

### A brief history of astronomy

Many ancient cultures followed the Sun and stars in order to keep track of the time of year, and by Ancient Greek times, astronomers had already worked out that Earth is round. Today, powerful telescopes allow us to peer so far into space that we can look back in time almost to the birth of the Universe.

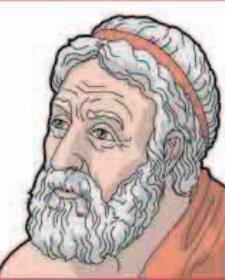
#### 3000 BCE Astronomical calendars

Many monuments built by ancient peoples, such as Stonehenge in the UK, align with the Sun. These monuments may have been used as calendars so that farmers knew when to sow crops.



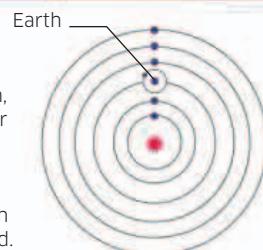
#### 150 CE Ptolemy

The Greek astronomer Ptolemy cataloged 1,022 stars in 48 constellations. He believed that Earth was the center of the Solar System and Universe, orbited by the Sun, Moon, planets, and stars.



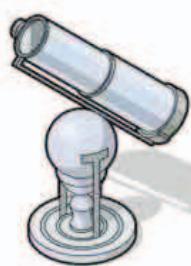
#### 1543 Copernicus

Polish astronomer Nicolaus Copernicus proposed that the Sun, not Earth, is the center of the Solar System. It was a shocking idea since it meant Earth must be flying through space, spinning around.



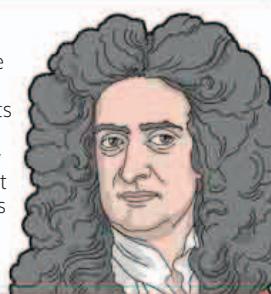
#### 1610 Galileo Galilei

Italian scientist Galileo Galilei built a telescope and used it to study the night sky. He saw spots on the Sun, mountains on the Moon, and four moons orbiting the planet Jupiter.



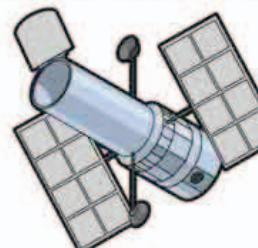
#### 1687 Isaac Newton

English scientist Isaac Newton worked out the laws of gravity—the force that makes objects fall to the ground. He discovered that gravity keeps the Moon in orbit around Earth and keeps the planets in orbit around the Sun.



#### 1990 Modern astronomy

Today, space telescopes such as Hubble, which was launched in 1990, give us breathtaking views of distant objects in space, including the furthest galaxies ever seen.



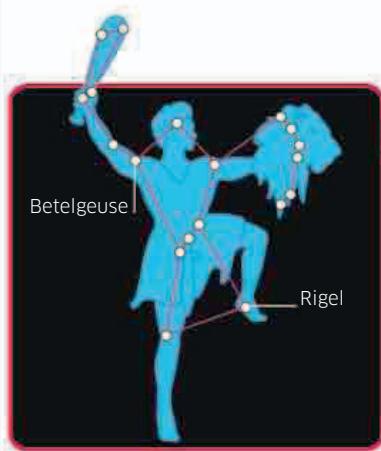
# Astronomy

People have been looking up at the night sky and marveling at its beauty and mystery for thousands of years. Today, a whole branch of science—astronomy—is devoted to studying stars.

Professional astronomers investigate not only stars but everything to do with space—from the meteors that burn up spectacularly as shooting stars in Earth's atmosphere and the planets of the Solar System to distant galaxies billions of light years away. Astronomy makes a rewarding hobby too, and many amateur stargazers enjoy observing the night sky with backyard telescopes or binoculars. Whenever astronomers observe the sky, they are looking back in time. This is because light takes such a long time to reach us from distant objects in space. We see the Moon as it was one and a quarter seconds ago and the stars as they were hundreds of years ago.

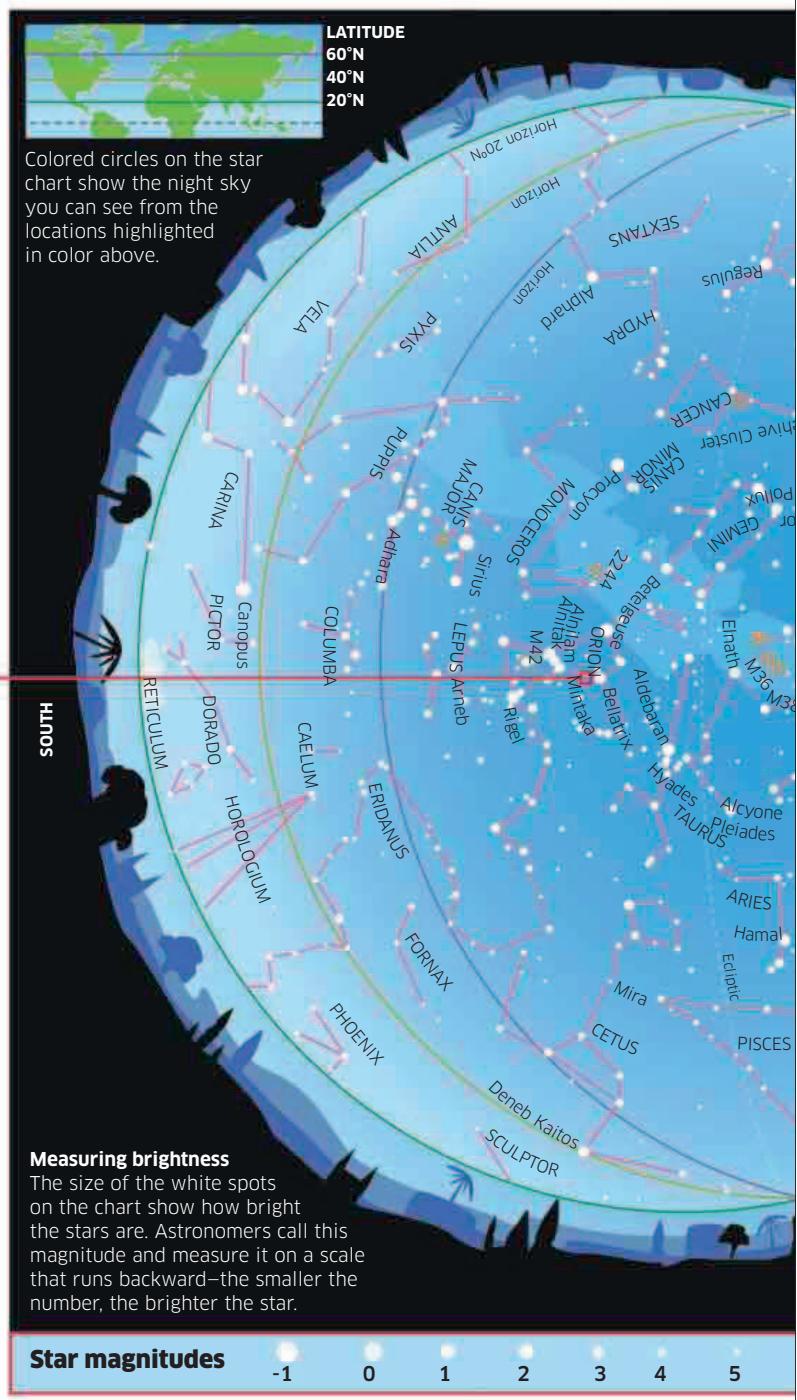
### The sky at night

Ancient stargazers saw patterns in the stars and named groups of stars after mythical beings and animals. These star patterns, called constellations, look little like the objects they are meant to represent, but we still use the old names. Today, astronomers divide the whole sky into 88 segments, each one named after the constellation within it. Star charts like the one here show which constellations are visible at a particular time and place. This chart shows the stars you can see at midnight in January from the northern hemisphere.



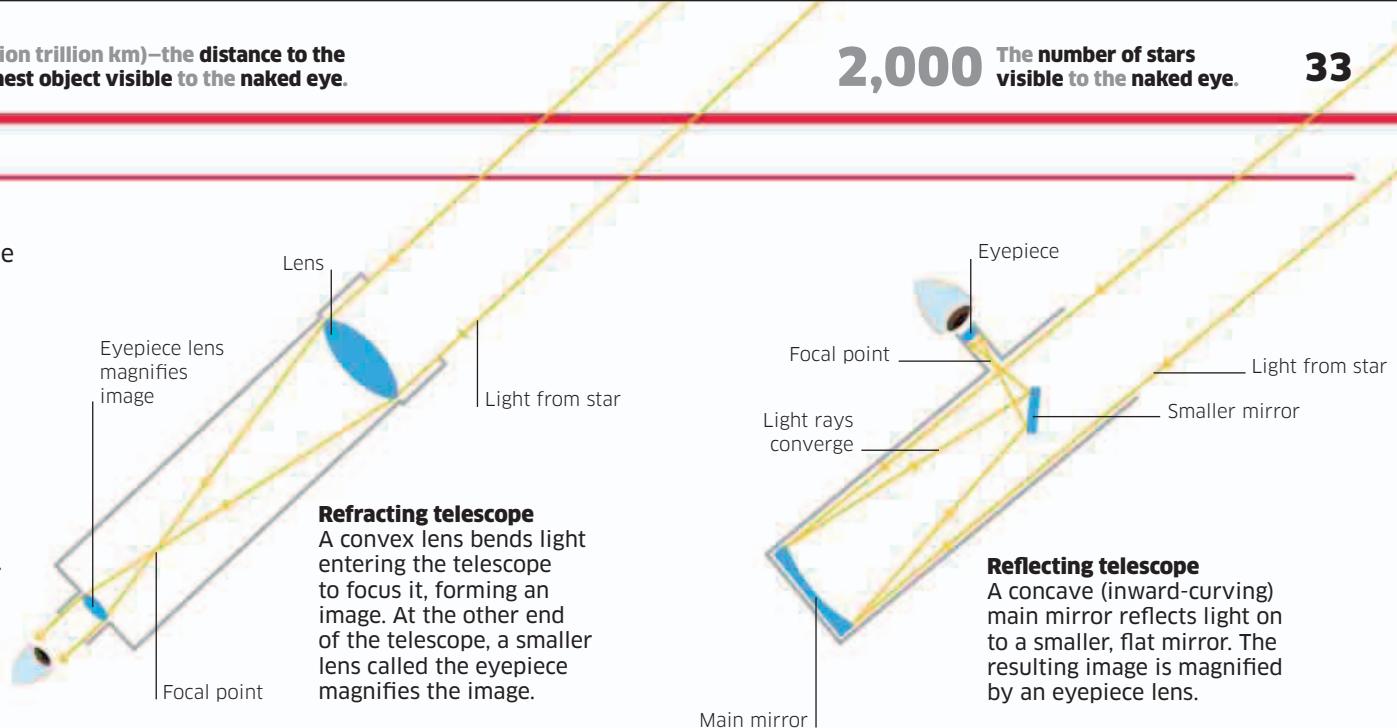
### Orion the hunter

One of the best-known and brightest constellations is Orion the hunter, which is visible the world over. Orion includes the red giant star Betelgeuse and the blue-white supergiant Rigel—two of the brightest stars in the night sky.



## How telescopes work

The invention of the telescope revolutionized astronomy. A telescope collects more light from an object than a human eye can. It uses this light to form a magnified image. There are two basic types of telescopes: refracting and reflecting. The refracting telescope has a large convex (outward-curving) lens that gathers and focuses the light. The reflecting telescope uses a curved mirror instead.

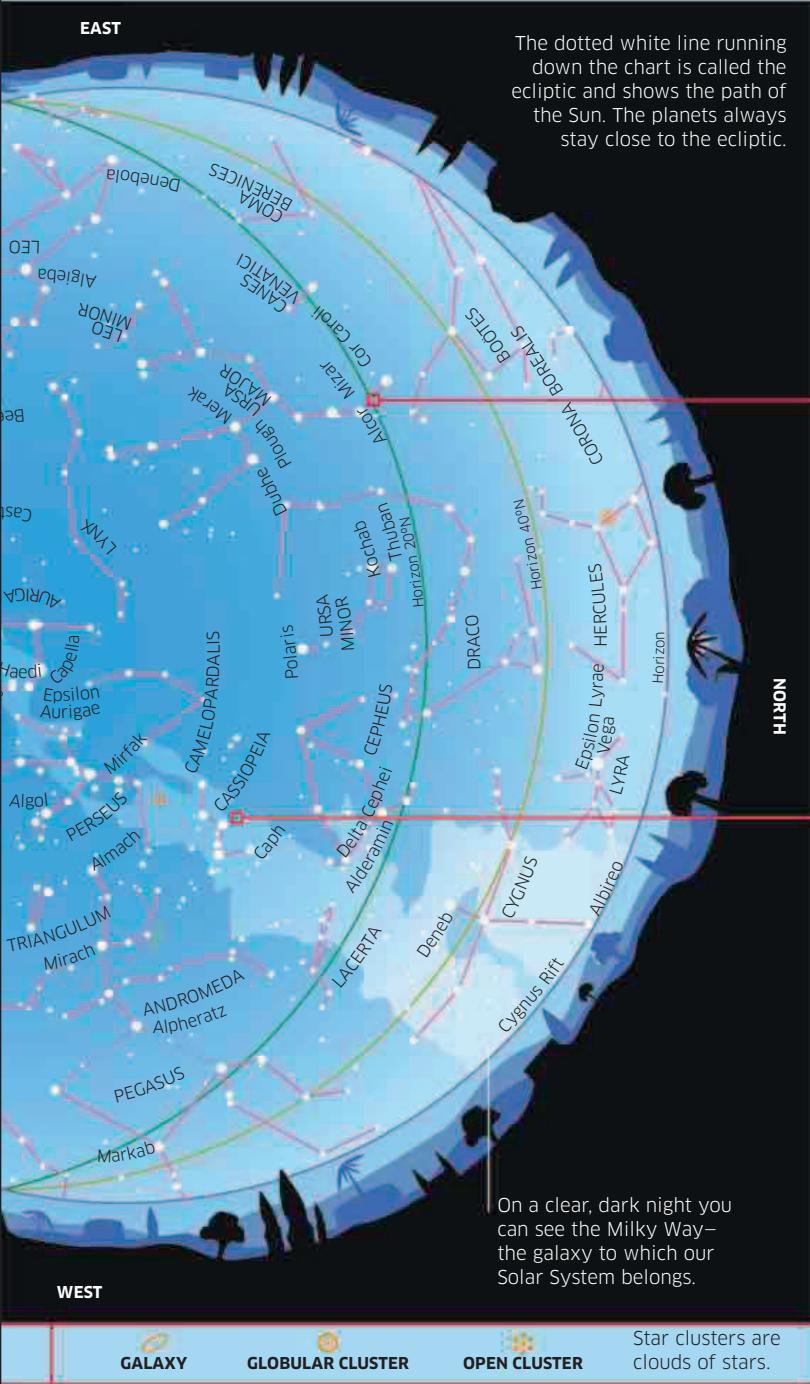


### Refracting telescope

A convex lens bends light entering the telescope to focus it, forming an image. At the other end of the telescope, a smaller lens called the eyepiece magnifies the image.

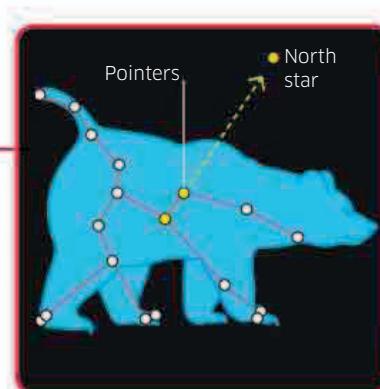
### Reflecting telescope

A concave (inward-curving) main mirror reflects light on to a smaller, flat mirror. The resulting image is magnified by an eyepiece lens.



## The Great Bear

Ursa Major is named after a bear. The seven bright stars running from its tail form a famous group of stars known as the Big Dipper or Plow. The last two of these point to the North Star, which is always due north. In ancient times, sailors used this star to find the way.

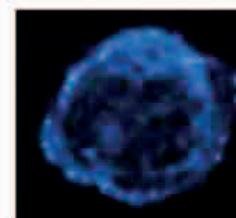


## Cassiopeia

This constellation is named after a vain queen in Greek mythology. It's very easy to spot in northern skies as it looks like a funky letter W.

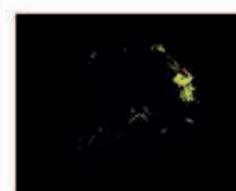
## Seeing the invisible

Professional astronomers don't just use visible light to see the night sky. Their telescopes can also create images from wavelengths of light that our eyes cannot see, such as X-rays, radio waves, and infrared rays. The images below all show Kepler's Supernova—the wreckage left by a giant star that exploded in 1604.



### X-ray image

This image of Kepler's Supernova is from the orbiting Chandra X-ray Observatory. It shows a cloud of incredibly hot gas that emits high-energy X-rays.



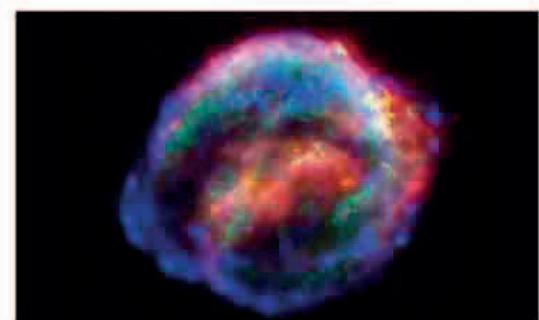
### Visible light image

Very little of the object can be seen in visible light, even in this image from the Hubble Space Telescope. The bright areas are clumps of gas.



### Infrared image

Taken by the Spitzer Space Telescope, this infrared image shows dust clouds that were heated by a shock wave from the exploding star.



### Combined image

Combining all three sources produces a complete image: a shell of supernova debris expanding into space at 1,240 miles (2,000 km) per second.