

Finding Your Way Around The Night Sky

When you first start trying to find your way around the night sky, it can be a bit daunting. But you can use some of the better known star patterns to help you to find other stars and interesting objects.

First of all, a bit of an explanation about the sky is divided up. In the same way that Earth is divided into latitude and longitude, the sky is also divided up and this helps us to find our way around it. Instead of latitude and longitude, the sky is divided into altitude and azimuth and both are in units of degrees ($^{\circ}$). Altitude refers to how high something is in the sky in relation to the horizon. The point directly above your head is called the zenith, and if an object is located right at the zenith, its altitude is 90° . If something is on the horizon, it would be 0° . When an object is below the horizon it has a negative value. So if you see that the International Space Station or a planet is at an altitude of 45° you know to look about half way between the horizon and zenith. Azimuth refers to how far around the sky something is from the North. Imagine the entire sky is a huge sphere around Earth. That sphere is divided into degrees, and there are 360° in total. If something is directly North it has an azimuth of 0° ; if it is East, it would be 90° ; if it is South it would be 180° ; if it is West it would be 270° . If you know the altitude and azimuth of an object, it is very easy to locate it in the night sky.

You can use your hand to measure approximate distances in the sky. This diagram shows you how:

MEASURE THE SKY WITH YOUR HAND

Outstretch your arm and measure the angular measurement of sky objects. This is a good approximate figure whatever size your arms and hands are.

- Moon & Sun = $\frac{1}{2}^{\circ}$** : A hand with the index finger pointing up, measuring a distance of 1° between two points.
- Plough**: A hand with the index and middle fingers spread, measuring a distance of 5° between the stars Merak and Dubhe.
- Height of Orion = 20°** : A hand with the index and middle fingers spread, measuring a distance of 10° between two points in the constellation Orion.
- Square of Pegasus**: A hand with the index and middle fingers spread, measuring a distance of 15° across the Square of Pegasus.
- Plough**: A hand with the index and middle fingers spread, measuring a distance of 25° across the Plough constellation.

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In addition to knowing the celestial coordinates, you can use the brighter constellations to find your way around the sky. One of the most recognisable star patterns is The Plough. The Plough is an asterism which makes up part of a bigger constellation called URSA Major, or The Great Bear. This constellation is circumpolar, which means it is visible all year round. As the seasons change, it changes position in the sky, but it is always moving around Polaris, The Pole Star. Polaris never changes position. It sits in the North every night and has long been used as a navigation aid. The picture below is a long exposure photo which shows how the stars move around Polaris. This photo has a total exposure time of 1 hour and was taken in Tackley.



As you can see from the picture, the stars appear to move around Polaris at the centre of the photo.

If you look for Polaris at the North Pole, it will be directly above your head, but the further South you go, the lower in the sky it will appear to be. For us in Oxfordshire, we are at 51.88 degrees, so Polaris is approximately 52 degrees up from the horizon. Polaris is part of a quite faint constellation called URSA Minor, or The Little Bear. You can use the Plough to find Polaris. If you find the 2 stars at the edge of the “box” of The Plough, then draw an imaginary line through them and upwards, the first star you see will be Polaris. If you follow the “handle” of The Plough, it points to a very bright, red coloured star called Arcturus which is in the constellation Boötes. The picture below shows you how to find Polaris and Arcturus using The Plough.

Using The Plough to find Polaris & Arcturus



Graphic created by Mary Spicer, using pictures from www.gcseastronomy.co.uk

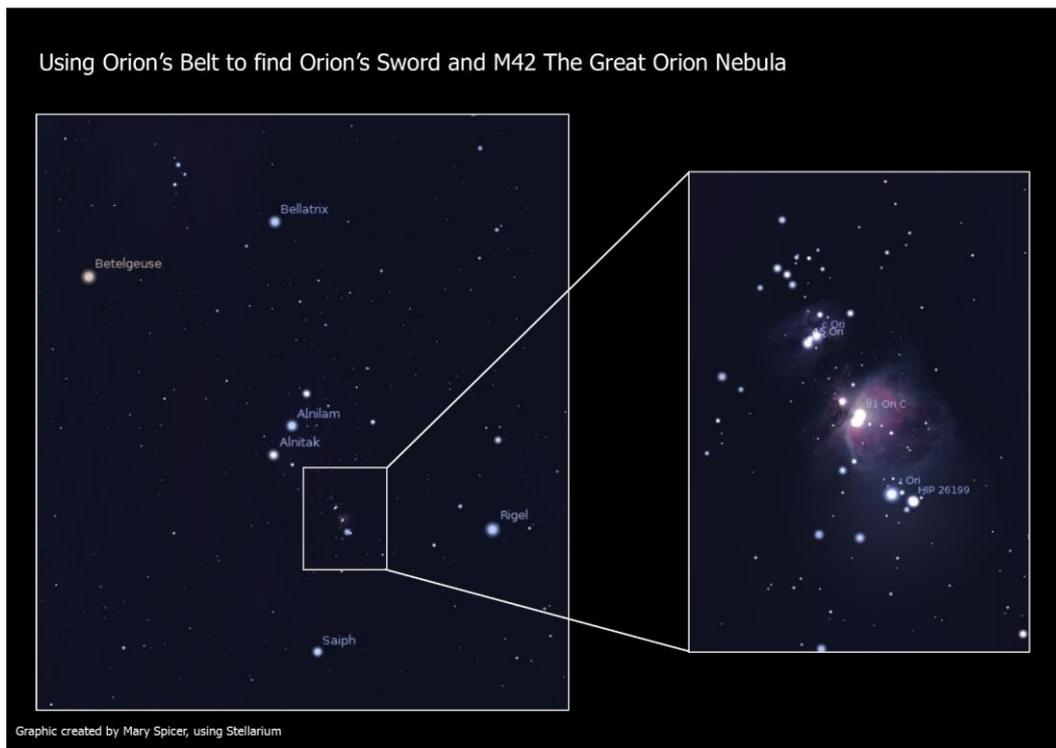
Next we will look at the constellation Orion. He sits in the Southern sky watching over us all through the winter months and is very bright and distinctive. The stars of Orion's Belt point downwards towards the brightest star in the sky, Sirius. If you follow the belt stars upwards, it takes you to Aldebaran, the brightest star in the constellation Taurus, and the beautiful little star cluster M45 The Pleiades, which is a cluster of new, bright blue stars. It is a very pretty binocular object, and long exposure photography of The Pleiades reveals some of the clouds of blue gas around the cluster.

Using Orion's Belt to find Sirius, Aldebaran & M45 The Pleiades

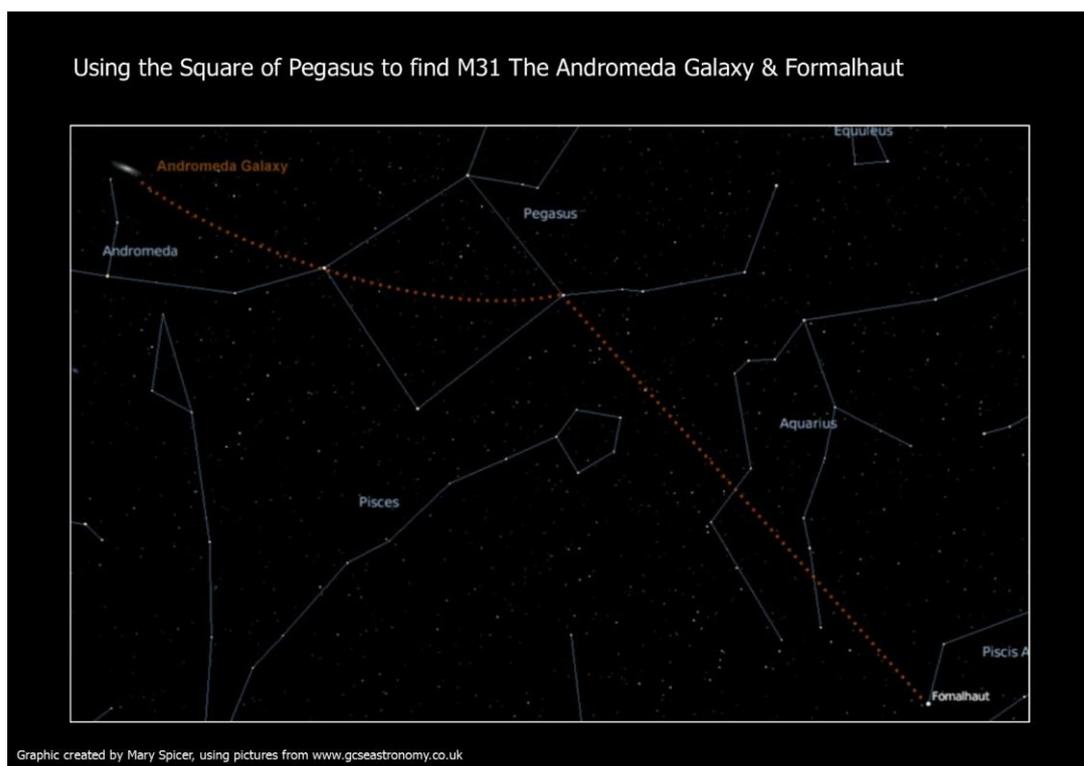


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Below the belt is a smaller row of 3 fainter stars which make up Orion's Sword. If you look at those faint stars through binoculars or a telescope, you will see that the middle star isn't actually a star at all; it is M42 The Orion Nebula. This is a huge stellar nursery where new stars are being born. It is a stunning object visually and is a firm favourite with astrophotographers!



Finally, we can use the huge Square of Pegasus to find M31 The Andromeda Galaxy. M31 is the nearest galaxy to our own galaxy, The Milky Way. It is tricky to spot with the naked eye, but it is easy to pick up in binoculars as it appears to be a fuzzy grey blob. Telescopes will pick up more detail, but once again, long exposure photography reveals its full glory. If you draw an arc from the 2 corner stars of the Square of Pegasus, and continue it upwards, it points to the Andromeda Galaxy. If you draw a line downwards, it points to the star Fomalhaut which is the brightest star in the constellation Piscis Austrinus.



I hope this gives you a good start to finding your way around the night sky. There are many smartphone apps, such as Sky Safari and Google Sky Map which allow you to point your phone at the sky it will tell you exactly what you are looking at. If you prefer to use a computer, you can download the free software called Stellarium. Once you have set your location it will show in real time exactly what you can see, and where, in the whole sky. Another essential item is a planisphere, which allows you to figure out what is visible on each night of the year.

Happy observing!

