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DISPATCH · EARLY GALAXIES · 2 MIN

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Galaxy cluster magnifies a faint early galaxy enough to reveal its star clumps

A JWST survey finds a galaxy at redshift 11 to 12, nicknamed the Misty Moons, which lens models suggest appears five times behind a cluster and which resolves into compact star clumps.

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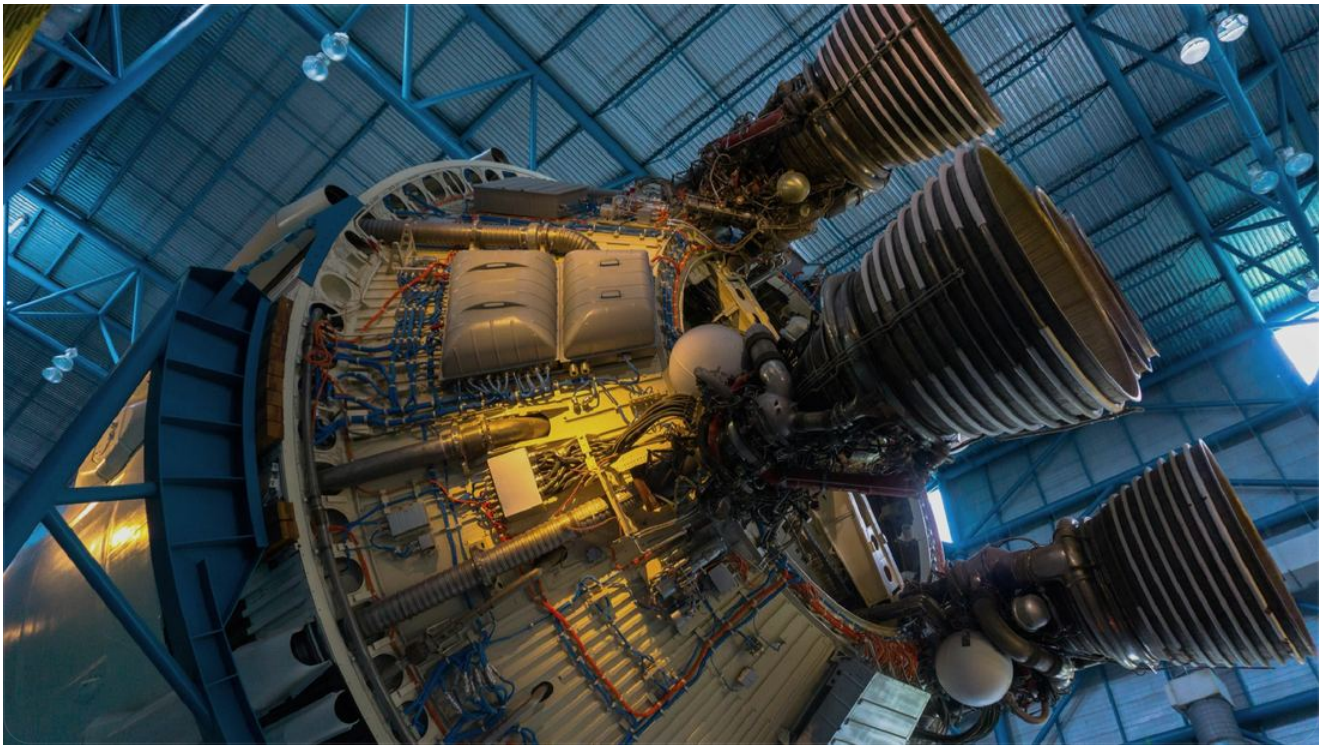


Photo: Maarten Wijnants

Galaxies seen at redshift above 10 are usually little more than smudges, even to the James Webb Space Telescope (JWST). Redshift measures how much light has been stretched by the expanding universe, and a higher value means the light set out earlier. In a 2026 paper in The Astrophysical Journal, a team with members at the National Astronomical Observatory of Japan, Ben-Gurion University of the Negev and the University of Texas at Austin reports a faint galaxy at redshift around 11 to 12 that nature has enlarged enough to show its internal structure.

The object, which the authors call the Misty Moons, turned up in VENUS (Vast Exploration for Nascent, Unexplored Sources), a JWST treasury survey. It lies behind the galaxy cluster MACS J0257.1-2325, at redshift 0.505, whose mass bends passing light like a lens. According to the study, two independent models of that lens suggest the background galaxy appears five times on the sky. Two of the images, labelled ID1 and ID2, are magnified roughly 20 to 30 times and are bright, at

about 26 AB magnitude in JWST's F200W filter. Their light shows a sharp drop at short wavelengths, the Lyman-alpha break, caused by hydrogen absorbing light. Astronomers use the position of that break to estimate distance. The abstract gives the distance as a range rather than a single value.

The team then undid the lensing to rebuild the galaxy as it would appear without distortion. Their reconstruction shows a galaxy fainter than the characteristic luminosity astronomers use as a benchmark, with an ultraviolet absolute magnitude of about −18.0. It breaks up into several clumps of stars. The authors report that each clump has an effective radius of roughly 10 to 70 parsecs and a stellar mass of around 10 million Suns. Together, the clumps hold at least about 80% of the galaxy's stellar mass. The authors say this is similar to clumps found in other distant galaxies and suggests a highly clustered mode of star formation in the early universe, unlike that seen in nearby dwarf galaxies.

To test whether the galaxy is unusual, the researchers blurred the reconstruction to match how JWST's NIRCam camera would see it without any magnification. Its brightness profile, they report, resembles those of other faint galaxies beyond redshift 10, such as JADES-GS-z13-0 and JADES-GS-z14-1. They therefore treat it as a representative example rather than an oddity.

Those conclusions rest on the lens models. The five images are described as suggested by the models, and the clump sizes and masses come from a reconstruction that depends on how accurately the cluster's mass has been mapped. The finding also concerns one galaxy, so whether clustered star formation is typical at these distances would need more examples.

Mapping cluster mass is also the aim of a braintankAI story on SuperBIT, a balloon-borne telescope that measured faint distortions of background galaxies to build weak-lensing catalogues for 30 merging clusters (earlier story). That work uses lensing to weigh the clusters themselves, whereas this study relies on a strongly lensing cluster's mass model to see the galaxy behind it.

PAPER	*VENUS: A Strongly Lensed Clumpy Galaxy at z ~ 11–12 Behind the Galaxy Cluster MACS J0257.1-2325*
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