that it allows scientists to measure the mass of planets that are already known, as well as planets that are yet to be discovered.

“In 24 hours, Euclid has already captured the stars involved in all the future microlensing events that the Roman space telescope will detect, but before the stars and planets involved have aligned,” says Natalia Reksini of the Institut d’Astrophysique de Paris in France, who led the release of Euclid’s galactic bulge survey data for the scientific community.

“This means that anyone who detects a microlensing event in the same region, for example with Roman, will be able from now on to use Euclid data as a time reference in the past and see how the stars looked before they overlapped,” Natalia explains. “Since Euclid can clearly separate individual stars, one can then measure how fast they move over time and use that information to confirm the existence of a planet and determine its mass. This would not be possible with data from one point in time.”

### **Icy planets and more**

With most planet-hunting techniques, it’s easier to find large, hot planets orbiting massive stars. For microlensing that is not the case. “This technique is unbiased, we discover whatever is out there,” says Natalia. “It is uniquely suited to discover cold exoplanets. And we expect every star in the Milky Way to host at least one such planet.”

The host stars of two known cold exoplanets appear in Euclid’s data, and both are special to the team.

“I led the team that discovered [OGLE-2005-BLG-390Lb](#) 20 years ago,” says Jean-Philippe. “It’s an icy planet, a bit like Hoth from Star Wars. After all this time, I’m excited that Euclid might finally allow us to measure its precise mass.”

“[OGLE-2013-BLG-341Lb](#) is a rare and fascinating system,” says Natalia. “It consists of two stars and one planet. By combining earlier observations from Keck and Hubble with new Euclid data, we can finally separate the stars and confirm the planet’s mass.”

“This result shows what a relatively small, dedicated team, can achieve within a large international mission,” says Valeria Pettorino, Euclid Project Scientist at ESA. “The exoplanet team included strong contributions from early-career researchers and was supported by the Science Ground Segment unit working on the visible instrument.”

“In just 24 hours, Euclid has delivered unique data on the Milky Way’s centre, with a large and sharp view of this region. With time, the separation between sources and lenses increases. That’s why this Euclid data will be a time reference for past and future missions and enable studies of exoplanets and their masses. This data can also be used for other scientific applications, from brown dwarfs and binary stars to stellar motions and dust across our galaxy.”

## Notes for editors

[Explore this image at the highest resolution in ESASky.](#)

[More information on how to download the new Euclid data can be found here.](#)

[1] For the galactic bulge survey, to keep the observations as stable as possible only Euclid's visible camera (VIS) was used. That's why the original image is in black and white. To add colour to the photo for this public release, data from the ground-based Canada France Hawaii Telescope (CFHT) was added.

## About Euclid

[Euclid was launched in July 2023](#) and started its [routine science observations on 14 February 2024](#). The [goal of the mission](#) is to reveal the hidden influence of dark matter and dark energy on the visible Universe. Over a period of six years, Euclid will observe the shapes, distances and motions of billions of galaxies out to 10 billion light-years.

Euclid is a European mission, built and operated by ESA, with contributions from NASA. The Euclid Consortium – consisting of more than 2000 scientists from 300 institutes in 15 European countries, the USA, Canada and Japan – is responsible for providing the scientific instruments and scientific data analysis. ESA selected Thales Alenia Space as prime contractor for the construction of the satellite and its service module, with Airbus Defence and Space chosen to develop the payload module, including the telescope. NASA provided the detectors of the Near-Infrared Spectrometer and Photometer, NISP. Euclid is a medium-class mission in [ESA's Cosmic Vision programme](#).