Pack a Space Telescope

Design and launch a model space telescope to study the Solar System!

James Webb Space Telescope. Image: Northrop Grumman.

Astronomers use space telescopes to study the Solar System, as well as distant stars and galaxies. To reach orbit, a space telescope must be folded up inside a rocket and launched. When it reaches space, it must unfold by itself, without humans present to help it.

Materials Needed:

Space Telescope printable (or draw your own), toilet paper tube, scissors, tape, string.

Instructions:

Step 1: Prepare your materials. Cut out the sunshield, mirror array, and rocket cover (or draw your own). Tape the rocket cover around the toilet paper tube. Cut two pieces of string, each 12 inches (30 cm) long.

Step 2: Build your model space telescope. Tape the sunshield, mirror array, and two pieces of string together. Fold it up so it can fit in your rocket (the toilet paper tube). Try different designs to see what works best!

Step 3: Test your design! Fold your space telescope inside the rocket, and deploy it by pulling on the two pieces of string. Did it unfold properly?

Step 4: Make adjustments to your design and test it again! There is no right or wrong way to make your space telescope. Be creative, try different designs, and see what works best.

Activity adapted from National Informal STEM Education Network:
www.nisenet.org/catalog/exploring-universe-pack-space-telescope-2018

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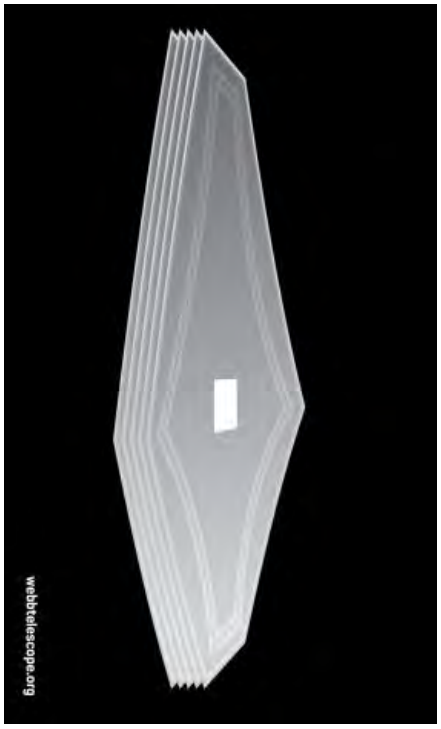
Space Telescope Printables



Sunshield

Mirror Array

Rocket Cover

Images from National Informal STEM Education Network:
www.nisenet.org/catalog/exploring-universe-pack-space-telescope-2018

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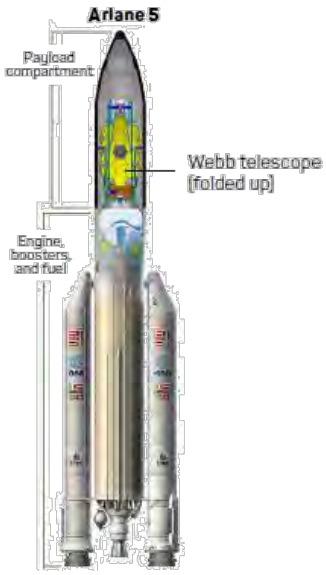
Space Telescopes

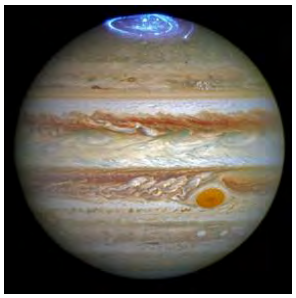
Telescopes are scientific tools that collect light so that we can see distant and faint objects better. Ground-based telescopes can be effective tools, but NASA also uses telescopes based in space. Earth's atmosphere distorts light, making images less clear. Space telescopes help scientists gather clearer images of distant objects.

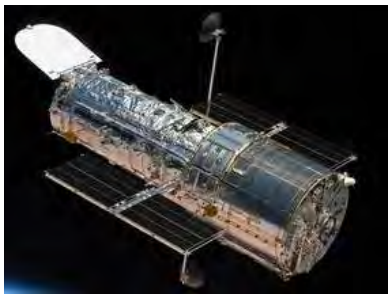
Putting a telescope into outer space is an engineering challenge. A telescope need to fold up to be launched in a rocket. When it reaches space it must automatically unfold, since no humans will be around to help once it reaches orbit. NASA engineers were inspired by origami, the Japanese art of paper folding, while designing a telescope to fold into a compartment on a rocket.



Left: *Mirror array on the James Webb Space Telescope (NASA/ ESA/CSA/The Space Telescope Science Institute).*
Right: *Ariane 5 rocket (Arianespace).*

The **Hubble Space Telescope** was launched in 1990, and since then has made made more than 1.4 million observations. Among other achievements, it has watched a comet collide with Jupiter, discovered moons around Pluto, found stellar nurseries throughout the Milky Way, and and studied the atmospheres of planets that orbit other stars.



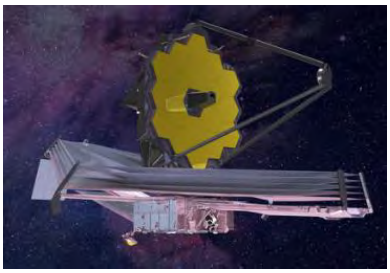


Left to Right: *Jupiter's Aurora, Hubble Space Telescope, galaxy M83 (the Southern Pinwheel). Images: NASA/ESA.*

See more images from the Hubble Space Telescope:
www.nasa.gov/mission_pages/hubble/multimedia

Parts of a Space Telescope

The **James Webb Space Telescope** is scheduled to be launched in 2021. It will be the largest, most powerful, and complex space telescope ever built. One of its goals is to measure the physical and chemical properties of planetary systems, including our own Solar System, and investigate the potential for life in those systems.



Artist's conception of the JWST. Image: Northrop Grumman.

The James Webb Space Telescope is made up of several key parts:

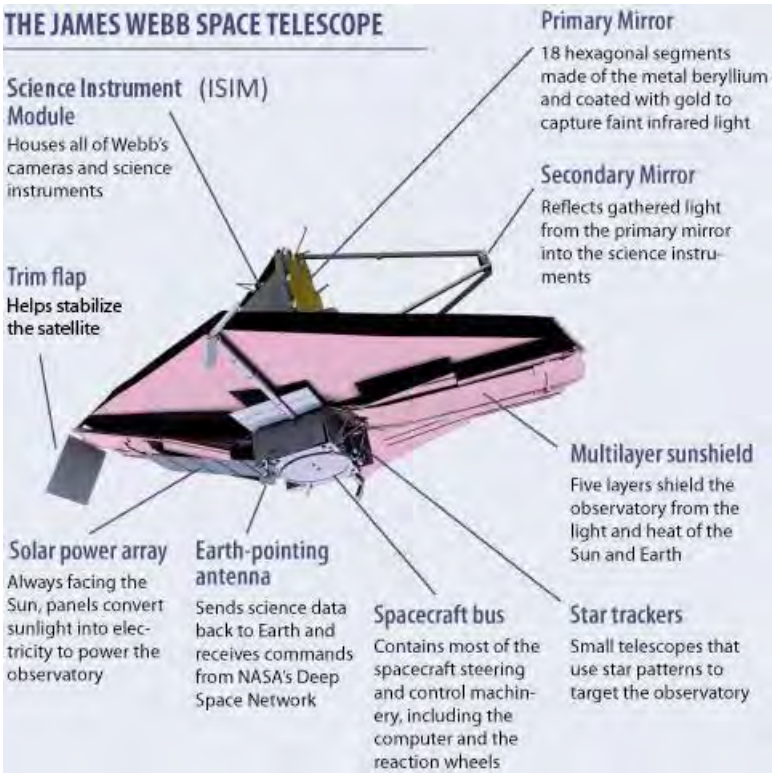


Image: NASA.

The **mirror array** gathers the light coming from space. The bigger the mirror is, the more light can be collected, and the better distant objects can be seen.

The **sunshield** protects the telescope's instruments from the heat and light of the Sun.

The **Integrated Science Instrument Module** houses all of the cameras and scientific instruments.

The **antenna** sends science data back to Earth.

The **solar panel array** gathers energy to power the telescope.

The **spacecraft bus** contains the telescope's computer, power system, altitude and steering systems, and communication instruments.

The **star trackers** observe the telescope's position in space.

Build a paper model of the James Webb Space Telescope:

www.jwst.nasa.gov/content/features/educational/paperModel/paperModel.html