



New Study on Spiral Galaxies

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Why in News?

Recently, a **new study has shown that there were more [spiral galaxies](#)** in the early universe than astronomers had previously anticipated

What are the Key Highlights of the Research on Spiral Galaxies?

- **Existing Theory:** In astronomy, it's believed that as the **universe cooled from a hot**, dense state, it **contained a lot of hot gas**. This gas formed clumps that eventually **came together to form galaxies**.
 - These early galaxies **were irregular in shape** and didn't have flat disks like we see in spiral galaxies today.
 - Over billions of years, as these galaxies **continued to cool down**, they **developed thick, hot disks** that later flattened out into the spiral arms humans recognise now.
- **Unexpected Early Formation:** Contrary to the above theory, the new study suggests that spiral galaxies may **have formed much earlier**, around the same time as other types of galaxies were evolving.
 - The study used data from NASA's [James Webb Space Telescope](#) to analyse 873 galaxies, identifying at least 216 as spiral galaxies.
 - The research found that between 3 billion and 7 billion years after the [Big Bang](#), the proportion of galaxies with **spiral shapes increased significantly**, from about 8% to 48%.
- **Implications for Star Formation:** The study's results could impact **current understanding of [star formation rates](#)** and the conditions necessary for [earth-like planets](#) to form within spiral galaxies.
 - The presence of heavy elements in spiral arms, derived from [supernovae](#), is crucial for planet formation.

James Webb Space Telescope (JWST)

- JWST, successor of [Hubble Space Telescope](#) is a large, [infrared telescope](#) designed to observe the most distant objects in the universe.
 - It is a collaboration between [NASA](#), the European Space Agency (ESA), and the Canadian Space Agency (CSA).

What are the Various Types of Galaxies?

Type	Description	Examples
Spiral Galaxies	Flattened disk with spiral arms (regions of active star formation), central bulge. Can be barred or unbarred.	Milky Way , Andromeda Galaxy

Elliptical Galaxies	Smooth, oval or round shape, little gas and dust, mostly old stars.	Messier 87
Lenticular Galaxies	Intermediate between spiral and elliptical, have a disk but no arms.	Sombrero Galaxy
Irregular Galaxies	No regular shape, can be dwarf or large.	Large Magellanic Cloud
Active Galaxies	Emit 100x more light from the center than stars, powered by supermassive black hole .	Various subtypes
Seyfert Galaxies	Most common active galaxy, emit infrared and X-rays .	Type I & II Seyfert galaxies
Quasars	Most luminous active galaxy, emit light across spectrum and powerful jets.	Markarian 231
Blazars	Active galaxies with jets pointed at Earth, appear very bright.	TXS 0506+056

UPSC Civil Services Examination, Previous Year Question (PYQ)

Prelims:

Q. Consider the following phenomena: (2018)

1. Light is affected by gravity.
2. The Universe is constantly expanding.
3. Matter warps its surrounding space-time.

Which of the above is/are the prediction/predictions of Albert Einstein's General Theory of Relativity, often discussed in media?

- (a) 1 and 2 only
- (b) 3 only
- (c) 1 and 3 only
- (d) 1, 2 and 3

Ans: (d)

Q. Consider the following phenomena: (2013)

1. Size of the sun at dusk
2. Colour of the sun at dawn
3. Moon being visible at dawn
4. Twinkle of stars in the sky
5. Polestar being visible in the sky

Which of the above are optical illusions?

- (a) 1, 2 and 3
- (b) 3, 4 and 5
- (c) 1, 2 and 4
- (d) 2, 3 and 5

Ans: (c)

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