

Webb telescope reveals deepest image of early universe

July 12 2022, by Issam AHMED



In this screen grab of a White House broadcast the first infrared image from the James Webb Space Telescope (JWST) is seen during a briefing with US President Joe Biden and National Aeronautics and Space Administration (NASA) officials in the South Court Auditorium at the White House in Washington, DC, on July 11, 2022. The JWST is the most powerful telescope launched into space and it reached its final orbit around the sun, approximately 930,000 miles from Earth's orbit, in January, 2022. The technological improvements of the JWST and distance from the sun will allow scientists to see much deeper into our universe with greater detail.

Humanity's view of the distant cosmos will never be the same.

The James Webb Space Telescope, the most powerful to be placed in orbit, has revealed the clearest image to date of the early universe, going back 13 billion years, US space agency NASA said Monday.

The stunning shot, released in a White House briefing by President Joe Biden, is overflowing with thousands of [galaxies](#) and features some of the faintest objects observed, colorized in blue, orange and white tones.

Known as Webb's First Deep Field, it shows the galaxy cluster SMACS 0723, which acts as a gravitational lens, bending light from more distant [galaxies](#) behind it towards the observatory, in a cosmic magnification effect.

Webb's primary imager NIRCam—which operates in the near infrared wavelength spectrum because light from the [early universe](#) has been stretched out by the time it reaches us—has brought these faint background galaxies into focus.

Webb compiled the composite shot in 12.5 hours, achieving well beyond

what its predecessor the Hubble Space Telescope could in weeks.

"Fantastic—galaxies upon galaxies upon galaxies," Jonathan Lunine, chair of the astronomy department at Cornell University, told AFP, rejoicing with the rest of the global astronomy community.



Carina Nebula is famous for its towering pillars that include "Mystic Mountain," a three-light-year-tall cosmic pinnacle captured in an iconic image by the Hubble Space Telescope, until now humanity's premier space observatory.

"Even though this is by no means the farthest Webb can see, it's the deepest image ever taken, and shows the power of this remarkable telescope: tremendous sensitivity, a broad range of wavelengths, and sharp image clarity."

Avi Loeb, a professor of astronomy at Harvard, explained the reddish arcs are the ancient galaxies, while the light colored circles and ellipses belong to the younger galaxy cluster in the foreground.

He added he was "thrilled" about the idea of Webb looking even closer to the Big Bang, back some 13.8 billion years ago.

Stellar nursery

The next set of images will be released Tuesday, revealing details about the atmosphere of faraway planets, "stellar nurseries" where stars form, galaxies locked in a dance of close encounters, and the cloud of gas around a dying star.

Biden conveyed a sense of awe that Webb is documenting universe imagery from some 13 billion years ago.



Le président américain Joe Biden lors de la publication de la première image du télescope spatial James Webb, le 11 juillet 2022 à la Maison Blanche à Washington.

"It's hard to even fathom," the president said.

"These images are going to remind the world that America can do big things and remind the American people, especially our children, that there's nothing beyond our capacity."

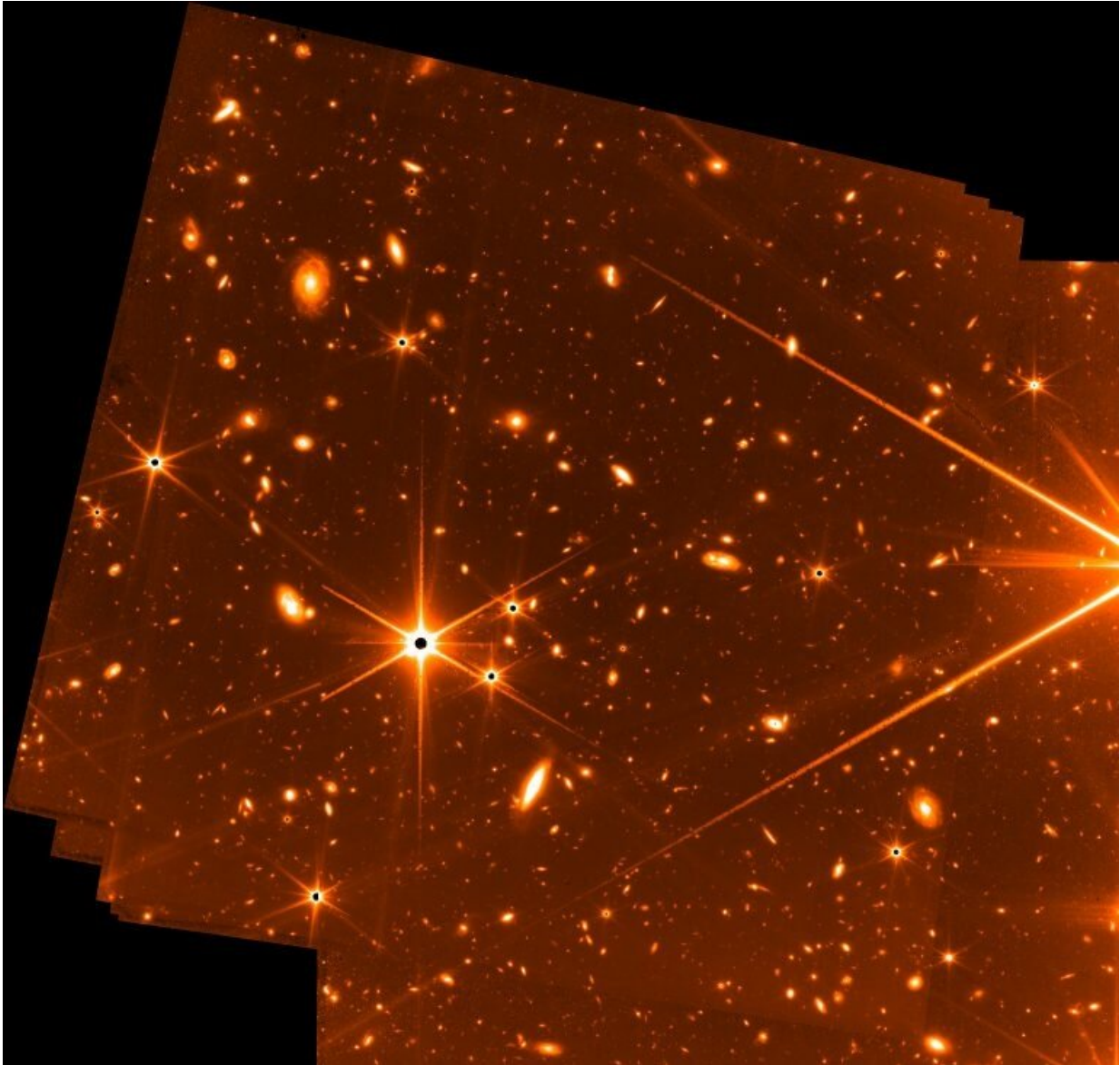
Carina Nebula, a stellar nursery, is famous for its towering pillars that include "Mystic Mountain," a three-light-year-tall cosmic pinnacle captured in an iconic image by Hubble.

Webb has also carried out a spectroscopy—an analysis of light that reveals detailed information—on a gas giant planet called WASP-96 b, which was discovered in 2014.

Nearly 1,150 light-years from Earth, WASP-96 b is about half the mass of Jupiter and zips around its star in just 3.4 days.

Nestor Espinoza, an STSI astronomer, told AFP that previous exoplanet spectroscopies carried out using existing instruments were very limited compared to what Webb could do.

"It's like being in a room that is very dark and you only have a little pinhole you can look through," he said of the prior technology. Now, with Webb, "You've opened a huge window, you can see all the little details."



This handout image released on July 6, 2022 by NASA, CSA and FGS shows a Fine Guidance Sensor test image which was acquired in parallel with NIRCam imaging of the star HD147980 over a period of eight days at the beginning of May.

Million miles from Earth

Launched in December from French Guiana on an Ariane 5 rocket, Webb is orbiting the Sun at a distance of a million miles (1.6 million kilometers) from Earth, in a region of space called the second Lagrange point.

Here, it remains in a fixed position relative to the Earth and Sun, with minimal fuel required for course corrections.

A wonder of engineering, the total project cost is estimated at \$10 billion, making it one of the most expensive scientific platforms ever built, comparable to the Large Hadron Collider at CERN.

Webb's primary mirror is over 21 feet (6.5 meters) wide and is made up of 18 gold-coated mirror segments. Like a camera held in one's hand, the structure must remain as stable as possible to achieve the best shots.

Charlie Atkinson, chief engineer on the James Webb Space Telescope program at lead contractor Northrop Grumman, told AFP that it wobbles no more than 17 millionths of a millimeter.

James Webb telescope

The most powerful space telescope* ever launched, successor to Hubble, to reveal its first images

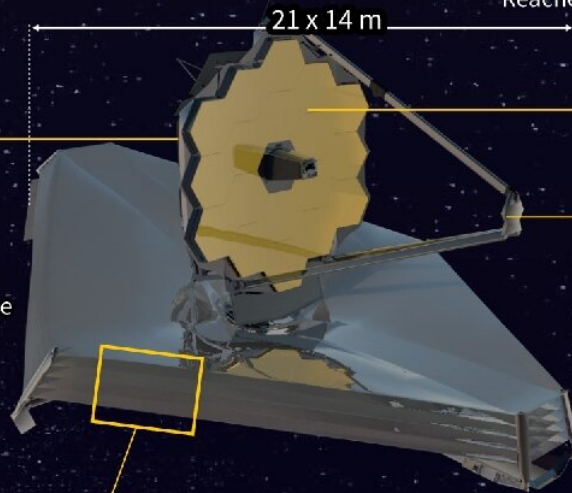
MISSION GOALS (10 YEARS)

- Measure planetary systems and investigate for potential life
- Observe the formation of stars and evolution of galaxies
- Search for the first galaxies formed in the early universe

LAUNCHED on an Ariane 5 rocket on Dec 25, 2021
Fully deployed its sunshield on Jan 4, 2022
Reached destination Jan 24, 2022

Instruments: cameras and spectrographs

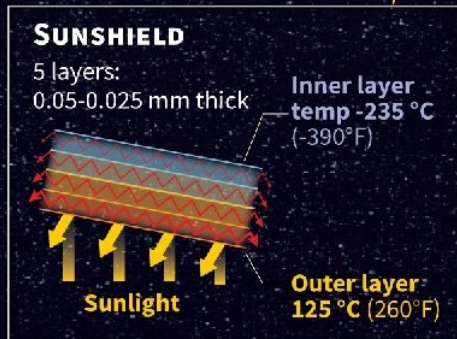
must be kept very cold to detect extremely faint heat signals in the universe



Primary mirror
diameter: 6.5 m
18 segments

Secondary mirror:
0.74 m

Weight:
6.2 tonnes



Source: NASA

*Joint project by NASA, ESA and Canadian Space Agency



Graphic of the James Webb space telescope, successor to Hubble.

After the first images, astronomers around the globe will get shares of time on the telescope, with projects selected competitively through a process in which applicants and selectors don't know each other's identities, to minimize bias.

Thanks to an efficient launch, NASA estimates Webb has enough propellant for a 20-year life, as it works in concert with the Hubble and Spitzer space telescopes to answer fundamental questions about the cosmos.

More information: [www.nasa.gov/image-feature/god ... mage-of-universe-yet](http://www.nasa.gov/image-feature/god...mage-of-universe-yet)

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