Discovery of new moon or ring system orbiting mysterious distant planet Quaoar

September 11 2025, by Paul Arnold

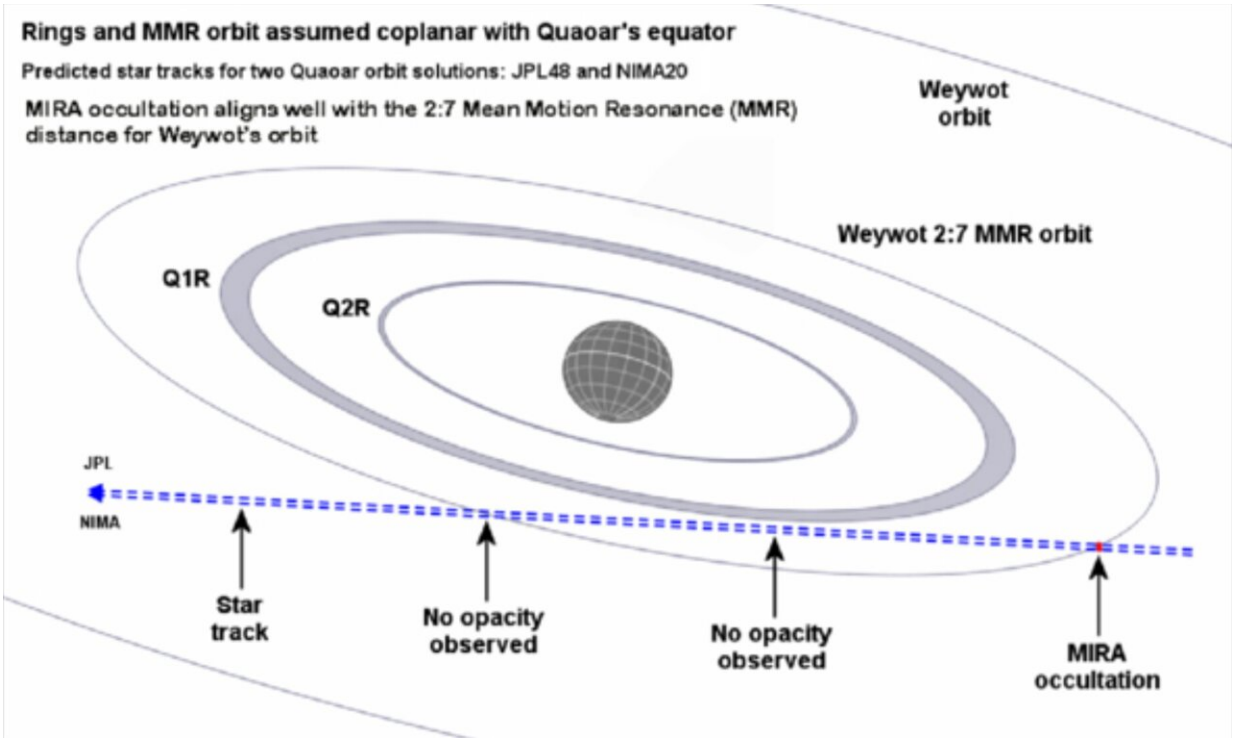
Artist's impression of the icy Kuiper belt object 2002 LM60, dubbed "Quaoar" by its discoverers. Credit: NASA and G. Bacon (STScI); Science Credit: NASA and M. Brown (Caltech)

Astronomers have discovered what they think may be another moon orbiting a distant dwarf planet called Quaoar. This small, icy, egg-shaped planet in the far reaches of our solar system, beyond Neptune, is already known to have two rings and a moon, but this discovery was unexpected and accidental.

The previously unknown satellite was discovered during a stellar occultation event on June 25, 2025, when it passed in front of a distant star. Astronomers were already observing the planet to learn more about its known ring, Q1R, and were expecting to see it cause a brief dimming of the background star's light. Instead, something else blocked out the starlight completely for 1.23 seconds. This suggested that the new object was either a satellite or a dense ring. The light signature is what would be expected from something solid like a moon, not a faint, dusty ring.

"Given the lack of other credible explanations, the most likely cause of this MIRA occultation was by material orbiting Quaoar; either a new satellite, or third ring," wrote the researchers in a paper published in the *Research Notes of the AAS*.

The astronomers do not rule out a third ring, but previous observations from the James Webb Space Telescope (JWST) showed no evidence of another ring at this location. This makes the satellite hypothesis more plausible.



Sky plane geometry of the MIRA occultation relative to known structures. Credit: *Research Notes of the AAS* (2025). DOI: 10.3847/2515-5172/adfeda

Planetary puzzle

Quaoar is a distant planet in the Kuiper Belt, a vast ring of icy bodies beyond Neptune. It has a radius of 345 miles and takes 286 Earth years to orbit the sun. Its one known moon is called Weywot, which orbits Quaoar at a distance of about 9,000 miles.

The two rings, which were discovered in 2023, are located outside of its Roche limit, the point where a planet's gravity would tear apart smaller orbiting bodies. The existence of these rings is puzzling because the conventional view is that they only exist close to a planet, within the Roche limit, while moons should form outside it.

This discovery adds to the mystery of the Quaoar system and challenges what we thought we knew about how rings and moons form. Further observations and JWST imaging may confirm exactly what the object is and whether there are even more satellites or rings. Besides telling us more about mysterious Quaoar, this could also shed new light on how planetary systems form in the cold, distant parts of the Milky Way.

More information: Richard Nolthenius et al, Discovery of a New Satellite or Ring Arc around (50000) Quaoar, *Research Notes of the AAS* (2025). DOI: 10.3847/2515-5172/adfeda