

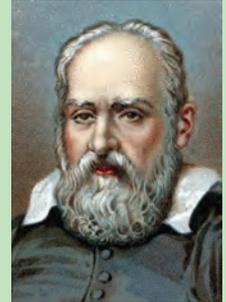


Telescopes



'Tele' means 'far' and 'scope' means 'to look'. So in simple terms, a telescope is used to look at far away objects. Optical telescopes are the most common type and can be easily purchased from many hunting and outdoors shops, even binoculars and camera zoom lenses are forms of optical telescopes.

The origin of the telescope is believed to be in Holland and due to three individuals (two of which were eye glass lens makers) in the very early 1600s. But it was Galileo who first pointed a telescope at the sky to observe celestial bodies. He took the idea for the telescope from the Dutch design and improved it to make it more effective. It was Galileo's design that was first called a telescope. Galileo Galilei was a very famous astronomer as well as a mathematician, physicist, engineer and philosopher. He proposed many ground breaking scientific ideas, mostly to do with space and the tides (some of which have now been proven incorrect). A key concept was that the Earth revolved around the Sun, rather than the Sun revolved around the Earth, which was previously thought. This



Galileo Galilei (1564-1642)

idea got him into a lot of trouble and he was sentenced to house arrest for the rest of his life and was prohibited from publishing any further work.

These first telescopes were refracting telescopes which meant they used a lens and eyepiece to collect light and focus it to create an image clearer and brighter than what the naked eye of a human can see at a distance. This type was quickly superseded by the reflecting telescope which uses curve mirrors to create an image of a faraway object. This type was more successful because it could be made bigger more cheaply and allowed for larger objects to be seen in full. These are both examples of optical telescopes which use visible light waves to create an image, much the same as our eyes except with a much longer range. These telescopes have been used to observe celestial bodies and gather data about them for many, many years.

X-ray telescopes are found orbiting the Earth attached to a satellite-type vehicle. These telescopes can be used to identify and locate black holes because they detect (and 'see') X-ray waves which the human eye can't detect.

The infrared telescope picks up the heat radiation (or infrared radiation waves) emitted by all objects (as long as there temperature is above absolute zero or -273.15°C). These telescopes are much more effective if above the atmosphere (water vapour interferes with the infrared radiation). NASA currently have a solar powered infrared telescope on a spacecraft in outer space. Infrared telescopes have been used to find information such as temperatures of our galaxy and other further away galaxies.

Another type of telescope used by organisations such as NASA are submillimetre telescopes. These telescopes pick up electromagnetic waves that are between infrared and microwaves. This means they have wavelengths of 1 mm or less and frequencies in the terahertz (1 THz = 10^{12} Hz) range, hence they are sometimes called T-waves. These telescopes have allowed scientists to study how stars form and how galaxies change over time.

A radio telescope looks like a large dish and collects microwaves from outer space. These microwaves are a type of radio wave that are used for communication in space and for information-dense, line-of-sight communication on Earth. There are some radio telescopes that are programmed to look for signs of alien life and alien communication.

All of these types of telescopes can be used to examine and study the space around Earth and beyond. They all produce images (in slightly different ways) that can be used to identify and map our Universe.



This false-colour image taken from NASA's Spitzer Space Telescope shows stars 1,500 light years away in the cosmic cloud of the Orion Nebula. Image credit: NASA.