

# Webb telescope finds most distant galaxy ever observed, again

June 1 2024, by Issam AHMED

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The galaxy JADES-GS-z14-0, as seen by the James Webb Space Telescope,

existed 290 million years after the Big Bang.

The James Webb Space Telescope has discovered what appears to be a new record-holder for the most distant known galaxy, a remarkably bright star system that existed just 290 million years after the Big Bang, NASA said Thursday.

Since coming online in 2022, the Webb telescope has ushered in a new era of scientific breakthroughs, peering farther than ever before into the universe's distant reaches—which also means it is looking back in time.

And the latest finding has "profound implications" for our understanding of the so-called Cosmic Dawn, researchers said.

An international team of astronomers first spotted the galaxy called JADES-GS-z14-0 in early 2023, but they needed further observations to be sure it really was a record-breaker rather than a "confounding oddball," they said in a joint statement.

"The source was surprisingly bright, which we wouldn't expect for such a distant galaxy, and it was very close to another galaxy such that the two appeared to be part of one larger object," said Stefano Carniani from Scuola Normale Superiore in Italy and Kevin Hainline from the University of Arizona.

By the time light from the most distant galaxies reaches Earth, it has been stretched by the expansion of the universe and shifted to the infrared region of the light spectrum, which Webb is equipped to detect with unprecedented clarity.

The team carried out confirmatory observations in October and then

January—first with Webb's primary imager called NIRCam, and second with its NIRSpec that analyzes the spectrum of light from an object to determine its physical properties—to be more certain of their hypothesis.

JADES-GS-z14-0 comfortably beats the previous record for oldest known galaxy, which was held by JADES-GS-z13-0 that was present 320 million years after the Big Bang.

## James Webb telescope

The new space telescope\*, successor to Hubble, will detect primarily infrared light outside visible range to show otherwise hidden regions of space, from mid-2022 after arriving in position 1.5 million kms from Earth

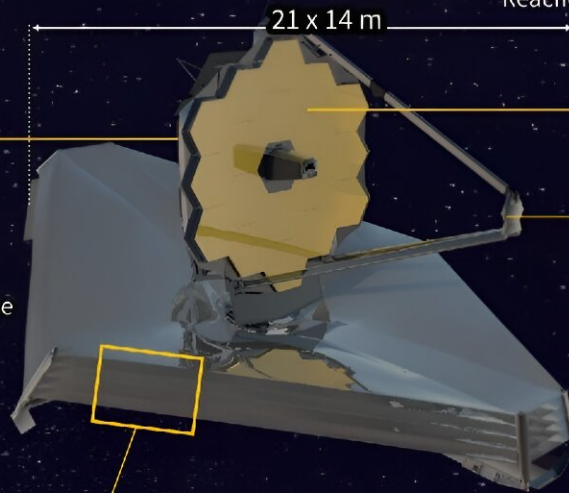
### MISSION GOALS (10 YEARS)

- 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



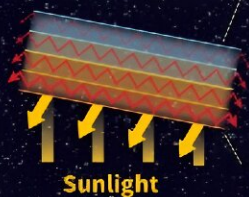
**Primary mirror**  
diameter: 6.5 m  
18 segments

**Secondary mirror:**  
0.74 m

**Weight:**  
6.2 tonnes

### SUNSHIELD

5 layers:  
0.05-0.025 mm thick



**Inner layer**  
temp -235 °C  
(-390 °F)

**Outer layer**  
125 °C (260 °F)

### ORBIT

In position  
1.5 million kms  
from Earth



Source: NASA

\* Joint project by NASA, ESA and Canadian Space Agency

AFP

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

Once its age was confirmed in January, "I had to stand up away from my computer, it just felt so ridiculous to see this," Hainline said in a video posted to YouTube.



"If the universe were a two-hour movie, this galaxy is from the first two and a half minutes," he added.

## **Predictions upended**

"The most important aspect of JADES-GS-z14-0 was that at this distance, we know that this galaxy must be intrinsically very luminous," said Carniani and Hainline.

From the images, the galaxy was determined to be 1,600 light years across, suggesting that the light is coming from mostly young stars and not from emission near a growing supermassive black hole.

"This starlight implies that the galaxy is several hundreds of millions of times the mass of the sun!" said the researchers. "This raises the question: How can nature make such a bright, massive, and large galaxy in less than 300 million years?"

Further analysis of the light emissions indicates the presence of oxygen, another surprising finding that points to "multiple generations of very massive stars had already lived their lives before we observed the galaxy."

Taken together, the observations of JADES-GS-z14-0 upend astronomical predictions of what the earliest galaxies may have looked like following the Big Bang 13.8 billion years ago.

Given the relatively small portion of the night sky they looked at, it's highly likely more luminous galaxies at possibly even earlier times will be found in the coming years, said the researchers, who will now look to publish their findings in a peer-reviewed journal.

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