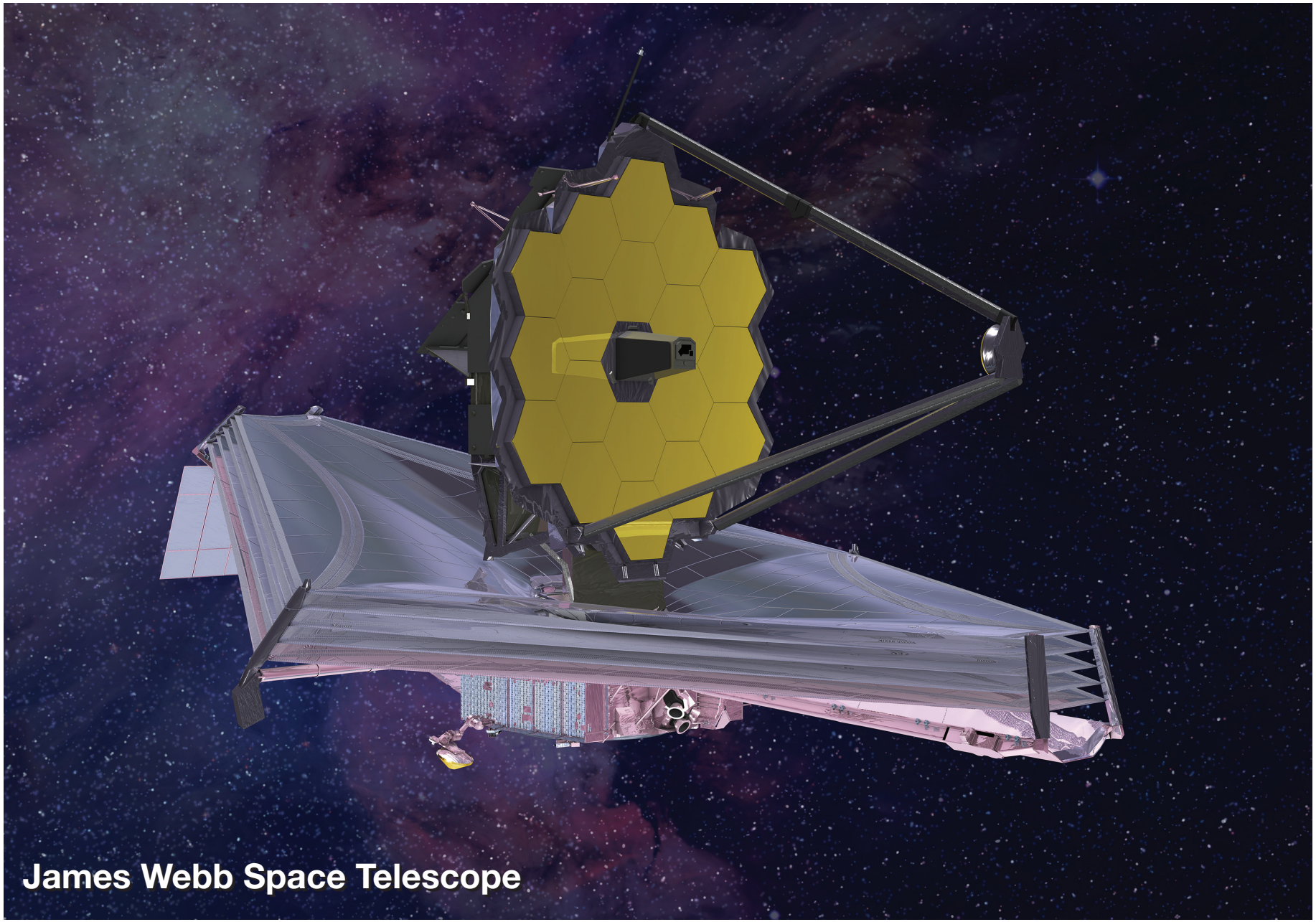
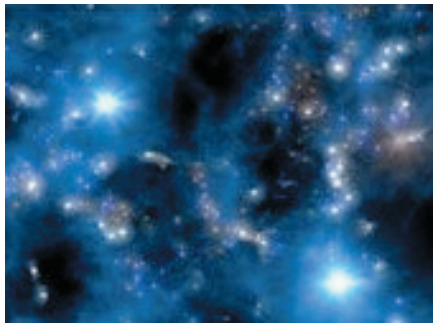

James Webb Space Telescope

James Webb Space Telescope—The Science Mission

The launch of the James Webb Space Telescope will be a giant step forward in the human quest to understand our place in the Universe. With its infrared-optimized telescope cooled to tens of degrees above absolute zero, it will hang in the darkness of space a million miles from Earth. The Webb telescope will examine every phase of our history: from the first galaxies to form after the Big Bang, to the formation and evolution of planetary systems capable of supporting life, to the history of our own Solar System. Webb telescope will be the premier space observatory for astronomers worldwide, extending the tantalizing discoveries of the Hubble Space Telescope, the Spitzer Space Telescope, and giant ground-based telescopes.



First Light: After the Big Bang, the first galaxies probably formed as groups of very massive stars. As these stars finished their lives in explosions called supernovae, elements such as carbon, oxygen and iron were formed and blown into space to seed future generations of stars. Webb telescope will find and study the first light objects.

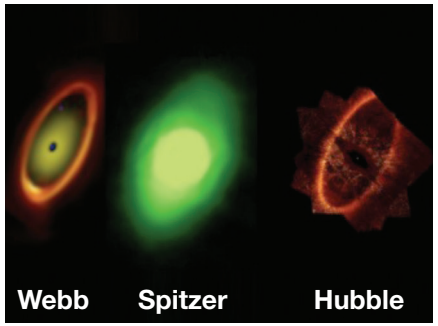
Illustration: WMAP Science Team, NASA/GSFC

Galaxy Assembly: Large galaxies are assembled through mergers of smaller ones. Webb telescope will observe galaxies at all stages of development with broad wavelength coverage and Hubble-like image quality. The result will be a complete picture of galaxy assembly from the epoch of first light through the present.

Image: Beckwith et al., STScI

The Birthplaces of Stars: Stars and planetary systems form within nearby dust clouds, which hide the details of this process from view. Webb telescope—observing in infrared light that can penetrate these dusty shrouds—will reveal the environments within these stellar nurseries and the conditions for formation of planetary systems.

Image: M. McCaughrean, M. Andersen, AIP/ESO



Planets and Life: Webb telescope will study the evolution of planetary systems and the ways they could support life. It will explore the distribution of organic molecules and water in our own solar system, identify planetary footprints around other stars, image young planets in nearby systems, and study the atmospheres of planets as they transit parent stars.

Images: Webb (simulation): G. Rieke, Univ. of Arizona. Spitzer: K. Stapelfeldt, JPL-Caltech Hubble: P. Kalas, Univ. of CA, Berkeley

Mission Concept

The Webb telescope will have a large 6.5-meter primary mirror, passively cooled by a sunshield to about 45K (–400° Fahrenheit). It will be sensitive to light from 0.6 to 28.5 micrometers. There will be four instruments: a near-infrared (IR) camera, near-IR multi-object spectrograph, mid-IR instrument, and near-IR imager/spectrograph.

Technology

Innovations for Webb telescope include a folding, segmented, primary mirror adjusted to shape after launch; ultra-lightweight beryllium optics; extremely sensitive detectors to record very faint signals; microshutters that enable programmable object selection for the multi-object spectrograph; and a cryocooler for cooling the mid-IR detectors to 7K (-447° Fahrenheit).

Mission Status

The James Webb Space Telescope is the successor to NASA's Hubble Space Telescope. It will be the most powerful space telescope ever built. Webb is an international project led by NASA with its partners, the European Space Agency and the Canadian Space Agency. Webb will be launched on an Ariane 5 rocket. Keep up with progress of the Mission at jwst.nasa.gov.

www.nasa.gov

Partners

The James Webb Space Telescope is an international collaboration among NASA, the European Space Agency (ESA), and the Canadian Space Agency (CSA). The Goddard Space Flight Center is responsible for overall project management, mission systems engineering, development of the Integrated Science Instrument Module, and verification of the telescope and instrument performance. Northrop Grumman Aerospace Systems is the observatory contractor. ESA is responsible for two instruments and the rocket. CSA is responsible for delivering one instrument. The University of Arizona and Lockheed Martin are responsible for delivering the US instrument.

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