

# Unveiling the secret of distant dwarf galaxy formation

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Signals from the outskirts of a galaxy that is not more than 150 million years indicate formation of newer stars by the galaxies beyond their visible boundaries, according to a recent study. The research traces how these young stars, that are found in the form of star-forming complexes or clumps, migrate towards the inner regions and gradually build up the stellar content of these galaxies.

Astrophysicists have been exploring to learn how galaxies, the basic building blocks of our Universe, form and evolve into present-day ones. But the picture still remains incomplete.

The UltraViolet Imaging Telescope (UVIT) onboard AstroSat, India's first dedicated multi-wavelength space observatory, has recently detected faint emission of Far UltraViolet (FUV) light in the outskirts of a sample of distant Blue Compact Dwarf (BCD) galaxies that are about 1.5 - 3.9 billion light-years away. These are small galaxies usually characterized by their centrally concentrated star formation.

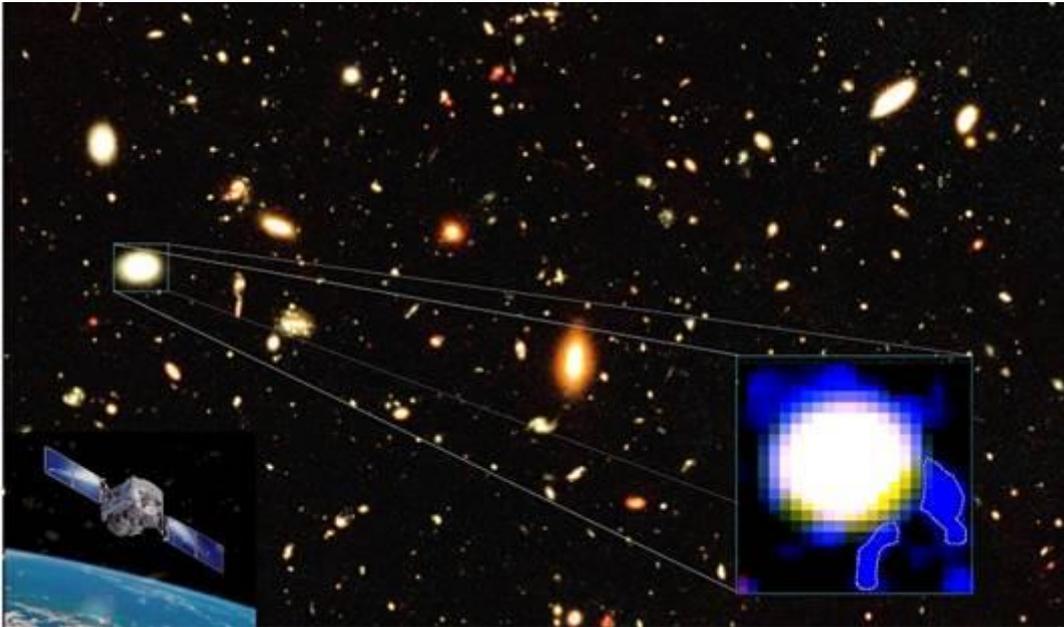
The discovery, a joint outcome of a study by an international team of astronomers from India, the USA and France, is a significant step towards tracing the mysteries of galaxy formation. The study published in the journal *Nature* was conceived by Prof. Kanak Saha of Inter University Center for Astronomy and Astrophysics (IUCAA), Pune.

Anshuman Borgohain, the lead author of the article), said that the occurrence of such young stars at the periphery of galaxies is usually a tell-tale signature of recent gas accretion from their surroundings that fuel the star-formation and subsequent galaxy growth. "The resolving power of UVIT deep field imaging techniques has been the key to spotting these very young, large star-forming clumps. Due to their large distances from us, it was a challenging task to establish the detection of these faint, extremely blue star-forming clumps with million solar masses," said Prof. Kanak Saha, highlighting that it helped witnessing the 'live' formation of these far-way dwarf galaxies.

Dr. Bruce Elmegreen, a principal research staff in the IBM Research Division, USA, who contributed to the study, said, "It has been a mystery how some small galaxies like these can have such active star formation. These observations suggest that accreting gas in the far outer parts can be forced to move inward through torques exerted by giant gas and stellar complexes. This migration builds up the central density over the galaxy's lifetime."

Coauthor Prof. Francoise Combes of Observatoire de Paris, France, Professor at the College de France, elaborated that the discovery illustrates how surprisingly the star formation can proceed in relatively pristine low-metallicity gas. "The outer portions of these gaseous disks are unstable towards fragmentation, even though these dwarfs must be dominated by dark matter, which would limit the fragmentation," she explained. Coauthor Prof. Shyam Tandon, PI of UVIT, highlighted the importance of UVIT data in this study.

**Reference** : Borgohain, A., Saha, K., Elmegreen, B., Gogoi, R., Combes, F., Tandon, S. N.: 2022, Extended far-ultraviolet emission in distant dwarf galaxies, Nature, arXiv:2207.10708 <https://arxiv.org/abs/2207.10708>



*The background is a 3-color optical image taken by the Hubble Space Telescope. The small box (left) shows a sample dwarf galaxy that was observed with the Ultraviolet Imaging Telescope on AstroSat.*

*AstroSat detected extremely blue star-forming clumps on the galaxy's outer boundary (3-color UV-optical image shown in zoomed-in box).*