

A Tiny World's Rings Are Puzzling Scientists

New James Webb observations suggest Chariklo's faint rings may be changing in unexpected ways.



An illustrated small ringed object passes in front of a distant star in deep space.

Scientists studying a small object between Saturn and Uranus say its **rings** may be changing in puzzling ways. According to reporting by Live Science, observations from the James Webb Space **Telescope**, a space observatory built to study faint light in space, suggest that the two rings around an object called Chariklo do not look the same as they did in earlier studies. One ring now seems harder for light to pass through, while the other seems easier for light to pass through.

Chariklo is a **centaur**, which means a small solar system object with some features like an **asteroid**, a rocky body, and some like a **comet**, an icy body that can release gas and dust. It orbits in the outer solar system between Saturn and Uranus. Chariklo is much smaller than a planet, but it became famous to astronomers in 2013 because it was the first small solar system body found to have rings. Before that, rings were mostly associated with giant planets such as Saturn.

The new study, published Sept. 9 in *Science Advances*, compared the James Webb observations with earlier looks from ground-based tele-

scopes in 2014 and 2017. Scientists are not saying they have solved the mystery. They are saying the **evidence** points to unexpected differences. In science, that kind of result matters because it can show that an old explanation is incomplete.

The key word is **opacity**, which means how much a **material** blocks light. A window has low opacity because light passes through it. A thick curtain has high opacity because it blocks more light. In Chariklo's rings, the inner ring appeared to have higher opacity in the James Webb observations, while the outer ring appeared to have lower opacity. That could mean the ring material changed. It could also mean the telescope saw details that older observations could not separate clearly.

Scientists studied the rings during a stellar occultation, which is when an object in space passes in front of a distant star from the viewer's point of view. Chariklo's rings are too faint to photograph directly. Instead, astronomers measure how the star's light dims and brightens as Chariklo and its rings cross in front of it. It is a little like noticing someone walked past a lamp be-

cause the light flickered, even if you could not see the person clearly.

The team also had to plan the observation very carefully. James Webb was far from Earth, and Chariklo was moving. Researchers used information from the European Space Agency's Gaia mission, a spacecraft that measures the positions and motions of stars, to predict the exact timing. Live Science reported that this was the first time scientists planned a James Webb viewing campaign around this kind of star-blocking event for Chariklo.

The mystery now has several possible answers. The rings may really be changing over time. The grains in the rings may have different sizes or

materials than scientists expected. Or James Webb may be seeing the rings differently because it observes certain wavelengths, which are types of light measured by the distance between light waves. A future occultation could help scientists test which idea fits best.

This matters beyond one strange object. Middle school science often treats the solar system as a set of finished facts: planets, moons, asteroids, comets. Chariklo shows that the solar system is still being measured, questioned, and revised. Even small worlds can force scientists to rethink how rings form, how they last, and how much can change far from the sun.

Written from reporting by Live Science.

THINK IT THROUGH

1. When scientists cannot photograph something directly, what makes indirect evidence convincing or not convincing?

2. Which explanation for Chariklo's changing rings seems most reasonable: real changes in the rings, better telescope detail, or different kinds of light being measured?

3. How should science textbooks handle discoveries that are still uncertain but important?

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I M S J I D O I E O D E E E E A H C
D A B C B A O I D O R I N G S T R R
Y I N T C E T N M R T E J E E E A L
R T N M Z R X V G O E N O T L U N G
U L E H W P A L R E R T R S S L V T
V R I S B T P E N E U T C C Y M Z C
R T C E N O I O R I I B N M E E E T
E A G I V L I O T I E O E E T E E A
U T C L A C R S P T I E I E E E L D
U S E M A T E R I A L A D C S A I C
L T T O A E I N I M C C P B D Y T L
H L Y P H L R H T U D I O T N G Y A
C E V I D E N C E A E O T M O A E E
E O O E W S O N S E U F H Y T X S O
T Y M E G C E R I I G R O I N O M R
A S T E R O I D B L R T L C R N T A
A B T H T P E T E I T N P B A O A V
P R W A V E L E N G T H R R I I V E

ASTEROID

CENTAUR

COMET

EVIDENCE

MATERIAL

OPACITY

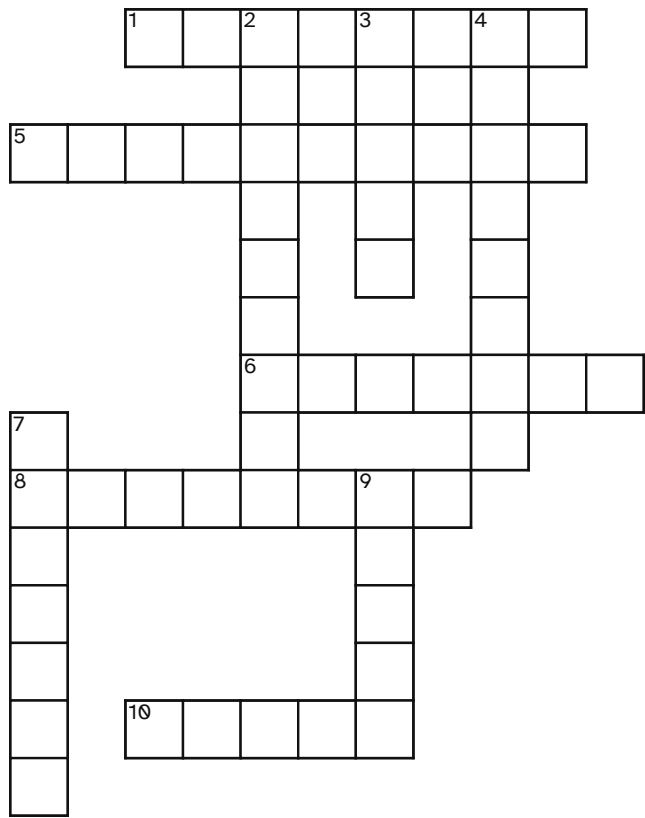
ORBIT

RINGS

TELESCOPE

WAVELENGTH

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ACROSS

- 1 Substance something is made of
- 5 Distance between matching points on nearby light waves
- 6 Amount a material blocks light from passing through
- 8 Information that supports or challenges a scientific explanation
- 10 Curved path an object follows around another object

DOWN

- 2 Instrument that gathers light to study faraway space objects
- 3 Narrow bands of dust, ice, or rock circling an object in space
- 4 Small rocky object traveling around the Sun
- 7 Small solar-system body with traits of rocky asteroids and icy comets
- 9 Icy space object that can release gas and dust

Where this came from

This article was written for 3andB from the reporting below. It is not a reprint — the wording is ours and the facts are theirs.

Live Science

“Strange 'centaur' object between Saturn and Uranus has mysterious, changing rings, James Webb telescope study hints”

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<https://www.livescience.com/space/astronomy/strange-centaur-object-between-saturn-and-uranus-has-mysterious-changing-rings-james-webb-telescope-study-hints>

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The article and its discussion questions, a word search, and a crossword.

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