

Look Up! Step Back in Time with the James Webb Space Telescope



CHALLENGE DESCRIPTION

Welcome to the Look Up! Step Back in Time with the James Webb Space Telescope challenge.

This challenge is designed to help you explore the science behind NASA's newest space telescope mission, the [James Webb Space Telescope](#) (JWST), now in orbit around a point in deep space known as the second Lagrange point, or L2. JWST is the most advanced infrared space telescope ever launched and allows scientists to look deeper into time and space than ever before!

Read books about space science, watch videos, and complete activities to complete this challenge.

CHALLENGE STRUCTURE

1 Registration Badge

1 Completion Badge

10 Logging Badges (Minutes)

5 Activity Badges

ACTIVITY BADGES

Activity Badge 1

Reading Recommendations

Badge Description

Explore Earth and space science reading recommendations for all ages. Log your reading throughout the challenge.

Activities

- Check out Earth and space science book recommendations! Which book did you choose? **(text box)**
 - [Look Up! Explore Our Universe Booklist](#)

Activity Badge 2

Learn About the James Webb Space Telescope

Badge Description

The James Webb Space Telescope (JWST) reached its final destination a million miles from Earth and is now looking out into the universe! JWST is the largest telescope ever sent into space and allows scientists to see further into space and time than humanity ever has before. Learn more about JWST, its current operations, and the science behind the space telescope by completing three of the eight activities below to earn this badge!

Activities

- What is the James Webb Space Telescope? Watch this short video all about the world's largest orbital telescope and its mission.
 - [James Webb Space Telescope: An Overview](#)
- JWST's primary mirror array is made from 18 smaller mirrors that must work together to create clear images for JWST's sensors. Each of these mirrors is capable of making adjustments that are 0.0001 times the width of a human hair! Watch this video from NASA to find out more about their engineering.
 - [Aligning the Primary Mirror Segments of the James Webb Space Telescope](#)
- JWST's many unique features make it the largest and most advanced space telescope ever launched. Read about some of those features in this article.
 - [Space Place: The James Webb Space Telescope](#)

- JWST required a specialized rocket called the Ariane 5 to launch it into space. Build your own small-scale straw rocket with this activity.
 - [Straw Rocket Tutorial](#)
- JWST took 25 years to go from the design to launch stages. Design and build your own space telescope spacecraft from found objects with this activity.
 - [Homemade Satellite Instructions](#)
- JWST has a 21-foot-wide primary mirror made up of 18 individual, hexagonal gold-plated mirrors. It uses its large primary mirror to capture light from faraway stars. What colors will JWST see in space? How would you color JWST? Print and color one of these coloring sheets or use them as inspiration to draw your own space telescope.
 - [Webb Coloring and Art Activities](#)
- JWST's primary mirror was designed to fold up within the Ariane 5 rocket used to take it into space and then unfold once it reached its final destination. Fold your own JWST mirror with this origami activity!
 - [Folding and Unfolding Webb](#)
- What did you enjoy most while earning this badge? **Text Box**

Activity Badge 3

Find Faraway Worlds with the James Webb Space Telescope

Badge Description

The James Webb Space Telescope (JWST) is positioned far away from Earth in order to look deep into space. Part of JWST's mission is to look for exoplanets—planets that orbit other stars in different solar systems. The number of known exoplanets continues to increase as scientists launch more high-powered robotic telescopes like JWST into space. Learn more about these distant worlds by completing four of the nine activities below to earn this badge!

Activities

- JWST hopes to answer questions about planets in our own solar system and beyond. Watch this video about what scientists hope to learn from the observations JWST will make about our planetary neighbors and planets outside our stellar neighborhood.

- [Planetary Studies: James Webb Space Telescope Science](#)
- How do we find exoplanets? Head to NASA's Space Place to read about how previous NASA missions like the Kepler space telescope have looked for distant worlds.
 - [What Is an Exoplanet?](#)
- Interested in visiting an exoplanet? Visit NASA's Exoplanet Travel Bureau to see what artists think previously discovered exoplanets might look like and learn more about the observatories that found them.
 - [Exoplanet Exploration](#)
- Want to explore alien solar systems yourself? Use NASA's Eyes on Exoplanets web app to explore exoplanet systems throughout the Milky Way galaxy and compare them to our own!
 - [Eyes on Exoplanets](#)
- What do you think exoplanets might look like? Print and color these coloring pages or use them as inspiration to draw what you think an exoplanet surface might look like.
 - [#ColorWithNASA Coloring Pages](#)
- Thinking about looking for exoplanets yourself? Learn the five techniques astronomers use to find exoplanets with the 5 Ways to Find a Planet interactive from NASA.
 - [5 Ways to Find a Planet](#)
- You don't need a telescope to study space. Go outside this month and find the constellation Ursa Major. Directly below the "torso" of Ursa Major lies the Owl Nebula, the result of a red giant star collapsing and shedding its gaseous remnants into the solar wind.
 - [Interactive Sky Chart](#)
- Just how big are stars, planets, and moons? Try our online Sizemology game to see.
 - [SCI Games - Sizemology](#)
- What type of exoplanet would you like to visit? **Text Box**

Activity Badge 4

Looking at Different Types of Light with the James Webb Space Telescope

Badge Description

The James Webb Space Telescope (JWST) is observing distant objects in our universe using infrared radiation, a type of light that is invisible to the human eye but can be felt as heat. JWST will use its infrared cameras to see through the dust-filled clouds of our universe where stars and planets form. Learn more about the different types of light in the universe by completing four of the nine activities below to earn this badge!

Activities

- What types of light are there? Watch this musical video to learn about the different types of visible and invisible light on the electromagnetic spectrum.
 - [NOTGLaDOS: Electromagnetic Spectrum The Musical](#)
- Why does JWST measure infrared light? Find out how the infrared light JWST measures differs from the broad spectrum of light measured by the Hubble Space Telescope and what that can tell us by watching this video.
 - [Hubblecast 126: From Ultraviolet to Infrared: Comparing the Hubble and James Webb Space Telescopes](#)
- What captures light on the JWST? Watch this video from NASA to learn more about the mirrors and instruments on JWST that will allow it to look for light across the universe.
 - [The Webb Telescope's Optics](#)
- Why do we study so many different types of light? Find out more about the electromagnetic spectrum and the origins of different types of light by reading this comic from NASA and the Stanford Solar Center.
 - [Light Energy Electromagnetic Spectrum](#)
- Want to see different parts of the electromagnetic spectrum yourself? Explore what makes the sky blue and the sunset red with this activity.
 - [Exploratorium - Blue Sky](#)
- Want to see how different types of light can affect things here on Earth? Complete this activity to measure the effects of ultraviolet light using your hands, sunscreen, and colored paper.

- [Sunscreen Handprints Activity](#)
- Where is all this light coming from? Stars! But it turns out it's quite a journey for light to get from the center of a star to the surface. Try our Solar Maze game and help light escape from the core of a star.
 - [Solar Maze - The Great Escape](#)
- Light from the sun can get in our way when we're studying space, but there's one astronomical object besides the sun that you can still see in the day: the moon! This site will show you the current moon phase. If it's at the first or last quarter phase, you can see it during the day! Scroll to the bottom of the page to make your own moon chart to predict when you'll see a daytime moon.
 - [Moon in Motion](#)
- What spectrum or color of light is your favorite? **Text Box**

Activity Badge 5

Traveling Back in Time with James Webb Space Telescope

Badge Description

The instruments on board the James Webb Space Telescope (JWST) are designed to look far back in time and examine light first emitted 13.7 billion years ago during the Big Bang, the beginning of the universe. Learn more about the science of looking far back in time and space by completing three of the seven activities below to earn this badge!

Activities

- JWST will look for signs of the first galaxies to light up after the Big Bang, but what was the Big Bang? Head to NASA's SpacePlace to read about how scientists think our universe got its start.
 - [What is the Big Bang?](#)
- Light travels at a set speed through space—the speed of light—and can take a long time to get from its location to telescopes on and around Earth. This allows us to understand what stars and galaxies looked like a very long time ago. We measure the vast distances between us and these distant objects in light-years. Read more about what a light-year is at NASA's SpacePlace.

- [What is a Light-Year?](#)
- In its first year, JWST is conducting the JWST Advanced Deep Extragalactic Survey (JADES). JADES is a deep-field survey, which is a long exposure image of a part of the sky meant to detect faint light from ancient stars and galaxies. Watch this video from ViewSpace to learn more about previous deep field images from JWST's predecessor, the Hubble Space Telescope.
 - [Frontier Fields—Peering ever Deeper into the Universe](#)
- JWST will peer deeper into time than any other previous space telescope, building on deep-field images taken by predecessors like the Hubble Space Telescope. Learn more about the observations into deep time made by Hubble with this interactive from ViewSpace.
 - [Seeing Farther: Hubble Ultra Deep Field](#)
- JWST's ability to see distant, ancient light will give scientists a new understanding of how galaxies evolve over time. Watch this video from the Space Telescope Science Institute to learn more about how JWST will begin to fill in the earliest pages of galactic history.
 - [Galaxies Through Time](#)
- JWST will gather new data about the life cycles of stars and galaxies that are nearly as old as the universe itself. Learn about the different stages of a star's life cycle with this bracelet making activity from NASA.
 - [Seeing Starlight with the James Webb Space Telescope](#)
- If you could peer back in time, like JWST, what would you want to see? **Text Box**