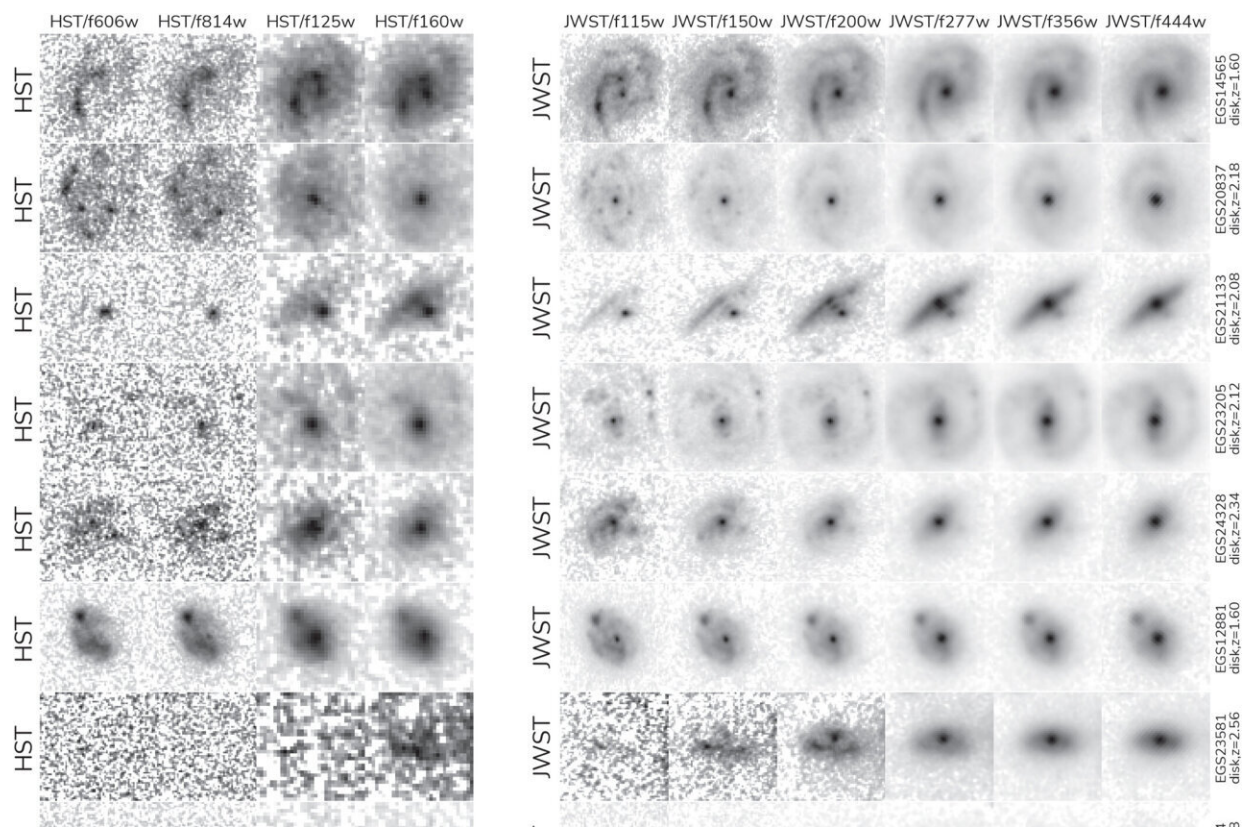


Astronomers find abundance of Milky Way-like galaxies in early universe, rewriting cosmic evolution theories

September 22 2023, by Jessica Marsh



A comparison of HST vs. JWST. We show 13 galaxies in our sample that have observations in the four main CANDELS filters (left panel) and SW and LW filters in JWST (right panel). Faint features in CANDELS are generally very clear in JWST. In some cases only the central core of the galaxy is visible with the HST imaging. The classification label shown is derived from our JWST classifications. Credit: *The Astrophysical Journal* (2023). DOI:

10.3847/1538-4357/acec76

Galaxies from the early universe are more like our own Milky Way than previously thought, flipping the entire narrative of how scientists think about structure formation in the universe, according to new research published today.

Using the James Webb Space Telescope (JWST), an international team of researchers including those at The University of Manchester and University of Victoria in Canada discovered that [galaxies](#) like our own Milky Way dominate throughout the universe and are surprisingly common.

These galaxies go far back in the universe's history with many of these galaxies forming 10 billion years ago or longer.

The Milky Way is a typical disk galaxy, which has a shape similar to a pancake or compact disk, rotating about its center and often containing spiral arms. These galaxies are thought to be the most common in the nearby universe and might be the types of galaxies where life can develop given the nature of their formation history.

However, astronomers previously considered that these types of galaxies were too fragile to exist in the early universe when galaxy mergers were more common, destroying what we thought was their delicate shapes.

The new discovery, published today in [The Astrophysical Journal](#), finds that these disk galaxies are 10 times more common than what astronomers believed based on previous observations with the Hubble Space Telescope.

Christopher Conselice, professor of extragalactic astronomy at The University of Manchester, said, "Using the Hubble Space Telescope we thought that disk galaxies were almost non-existent until the universe was about 6 billion years old, these new JWST results push the time these Milky Way-like galaxies form to almost the beginning of the universe."

The research completely overturns the existing understanding of how scientists think our universe evolves, and the scientists say new ideas need to be considered.

Lead author, Leonardo Ferreira from the University of Victoria, said, "For over 30 years it was thought that these disk galaxies were rare in the early universe due to the common violent encounters that galaxies undergo. The fact that JWST finds so many is another sign of the power of this instrument and that the structures of galaxies form earlier in the universe, much earlier in fact, than anyone had anticipated."

It was once thought that disk galaxies such as the Milky Way were relatively rare through cosmic history, and that they only formed after the universe was already middle aged.

Previously, astronomers using the Hubble Space Telescope believed that galaxies had mostly irregular and peculiar structures that resemble mergers. However, the superior abilities of JWST now allows us to see the true structure of these galaxies for the first time.

The researchers say that this is yet another sign that "structure" in the universe forms much quicker than anyone had anticipated.

Professor Conselice continues, "These JWST results show that disk galaxies like our own Milky Way, are the most common type of galaxy in the [universe](#). This implies that most stars exist and form within these

galaxies which is changing our complete understanding of how galaxy formation occurs. These results also suggest important questions about [dark matter](#) in the [early universe](#) which we know very little about."

"Based on our results astronomers must rethink our understanding of the formation of the first galaxies and how galaxy evolution occurred over the past 10 billion years."

More information: Leonardo Ferreira et al, The JWST Hubble Sequence: The Rest-frame Optical Evolution of Galaxy Structure at 1.5 The Astrophysical Journal (2023). [DOI: 10.3847/1538-4357/acec76](https://doi.org/10.3847/1538-4357/acec76)

Provided by University of Manchester

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