

A telescope on million-mile voyage

The James Webb telescope has left Earth on its mission to show the first stars to light up the Universe.

The James Webb Space Telescope

- NASA's flagship infrared observatory.
- Contributions from the European Space Agency and the Canadian Space Agency.
- Webb is the successor of the Hubble telescope.
- It will offer scientists the opportunity to observe galaxy evolution, the formation of stars and planets, exoplanetary systems, and our own solar system, in ways never before possible.



In high-res: unfolding mysteries of the night sky

Context

- The release of images by NASA captured by JWST

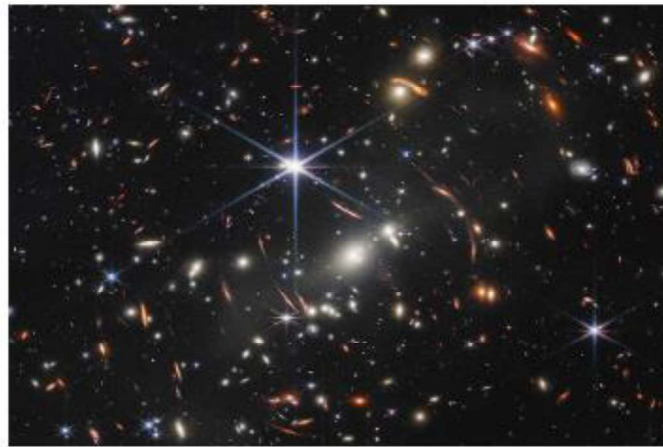
James Webb Space Telescope (JWST)

- The James Webb Space Telescope (JWST) or also called Webb is the largest infrared telescope which was mainly designed to conduct infrared astronomy.
- The telescope was launched in an Ariane 5 rocket from French Guiana in 2021.
- It is a part of an international collaboration between the NASA, the European Space Agency (ESA), and the Canadian Space Agency (CSA)
- The Goddard Space Flight Center of NASA is managing the development effort.
- The telescope is expected to help in the study of aspects like the phases of the history of the Universe, the Big Bang, the formation and evolution of the solar system.

To read more about - [James Webb Space Telescope \(JWST\)](#)

First five images released so far by NASA includes that of:

- SMACS 0723



- Said to be a cluster of galaxies.
- Distance: 5.12 billion light-years
- Located: Direction of the southern constellation of Volans.
- The deep field images taken by the JWST have ones that date back to the times when the first stars were born.

- One of the images appears to be 4.6 billion years ago, which is said to be the time when the Sun and the Earth evolved.
- NGC 3324



- The JWST has captured an image of NGC 3324 (interstellar gas cloud) which is
 - Located: Direction of the Carina Nebula.
 - Distance: 7,600 light-years.
- Home to many more massive and young stars than the Sun.
- Stars and star clusters are formed through these giant interstellar gas clouds and hence they are regarded as "star nurseries"
- The image of the edge of the NGC 3324 is called the "Cosmic cliff" which appears in the shape of mountains and valleys.
- However, the "steam" that appears to rise from the celestial "mountains" is in reality a hot, ionized gas and hot dust streaming away from the nebula.

- Southern Ring Nebula



- JWST has also revealed images of the Southern Ring planetary nebula (NGC 3132) which is also called the Eight-Burst Nebula.
- Planetary nebulae are the shells of gas and dust ejected from dying stars.
- Distance: 2,500 light years
- Located: In the constellation Vela.
- The image captured by JWST shows the consecutive waves of expelled shells.

- Stephan's quintet



- It is a visual grouping of five galaxies and these five galaxies are also together known as the Hickson Compact Group 92 (HCG 92).

- Located : Constellation Pegasus
- Distance: 290 million light-years.
- WASP-96 b3
 - A hot gas giant exoplanet that orbits a Sun-like star.
 - Distance: 1500 light years
 - Located: In the constellation Phoenix
 - The planet orbits extremely close to its star and completes one orbit in less than 3 and half Earth-days.
 - A transmission spectrum made from a single observation using JWST's Near-Infrared Imager and Slitless Spectrograph (NIRISS)
 - Reveals the atmospheric characteristics of WASP-96 b.

Significance of JWST and its observations

- With its sharp vision, large light-collecting area and better ability to observe invisible infrared regions
 - Expects to help expand the ability to understand the cosmos.
- Collects more photons than any other infrared telescopes.
 - Can observe and detect even the faintest flicker from the most distant regions of the cosmos.
- JWST's Near-Infrared Camera (NIRCam) provides stunning images with rich details about the features of the objects.

- This ability of helps reveal details about celestial objects that were previously unknown to astronomers.
- These observations will act as a foundation for astronomers
 - To use the JWST data and study further about celestial phenomena.
- The spectroscopic observation of JWST reveals that
 - There is a significant amount of water vapour present in the WASP-96 b's atmosphere but due to severe heat, WASP-96 cannot host life.
 - This same technique can be used by astronomers to examine other exo-planets that are in the habitable zone of the central star.