

## **Do-it-yourself stargazing for beginners**

As people are staying at home, children are off from school and we are encouraged to maintain social distancing there is no better time to go outside on a clear night and do a bit of stargazing. That is easy to say if you are an experienced observer but to those that have never done it before it can be a bit daunting. This guide is intended for absolute beginners to follow as the first steps to understanding how to look at and appreciate the sky. Please remember the Governments guidelines when doing any activity, keep your distance from everyone and only consider going out with members of your own household.

### **What you can learn**

In this session you will be introduced to preparing for stargazing, orientating yourself, finding and recognising some constellations and getting to know some of the brighter stars. We will also look at some “deep sky” objects (things that are outside the solar system such as star clusters).

### **Getting ready**

Wrap up warm with a coat, hat scarf and gloves, if it is clear it will be cold. Stargazing is not a very physical activity so you can get colder than you think.

If possible use a red torch. Red LED headlamps are quite cheap from online suppliers but an alternative is red plastic wrapped over a normal torch. The red light preserves your ability to see in very low light conditions (called dark adaptation).

Avoid using mobile phones and particularly the torches in them, they contain a lot of blue light which defeats dark adaptation instantly.

If you can you may want to print a copy of one of the star charts attached with this document.

Read through the notes before you go out and make sure you understand them. You can also look up some of the objects on the internet to give you more background information. Take your time and don't try to see too many things in one evening, that will help you see more and remember what you have learnt.

### **Going outside**

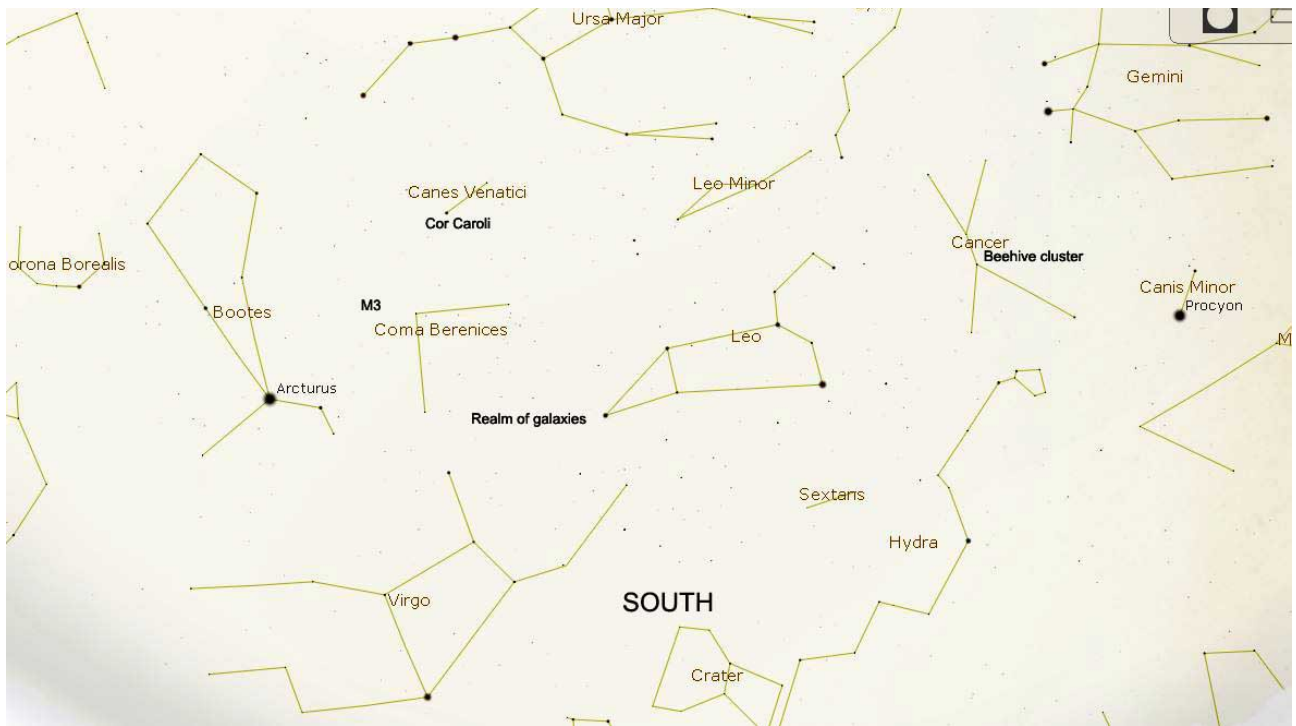
Find a spot outside where you have the best view of the sky to the south. You may want to do this in daylight. Make sure you know the cardinal points, north, south, east and west. It can also be useful to make a mental note of some object, such as a tree or building, that is exactly due south from you. A line vertically up from this point is called your meridian, when any object passes across this line it will be at its highest point. That is where the Sun will be at midday. Always start your session by facing south, this allows you to orientate yourself. If you try starting in any random direction you will just get confused.

### **Finding your first constellation**

Please use the star charts attached to this document. These notes and charts are valid from late March until the end of April from about 10pm to midnight.

Don't be in a hurry, if you take your time to carefully look at the objects in the sky the more you look the more you will see. You will start to recognise the different colours of the stars and be able to make out fuzzy patches and star clusters etc.

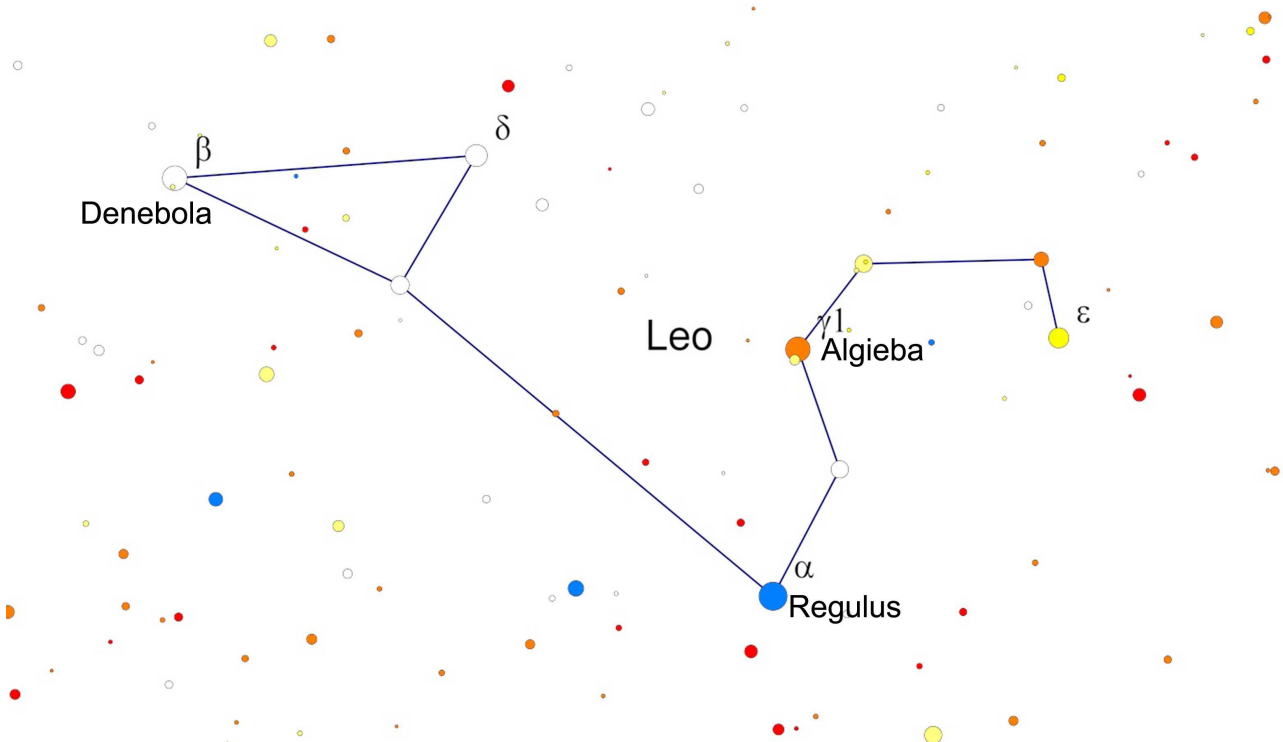
The constellations are nothing more than chance arrangements of stars whose patterns help us to recognise and remember parts of the sky. Usually the pattern looks nothing like its name but we will start with a notable exception - Leo. Have a look at the star chart below so that you can recognise the main features of the constellation.



This is a negative version of how the sky will look at around 10pm looking due south. Leo is the most prominent constellation. The other constellations around it such as Cancer and Coma Berenices are much harder to see so don't worry about those for the moment.

## Leo

Leo is quite high in the sky when due south, the bottom of the constellation is over 40 degrees above the horizon. Look for the backward question mark that is to the right of the constellation.



The bright blue star Regulus is the dot of the question mark that passes up through a small white star and orange coloured star called Algieba before hooking over to the right with three dimmer stars. Don't worry at this stage if you cannot easily see the colours. With the naked eye it can be hard at first, they are much more obvious in binoculars.

This is the head of the Lion Leo. Once you think you can see that part look for the rest of the body stretching out to Denebola on the left. The little Greek letters by each star are the technical names astronomers call them, for example Regulus is called "alpha Leonis", but it is often easier to remember the common names, most of which come from Arabic. Regulus comes from Latin and means "prince". Denebola (Beta Leonis) gets its name from the Arabic for "tail of the lion" and Algieba (gamma Leonis) comes from the Arabic for forehead.

In Greek mythology Leo represents the Nemean Lion killed by Hercules as one of his twelve labours and was one of the 48 constellations described by the 2nd-century astronomer Ptolemy.

The colour of the stars comes from their surface temperatures, which is an indication of where they are in their life cycle. Regulus has a temperature of over 12,000 degrees Celsius so is a blue colour, Denebola is just over 8000 Celsius so is more white.

Many stars have companions that were formed at the same time and orbit each other. Algieba is a showcase double and if you get a chance to look at it through even a modest telescope (although not with binoculars) you will see it consists of two stars with orange-red and yellow or greenish-yellow components.

Regulus is around 80 light years away, Denebola about 36 light years away and Algieba about 130 light years away.

## **Cancer**

Cancer is a difficult constellation to see as the stars are very dim but it is worth looking for as it contains a spectacular deep sky object the Beehive open cluster. In fact using this cluster is probably the easiest way to find the constellation. Having found Leo look to the right (south west) and a bit higher. You should quite easily be able to see the two brightest stars of Gemini, Castor (the lower star) and Pollux. If you imagine a line connecting Castor to Regulus about half way along that line you should just be able to see a hazy patch of light. That is the Beehive cluster. If you look at it through binoculars the reason for its name becomes obvious there are 4 brighter stars in a square (the hive) and a mass of tiny stars (the bees) inside it. It is also called "the manger" which in Latin is "Praesepe" (pray-see-pea). It is well over 500 light years away and contains more than 1000 stars. Open clusters are groups of stars that were born together from a massive nebula of gas and dust, in this case over 600 million years ago. The stars will usually drift apart in time. The Beehive cluster has been found to contain some Sun like stars and also some white dwarfs, they are stars that have lived their lives to the end and are now just white hot embers.

## **The realm of galaxies**

To the east of Leo and above Virgo is an area of the sky called the realm of galaxies. This is a part of the sky that is as far as one can get from the Milky Way, which in April is located close to the north west horizon, well away from where we are looking. The Milky Way is our home galaxy and full of stars, gas and dust. It is not possible to see through the galaxy into intergalactic space beyond, but it is possible to see the galaxies beyond our own by looking vertically up and away from the plane of the Milky Way. You will need a

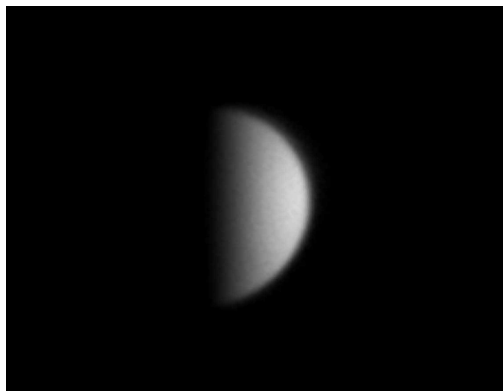
telescope and some experience to see the galaxies.

You can also try looking for Virgo, try looking for the large V shape just below and to the left of Leo.

Above Virgo in the south east you will be able to see a very bright yellow/orange star. That is Arcturus, it is what astronomers call a red giant. It is the fourth brightest star as seen from Earth and the brightest in the northern hemisphere. Arcturus is coming to the end of its 7 billion year life and although having a mass quite similar to our Sun has expanded to a diameter about 25 times larger and 170 times brighter. It has a surface temperature of around 4000 Celsius, hence the orange colour. It is just less than 40 light years away.

## **Planets**

Most of the planets are not on display this April but with one exception – Venus. Venus is the very bright white star-like object low in the west after the sun has set. It has a covering of thick white clouds that reflect the Sun's light very effectively which is why it is so bright. It has phases like the Moon which you may just see in binoculars or clearly see in a telescope.



The above picture of Venus was taken from Abergavenny on March 22<sup>nd</sup> 2020.

## **And finally-**

This short stargazing session will hopefully give you a taste of some of the wonders of the night sky in spring and an incentive to start stargazing for yourself. Of course you will realise that we have barely touched the surface and there are many many more things to see – remember it gets much easier and even more fun with practice so keep stargazing!