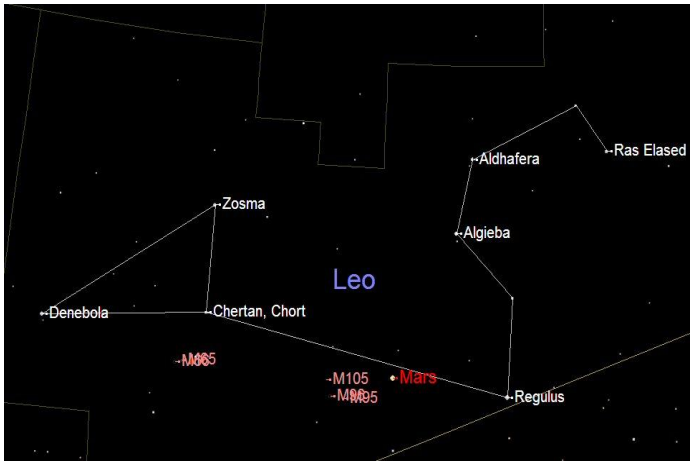
NEWBURY ASTRONOMICAL SOCIETY
BEGINNERS MAGAZINE - APRIL 2012

THE CONSTELLATION OF LEO THIS MONTH

Leo is the predominant constellation in the night sky this month and hosts two objects of major importance at the moment. The first is the planet Mars which although now past its best is still well worth a look. Mars is very easy to find because it is brighter than any of the stars of Leo and appears distinctly 'reddish' even to the naked eye.



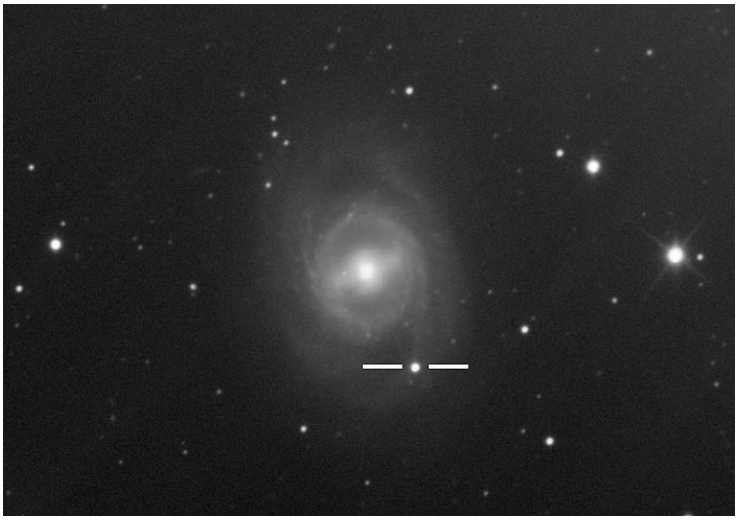
The constellation of Leo

Leo is very easy to find it is due south at 10 o'clock BST. Leo is quite distinctive with the sickle shaped pattern of stars looking much like the head of the lion that Leo represents. The 'sickle' is also described as looking like a backwards question mark (?). All the stars of the 'sickle' are quite bright but the bottom (most southerly) is noticeable brighter. This star is referred to as α (Alpha) Leonis and by its proper name Regulus. Regulus is a large blue / white star approximately 160 times brighter than our Sun and lying at a distance of 69 light years. Regulus sits virtually on the ecliptic line. This is the imaginary line along which the Sun, Moon and planets appear to move across the sky. Leo is therefore one of the 12 constellation of the Zodiac. Every 18 years Regulus is occulted by the Moon every month for a period of 18 months. The last series of occultations occurred around 2007 and the next series will be around 2024.

This year Mars is located to the east (left) of Regulus just below the imaginary line that defines the body of the lion.

Mars imaged by Steve Harris on 19th February 2012

Just to the south east of the planet Mars in the constellation Leo are the bright galaxies M95 and M96. On 16th 2012 a new supernova was discovered in M95. A supernova is a massive star that has used up most of it Hydrogen fuel and has destroyed itself in an enormous explosion.



M95 with supernova SN 2012AW between the two bars

The supernova in M95 has been officially designated SN 2012AW. It appeared to us on Earth this month but actually exploded about 38 million years ago. It has taken all that time for the light from the explosion to reach our telescopes here on Earth.

This newly detected supernova offers astronomers a rare close-up opportunity to study the evolution of a massive dying star. Although 38 million light-years sound incredibly far away, it's actually quite close as galaxies go. Most supernovae are detected in galaxies far across the universe. This supernova is still very far away and of course not a danger to Earth in any way. Yet, on a cosmic scale this explosion is almost in our backyard.

M95 is a favourite target for amateur astronomers as it quite bright for a galaxy. Usually supernovae are noticed only after they have reached their peak brightness but SN 2012AW is continuing to get brighter night by night. Astronomers hope that it can teach them about the earliest moments of the death throes of a massive star. That in turn may provide some insight into how these stars operate beneath their luminous outer layers.

Currently SN 2012AW is shining with the light of 500 million suns and will most likely get much brighter before slowly fading away over the coming months.

THE NEXT NEWBURY BEGINNERS MEETING

18th April — The Planet Venus and Using Filters

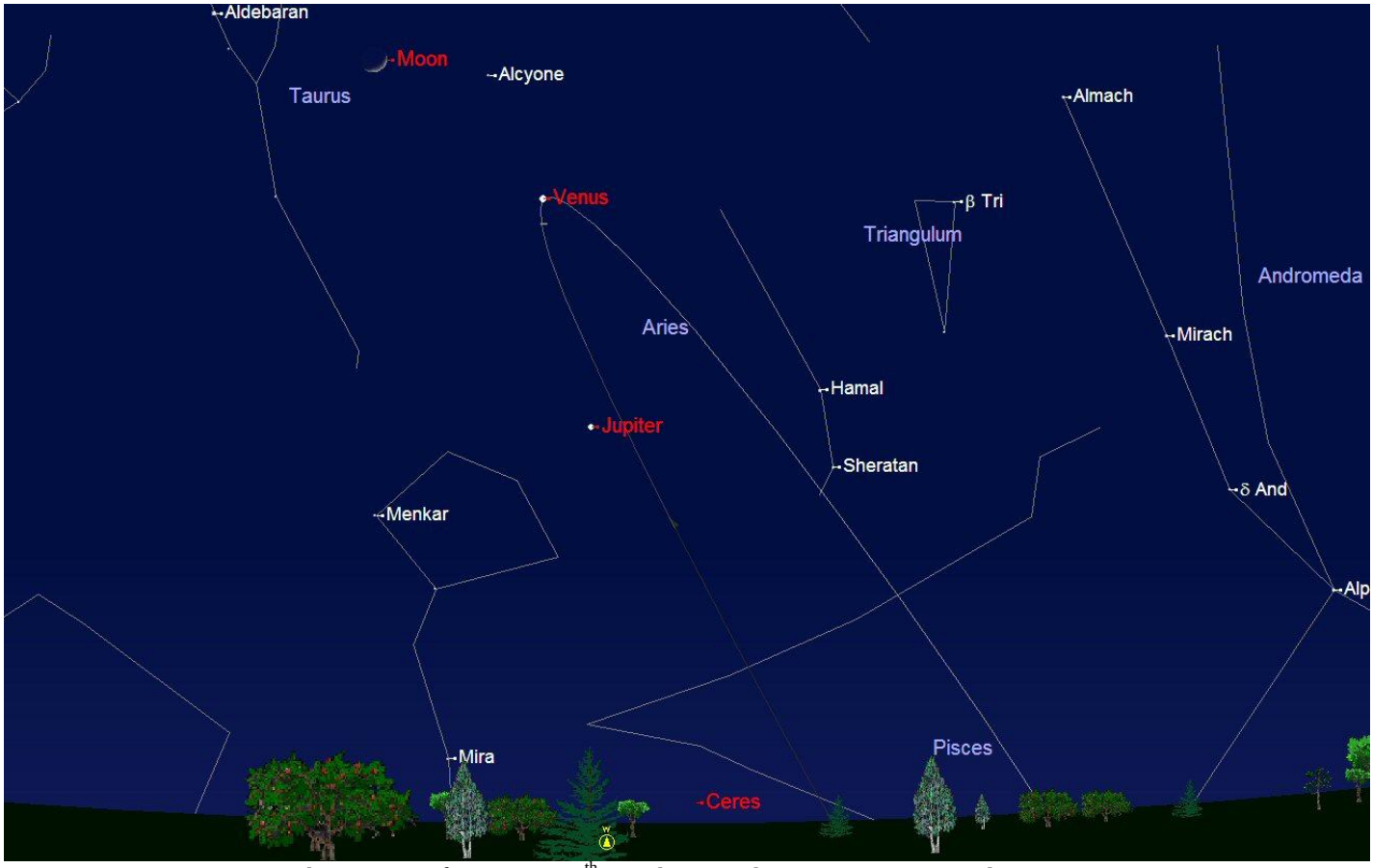
Website: **www.naasbeginners.co.uk**

NEWBURY ASTRONOMICAL SOCIETY MEETING

4th May — Light Pollution Causes and Cures

Website: **www.newburyas.org.uk**

VENUS BLAZING IN THE WEST



The position of Venus on 27th March 2012 when it was at greatest elongation

Venus is the brightest object in the night sky at the moment except for the Moon. As the Sun sets in the west and the sky begins to darken the first 'star' to appear is in fact the planet Venus. It is so bright that it cannot be missed as the light begins to fade in the west.

Venus is currently moving towards us having emerged from behind the Sun in November 2011. The diagram above shows the orbit of Venus with the darker half plotting the passage of Venus as it moved out from behind the Sun. Over the next few months Venus will begin to move back towards the Sun. The lighter part of the orbit, shown in the diagram above, shows how Venus will eventually move back to pass between the Sun and Earth. It will then emerge as the 'Morning Star' shining brightly in the east later in the year.

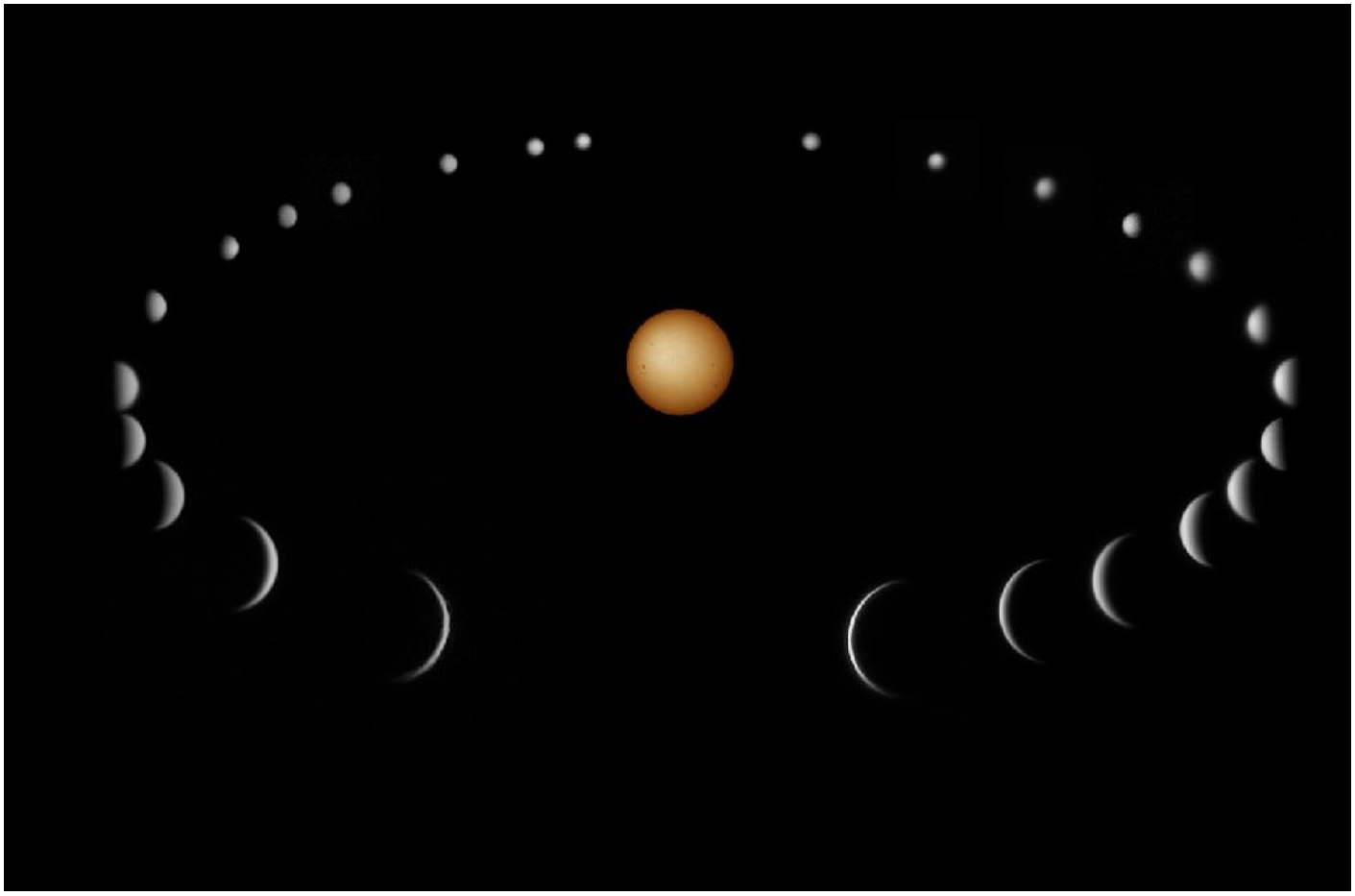
When Venus emerged from behind the Sun in November 2011 it was on the far side of the Sun and 40 million kilometres further away. It therefore appeared comparatively small in diameter. However the whole of the surface facing towards us was illuminated by the Sun so it appeared bright. As Venus reached the top of the loop of its orbit it appeared larger because it was at the same distance away as the Sun. However only the half of the planet facing the Sun was illuminated so we saw it half lit. As Venus moves further towards us and closer to conjunction with the Sun it will be 40 million kilometres closer than the Sun and will appear much larger to us. Strangely Venus will not be noticeably brighter this is because the other side of the planet (facing the Sun) will be illuminated and all we will see is a thin crescent (see the images on the next page).

A small telescope shows Venus as a 'half Moon shape' and it will be possible to watch it develop into a thinning crescent.

The view through a telescope may be improved by fitting a mask over the open end to reduce the glare of the bright planet. Venus is regarded by astronomers as the twin of Earth but the two planets are defiantly not identical twins. Earth is 12,756km in diameter and Venus is slightly smaller at 12,104km. Both planets have a similar composition but the atmospheres are completely different.

Earth as we know has a surface that is just warm enough for life and allows water to exist as solid ice, liquid and as vapour. It also has an atmosphere comprised of Nitrogen and Oxygen with traces of other gasses like Carbon Dioxide. Venus has very little Nitrogen no oxygen but a huge proportion of Carbon Dioxide. Earth and Venus have a similar amount of Carbon Dioxide however on Earth it has nearly all been trapped in the rocks of the crust but on Venus it is nearly all in the atmosphere. Venus has a run-away Green House effect and as a consequence has a surface temperature of 450°C. Venus also has an atmosphere so thick that the surface pressure is 90 times that on Earth.

From Earth and indeed from orbit above the surface of Venus the planet is seen to be shrouded in white cloud. It is impossible to see the surface from above and the clouds are virtually featureless. Faint makings can be detected in the clouds when viewed in ultraviolet light but these are very subtle. Radar can be used to penetrate the clouds and scan the surface. The planet does have mountains, canyons and plains like the surface of Earth. Some of the mountains appear to be volcano shaped but there is no evidence yet that they are active or have been active for millions of years.
Radar scans have also shown that the ratio of the number of days to a year on Venus is very odd. A year on Venus is equivalent to 226 Earth days and day on Venus is equivalent to 243 Earth days – a day is longer than the year on Venus.



The phases of Venus imaged by Dave Smith

The sequence of images of Venus were taken by Dave Smith from his home in Maldon in Essex using a Vixen FL102S refracting telescope fitted with a x2 barlow and a DMK21 camera. The purpose of his project was to show the varying phase of Venus and its apparent change in size as it orbits the Sun. The image of the Sun was taken on 4th March 2011. As this inferior conjunction has been unfavourable with Venus well south of the ecliptic all images were taken in daylight. The individual Venus images are accurately positioned based on their position in the sky relative to the Sun.

The last image to complete the set was taken on 13th January 2012. The individual frames were stacked in Registax 5/6 and processed in Photoshop.

For an observer new to astronomy it is interesting to follow Venus as it emerges from behind the Sun in the evening sky low in the west. This phase is shown at the top left of the orbit in the image above. As Venus moves out from the Sun it also moves towards us and appears to grow larger. When the planet reaches greatest eastern elongation (about where the eighth image to the left is) it will have reached its furthest separation from the Sun as viewed from Earth. This is where Venus was on 27th March this year.

Venus will now continue on its orbit moving closer towards Earth but drawing back in towards the Sun. As it moves between us and the Sun we will see less of the illuminated side and the crescent shape will become progressively narrower.

The gap in the images of Venus at the bottom of the sequence is where the planet was too close to the Sun to be imaged. On 7th June Venus will emerge from conjunction with the Sun and will gradually become visible in the east before sunrise.

However, sunrise on the 6th of June will be the really interesting time to observe Venus because the planet will be silhouetted against the surface of the Sun in a 'Transit'. Unfortunately we in the UK will just catch the end of the transit at sunrise unlike the transit in 2004 when we were able to watch the whole event.

A transit of Venus takes place when Venus passes directly between the Sun and Earth and is visible against the bright solar disk. During a transit, Venus can be seen from Earth as a small black disk moving across the face of the Sun. The duration of such transits is usually measured in hours (the transit of 2004 lasted six hours). A transit is similar to a solar eclipse by the Moon. While the diameter of Venus is almost four times that of the Moon, Venus appears smaller and travels more slowly across the face of the Sun because it is much farther away from Earth.

Transits of Venus are among the rarest of predictable astronomical phenomena. They occur in pairs of transits eight years apart separated by long gaps of 121.5 years and 105.5 years.

A transit of Venus took place on 8 June 2004 and the second of this pair will be on 6 June 2012. The previous pair of transits were in December 1874 and December 1882. After 2012, the next transits of Venus will be in December 2117 and December 2125.

A transit of Venus can be safely observed by taking the same precautions used when observing the partial phases of a solar eclipse. Observation must never be attempted without the use of special solar observing equipment. Staring at the brilliant disk of the Sun (the photosphere) with the unprotected eye can quickly cause serious and often permanent eye damage.

There will be more about this transit of Venus in the May issue of this magazine.

ASTRONOMICAL FILTERS

An astronomical filter is an accessory used by astronomers to simply enhance the details of an object they are observing (much as with amateur photography). The most common filters screw into the bottom of the eyepiece body.

A Broadband filter fitted to a standard 1¼" eyepiece

Most astronomical filters work by blocking a specific part of the colour spectrum above and below a 'bandpass' significantly increasing the signal to noise of the interesting wavelengths thus giving the object more contrast or definition. While colour filters transmit certain colours from the spectrum and are usually used for observation of the planets and the Moon the polarizing filters work by adjusting the brightness and are usually used for observing the Moon. Broadband and narrowband filters transmit the wavelengths that are emitted by a nebula (by the Hydrogen and Oxygen atoms) and are frequently used for reducing light pollution.

COLOUR FILTERS

Colour filters work by absorption/transmission and can tell which part of the spectrum they are reflecting and transmitting. Filters can be used to increase contrast and enhance the details of the Moon and planets. Each of the visible spectrum colours has a filter and every colour filter is used to bring a certain lunar and planetary feature. For example: the #8 yellow filters are used to show darker features on Mars and Jupiter's belts. The 'Wratten' system is the standard number system used to refer to the colour filter types. It was first manufactured by Kodak in 1909.

A set of the most commonly used coloured filters

Some of most common colour filters and their uses are:

Chromatic aberration filters: Used for reduction of the purplish halo caused by chromatic aberration of refracting telescopes. Such halo can obscure features of bright objects especially Moon and planets. These filters have no effect on observing faint objects.

Red: Reduces sky brightness, particularly during daylight and twilight observations. Improves the definition of maria, ice and polar areas of Mars. Improves contrast of blue clouds against background of Jupiter and Saturn.

Deep yellow: Improves resolution of atmospheric features of Venus, Jupiter (especially in polar regions) and Saturn. Increases contrast of polar caps, clouds, ice and dust storms on Mars. Enhances comet tails.

Dark green: Improves cloud patterns on Venus. Reduces sky brightness during daylight observation of Venus. Increases contrast of ice and polar caps on Mars. Improves visibility of the Great Red Spot on Jupiter and other features in Jupiter's atmosphere. Enhances white clouds and polar regions on Saturn.

Medium blue: Enhances contrast of Moon. Increases contrast of faint shading of Venus clouds. Enhances surface features, clouds, ice and dust storms on Mars. Enhances definition of boundaries between features in atmospheres of Jupiter and Saturn. Improves definition of comet gas tails.

MOON FILTERS

Neutral density filters (also known in astronomy as Moon filters) are another approach for contrast enhancement and glare reduction. They work simply by blocking some of the Moon`s light to enhance the contrast. Neutral density filter are mainly used in traditional photography but are used in astronomy to enhance lunar and planetary observations.

A Neutral Density Moon Filter

If the Moon is near 'full' and a new astronomer does not have a moon filter then it may be useful to lessen the glare by reducing the amount of light entering the telescopes. This can be done by fitting the dust cover over the telescope and removing the small cap to reduce the aperture. However using the full aperture of the telescope with a filter fitted does provide a better image. So if observing the Moon is an important aspect of future observing then for a small outlay of less than £20 to buy a moon filter will be money well spent.

POLARISING FILTERS

Polarising filters adjust the brightness of images to a better level for observing but much less so than solar filters. With these types of filter the range of transmission varies from 3% to 40%. They are usually used for the observation of the Moon but may also be used for planetary observation.

A Polarising Moon Filter

Polarising filters consist of two polarizing layers in a rotating cell which changes the amount of transmission of the filter by rotating them. This reduction in brightness and improvement in contrast can reveal the lunar surface features and details especially when it is near full. Polarising filters must not be used in place of solar filters designed especially for observing the sun.

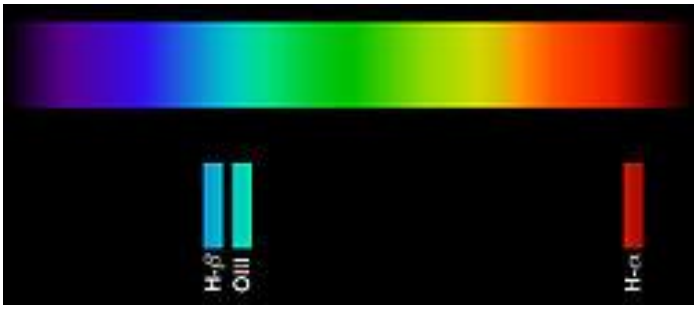
BROADBAND FILTERS

The Broadband or light pollution reduction (LPR) filters are nebular filters that block the light pollution in the sky and transmit the H-alpha, H-beta, and O-III spectral lines which makes observing nebulae from the city and light polluted skies possible. These filters block the Sodium and Mercury vapour light, and also block the natural 'skyglow' such as the auroral light. The broadband filters differ from the narrowband with the range of wavelengths transmission. The broadband filters have a wider range because the narrower transmission range causes a fainter image of sky objects, and since the work of these filters is revealing the details of nebulae from light polluted skies it has a wider transmission for more brightness.

A Broadband Filter

Broadband filters are particularly designed for nebulae observing, are not useful with other deep sky objects. However it can improve the contrast between the object being observed and the background sky and may clarify the image.

NARROWBAND FILTERS



The three main spectral lines that Narrowband filters transmit

Narrowband filters are astronomical filters that transmit only a narrow band of spectral lines (usually 22nm or less). These filters are mainly used for nebulae observation. Emission nebulae mainly radiate the doubly ionized oxygen in the visible spectrum that emits near 500nm wavelength. These nebulae also radiate weaker at 586nm from the Hydrogen-beta atoms.

There are three main types of Narrowband filters:

Ultra-high contrast (UHC)

Oxygen-III

Hydrogen-beta and Hydrogen-alpha

Hydrogen-beta and Hydrogen-alpha are the narrowest of the three filters, with 8nm range. The UHC filters range from 484 to 506nm. It transmits both the O-III and H-beta spectral lines, blocks a large fraction of light pollution and brings the details of planetary nebulae and most of emission nebulae under a dark sky.

INFRARED CUT-OFF FILTERS

Infrared cut-off filters, sometimes called IR filters or heat-absorbing filters, are designed to reflect or block mid-infrared wavelengths while passing visible light. They are often used with webcam video cameras to block IR due to the high sensitivity of the camera sensor to near-infrared light. These filters have a red hue to them so they also sometimes block some of the light from the longer red wavelengths.

An Infrared cut-off filter

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THE SOLAR SYSTEM THIS MONTH

MERCURY rises at 05:51 on 1st April, 05:31 on 15th and 05:15 on 30th April. It will be very low in the east just before sunrise during this month. It will very close to the Sun and will not be far above the horizon so will be difficult to see and will need a clear view to the eastern horizon. DO NOT SEARCH FOR MERCURY WHILE THE SUN IS VISIBLE.

VENUS rises over the eastern horizon at about 07:37 on 1st April, 07:18 on 15th and 07:00 on 30th and will be observable in the south west at sunset this month. It will be very bright at magnitude -4.7 and high in the south western sky. Seen through a telescope its waning phase will be changing from 'half full' to a distinct crescent. Although the phase will be getting narrower the brightness will remain about the same. This is because Venus is approaching us on Earth and therefore appears to be getting bigger. Through the month it will increase in size from 26 arc-seconds to 34 arc-seconds. Venus can look very bright through a telescope so it is worth fitting the dust cover to the telescope and removing the small cap to reduce the glare and to get a better image. See the special article on page 2.

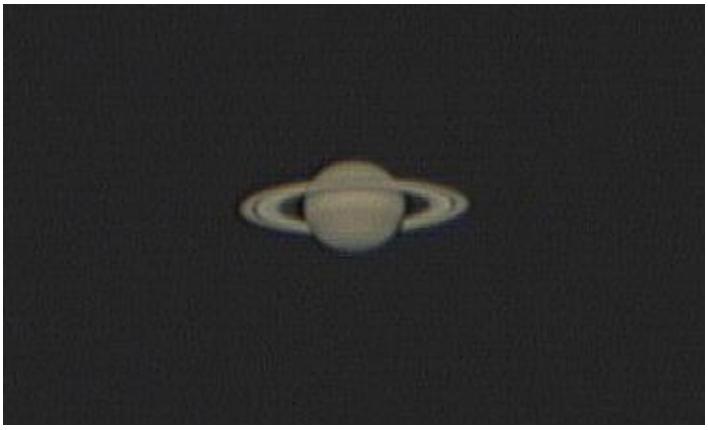
Venus imaged on 19th February 2012

MARS rises at 15:21 on 1st April, 14:41 on 15th and 14:07 on 30th. It is still starting to draw away from us and will be only 10.0 arc-seconds in diameter by the end of the month. It is starting to look quite small even in a larger telescope. Mars is observable all night in the constellation of Leo. It is still just about big enough to show some detail on the surface and the south pole ice cap is quite easy to make out. Mars passed through opposition on 3rd March. This was when Earth overtook Mars and was at its closest approach to Earth. It will be another two years before it returns to our sky.

Mars imaged by John Napper on 27th March 2012

JUPITER rises at 07:28 on 1st April, 06:54 on 15th and 06:20 on 30th. It will be low the south west at sunset and will disappear over the horizon by about 21:30. Jupiter is now well past its best for this apparition but it is still worth a last look.

SATURN rises at 20:22 on 1st April, 19:39 on 15th and 18:55 on 30th so it will be observable later in the evening in the east close to the bright star Spica in the constellation of Virgo. It now reaches a high enough altitude for observing at about 22:00 at the beginning of the month and 21:00 by the end of the month.

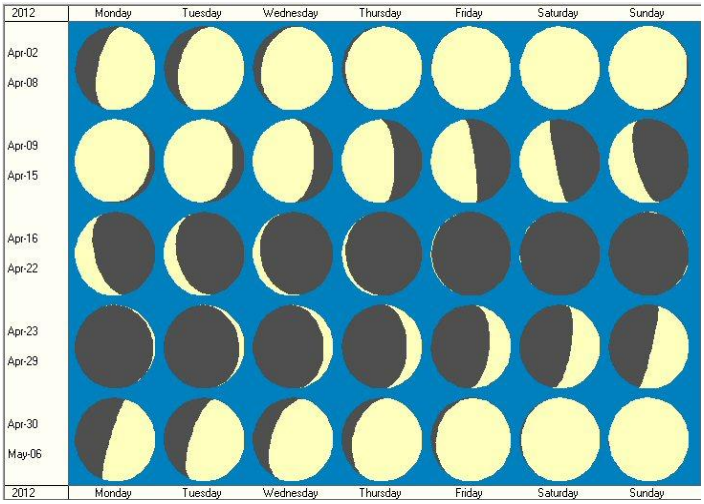


Saturn imaged by Steve Harris on 1st April 2012

URANUS will not be observable this month.

NEPTUNE will not be observable this month.

THE MOON's PHASES THIS MONTH

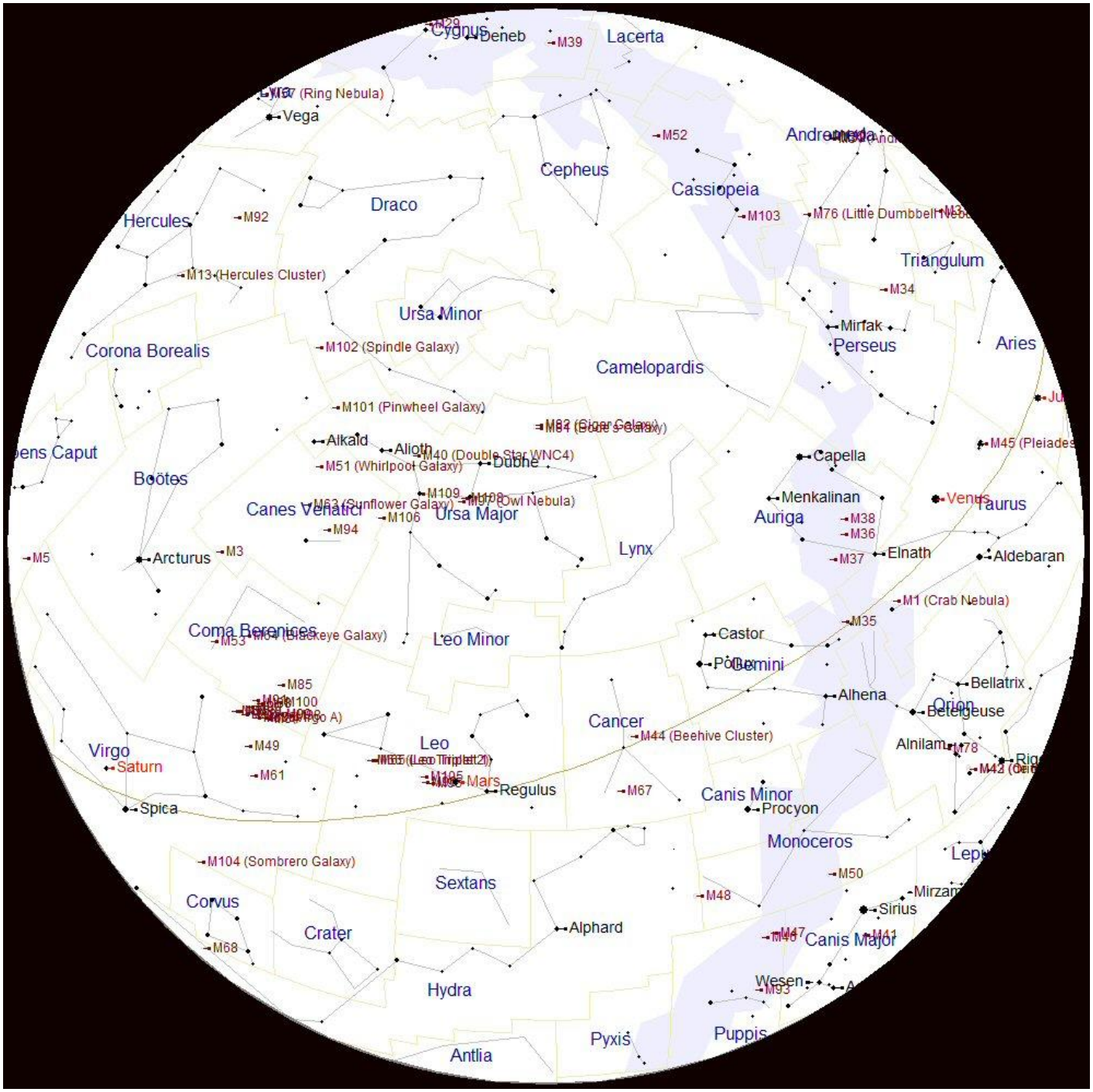


LYRID METEOR SHOWER

In April every year there is an increase in the number of meteors, normally between 16th and 25th, this increase in numbers is known as a Meteor Shower. The April shower is known as the Lyrids. The best night to watch for the Lyrid meteors will be the evening of 21st April and morning of 22nd April when the shower should be at its peak. Fortunately the Lyrid shower should be favourable this year in a moonless sky subject to cloud cover.

The Radiant Point of the Lyrid meteor shower is always located to the west of the familiar shape of Lyra and its very bright star Vega. Although Lyra does not appear over the eastern horizon until 10 o'clock BST meteors may be seen rising up over the horizon before the constellation appears. The number of meteors is usually at its highest after midnight because at this time Earth is crashing headlong into the particle stream.

THE NIGHT SKY THIS MONTH



The chart above shows the night sky as it appears on 15th April at 9 o'clock in the evening British Summer Time (BST). As the Earth orbits the Sun and we look out into space each night the stars will appear to have moved across the sky by a small amount. Every month Earth moves one twelfth of its circuit around the Sun, this amounts to 30 degrees each month. There are about 30 days in each month so each night the stars appear to move about 1 degree. The sky will therefore appear the same as shown on the chart above at 10 o'clock BST at the beginning of the month and at 8 o'clock BST at the end of the month. The stars also appear to move 15º (360º divided by 24) each hour from east to west, due to the Earth rotating once every 24 hours,

The centre of the chart will be the position in the sky directly overhead, called the Zenith. First we need to find some familiar objects so we can get our bearings. The Pole Star **Polaris** can be easily found by first finding the familiar shape of the Great Bear 'Ursa Major' that is also sometimes called the Plough or even the Big Dipper by the Americans. Ursa Major is visible throughout the year from Britain and is always quite easy to find. This month it is almost overhead. Look for the distinctive saucepan shape, four stars forming the bowl and three stars forming the handle. Follow an imaginary line, up from the two stars in the bowl furthest from the handle. These will point the way to Polaris which will be to the north of overhead at about 50º above the northern horizon. Polaris is the only moderately bright star in a fairly empty patch of sky. When you have found Polaris turn completely around and you will be facing south. To use this chart, position yourself looking south and hold the chart above your eyes.