The Night Sky in April, 2021

The Sun and Moon

Welcome to Spring! The English poet Robert Browning published a poem called "Home Thoughts From Abroad" whilst in Northern Italy in 1845. It opens with the famous line "Oh to be in England now that April's there"! I am sure that the sight of the daffodils, the blossom on the trees and the birds in the sky is uplifting for us all after a long winter particularly the one we have just endured! Also it is not a bad month for observing since the nights are warmer but we still have a number of hours of darkness. We are now happily in British Summer Time which started on March 28th! In this newsletter, times will now be quoted in BST until October 31st. At the beginning of the month the **Sun** will rise at 06:43 and set at 19:46 BST. At the end of the month it will rise at 05:35 and set at 20:40 BST. There will be a **Full Moon** on April 27th and a **New Moon** on April 12th. We will have the pleasure of seeing a thin crescent Moon for a few days before the New Moon and a few days after it.

The Planets

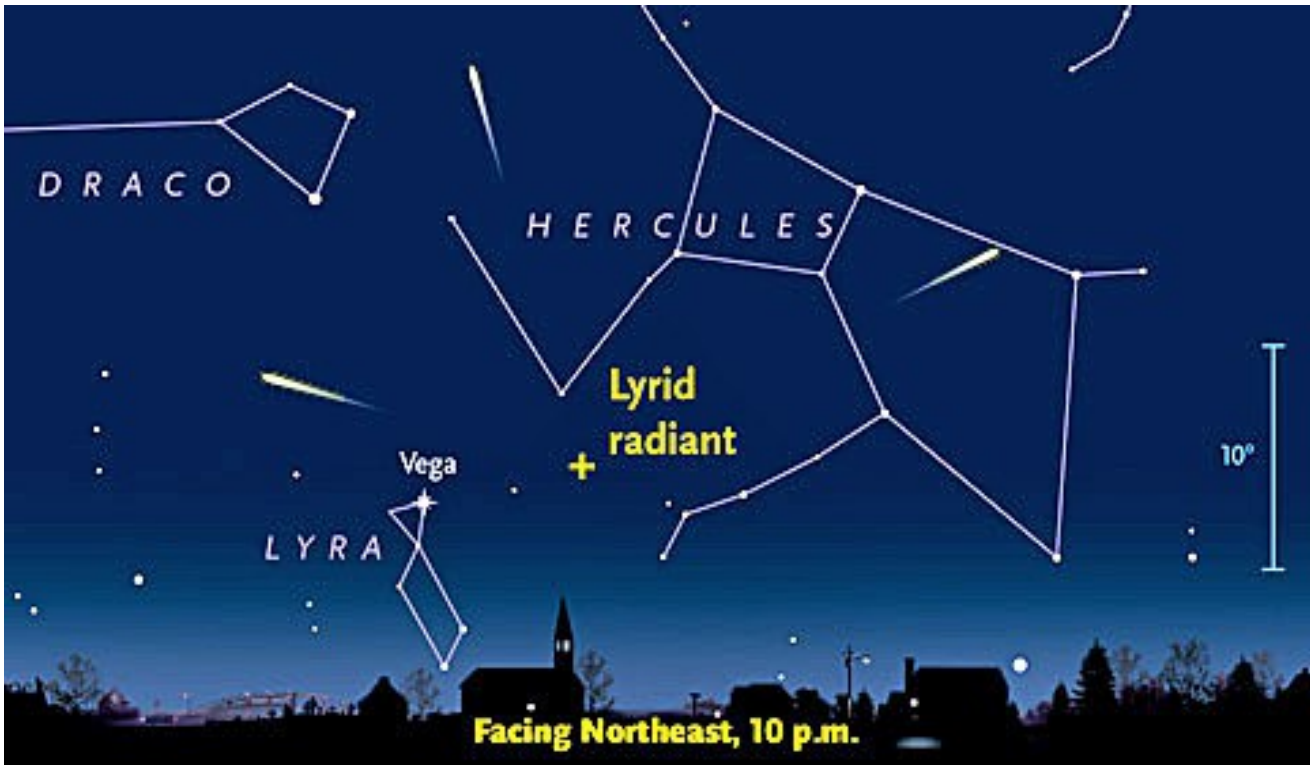
This year, April is not a good month for planets. Last month, **Venus** and **Mercury** were on the opposite side of the Sun from the Earth which is known as at **superior conjunction**. Of course, they are not visible to us then but they are now emerging from the eastern side of the Sun and can be glimpsed soon after sunset in the northwest. However, they will not be easy to spot. **Mars** can still be seen in the early evening throughout April. You can see it in the west as it moves from the constellation of **Gemini** into **Taurus** but it will be very faint compared with how it was at **opposition** earlier this year. That was when it was on the opposite side of the Earth from the Sun and so was at its brightest. **Jupiter** and **Saturn** can be seen low in the east in the pre dawn sky but they are not at their best. Both will improve a bit towards the end of the month. **Uranus** and **Neptune** will both be close to the Sun this month and so are not very visible.

Note that all star charts shown in this newsletter show the sky over Oxfordshire unless otherwise stated.

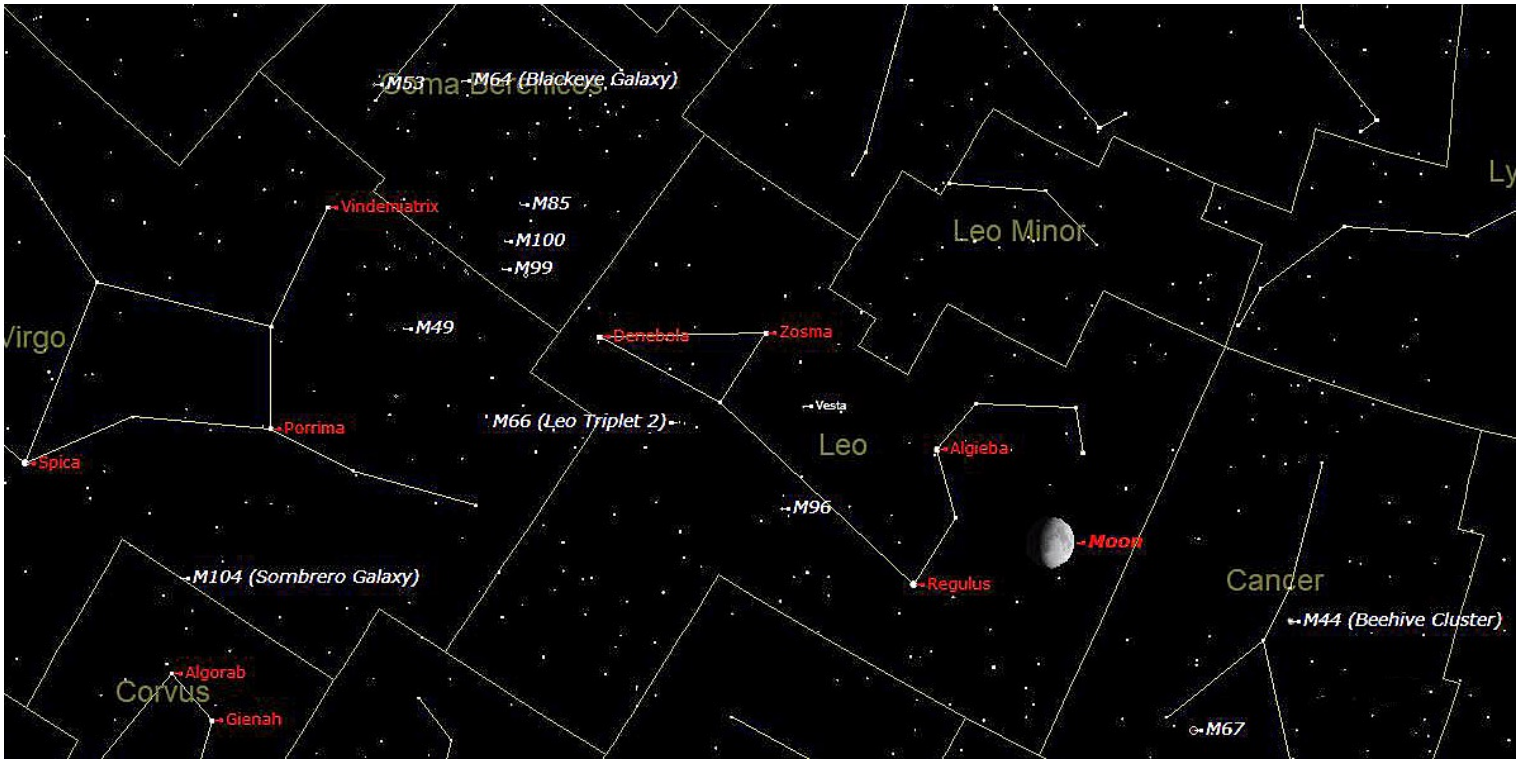
Meteor Showers

April is the month when we get to see the **Lyrids meteor shower** which is a different kind of "April shower" which may come your way!! The meteors can be observed between April 14th and April 30th but the shower will reach its peak at 14:00 on April 22nd. This is not ideal for the UK but you should be able to see Lyrids from about 10 pm onwards on that night. The star chart below shows the sky in the northeast at 10pm (courtesy of Sky and Telescope magazine). The shower is called the Lyrids because, although the meteors can be seen all over the sky, if you trace them back to their origin they all appear to come from same point in the sky called the **radiant** which for this shower is near to the constellation of **Lyra**. Hence their name. The star chart below shows the constellation of **Lyra (the Lyre)** in the bottom left of the chart. It can be found easily because of its bright star **Vega** which is the 5th brightest in the sky and the 3rd brightest in the northern hemisphere. In fact it is the brightest star in our sky and a dazzling sight in the Summer months. Above Lyra and to the right of the chart is the constellation of **Hercules** which is named after the Roman mythological hero who was called Heracles in Greek mythology. In the top left of the chart you can see the constellation of **Draco** the Dragon which is a circumpolar constellation and so is quite close to the north pole and the pole star **Polaris**. Draco is not a particularly distinctive constellation apart from the four stars that form the

head of the dragon which can be seen in the image. This is a famous **asterism** caleed the **Keystone**. An asterism is a distinctive pattern of stars which do not form a constellation.

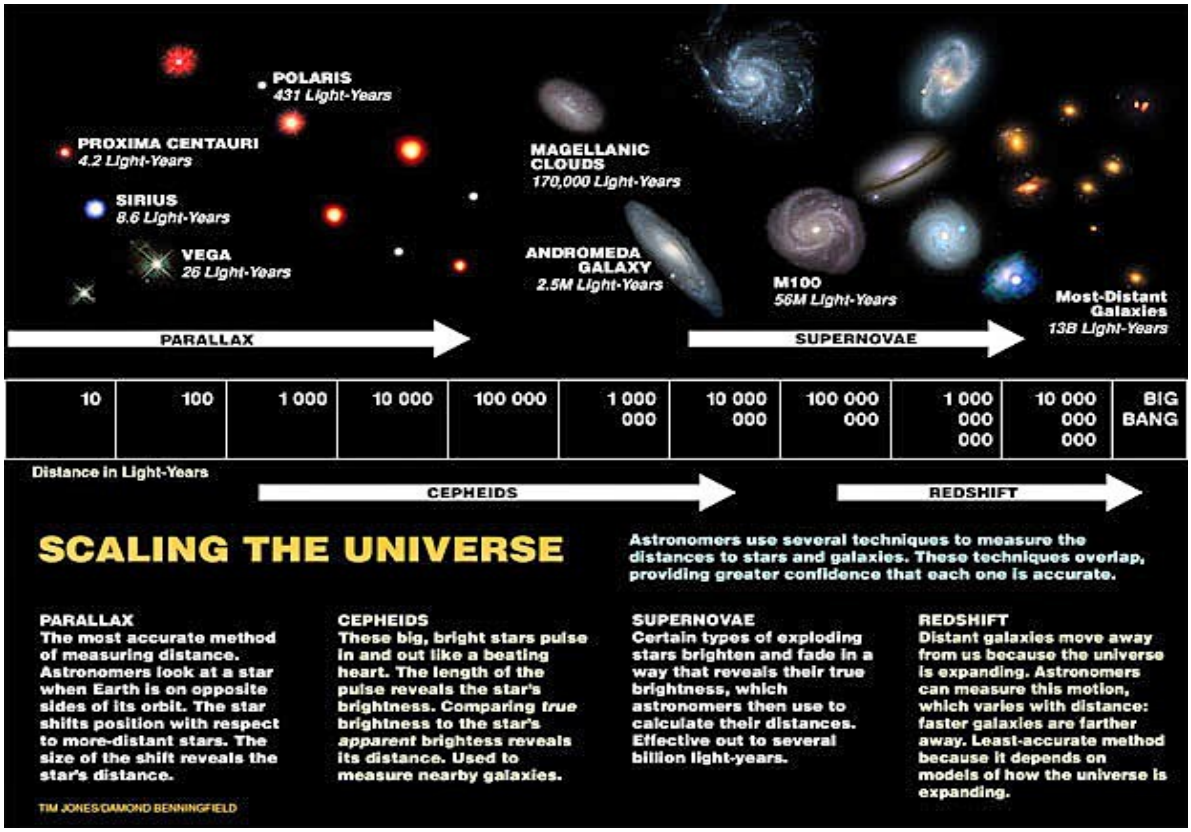


The Lyrids are medium speed meteors and are produced when the Earth passes through the debris left by the comet **C/1861 G1 Thatcher** and have been observed for mor than 2,600 years. You can expect about 10 meteors per hour, however on the nights of April 21st and 22nd the view will be spoilt by the Moon. This can be seen in the star chart below which shows the sky in the southwest at 23:55 on April 21st. There you can see a bright Moon amongst the stars of **Leo the Lion**. As always meteor showers are usually best observed between mignight and dawn so if you are willing to stay up until the early hours, the Moon will have set.

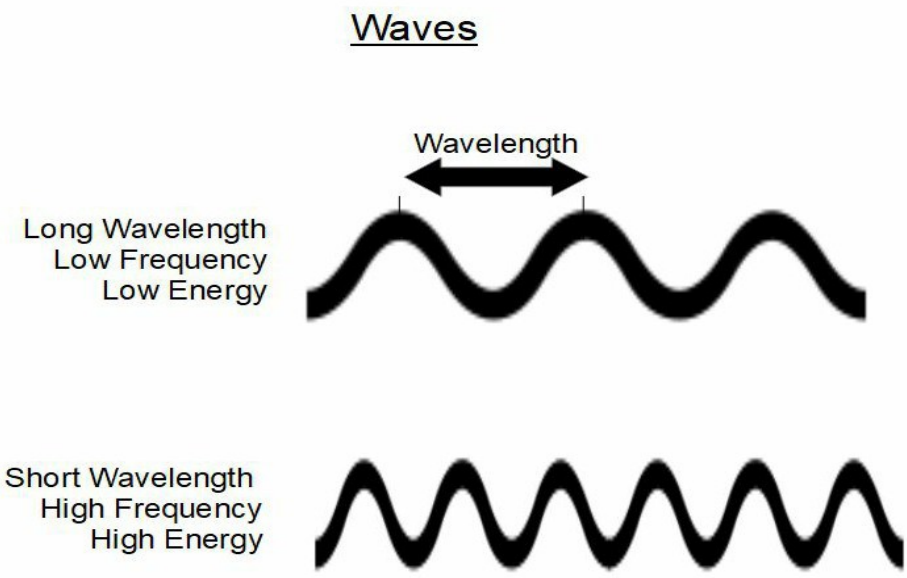


Astronomy for Dummies

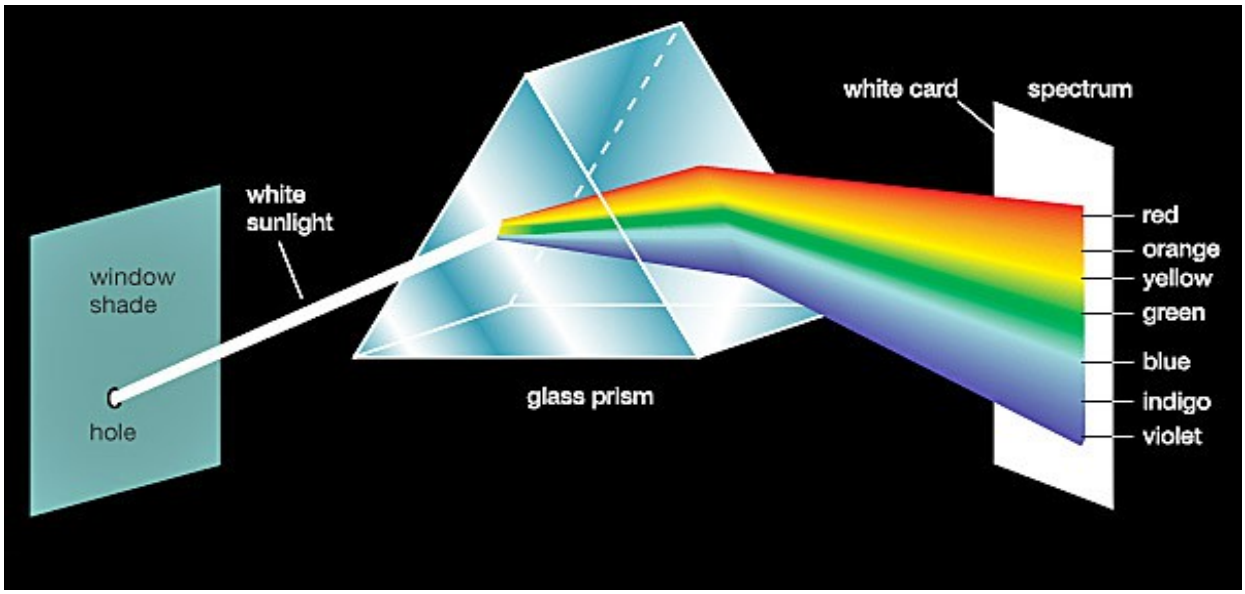
In the last few newsletters I have concentrated on responding to Andy Robertson's question which is "I (and maybe others) would be interested to know how such huge distances can be measured...and to what accuracy? How long have we been able to make such estimates?". I took this question as an opportunity to explain the distance ladder to all my readers although Andy's question is aimed at measuring huge distances. The diagram below shows a number of methods for finding distances to objects in the Universe. Which you use depends very much on the distance to the object of interest. I have already described the method of range finding using radar or lasers to measure the distance to nearby objects such as the Moon or planets. I have also described the method of parallax for finding the distance to nearby stars for example.



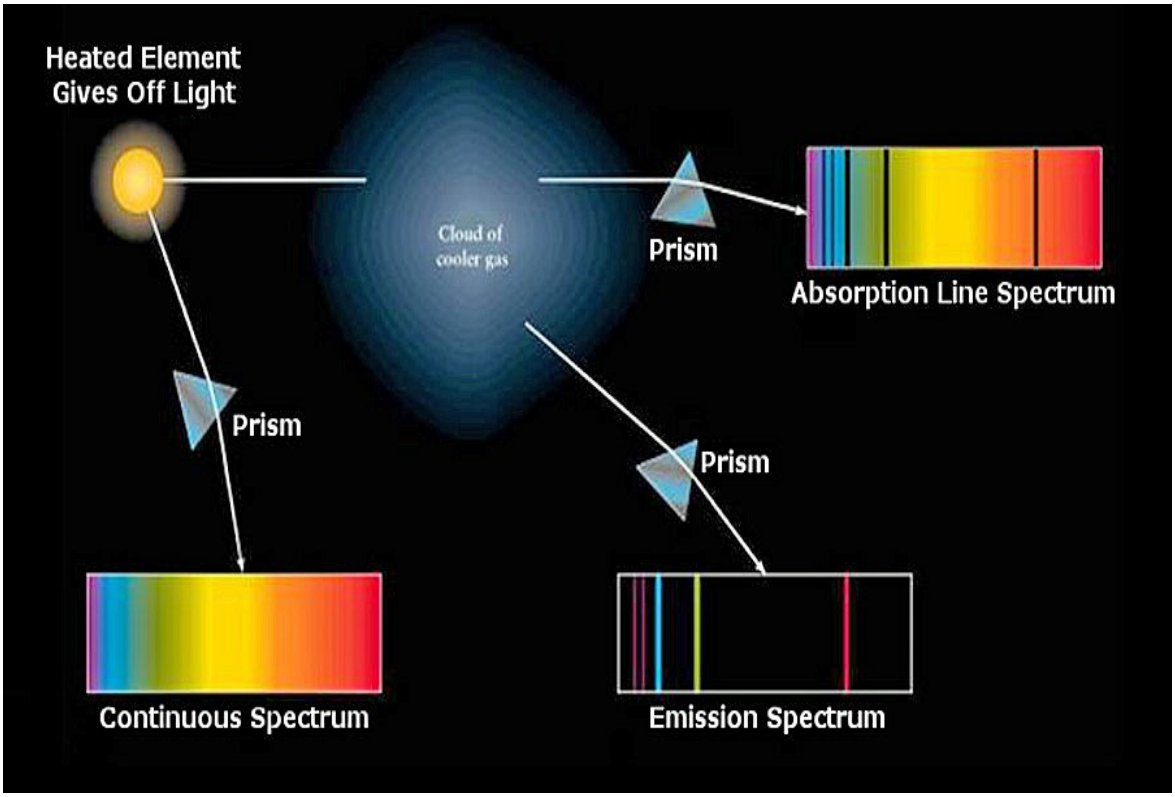
Last month I introduced the concept of a **standard candle** which is something of known brightness. If we measure the apparent brightness of an object such as a star then if we know its actual brightness it is possible to calculate the distance to it. Last month I described one standard candle which is a type of star known as a **cepheid variable**. These stars are unstable and pulsate with a regular period which is related to their brightness. So if we measure the period of pulsation of a cepheid variable then this gives its actual brightness. By measuring its apparent brightness it is possible to calculate the distance to it. If we want to measure the distance to objects even further away, say hundreds of millions of light years away then we can use a standard candle called a **Type Ia supernova.** A Type Ia supernova explosion is a special type of explosion which occurs in binary stars when one of them is a **white dwarf**. So I am now coming to the full answer to Andy's question. There are two methods used to measure the distances to very remote galaxies. One is to use standard candles and the other is to measure **redshift** which I will focus on today. First of all we have known since the 1700s that light is a wave and so, like waves in water, it has a wavelength which is the distance between the peaks of a wave. Different types of radiation have different wavelengths. Radio waves have a longer wavelength than microwaves for example.



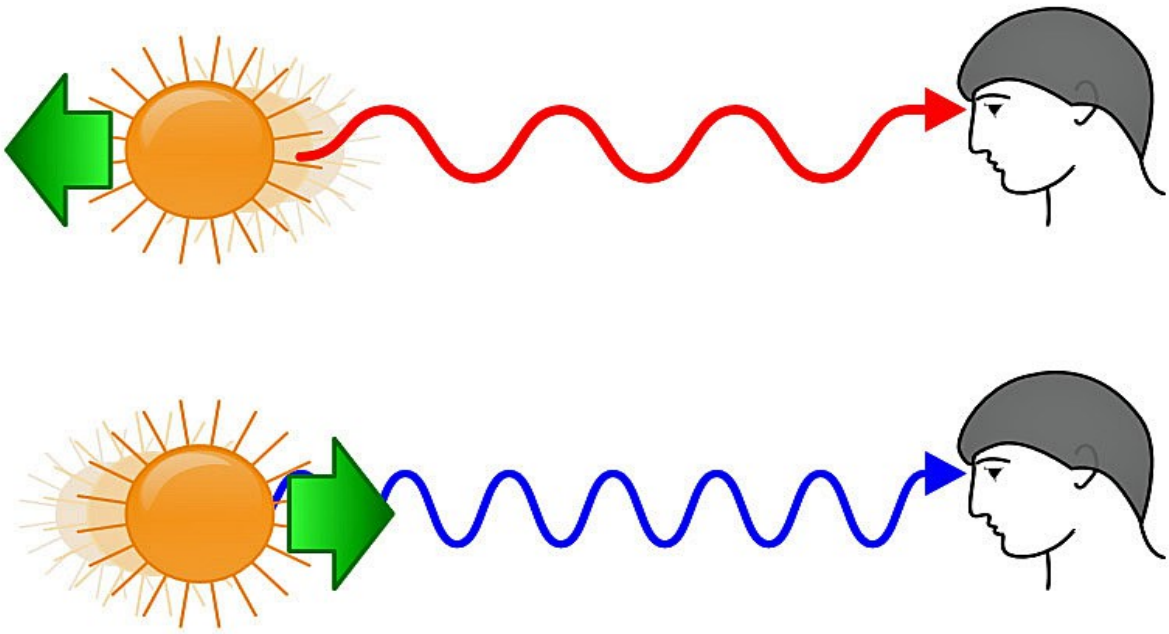
It was Sir Isaac Newton who first discovered that white light can be separated into its constituent colours. He covered a window with a blind which had a hole in it. Sunlight passed through this hole and then through a prism. The light was then projected onto a white card and it is shown in the image below that the light is split into its constituent colours that is the “colours of the rainbow” red, orange, yellow, green, blue, indigo, violet. We now know that red light has a long wavelength and blue light a shorter wavelength.



The scientific term for the colours of the rainbow is a **spectrum**. It is possible to look at the spectra from various objects by using an instrument called a **spectrometer**. This has shown that there are three different types of spectrum as shown in the image below. A rainbow type of spectrum is known as a **continuous spectrum** which is produced when light passes through a prism. However if light is passed through a cloud of gas and then through a prism, an **absorption line spectrum** is produced. The **absorption lines** are shown as black lines against the coloured background of the spectrum. The position and width of these lines can be used to determine the chemical elements in the gas. Finally if molecules in a gas for example emit radiation then if this is passed through a prism an **emission line spectrum** is produced.



So far we have assumed that the object emitting the light is stationary. The image below shows what happens if the source of light is moving. If the source is moving away from the observer then the waves of light are stretched out so that the wavelength is longer. This means that the light emitted is redder i.e it has shifted towards the red end of the spectrum. This is **redshift**. If the source of light is moving towards us then the waves of light are squashed closer together and the wavelength is shorter. This means that the light emitted is bluer i.e it has shifted towards the blue end of the spectrum.



If we use a spectrometer to look at the light coming from a distant star then this is equivalent to looking at light which has passed through a cloud of gas and then through a prism since the star is surrounded by a halo of gas. Thus we see an absorption spectrum with black lines superimposed on it. The usual positions of these absorption lines are known from laboratory experiments so that if the lines are shifted towards the red end or blue end of the spectrum then we know that the star is moving away from us or towards us.

In 1929 Edwin Hubble was the first to report that the light from distant galaxies was redshifted. He also showed that the redshift increased with increasing distance, He generalized this into what is now known a **Hubble's Law** which effectively states that the greater the redshift the greater is the distance to the star or galaxy and the greater is its velocity of recession. Tis is illustrated in the image below. It is estimated that this method of finding the speed of recession is accurate to within 5 Kms/sec. Well I hope that answers Andy's question satisfactorily. It has certainly kept me interested and busy so thank you for that!

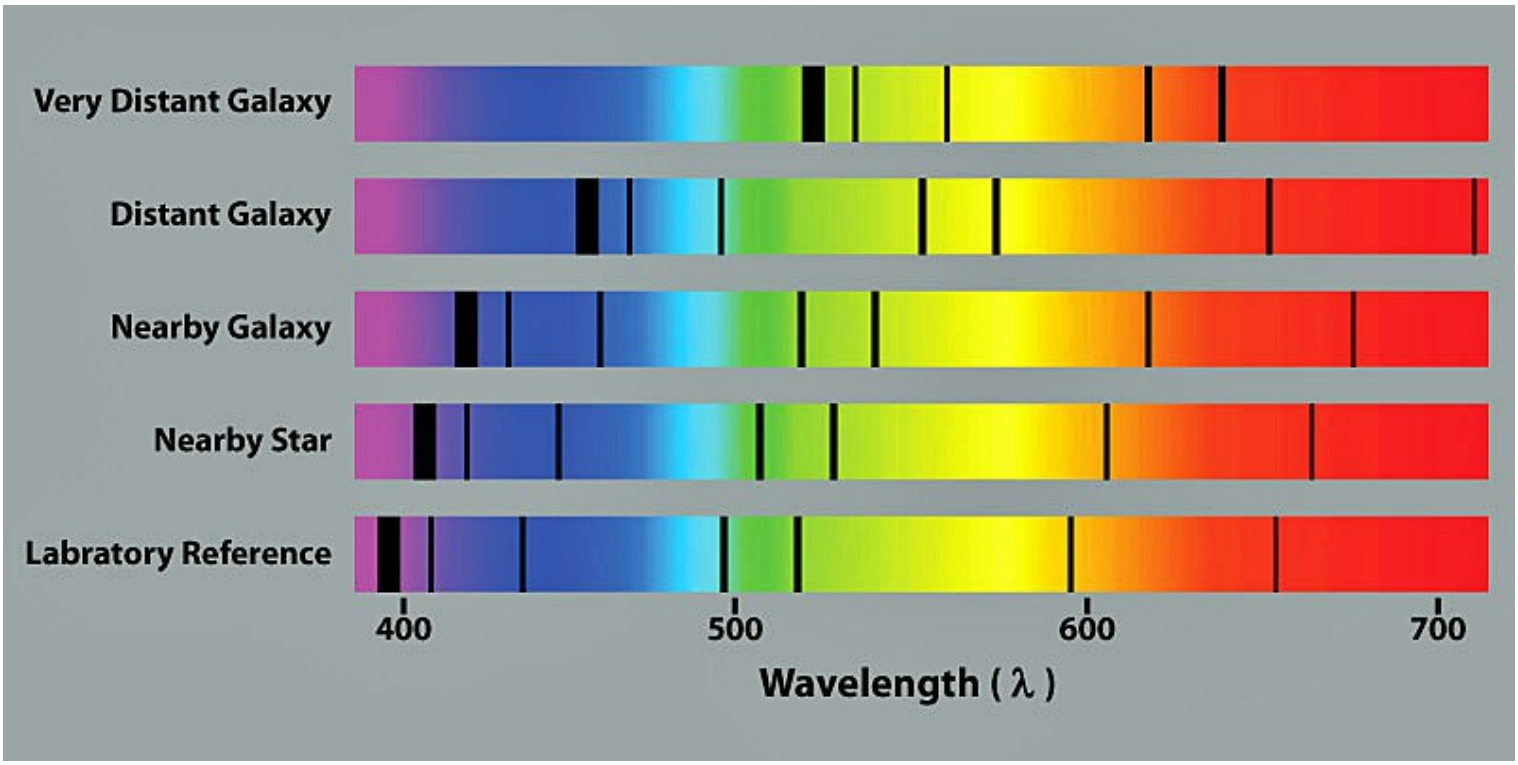
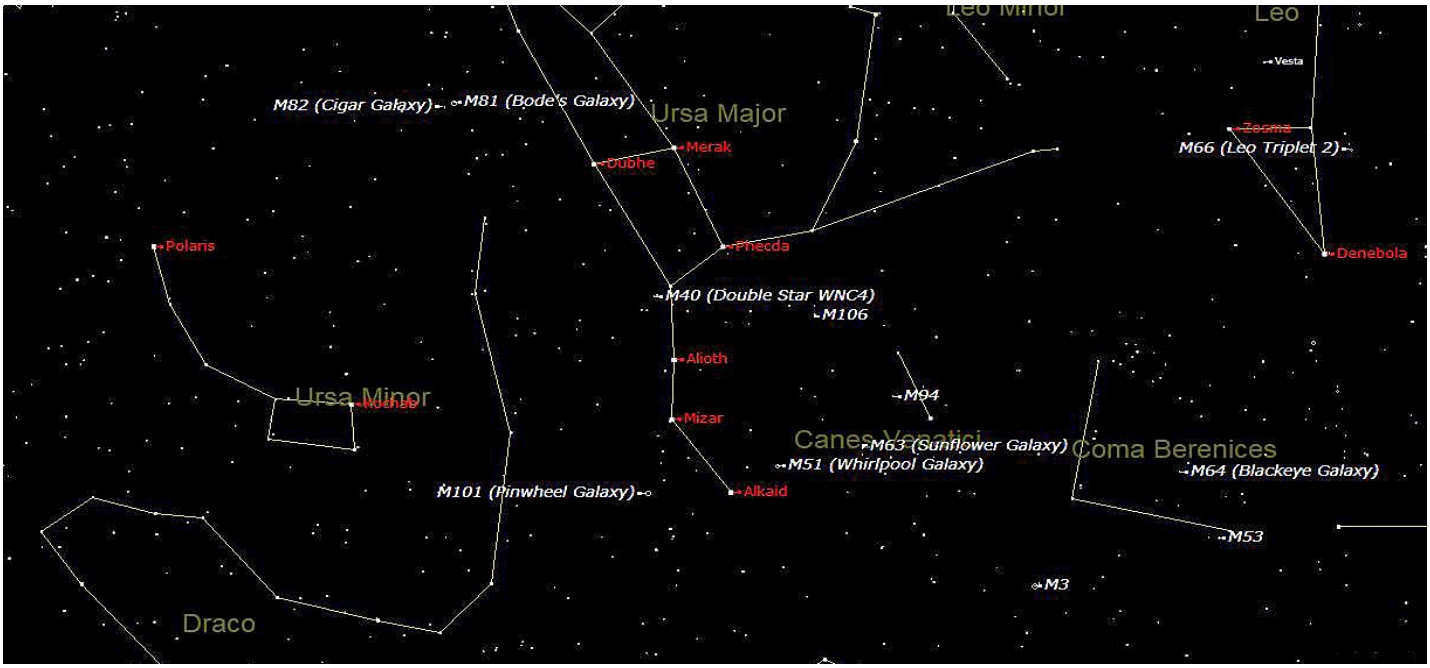


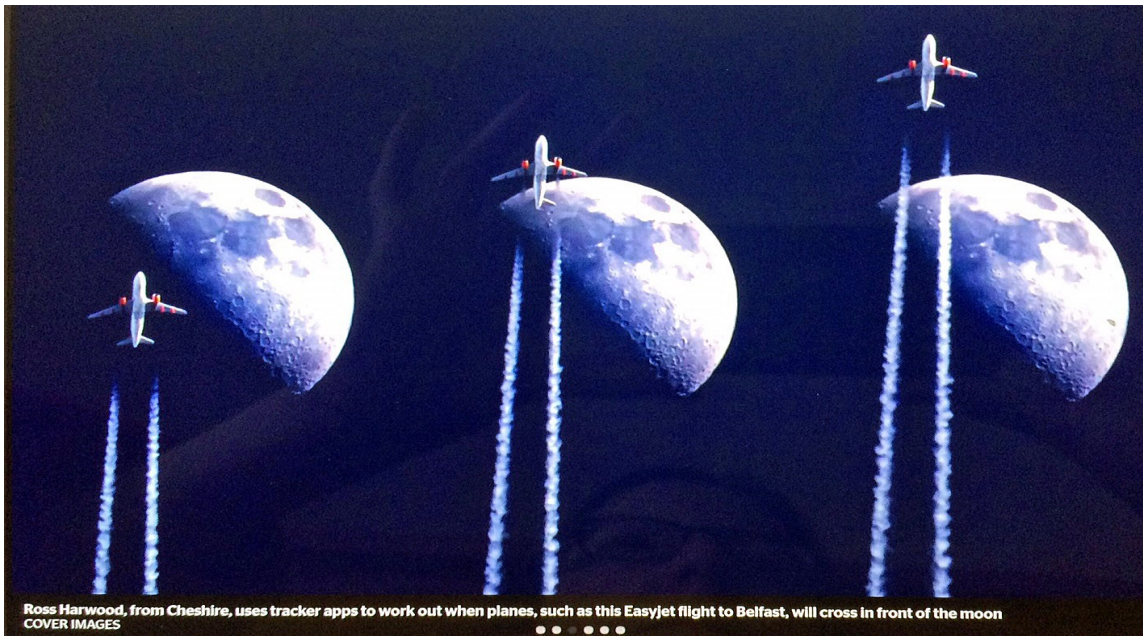
Image of the Month

Roland Gooday is continuing to be active in astrophotography as you will see if you visit his Facebook page. He recently took the wonderful image below of the **Whirlpool Galaxy** (**M51** – number 51 in the Messier catalogue). Wow!!

You can find M51 in the region of the Plough. The star chart below shows the sky in the northeast at 23:00 on April 20th 2021. This happens to be my birthday (no presents required)! On the left of the image you can see the pole star **Polaris** and the constellation of **Ursa Minor** (the little Bear). To the right of this you can see the Plough in the constellation of **Ursa Major** (the great Bear). In this region you can see a number of Messier objects including the **Whirlpool Galaxy M51**. This is a good region to search around if you have a telescope.



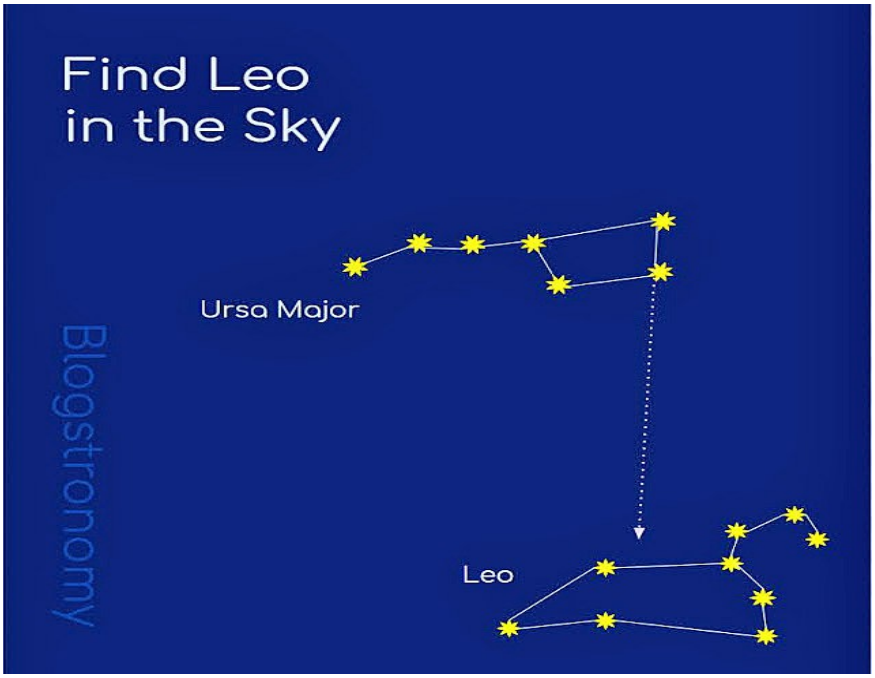
Andy Robertson sent in this image of an aeroplane crossing the Moon! It was published in the Times recently. I have seen a number of images of aeroplanes supposedly crossing the Moon but this is definitely the best. It certainly has wow factor!



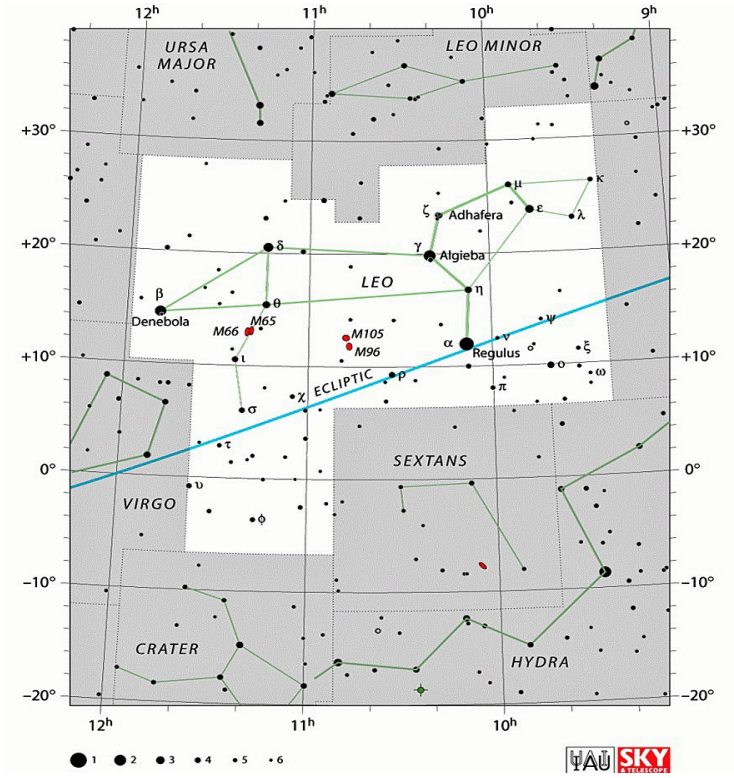
Many thanks to Roland and Andy.

Constellation of the Month

In recent months I have described the 6 circumpolar constellations in the northern hemisphere. After that I described the constellations of **Perseus** and **Andromeda**. Last month I focussed on the constellation of **Boötes the Herdsman**. This month I will focus on the constellation of **Leo the Lion.** The image below shows you just how easy it is to find Leo from the Plough. The two stars which form the outer edge of the bowl of the Plough can be used to find the pole star Polaris. If you follow a line upwards in the image, the first bright star you will see is Polaris. If you follow that line in the opposite direcion you will find the constellation of Leo as shown in the image.



Leo is a large and distinctive constellation in the northern hemisphere in Spring. As can be seen in the chart below, the stars in the head of the lion form a shape like a backwards question mark and is an **asterism** called the **Sickle**. An asterism is a distinctive pattern of stars which do not form a constellation. The most famous asterism is the Plough which forms part of the constellation of Ursa Major. At the base of the head of Leo is **Regulus**, the brightest star in this constellation, also known as Alpha Leonis. It is a bluish white binary star and the two stars can be seen separated in binoculars. Note that Leo is one of the constellations of the zodiac since it lies on the ecliptic. At the base of the lion is the star **Denebola** the second brightest star in the constellation which is also known as Beta Leonis. It is a bluish white star 36 light years from Earth. The name means “the lion's tail”. Leo contains many deep sky objects including Messier objects 65, 66, 95, 96 and 105. These are all bright galaxies and Messier 65, 66 and NGC 3628 are together known as the **Leo Triplet.** I hope you will enjoy browsing around this region with binoculars or a telescope.



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GoSpaceWatch

Michael Bryce is now advertising his next GoSpaceWatch Zoom presentations as shown below.Tickets are £3 pp and can be purchased from the website shown.

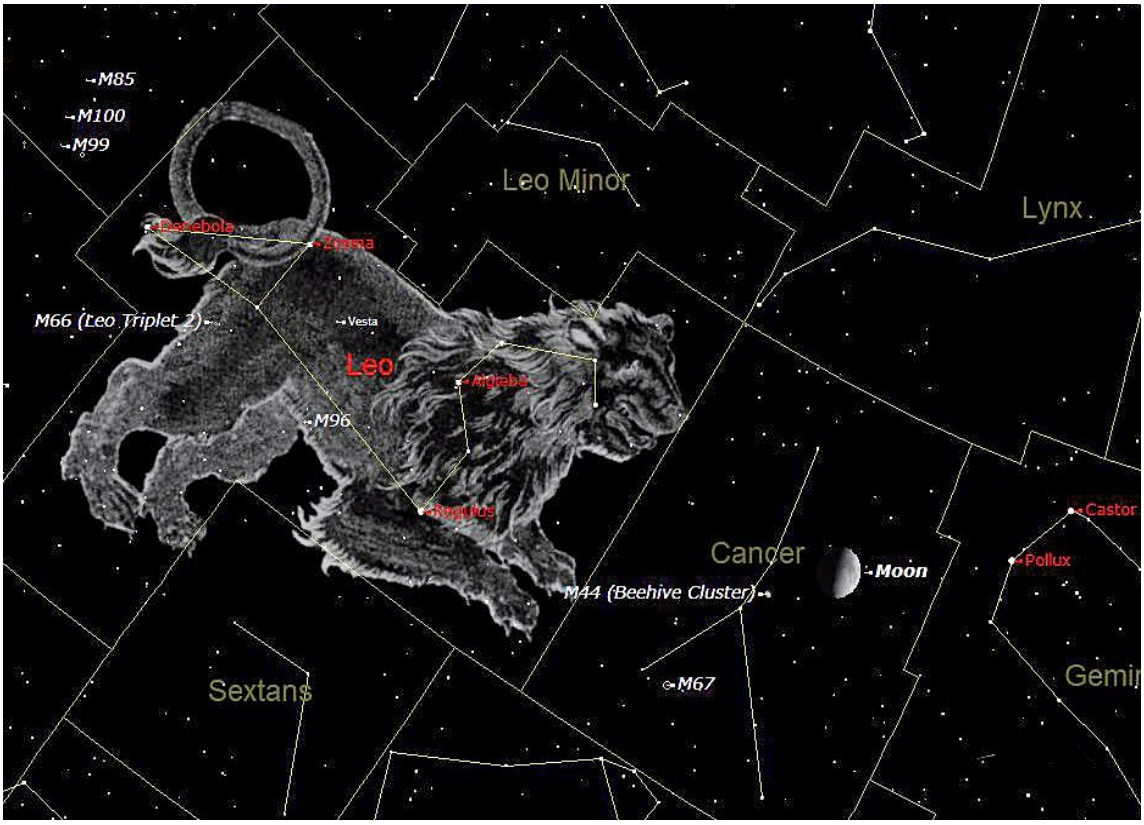
Wednesday 7th April at 7:30 BST
James Blake (PhD Student at the University of Warwick):
"The Sticky Issue of Space Debris”
Since the launch of Sputnik 1 in 1957, thousands of satellites have followed suit. The Space Age has opened up a wealth of opportunities, but sadly a great deal of mess has accrued in our wake. Fragments of space debris routinely pose a threat to active satellites and, if left untamed, may soon render certain orbital regions unusable for future generations to come. In this talk, I will look to paint a relatively current picture of the debris environment and explore the challenges and merits of potential solutions to the problem that have been proposed in recent years. I will also present some

of the ongoing efforts at the University of Warwick to detect, track and characterise artificial objects in space. Tickets: https://spacedeb.eventbrite.co.uk

Wednesday 21st April at 7:30 BST
Dr Leigh Fletcher (University of Leicester):
"The Jovian Explorers: >From Juno to JUICE"
NASA's Juno spacecraft has been orbiting the gas giant since 2016, providing exquisite views of the atmosphere of the giant planet, and discovering how atmospheric circulation in the hidden layers deep below the clouds can influence the dramatic visual changes we see through our telescopes. Whilst Juno's reconnaissance continues in the coming years, Europe is readying its first ambitious mission to Jupiter: the Jupiter Icy Moons Explorer (JUICE), which will explore the planet and its icy satellites in the early 2030s. Launching in 2022, this solar-powered spacecraft is destined to become humankind's first orbiter of an icy moon, Ganymede. This talk will reveal Juno's latest discoveries, and set the scene for JUICE. Tickets: https://junojuice.eventbrite.co.uk

What's Up in Dalian, China?

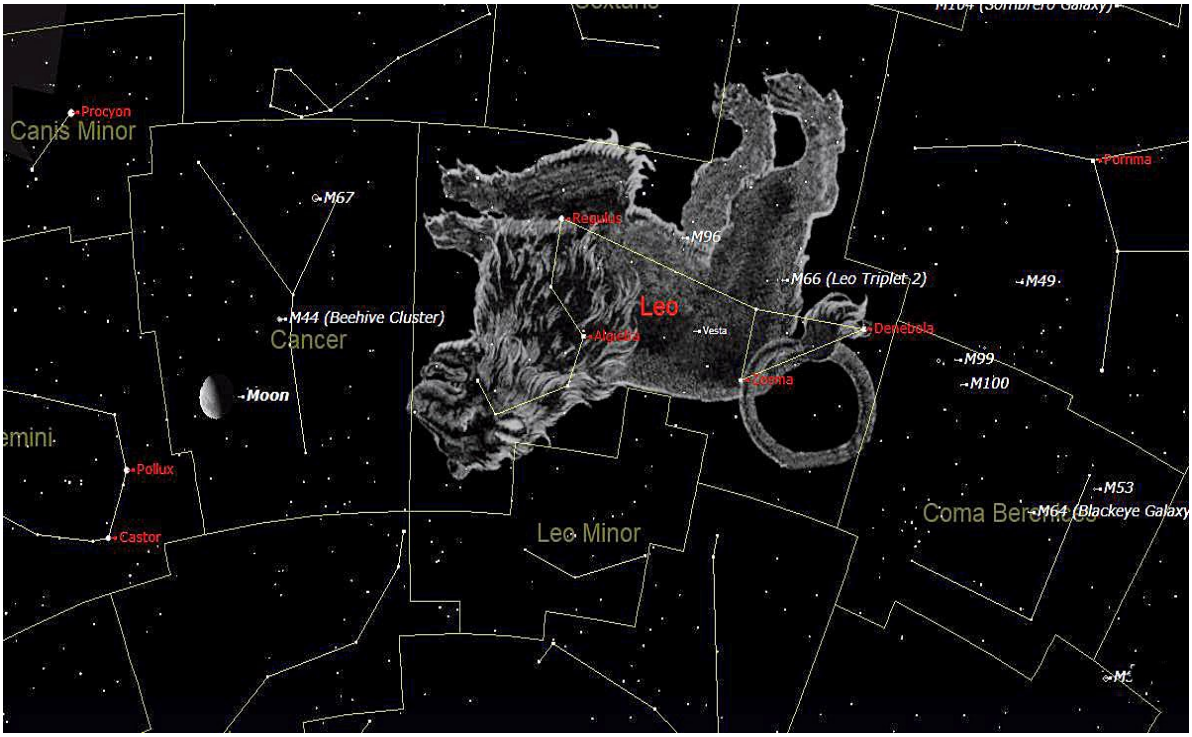
As mentioned before, you will see a very similar sky to us except that you can observe more of the southern sky than we can since you are further south. Also, since you are much further east, you will see things long before we do but at the same local time. The star chart below shows the sky in the southwest above Dalian at 23:00 on April 20th 2021. There you can see the constellation of **Leo the Lion** with the **Sickle** asterism representing the head. You can also see the **Leo triplet** of galaxies. To the right of Leo is a beautiful Moon very close to **M44** the **Beehive Cluster** which is a cluster of stars in the constellation of **Cancer**. Over to the right of the image you can see the bright stars **Castor** and **Pollux** which form the heads of the twins in the constellation of **Gemini the Heavenly Twins**.



What's Up in the Southern Hemisphere?

Sao Paulo, Brazil and Sydney, Australia

The star chart below shows the sky in the northeast over Sydney at 21:00 on April 20th. There you can see the constellation of Leo the Lion upside down! You can also see the Sickle asterism which represents the head of the lion. Above the body of Leo you can see how to find the Leo triplet of galaxies which are lovely to look at through a small telescope. To the left of Leo you can also see the Moon close to M44 the Beehive Cluster in the constellation of Cancer.



Just to remind you all that April 20th is my birthday. Since I can't party this year I hope you will all raise a glass to me!

That's all for now! Until we meet again, happy stargazing and dark skies!

Valerie Calderbank FRAS