

# STARDOME OBSERVATORY & PLANETARIUM FACTS, RESOURCES AND ACTIVITIES ON...

## EXTRA-TERRESTRIAL OBSERVATORIES

Over three hundred years passed between Galileo's astronomical exploration and the proposal of an extra-terrestrial observatory. In the 1960's, the first astronomical telescope went into space with the launch of the Orbiting Astronomical Observatory (OSO). The OSO was designed to collect light on the ultraviolet side of the spectrum, rather than visible. Not producing fantastic visual imagery, meant the first astronomical space observatories were overshadowed by their successor that was designed to observe multiple wavelengths of light - including visible.

The Hubble Space Telescope (HST) was launched in 1990 and is one of the largest and most adaptable space telescopes. Weighing over 11,000kg, its instruments include an infrared camera, ultraviolet

spectrograph, fine guidance sensors, as well as an optical survey camera, wide-field optical camera and optical spectrometer (for those stunning photos). It was developed in collaboration with NASA and the European

During its two decades in outer space, Hubble has been running on 100% renewable energy from its solar panels.

Space Agency, and is the only telescope ever designed to be serviced in space by astronauts. There have been five missions so far to make repairs, upgrade technologies, and replace instruments. The images from Hubble forever changed the how the public think about space and has illustrated far-reaching astronomical events.

Hubble's successor, the James Webb Space Telescope (JWST) is due to be launched in 2018 and is the result of an international collaboration of about 17 countries. It will operate about 1,500,000km from Earth - almost four times farther out than the Moon and over 2,000 times farther away than Hubble. Check back soon for a JWST resource.



Horsehead Nebula. Image credit: NASA, ESA, and the Hubble Heritage Team (STScI/AURA)

**SCIENCE CONTENT/ CURRICULUM LINK**  
APPRECIATE THAT SCIENTISTS ASK QUESTIONS ABOUT OUR WORLD THAT LEAD TO INVESTIGATIONS AND THAT OPEN-MINDEDNESS IS IMPORTANT BECAUSE THERE MAY BE MORE THAN ONE EXPLANATION.

### DISCUSSION POINTS

Why does Hubble have so many instruments on board?

What are the hundreds of space telescopes and probes doing, and what have we learnt from them?

Check out these other resources...  
➔ Hubble website - <http://hubblesite.org/>  
➔ James Webb construction live feed - <http://www.jwst.nasa.gov/>



# STARDOME OBSERVATORY & PLANETARIUM FACTS, RESOURCES AND ACTIVITIES ON...

## INTRODUCTION TO TELESCOPES

The first telescope was invented for terrestrial applications in the Netherlands by three Dutchmen, Hans Lippershey, Zacharias Jansen and Jacob Metius. Often, Galileo is credited with the invention, but his telescope was inspired by the Dutchmen's design. While he wasn't the original creator of the telescope, he was the first person to point one skyward for astronomical observations. The Galilean telescope could also magnify objects thirty times larger, rather than three times larger the original versions could manage.

A telescope collects and focuses light using either mirrors or lenses. There are two main types of telescopes - refracting and reflecting. A refracting telescope uses lenses while a reflecting telescope uses mirrors. The lens or mirror at the end of the

telescope gathers light from a large area and collects it into a smaller area to make a brighter image. A magnifying lens, aka the eyepiece, then takes that brighter image and enlarges it so that we can see it in more detail.

The word telescope derives from Ancient Greek, 'tele' meaning far, and 'skopein' is to look or see.

Telescopes come in many different shapes and sizes - small ones you can set up at home, to larger ones like the Edith Winstone Blackwell Zeiss telescope at Stardome. In fact, telescopes can get very large indeed - located in Chile is a telescope named 'The Very Large Telescope'! There, you'll find four Unit Telescopes, each with 8.2m diameter main mirrors that can work together to enable astronomers to see details up to 25 times finer detail than when the telescopes used individually.

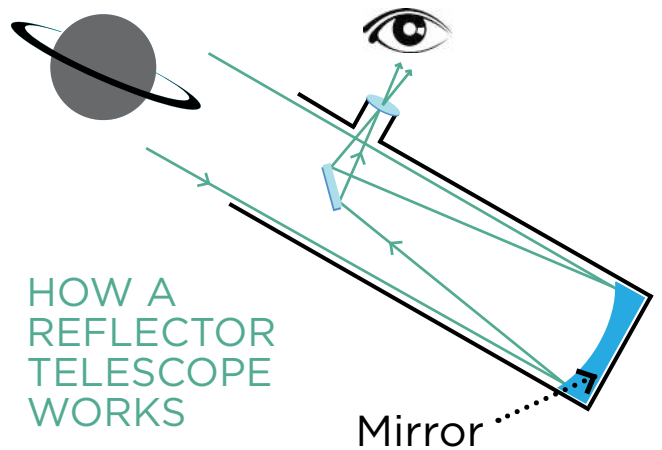
There aren't just telescopes here on Earth. Orbiting about 569 kilometers above us is one of the greatest telescopes in history. [Find out more about the extra-terrestrial observatory here.](#)

### DISCUSSION POINTS

What astronomical object would you use a telescope to look at?

How does seeing further away give us the ability to see back in time?

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HOW A REFLECTOR TELESCOPE WORKS

Mirror

Check out this other resource...

The Very Large Telescope  
- <http://www.eso.org/public/teles-instr/paranal/>



# ACTIVITY

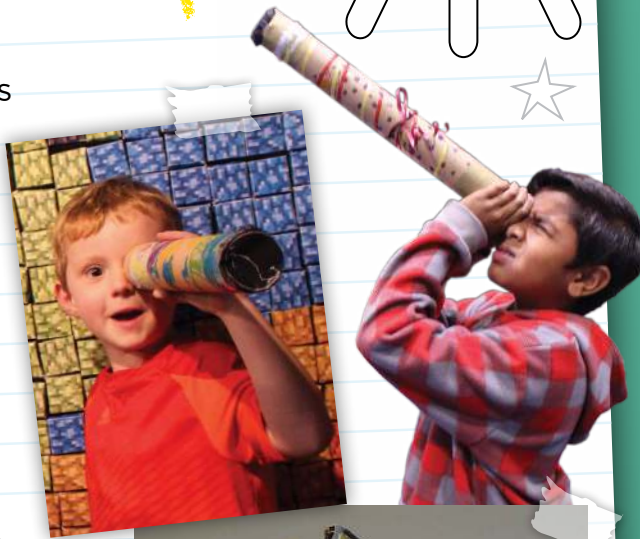
## STARDOME OBSERVATORY & PLANETARIUM

# BUILD YOUR OWN TELESCOPE!

Each of these activities is to give your students a better understanding of telescopes.

### Years 1-4

The Star Craft activity introduces children to the concept of constellations, how land based telescopes work and encourages them to look up at the night sky. [Click here to download the instructions.](#)



### Years 5-8

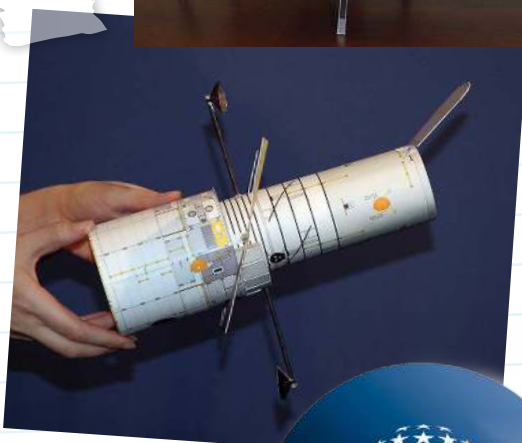
Using a clever flash animation game from NASA, your students can learn about some of the reasons for building satellites. They get to select which instruments are on board and which part of our universe they would like to study. At the end of the game, your students will be presented with information about a satellite that is the most similar to the one they designed. [Click here http://jwst.nasa.gov/build.html](http://jwst.nasa.gov/build.html)



### Years 9-13

On their own, or in pairs your students can build a model of Hubble or the James Webb telescope. You'll need some supplies and some time, but completing the craft will help your students understand how many instruments a satellite has on board, and what they are used for. **Download the free NASA model templates:**

- **Hubble**  
[http://hubblesite.org/the\\_telescope/hand-held\\_hubble/paper-intermediate.php](http://hubblesite.org/the_telescope/hand-held_hubble/paper-intermediate.php)
- **James Webb**  
[http://jwst.nasa.gov/papermodel\\_swales.html](http://jwst.nasa.gov/papermodel_swales.html)



Take a photo of your activity and send it to us. We'd love to see it!  
[education@stardome.org.nz](mailto:education@stardome.org.nz)



STARDOME.ORG.NZ  
09 624 1246