

Europe's space telescope to target universe's dark mysteries

June 29 2023, by Daniel Lawler and Juliette Collen



The Euclid spacecraft, pictured before being sent to Florida, will blast off on a mission to find out more about the 'dark universe'

Europe's Euclid space telescope is scheduled to blast off Saturday on the first-ever mission aiming to shed light on two of the universe's greatest

mysteries: dark energy and dark matter.

The launch is planned from Cape Canaveral in Florida at 11:11 am local time (1511 GMT) on a Falcon 9 rocket of the US company SpaceX.

The European Space Agency was forced to turn to the rival firm of billionaire Elon Musk to launch the mission after Russia pulled its Soyuz rockets in response to sanctions over the war in Ukraine.

After a month-long journey through [space](#), Euclid will join its fellow space telescope James Webb at a stable hovering spot around 1.5 million kilometers (more than 930,000 miles) from Earth called the second Lagrangian Point.

From there, Euclid will chart the largest-ever map of the universe, encompassing up to two billion galaxies across more than a third of the sky.

By capturing light that has taken 10 billion years to reach Earth, the map will also offer a new view of the 13.8-billion-year-old universe's history.

Scientists hope to use this information to address what the Euclid project manager Giuseppe Racca calls a "cosmic embarrassment": that 95 percent of the universe remains unknown to humanity.

Around 70 percent is thought to be dark energy, the name given to the unknown force that is causing the universe to expand at an accelerated rate.

And 25 percent is dark [matter](#), thought to bind the universe together and make up around 80 percent of its mass.

'Dark detective'

Euclid consortium member Guadalupe Canas told a press conference that the two-ton space telescope was a "dark detective" which can reveal more about both elements.

Euclid, which is 4.7 meters (15 feet) tall and 3.5 meters (11 feet) wide, will use two [scientific instruments](#) to map the sky.

Its visible light camera will let it measure the shape of galaxies, while its near infrared spectrometer and photometer will allow it to measure how far away they are.

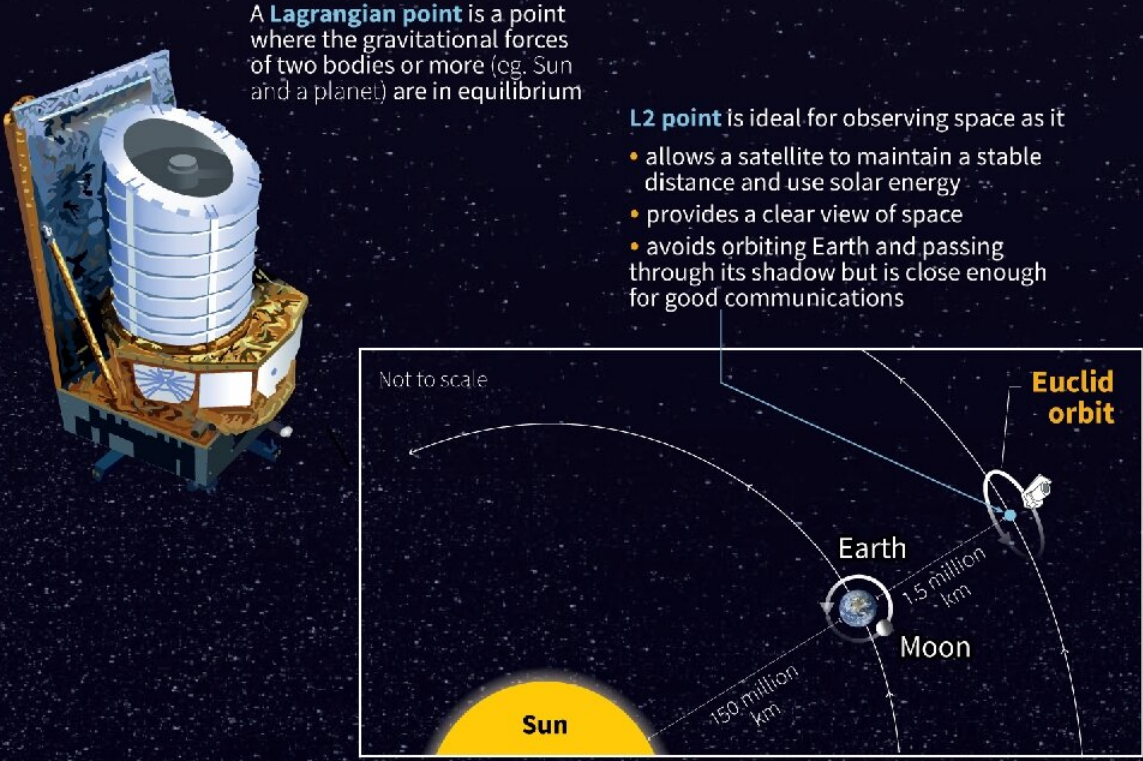
Europe's space telescope Euclid

The spacecraft will be sent to explore the evolution of the dark matter and dark energy in the Universe, joining the James Webb telescope in orbit around the **second Lagrangian Point, or L2**

A **Lagrangian point** is a point where the gravitational forces of two bodies or more (eg. Sun and a planet) are in equilibrium

L2 point is ideal for observing space as it

- allows a satellite to maintain a stable distance and use solar energy
- provides a clear view of space
- avoids orbiting Earth and passing through its shadow but is close enough for good communications



Not to scale

Sources: ESA, Nasa, Emmanuel Trelat., Theory of control, Lagrange points and space exploration, Image CNRS, 2010

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The Euclid space telescope.

So how will Euclid try to spot things that cannot be seen? By searching for their absence.

The [light](#) coming from billions of [light years](#) away is slightly distorted by the mass of visible and dark matter along the way, a phenomenon known as weak gravitational lensing.

"By subtracting the visible matter, we can calculate the presence of the dark matter which is in between," Racca told AFP.

While this may not reveal the true nature of [dark matter](#), scientists hope it will throw up new clues that will help track it down in the future.

For dark energy, French astrophysicist David Elbaz compared the expansion of the universe to blowing up a balloon with lines drawn on it.

By "seeing how fast it inflates," scientists hope to measure the breath—or dark energy—making it expand.

'Goldmine'

A major difference between Euclid and other space telescopes is its wide field of view, which takes in an area equivalent to two full moons.

Project scientist Rene Laureijs said that this wider view means Euclid will be able to "surf the sky and find exotic objects" like [black holes](#) that the Webb telescope can then investigate in greater detail.

Beyond [dark energy](#) and matter, Euclid's map of the universe is expected

to be a "goldmine for the whole field of astronomy," said Yannick Mellier, head of the Euclid consortium.

Scientists hope that Euclid's data will help them learn more about the evolution of galaxies, black holes and more.

The first images are expected once scientific operations start in October, with major data releases planned for 2025, 2027 and 2030.

The 1.4-billion-euro (\$1.5-billion) mission is intended to run until 2029, but could last a little longer if all goes well.

The launch comes as Europe finds itself with few ways to independently send its missions into space, due to Russia ending cooperation last year and long delays to the next-generation Ariane 6 rocket.

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