

# STARGAZING LIVE.

## STAR GUIDE 2012



The Open  
University



# WELCOME TO STARGAZING LIVE

Welcome to the 2012 Star and Moon Guide, designed to help you discover some of the best things to see in the night sky throughout the year and learn more about our closest neighbour, the Moon. Even if you've never tried stargazing before, you can get started with our easy-to-use star charts and Moon atlas.

When you're ready for the next step, there's more waiting for you at [bbc.co.uk/stargazing](http://bbc.co.uk/stargazing), including audio guides to the night sky and how to stargaze on your smart phone or computer.

So what are you waiting for? There's a whole world of incredible wonders above your head. Isn't it time you looked up? Happy Stargazing!



PROFESSOR  
BRIAN COX

DARA O BRIAIN



LIZ BONNIN



MARK  
THOMPSON

# BEFORE YOU HEAD OUT

You might like to take the following items to help with your stargazing:

- **Binoculars/telescope** – to help you get a better view of objects in the night sky, although most of the stars in this guide can be seen without them.
- **A red torch** – so that you can still read your Star Guide without affecting your night vision. You could adapt a normal torch using red cellophane or use a rear bicycle light.
- **Apps** – there are many free apps available for mobile devices that utilise inbuilt GPS to help navigate the night sky.
- **A compass** – so you know which direction you're facing.



For more information on using equipment and astronomy apps head to [bbc.co.uk/stargazing](http://bbc.co.uk/stargazing)

# GETTING STARTED

- 1 Choose a clear night and find an outside space – ideally away from tall buildings and bright lights. It could be anywhere from your back garden to a local park.
- 2 It may take up to 20 minutes for your eyes to adapt to the dim light. Light pollution can greatly affect what you can see in the night sky. Head to [bbc.co.uk/stargazing](https://www.bbc.co.uk/stargazing) and follow the link to Dark Sky Discovery to find out more about dark sky places near to where you live.
- 3 Our star charts face north or south. Using the relevant chart for the time of year, how many constellations can you find?

## DID YOU KNOW?

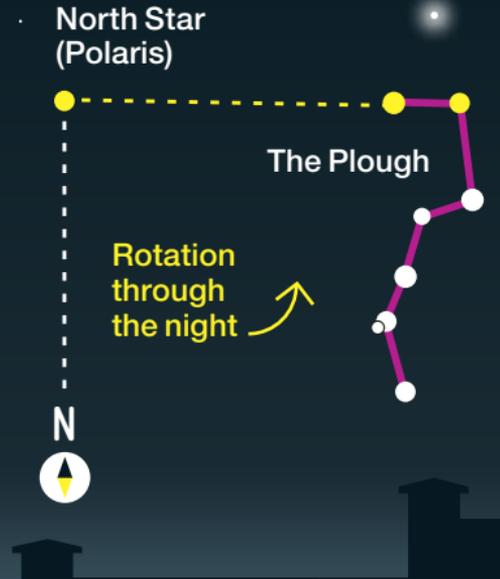
The sky is always changing – the stars you can see from a certain location change throughout the night as the Earth rotates, and throughout the seasons as the Earth orbits the Sun and we move to a different position in space.

# WHERE IS NORTH?

## HOW TO FIND POLARIS

Polaris (the North Star) is positioned above the North Pole, and so it seems to stay still in the night sky as the Earth rotates beneath it and the stars appear to rotate around it. As a result, it has been used for navigation for centuries.

It's easy to spot as two stars in the Plough (part of Ursa Major) point directly towards it, as shown here. If you drop a vertical line from Polaris to the horizon, this is due north. If you are looking north, east is to your right, west is to your left and south is directly behind you.



# THE BASICS

**So, you're all set for your night of stargazing... but what exactly will you be looking at?**

## PLANET

A body that orbits the Sun and has enough gravitational pull to be nearly spherical and clear its neighbourhood of debris. This 2006 definition resulted in Pluto being kicked out of the planetary club! The eight planets in our Solar System look like stars in the night sky, with five being bright enough to be seen with the naked eye. If a planet orbits a star other than the Sun, it is known as an exoplanet.

## METEOR

When dust particles fall through the Earth's atmosphere, they are seen as streaks of light across the sky (also known as shooting stars). Meteors vaporise high up in the atmosphere, whereas meteorites actually land on Earth.

### FIND OUT MORE

Does the Sun spark your curiosity? Explore the centre of the Solar System with The Open University's free online study material about the Sun. Go to [bbc.co.uk/stargazing](http://bbc.co.uk/stargazing) and follow the links.

## STARS

Spheres of gas that emit heat and light through nuclear processes. The nearest star to Earth is the Sun and the next nearest, Proxima Centauri, is 271,000 times further away.

## CONSTELLATIONS

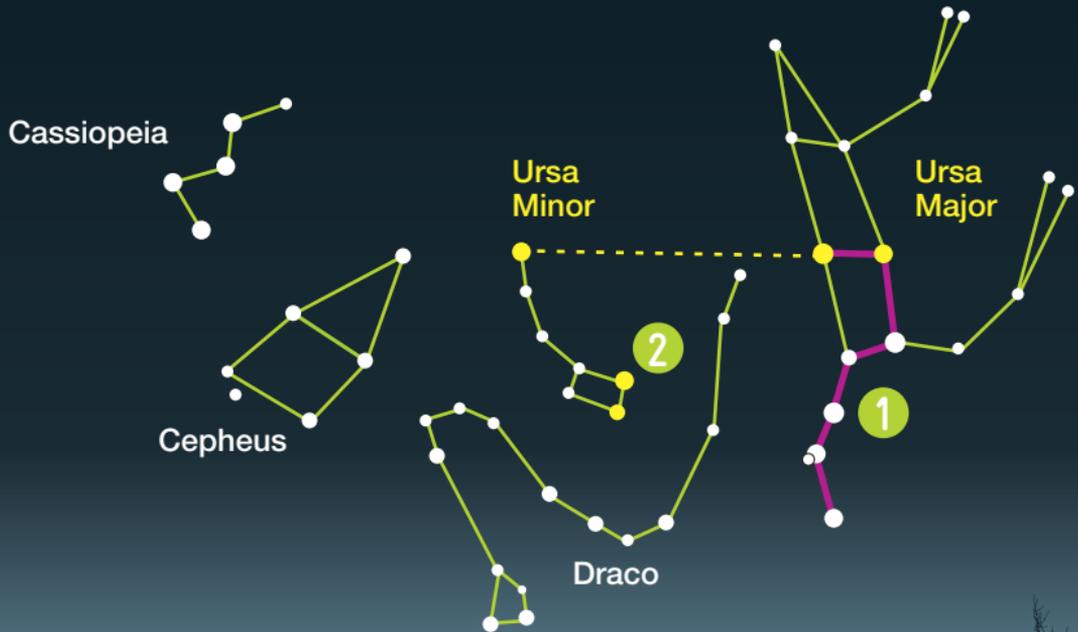
Chance patterns of stars in the sky, historically named after objects, animals and mythological characters. There are 88 recognised constellations.

## GALAXY

The name given to a collection of stars, gas and dust that are bound together by gravity. We are part of a galaxy called the Milky Way, which contains more than 400,000 million stars.



# LOOKING NORTH





JANUARY–MARCH



LOOKING NORTH



EARLY EVENING

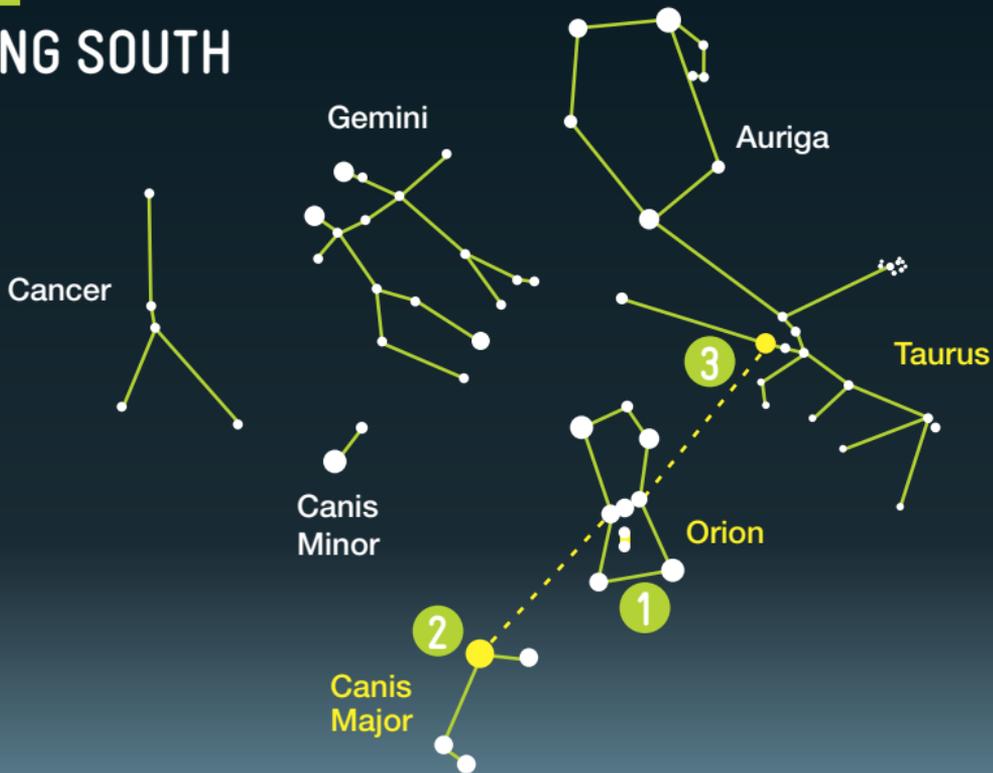
## WHAT TO LOOK FOR

- 1 In the UK, this is called the Plough and is part of a larger constellation called Ursa Major (Latin for Great Bear). The Plough is also known as the Big Dipper or the Saucepan in other countries.
- 2 Use the Plough's 'pointer' stars to locate Polaris, the Pole Star which marks the end of the tail of Ursa Minor, the Little Bear. The two stars at the other end of Ursa Minor (Kochab and Pherkad) are known as the Guardians of the Pole.

## PLANET WATCH

The really bright 'star' that you can see for a few hours after sunset in the western part of the sky from January to early May 2012 is actually the planet Venus.

# LOOKING SOUTH





JANUARY–MARCH



LOOKING SOUTH



EARLY EVENING

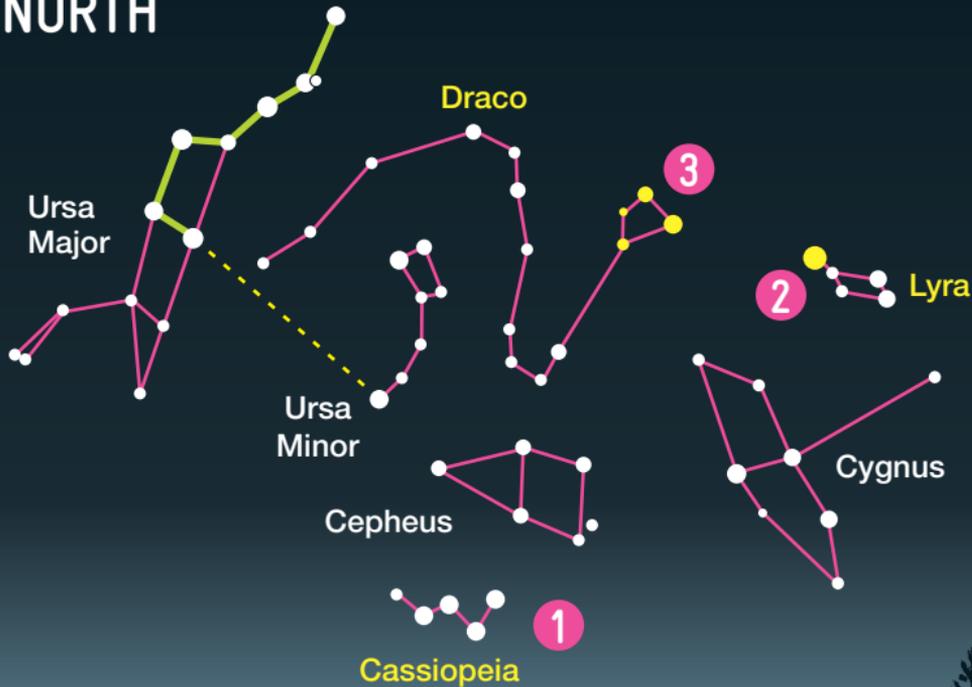
## WHAT TO LOOK FOR

- 1 Using binoculars, look below Orion's Belt for a 'fuzzy star'. This is a stellar nebula where hundreds of young stars and exoplanets are forming.
- 2 Follow the line of Orion's Belt left to find Sirius (the Dog Star) in the constellation Canis Major. This is the brightest star in the night sky. Although it looks like just one star, it's actually a system of two stars: Sirius and a fainter companion star.
- 3 Look out for the V-shaped arrangement of stars with Aldebaran at one end. These are the brightest objects in the cluster of stars called the Hyades.

## DID YOU KNOW?

On average it takes 1.3 seconds for light to travel from the Moon to the Earth and 8.3 minutes for it to arrive from the Sun.

# LOOKING NORTH



 APRIL–JUNE

 LOOKING NORTH

 LATE EVENING

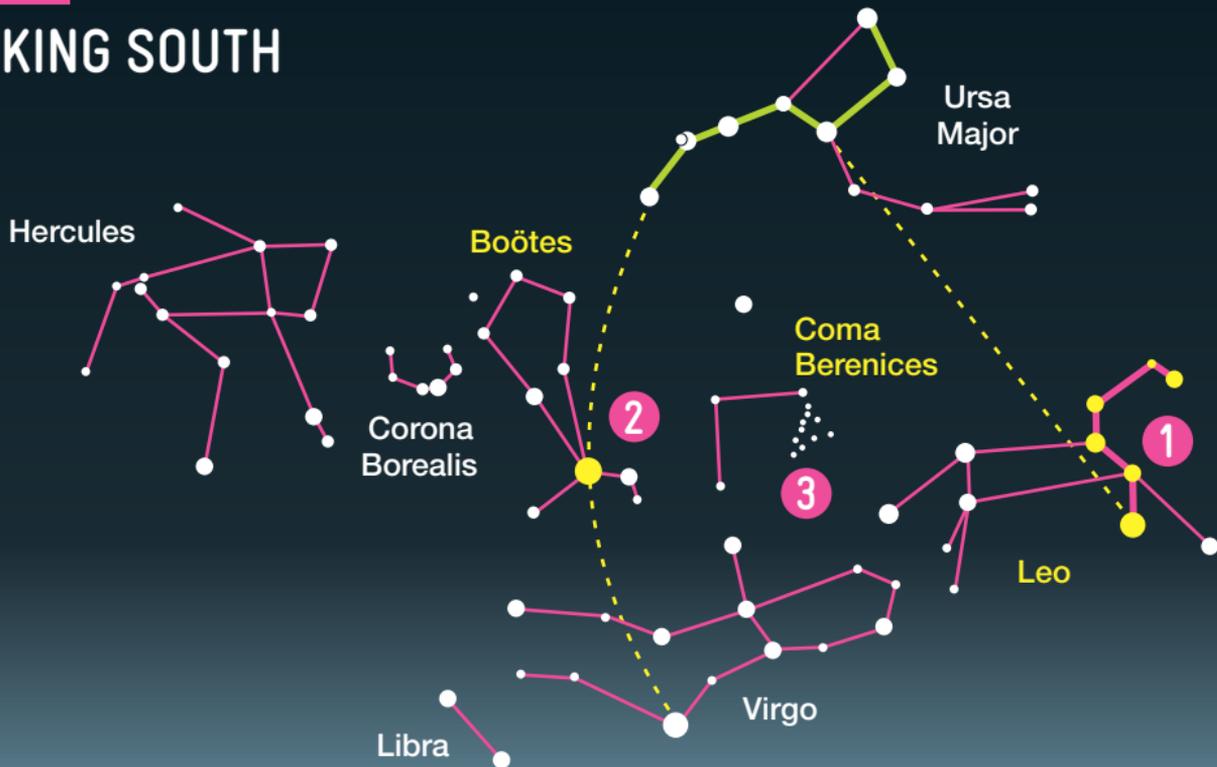
## WHAT TO LOOK FOR

- 1 Can you find Cassiopeia? In Greek mythology, this W-shaped constellation represents the wife of King Cepheus who sits nearby.
- 2 Have a look for Vega, a star in the constellation Lyra (the Harp). This is one of the brightest stars in the night sky and, in 1850, it became the first star other than the Sun to be photographed.
- 3 The constellation of Draco the Dragon wraps around Ursa Minor, the Little Bear. The head of the dragon is marked by four stars in a pattern known as The Lozenge.

## DID YOU KNOW?

Due to the Earth's rotation having a wobble, our pole star (currently Polaris) changes. Vega was the Earth's northern pole star 14,000 years ago and will be again by around the year 13700.

# LOOKING SOUTH



 APRIL–JUNE

 LOOKING SOUTH

 LATE EVENING

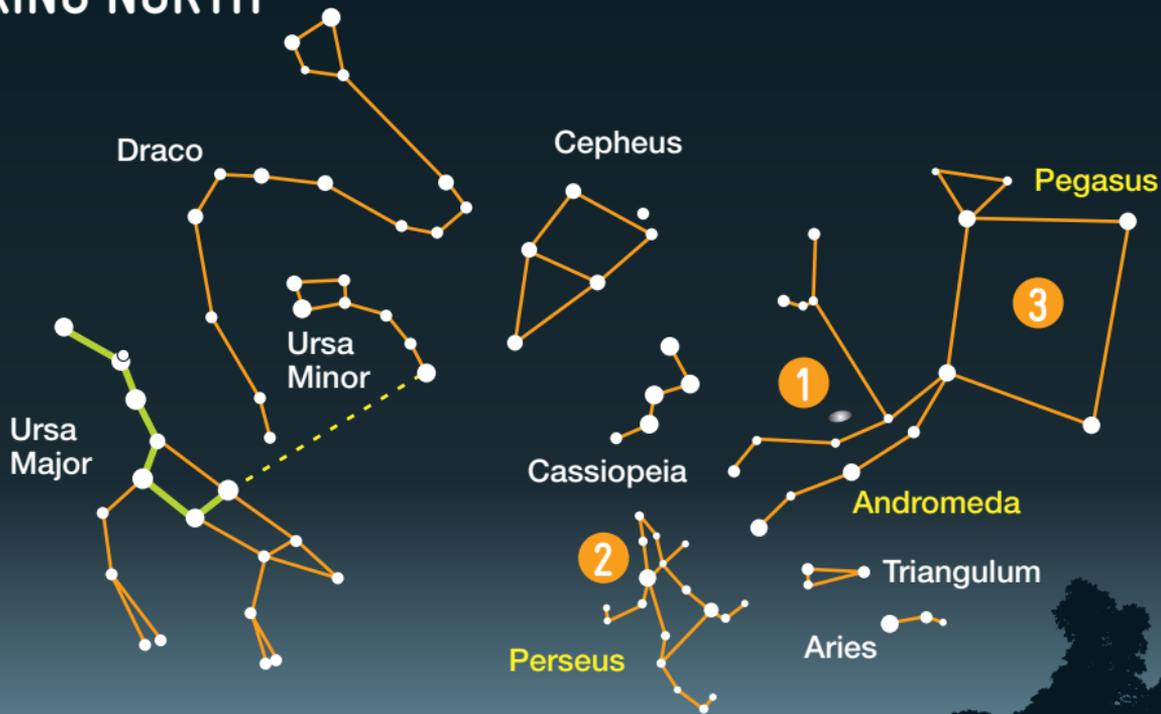
## WHAT TO LOOK FOR

- 1 Look for a group of stars in the shape of a reverse question mark. This is the lion's head of the constellation Leo.
- 2 Follow the curve of the handle of the Plough to locate Arcturus. This is the brightest star in the northern half of the sky and is part of the constellation Boötes, the Herdsman.
- 3 The Coma star cluster is a faint triangular smattering of stars and part of the constellation Coma Berenices (Queen Berenice's Hair).

## DID YOU KNOW?

In the darkest parts of the UK you can see approximately 2,000 individual stars with just the naked eye! However, in major cities, this figure drops to less than 200.

# LOOKING NORTH





JULY–SEPTEMBER



LOOKING NORTH



LATE EVENING

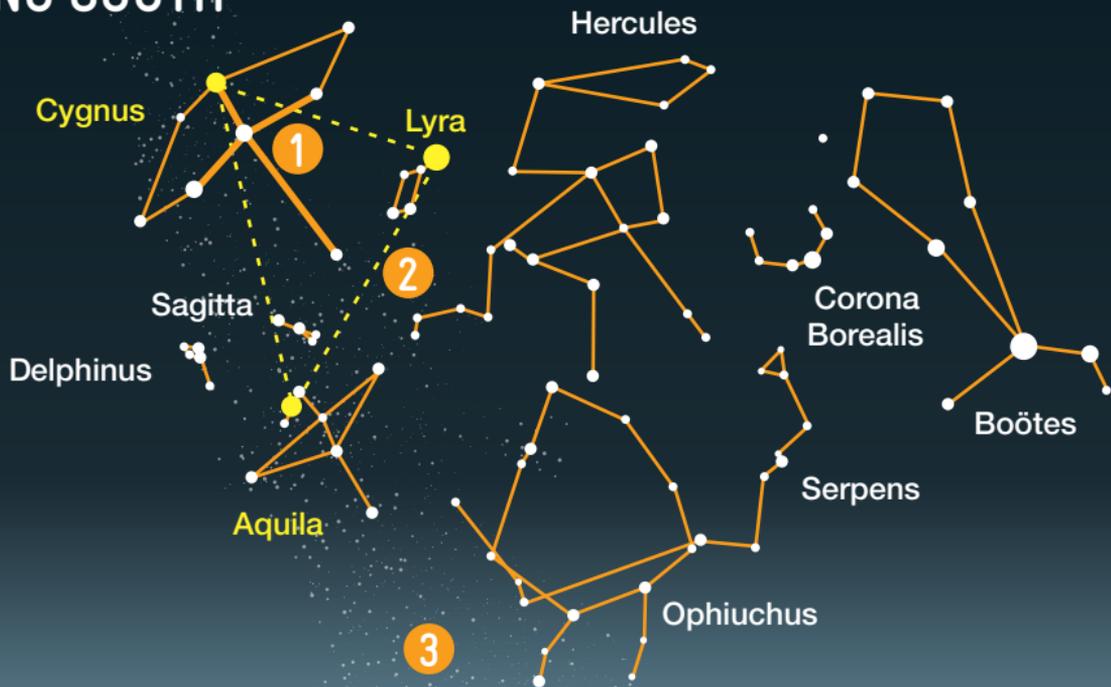
## WHAT TO LOOK FOR

- 1 Our nearest large galaxy – Andromeda – can be seen in the Andromeda constellation. It appears to us as an elongated fuzzy blob. The Andromeda galaxy is so far away that its light takes two million years to reach us.
- 2 Meteor showers are named after the constellation their meteors appear to come from when the shower is at its peak. So Perseids appear to come from Perseus.
- 3 The number of stars you can see inside the Great Square of Pegasus is an indication of how dark your sky is. Anywhere between four and 13 stars is good, while more than 13 indicates excellent skies.

## METEOR WATCH

Look out for the Perseid meteor shower peaking on 12–13 August.

# LOOKING SOUTH





JULY–SEPTEMBER



LOOKING SOUTH



LATE EVENING

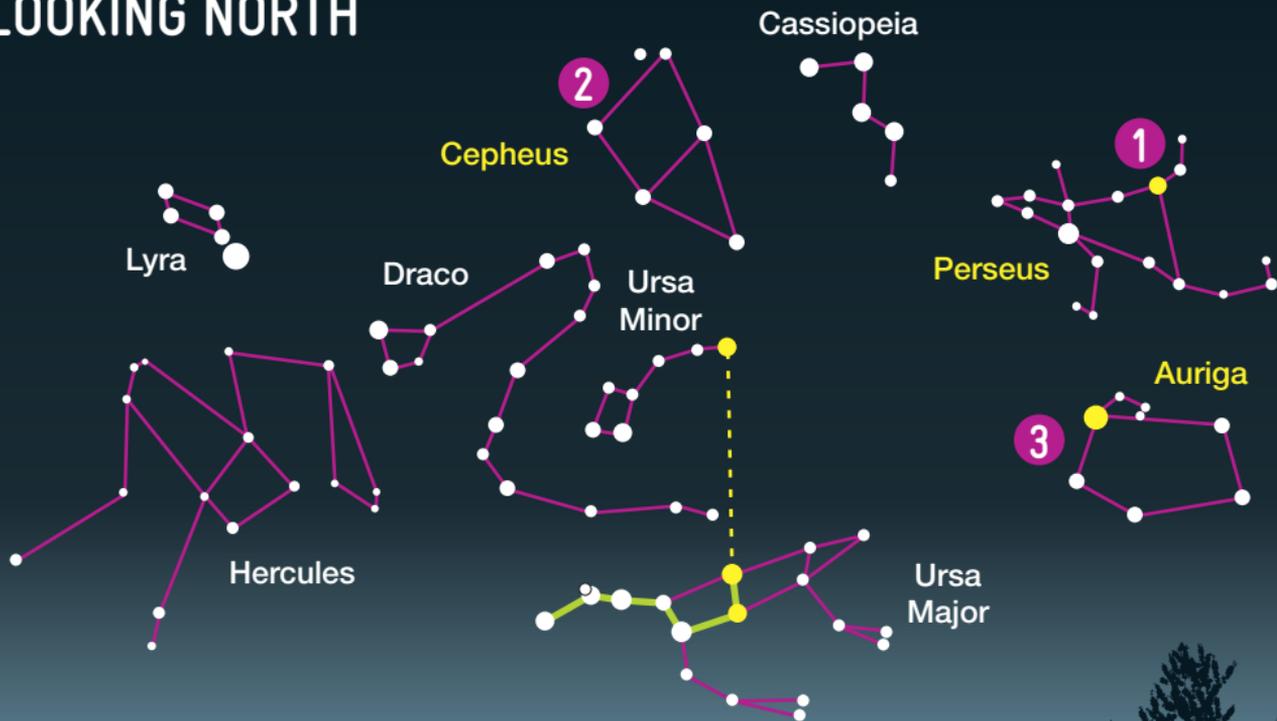
## WHAT TO LOOK FOR

- 1 Can you spot the Northern Cross? It's part of the constellation called Cygnus the Swan.
- 2 The Summer Triangle is made up of three bright stars: Altair in Aquila (the Eagle), Vega in Lyra, and Deneb in Cygnus.
- 3 Summer is a great time to see our own galaxy, the Milky Way, stretching across the sky as a hazy band of light.

## DID YOU KNOW?

The Milky Way is one in a cluster of more than 40 galaxies known as the Local Group. Local is a relative term, as the light from our nearest galaxy takes around 25,000 years to reach us.

# LOOKING NORTH





OCTOBER–DECEMBER



LOOKING NORTH



EARLY EVENING

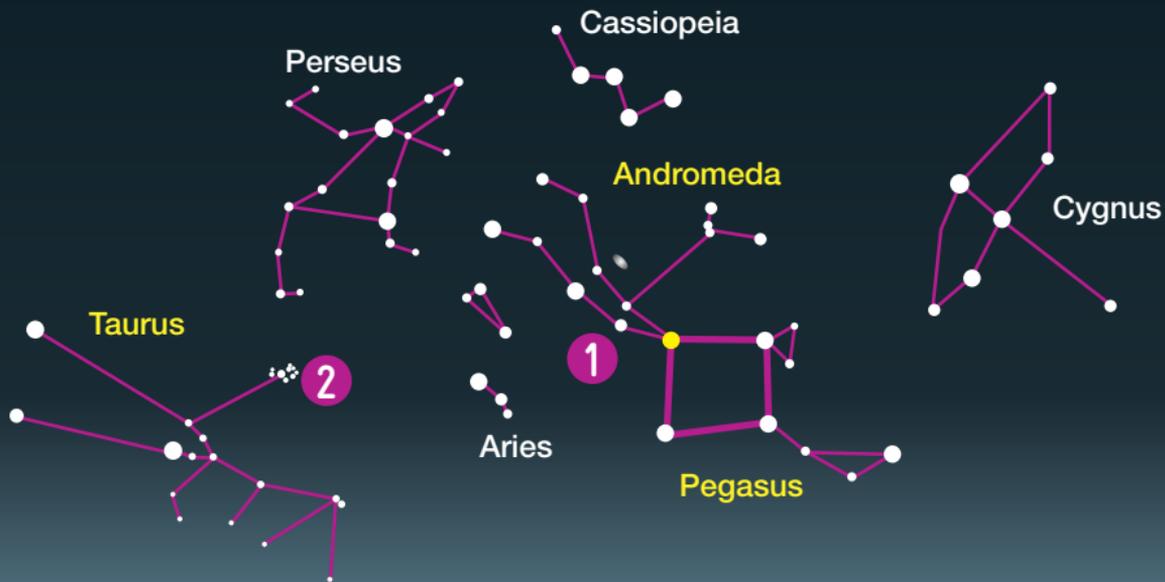
## WHAT TO LOOK FOR

- 1 Algol, the Winking Demon star in Perseus, appears to dip in brightness for 10 hours every two days, 20 hours and 49 minutes. This is an example of an eclipsing binary system where one star periodically blocks some of the light of the other.
- 2 Can you spot Cepheus? It looks like a child's drawing of a house.
- 3 Can you find Capella, the brightest star in the Auriga constellation? Although it looks like one star, it's actually made up of two stars which appear very close to one another.

## DID YOU KNOW?

Stars twinkle because some of the light coming from them is disturbed as it passes through the Earth's turbulent atmosphere.

# LOOKING SOUTH





OCTOBER–DECEMBER



LOOKING SOUTH



EARLY EVENING

## WHAT TO LOOK FOR

- 1 The wedge-shaped constellation of Andromeda appears to spread out of the top left corner of the Great Square of Pegasus. The upper left star in the square is called Alpheratz and officially belongs to Andromeda rather than Pegasus!
- 2 Can you spot the Seven Sisters star cluster, also known as the Pleiades, in Taurus? If you have good eyesight you should be able to see more than seven stars here. Using binoculars, you should see more than 50!

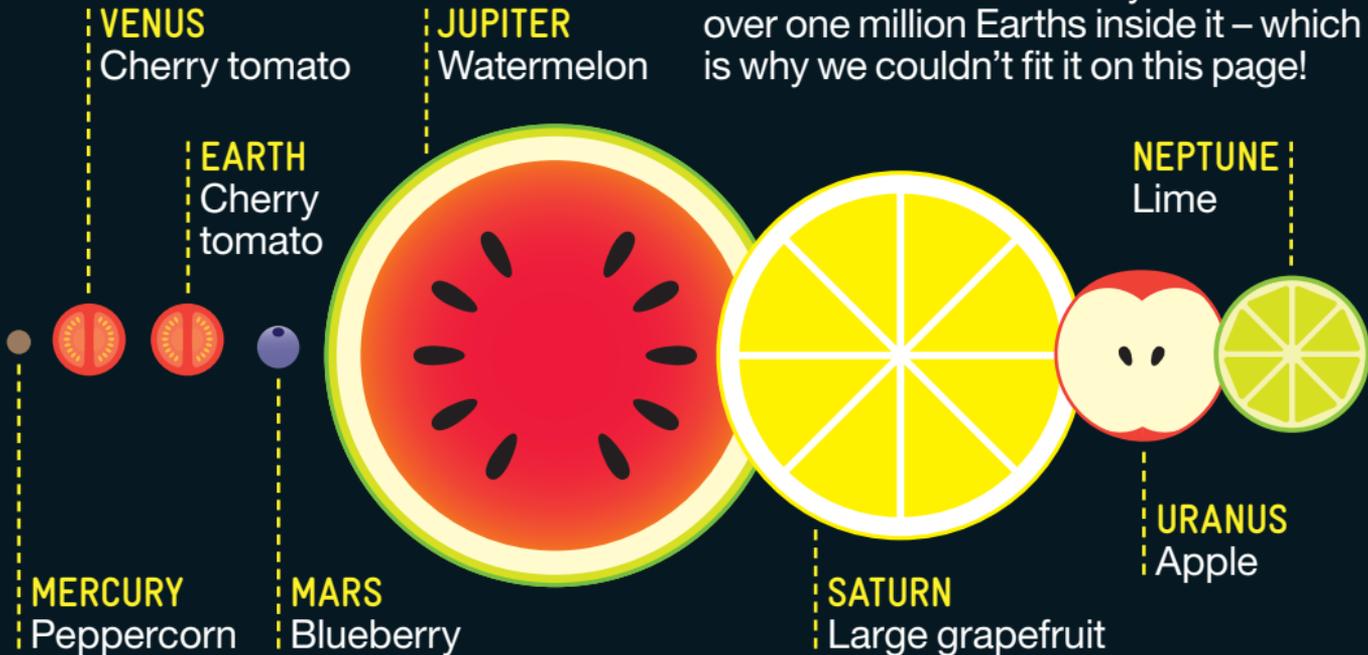
## METEOR WATCH

The Leonid meteor shower peaks on 17–18 November and the Geminid meteor shower peaks on 13–14 December.

# SPACE STATS!

## HOW BIG ARE THE PLANETS?

Here are the relative sizes of the other planets in our Solar System if the Earth was the size of a cherry tomato! The Sun is so enormous that you could fit over one million Earths inside it – which is why we couldn't fit it on this page!



## HOW BIG IS SPACE?

THE SUN

EARTH

← 1 AU →



- The distance between the Sun and the Earth is defined as one astronomical unit or AU.
- Average distance from the Sun to Neptune is 30 AU.

THE SUN

PROXIMA  
CENTAURI

← 271,000 AU →



- Our next nearest star, Proxima Centauri, is 271,000 AU away from the Sun.
- Our galaxy, the Milky Way is approximately 6,300,000,000 AU across.

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# STARGAZING LIVE.

## MOON GUIDE 2012



The Open  
University



# THE MOON

**The Moon is our nearest neighbour in space. It is a stark, barren world with no atmosphere and measures 2,160 miles across. It lies approximately 239,000 miles from Earth, and is big, bright and easy to find when it is in the night sky.**

Through binoculars or a telescope, the best views to be had are close to the terminator – the line that divides the sunlit portion of the Moon's surface from the unlit part. Features such as craters cast impressive shadows when they are close to the terminator, making them much easier to see.

The dark patches visible on the Moon's surface are known as seas (or maria) but are nothing like Earth's seas. On the Moon they are vast fields of solidified lava from ancient volcanic eruptions.

## DID YOU KNOW?

It takes 29.5 days for the Moon to go through a complete set of phases, which is the basis of the length of our months – the word for which derives from moon.



# PHASES OF THE MOON



The Moon's rotation keeps pace with its orbit round the Earth, which means that the same side of the Moon (the near side) faces the Earth at all times. The amount of the illuminated surface we can see from Earth changes as the Moon moves round the Earth and gives us the lunar phases.

## BEST TIMES TO SEE

- 1 Spring, early evening
- 2 Winter, middle of the night
- 3 Autumn, early morning

# WHAT YOU CAN EXPECT TO SEE

The detail you'll see depends on the equipment you use. For the most detailed view the best time to look at the Moon is when it's not full.

## 1 NAKED EYE

Moon phases and lunar maria.

## 2 BINOCULARS OR SMALL TELESCOPE

Maria, large craters, mountain ranges and valleys.

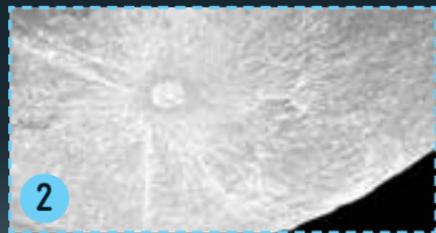
## 3 LARGE TELESCOPE

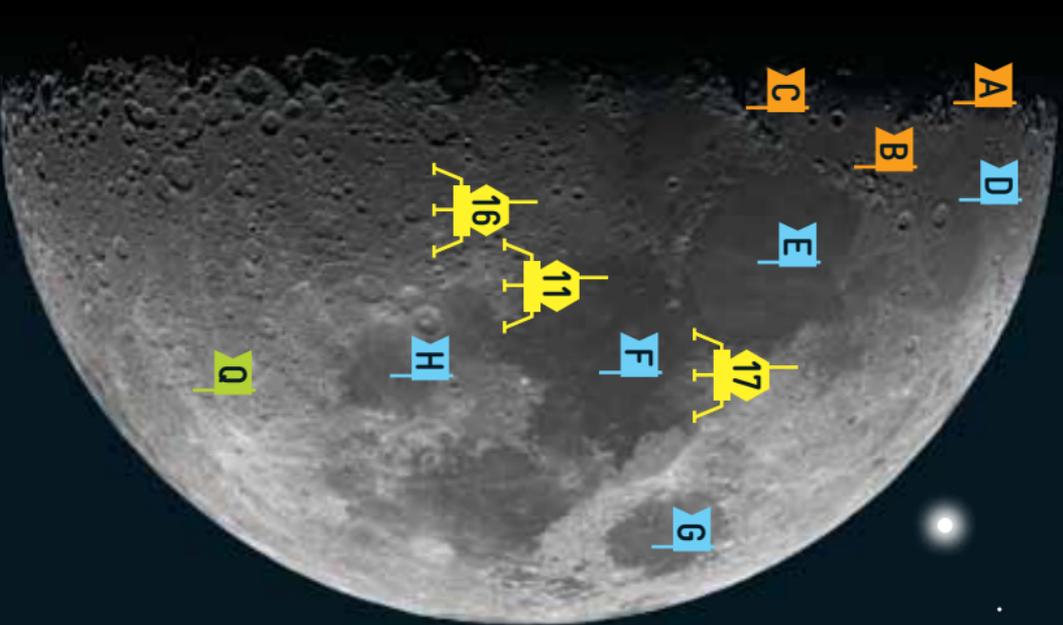
Details within craters, cracks in the Moon's surface, mountains and sinuous rilles (channels).



# FEATURES OF THE MOON'S SURFACE

- 1 Craters are the result of impacts by asteroids and comets on the Moon's surface. Large craters often contain a central mountain complex like Aristillus (right). The largest craters are hundreds of miles across.
- 2 Relatively new craters sit in the centre of bright rays, which show up best when the Sun is overhead. These are formed by material blasted out from the impact that formed the crater.
- 3 There are lots of mountains on the Moon. Some poke up through flat lava as single peaks, while others occur in vast ranges. The Moon has Alps too, as the lunar ranges take their names from those on Earth.





# MOON ATLAS

## FIRST QUARTER MOON

### MOUNTAINS SEAS

- A Alps
- B Apennines
- C Caucasus

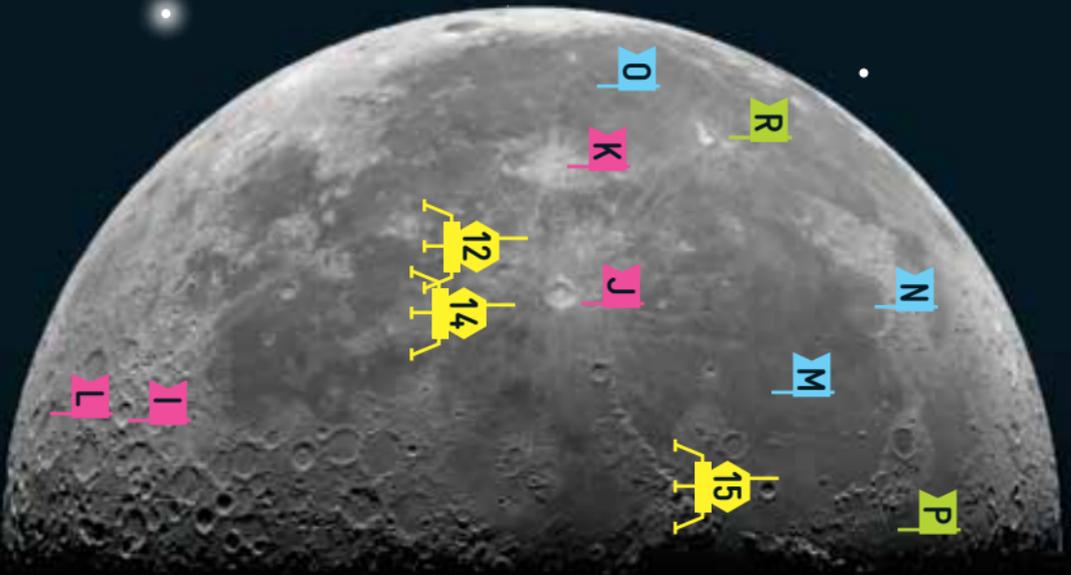
- D Mare Frigoris
- E Mare Serenitatis
- F Mare Tranquillitatis

- G Mare Crisium
- H Mare Nectaris



Apollo landings

Rotate and start to explore some  
of the Moon's landmarks



## LAST QUARTER MOON

### CRATERS

I Tycho  
J Copernicus  
K Kepler  
L Clavius

### SEAS

M Mare Imbrium  
N Sinus Iridum  
O Oceanus  
Procellarum

### VALLEYS

P Vallis Alpes  
Q Vallis Rheieta  
R Vallis Schröteri

# OTHER MOONS IN OUR SOLAR SYSTEM

**The Moon is the Earth's only natural satellite. Apart from Mercury and Venus, all the other planets in the Solar System have their own moons.**

Jupiter has more than 60 but only four can be seen easily through a small telescope. These are known as the Galilean moons in honour of their discovery by Galileo Galilei in 1610.

In order of distance from Jupiter, the Galilean moons are Io, Europa, Ganymede and Callisto. Ganymede is the largest moon in the Solar System. With a diameter of 3,273 miles, it's larger than the planet Mercury!

## FIND OUT MORE

Has the Moon grabbed your attention? Explore our nearest neighbour with The Open University's free online study material about the Moon. Go to **[bbc.co.uk/stargazing](https://www.bbc.co.uk/stargazing)** and follow the links.



# MOON-SPOTTING CHALLENGE

**In 2012, Jupiter starts the year in the constellation of Aries and later moves to Taurus. Saturn starts the year in Virgo and ends it in Libra. Flip to our Star Guide to find these constellations.**

- 1** Using binoculars, can you spot the Galilean moons around Jupiter? Take a look two hours later – you may see that they have moved slightly as they progress around their orbit. This is what prompted Galileo to accept that the planets orbit the Sun in the same way.
- 2** Saturn also has more than 60 moons, a number of which can be seen through small telescopes. Saturn's largest moon, Titan, has a dense atmosphere and is the second largest moon in the Solar System.



JUPITER'S GALILEAN MOONS



SATURN AND ITS MOONS