

PRESS RELEASE

The James Webb Space Telescope sheds light on the astonishing survival of small galaxies in the early Universe

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A team of international astrophysicists has observed and identified the smallest and faintest galaxies in the early Universe. These observations confirm the role of these galaxies, which were previously invisible, in the major transformation of the Universe more than 13 billion years ago. The study was led by Hakim Atek at the Institut d'astrophysique de Paris (CNRS/Sorbonne University), as part of the James Webb Space Telescope's (JWST) GLIMPSE¹ programme. It has just been published in [*The Open Journal of Astrophysics*](#).



"A glimpse of the distant past", ©ESA/Webb, NASA & CSA, H. Atek, M. Zamani (ESA/Webb) Acknowledgement: R. Endsley

Until now, our understanding of the Epoch of Reionisation - when the first stars illuminated and ionised the gas in the Universe - has relied on the brightest galaxies, which account for only 1 to 10% of all galaxies. For the first time, this study entitled "A Glimpse of the 99%", delves into the remaining 99% - the so-called faint galaxies. By using the Abell S1063 galaxy cluster as a large natural magnifying glass (via a phenomenon known as gravitational lensing), the researchers were able to amplify the light from extremely distant sources. Using this technique they achieved an unprecedented observational depth ($M_{\text{uv}} = -12$ mag), which is approximately three magnitudes deeper than was previously possible with the Hubble Space Telescope.

¹ The GLIMPSE programme is an ultra-deep observing programme carried out using the JWST's NIRCам instrument. It focuses on using gravitational lensing to probe the early Universe, producing the deepest images ever obtained to date.

Contrary to certain theoretical predictions, the number of very faint galaxies continues to increase rapidly as luminosity decreases. The study did not observe a slowdown in this trend. Current models of galaxy formation predicted an early and gradual decline in these small structures due to stellar feedback, such as galactic winds or supernova explosions. However, this new JWST data shows that these galaxies are far more resilient than expected, prompting us to review models of star formation suppression.

While these galaxies are faint individually, they are so numerous that they dominate the total emission of energetic radiation and are primarily responsible for the reionisation of the Universe. They provide enough ionising photons to keep the Universe transparent, even in conditions of very dense intergalactic gas. Their abundance also suggests that a tiny proportion of the radiation escaping from these galaxies is sufficient for reionisation. If this fraction were higher, this process would have occurred much earlier than measurements of the cosmic microwave background indicate.

For further information:

- Link to the article published in [The Open Journal of Astrophysics](#)

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