NEWBURY ASTRONOMICAL SOCIETY
BEGINNERS MAGAZINE - MARCH 2012

BACK TO BASICS ASTRONOMY WITH THE BAA

To meet the great surge of interest in astronomy over the past few years the BRITISH ASTRONOMICAL ASSOCIATION (BAA) has organised a series of mini seminars to introduce astronomy as a hobby. These events are being held at two different venues every year in various locations around the country. On Saturday 17th March the next 'Back to Basics' event will be held in our area at the St. Cassian's Centre in Kintbury near Newbury.

Anyone who has been encouraged by recent BBC television programmes or has a latent interest in astronomy is welcomed by the BAA to come along to this event. The programme for the event and details of how to book a place can be found in the opposite column.

The British Astronomical Association has designed the programme of talks and practical sessions to help anyone who has an interest in astronomy to learn basic techniques and develop this interest to its full potential. All talks and demonstrations will be at an entry level and suitable for all ages. If the weather is fine there will be practical solar observations in the grounds outside the centre. Experienced astronomers will be on hand to provide help in using the telescopes and answer any questions.

The event on 17th March is to be hosted by the Newbury Astronomical Society which is one of the most active societies in the country. The Society was formed in 1981 by three local ladies to bring together amateur astronomers in Newbury and the surrounding area. Since then the Society has grown and now has over 80 members. The society has two meetings every month. The first meeting is the Main Speaker meeting with a well-known amateur or professional speaker. The other is a meeting for beginners with short talks on practical aspects of astronomy with observing afterwards if skies are clear.

One of the major aims written into the constitution of the society since its inception has been to pass on the enthusiasm for astronomy and the night sky to the wider public. Members regularly give talks to schools, youth groups and other local organisations. The society has hosted several BAA meetings over the years and looks forward to making this Back to Basics meeting an enjoyable and fulfilling one for everyone.

The cost of this event is £8.00 to BAA members and £10.00 to non-members (price includes refreshments and a Buffet Lunch). The day starts at 10:30 with registration, finishes at 17:30 and promises to be very interesting and enjoyable day.

St Cassian's Centre is near Kintbury which is south of the A4 between Newbury and Hungerford. It is 12 miles from junction 13 of the M4 and 8 miles west of Newbury. After turning off the A4, follow the road through Kintbury village until the Blue Ball pub. Here turn left up Wallingtons Road and follow signs for St Cassian's. This is approximately 2 miles from the A4 junction. There will be BAA event signs on the road.

The Back to Basics event starts at 10:30 with registration and tea or coffee then the official welcome to start the day at 11:00.

THE PROGRAMME

10:30	Registration (Tea / Coffee)
11:00	Official Welcome
11:05	So what astronomy can I do?
11:15	What equipment and books do I need?
12:00	Solar observing and workshop
13:00	Lunch
14:00	Lunar observing and workshop
15:00	Planetary observing
16:00	Afternoon tea
16:30	Simple imaging
17:15	Feedback, Q&A session and raffle
17:30	Close

There is a map showing the location of St. Cassian's Centre and booking form to enroll for the event on the BAA website at: www.britastro.org/newburyb2b

If you would like to attend the Back to Basic astronomy event please visit the website address above and download the booking form.

The booking form should be returned to:

The British Astronomical Association

Burlington House

Piccadilly

London W1J 0DU

Booking forms should be sent to the above address by 10th March 2012.

For further information contact:

Steve Harris at steveharris234@aol.com or Tel. 01635 860047

or

Ann Davies at anndavies@dsl.pipex.com or Tel. 01635 30598

THE NEXT NEWBURY BEGINNERS MEETING

21st March — Variable Stars and What can I expect to see

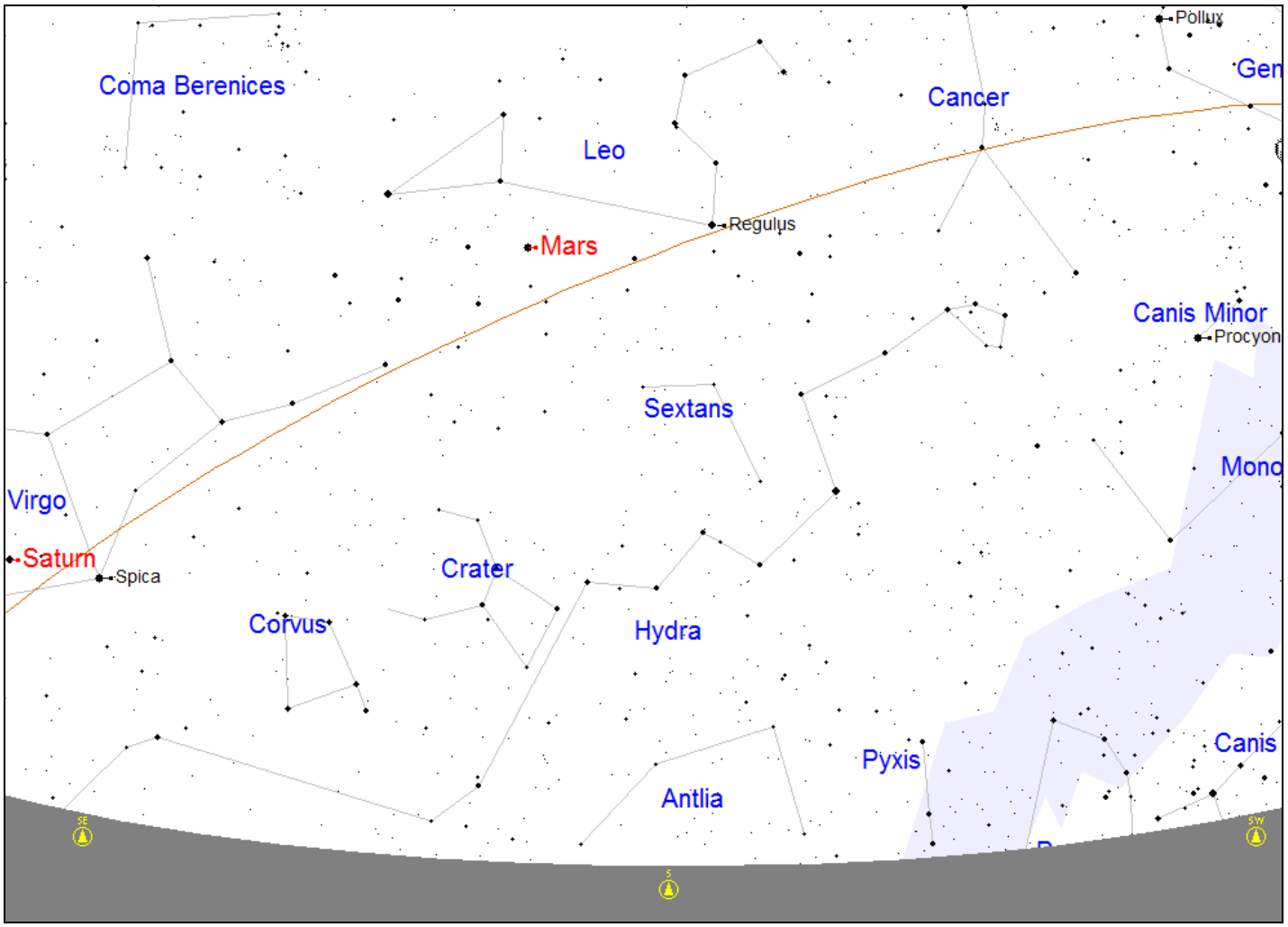
Website: **www.naasbeginners.co.uk**

NEWBURY ASTRONOMICAL SOCIETY MEETING

23rd March — The Radio Sky

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

MARS AND SATURN ARE COMING INTO VIEW



The position of Mars on midnight on 3rd March 2012

Mars will come into Opposition on 3rd March 2012 and two days later on 5th March the red planet will be at its closest approach to Earth during this apparition. Although Mars will be at its closest position for this visit to our night sky it will still be 100.78 million km (0.6737 AU) away. This is not very close to Earth compared to other oppositions. The reason for this is Mars will be close to aphelion (furthest distance from the Sun in its orbit) which it will pass through on 15th February.

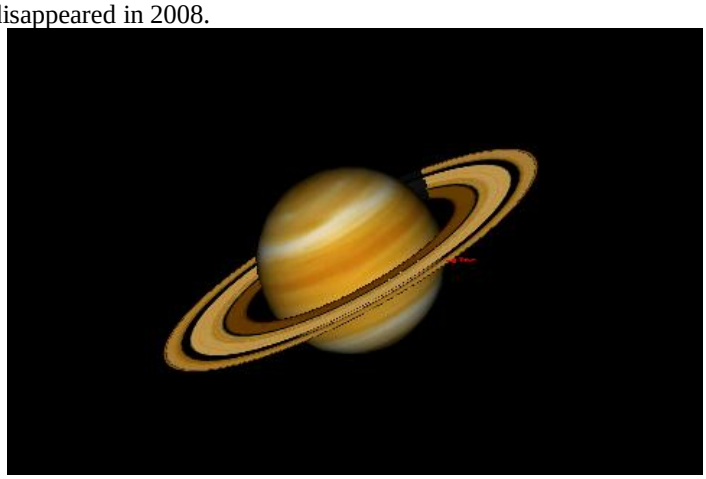
Opposition occurs close to Northern Summer/Southern Winter Solstice on Mars which takes place on 30th March. So Earth will be at high northern declination from Mars and the Martian North Pole will be in good observing position from Earth.

Mars is located in the constellation of Leo (see the chart above) and rises over the eastern horizon at 18:00 at the beginning of March and by 16:00 by at the end of the month. It does need a couple of hours to climb high enough in the sky to reach more stable air and produce a clearer image.

Mars is very easy to find, it is bright and distinctly orange coloured even to the naked eye. Through binoculars the colour will be even more noticeable. Using a telescope set at a magnification of 50x will show a small disc. Changing to an eyepiece to increase the magnification to 100x will bring the northern ice cap into view. Increasing the magnification to the maximum that seeing conditions will permit may just reveal some of the surface markings.

Also shown on the chart above is the beautiful ringed planet Saturn. Saturn rises about 3 hours after Mars and is close to the bright star Spica in the constellation of Virgo. It will not be in a good position for observing until after midnight at the beginning of the month but will be quite well placed by 22:00 at the end of the month.

The ring system is nicely opened up this year after it had all but disappeared in 2008.

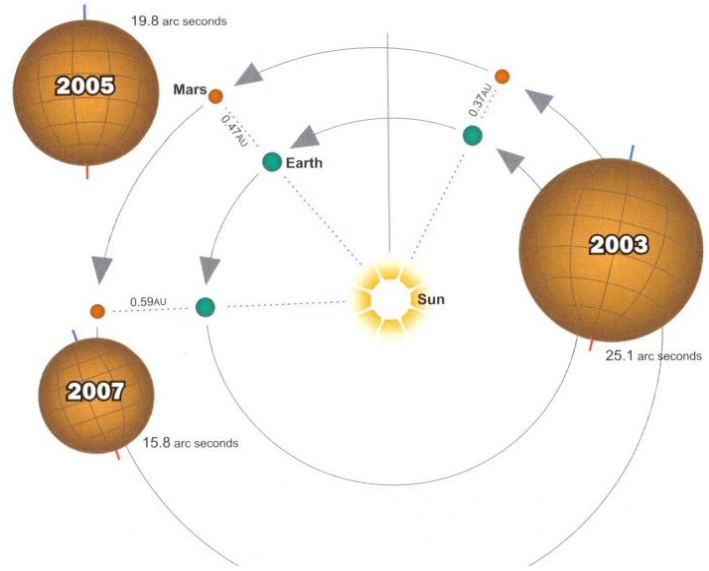


A computer image showing the appearance of Saturn this month

Saturn is still a long way from Earth and not yet near its best. It will be better placed during late April but will not achieve a very good altitude this year.

Mars is just coming into its best viewing position for its closest approach this year. On 3rd March it will be at its closest approach to Earth in this opposition. Every two years (approximately) Earth overtakes Mars as the two planets move around their respective orbits. As Mars occupies the next orbit out beyond Earth it takes longer to orbit the Sun. A year on Mars is equivalent to 1.88 Earth years. Therefore Earth catches up and overtakes Mars just a little over every two years.

On 22nd August 2003 Mars was as close to Earth as it can ever get. This was due to the positions that the planets were in on their elliptical orbits. Mars was at its minor axis (closest to the Sun) and Earth was at its major axis (furthest from the Sun).



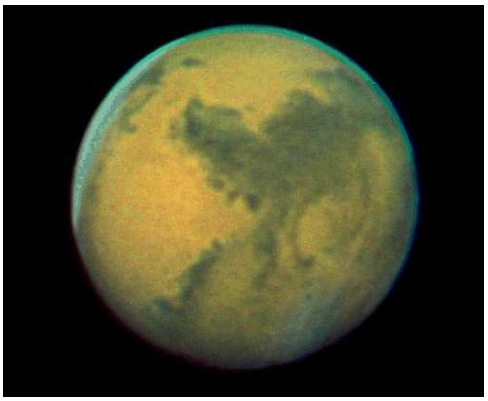
The relative positions of Mars and Earth

The diagram above shows that in 2003 Mars was just 0.35 AU from Earth (35 million miles). (1 Astronomical Unit AU is the average Earth Sun distance: 150 million kilometres). This means Earth and Mars were 55.5 million kilometres apart. In 2005 this distance was 70.5 million kilometres but this year will be 100 million kilometres. In 2003 Mars therefore appeared larger in the sky, actually 25.1 arc seconds. This is a measure of the diameter as an angle seen from Earth where one arc second is 1° ÷ 3,600. (60 arc seconds = 1 arc minute and 60 arc minutes = 1°). This year it will be only 13.7 arc seconds in diameter.

Despite Mars being so close in 2003 it was not a good year for observing the Red Planet. Unfortunately Mars was very low in the sky, if fact it was very close to the southern horizon. This meant that we had to peer through about 200 kilometres of dirty turbulent atmosphere to see it. This year Mars will be high in the sky and we will see it through only about 50 kilometres of comparatively clear and steady atmosphere. Although Mars is smaller this year the view should still be quite good.

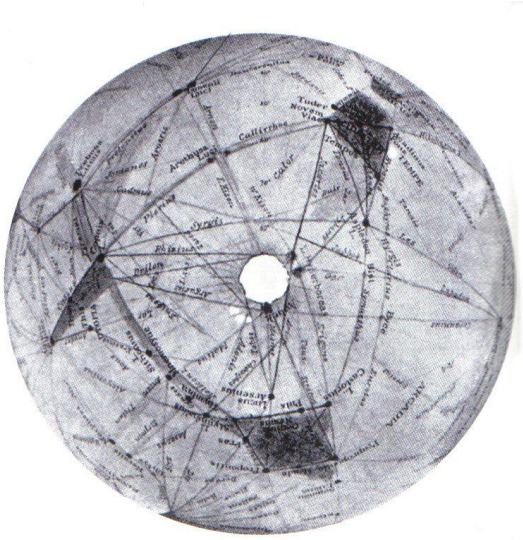
There is a lot to see on the surface of Mars although a larger telescope will be needed to see the details clearly. Unlike Venus and the gas giants Jupiter and Saturn it is the solid surface of the planet that we can see and not the cloud tops. Mars is actually the only planet other than our Earth that we can see surface detail on. Using a telescope with an aperture of 120mm to 150mm it is possible to see distinctive light and dark markings. It is also quite easy to see ice caps as they grow and shrink with the seasons. With larger telescopes it is possible to make out some of the main features. These features are quite difficult to define and mainly appear as large orange tinted areas and darker grey or even greenish coloured areas.

With modern amateur telescopes and cameras very good images can be taken of Mars.



Example of a good image obtained from Earth

We now have close-up images of the surface, taken by space probes and even 'rovers' on the surface so we know exactly what these features are. In the past however people had to speculate as to what they might have been. This lead to some ideas that we now consider bizarre but at the time they seemed quite plausible. In the 1890's the famous astronomer Percival Lowell declared to the world that he had seen canals on the surface of Mars.



Percival Lowell's drawing of canals on Mars

Lowell believed that Mars was a barren planet that was losing all its water. He thought intelligent beings had dug canals to transport water from the poles to the deserts that covered the rest of the planet. The darker areas that he saw he suggested were vegetation, perhaps crops that were irrigated from the canals.

This belief persisted right up to the 1950's and even into the 1960's and was not fully discounted until the first images were returned from probes sent to Mars. Even then there were interpretations, generally from cranks and 'dodgy' writers who claimed that features that appeared in images were the work of intelligent life. There were mountains that looked like faces and giant pyramids. All turned out to be natural features and tricks of the light.

Before the 1960's it was still accepted that there might be intelligent life on Mars and that there might still be a threat of invasion by little green men. Many stories were written about invasions from Mars including 'War of the Worlds' by HG Wells This and thousands of other stories featured in 'Comic' magazines and were even made into films.

WHAT CAN BE SEEN WITH A FIRST TELESCOPE

Meade Series 4000 eyepieces 26mm and 9.7mm with a 2x Barlow

First it needs to be stated that the views through a small telescope, like those normally purchased as a first telescope, will not produce views like those seen in books and magazines. The sorts of images reproduced in magazines are mainly those taken by experienced astronomers using state of the art equipment. The whole point of using a telescope is to be able to see these objects yourself. To be able to sense with our own eyes the photons that have actually come directly from the Moon, planets and even the stars is the ultimate thrill of using a telescope. As these photons of light enter our eye they activate our visual sensors and we are in effect able to touch those particles that have come from so far away. A beginner need not be disappointed at not seeing the same detail shown by the world's giant telescopes or space probes these can be seen on the internet or in the astronomy magazines. Enjoy finding and seeing these objects 'live' in the night sky and for real from your own backyard.

Before considering what we are able to see in our first telescope we should re-visit some the equipment that is typically supplied with a first telescope. Most telescopes are supplied with two eyepieces (see the image above). These are usually marked to enable them to be identified by the focal length. This is marked somewhere on the eyepiece body and appears as a dimension in millimetres. The larger one is normally between 20mm and 25mm and is the lower power (lowest magnification). The smaller (higher magnification) is normally around 10mm.

Magnification, strictly speaking, is not an attribute of the telescope it mainly depends on the eyepiece being used. A telescope of a specific focal length will produce an image of a specific size and this cannot be changed. For example a telescope of a certain focal length may produce an image of the full moon 10mm in diameter. A longer focal length will produce a larger image (perhaps 15mm) and a shorter focal length will produce a smaller image (Perhaps 6mm).

The eyepiece is then used, much like a microscope, to magnify that image. A larger image to start with will allow the eyepiece to produce a larger image to view (higher magnification).

The eyepiece with the longer focal length say 25mm (low power) used on a telescope with a 1000mm focal length will produce a magnification of 1000 ÷ 25 = 40x. A short focal length 10mm (high power) eyepiece used on the same 1000mm telescope will produce a magnification of 1000 ÷ 10 = 100x. However the same eyepieces used on a 1500mm focal length telescope (that naturally produces a larger image) will have magnifications of: 1500 ÷ 25 = 60x and 1500 ÷ 10 = 150x.

Some telescopes are supplied with a 'Barlow Lens' (see the image above). This is a single lens set into a body that fits into the focusing unit which generally has a 1¼ inch (31.75mm) diameter interface. The eyepiece is removed and the 'Barlow' fitted into the focuser. An eyepiece can then be fitted into the 'Barlow'. The 'Barlow' has the effect of doubling the focal length of the telescope. So in the magnification calculation example above the 1000mm focal length of the telescope now becomes 2000mm so the magnification is now 2000 ÷ 10 = 200x. NOTE: after fitting the 'Barlow' a considerable amount of refocusing will be required.

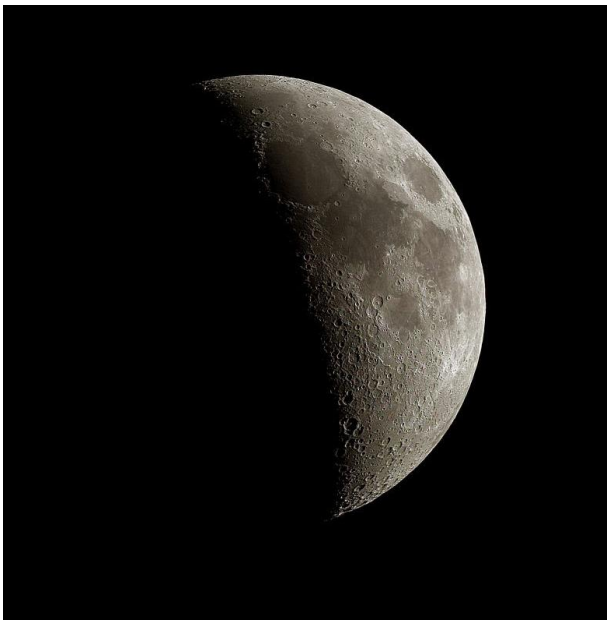
Using different magnifications is often misunderstood by newcomers to astronomy who mistakenly think 'the higher the magnification used the better will be the view of the object being observed'. This is not always the case, it depends as much on the type of object to be observed and the 'seeing' conditions of the sky on that night. An object that appears large and relatively faint in the sky will often look best at a low magnification. For example M45 The Seven Sisters star cluster or M31 the Great Galaxy in Andromeda. High magnifications can be used on the Moon, and the planets to see more detail. The conditions may still restrict the amount of magnification that can be used. If there is a lot of turbulence in the atmosphere using a lower magnification may improve the view.

Now to consider what we will be able to see when we take 'first light' through our new telescope. Let us consider a typical type of beginner's telescope.

The Skwatcher Evostar 90

The Skwatcher Evostar 90 has an aperture (lens diameter) of 90mm and a focal length of 900mm. It is supplied with 10mm and 25mm eyepieces. It is also supplied with a 2x Barlow which effectively converts the 10mm to a 5mm and the 25mm to a 12.5mm. These combinations allow magnifications of: 36x, 72x, 90x and 180x to be obtained.

This telescope will produce excellent views of the Moon and full magnification of 180mm can be used for observing the Moon.



The sort of view seen at 36x magnification

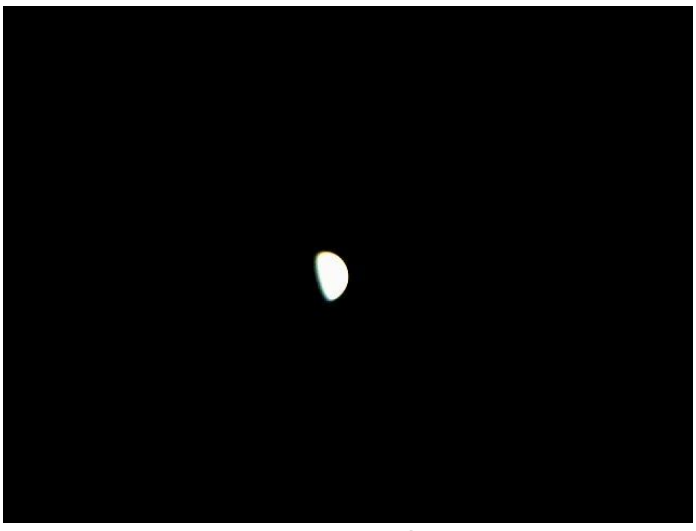
The low power eyepiece should be used first to get an overall view of the Moon. If the Moon is near 'full' then it may be useful to lessen the glare by reducing the amount of light entering the telescopes. This can be done by fitting the dust cover over the telescope and removing the small cap to reduce the aperture. The large dark areas known as 'Maria' or seas can be seen very well. Many large craters will be seen all over the Moon but are more obvious in certain areas. From night to night the 'Terminator' will move across the Moon revealing different targets to view.

Areas of special interest can be selected and centralised in the field of view. By carefully changing the eyepiece to increase the magnification a closer view can be obtained.

The sort of view obtained at maximum magnification

On a good calm night when the air is clear the view of the craters, mountains and valleys can be breathtaking. By tracking across the surface of the Moon, using the drive knobs, it almost looks as if the observer is flying over the Lunar landscape.

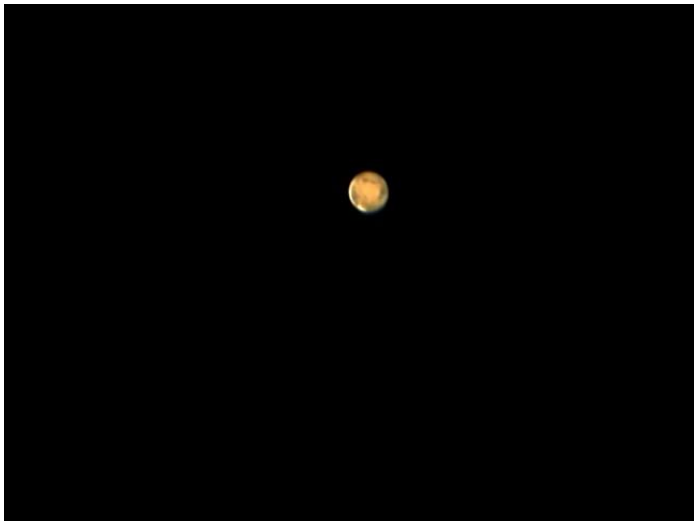
The planets are a little more difficult to observe and need a little more skill which is easily developed. Mercury and Venus do not show any surface detail but they do develop phases similar to the Moon. So when they first appear low in the western twilight they are emerging from behind the Sun. Consequently the Sun is shining on virtually the whole surface and the planet looks 'full'. However as the planet is further away from us it will appear small in diameter. As the planets move around the Sun less of their surfaces are illuminated. When they draw level with the Sun one side will be bright and the other will be dark.



Venus as it appeared on 19th February 2012

As Venus or Mercury move closer to Earth they begin to leave the Sun behind so it will be illuminating the far side and the side facing us will become progressively darker. The crescent shape will become narrower but the apparent size will become larger as the planet moves closer. The image above gives some idea of what Venus will look like using a 900mm focal length telescope with a 10mm eyepiece and a Barlow lens (180x magnification). Venus is bright enough to dazzle so the aperture of the telescope may need to be reduced to lessen the glare.

Mars is the next planet out from Earth so it does not show significant phases but it does lose the edges. This year Mars does not have the closest of approaches to Earth and will look quite small through the telescope compared to 2003 (see page 3). The highest possible magnification and good 'seeing' conditions will be required to see any detail on the surface.



Mars as it appeared on February 19th 2012

Now to the Gas Giants and the most spectacular of the planets to observe through a telescope. Jupiter is a very good and easy target for a first telescope. It is large, bright and shows some colour even when using a small telescope. At 35 arc seconds in diameter it is twice the size of Venus (this month) and three times the size of Mars. It is bright because a lot of sunlight is reflected off the light coloured clouds that cover its surface.

Fit a low power eyepiece into the focuser. Release the drive clutches and use the finder to locate Jupiter. Lock the clutches and centralise Jupiter in the finder. Look through the low power eyepiece and use the focusing knob to adjust the focus until the edge of Jupiter looks sharp. The four large moons should be in a line to the sides of Jupiter. They may sometimes all be to one side or one might be missing as it passes in front or behind the planet. Adjust the focus if necessary until the moons appear as points of light.

Centralise Jupiter in the field of view and gently replace the low power eyepiece with the high power eyepiece and re-focus. Jupiter will now appear larger and two darker (brown) parallel bands should be visible on the planet.

The sort of view obtained at maximum magnification

Take some time to adjust the focus and to get used to looking at the surface detail. If you have a Barlow Lens centralise Jupiter and gently remove the high power eyepiece. Fit the Barlow and fit the eyepiece back into the Barlow. The focuser will need to be adjusted 'in' by quite an amount to re-focus. The image will now be even bigger and appear similar to the image in the previous column.

Saturn is our next target and is spectacular due to its beautiful ring system. The planet itself is about half the diameter of Jupiter but only a quarter of the surface area. It receives less than half the sunlight of Jupiter and therefore reflects much less light back to us. However the rings stretch over half the diameter to each side making it a larger target. The rings are tilted about half way towards us this year so they are beginning to approach their best. Use the same technique to find Saturn as was described to find Jupiter in the previous column, starting with the low power eyepiece.

The sort of view of Saturn obtained at maximum magnification

Deep space objects such as galaxies, star clusters and nebulae are difficult to see in a small telescope but in a dark sky away from street light pollution some can be seen.

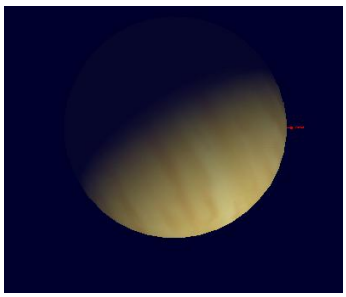
M31 The Andromeda Galaxy

M31 is the only spiral galaxy that can be seen through a small telescope and is worth searching out to say "I have seen it". Other deep sky objects to look for are M42 the Orion Nebula, M13 the Globular Cluster in Hercules and M45 the Pleiades Open Star Cluster in Taurus.

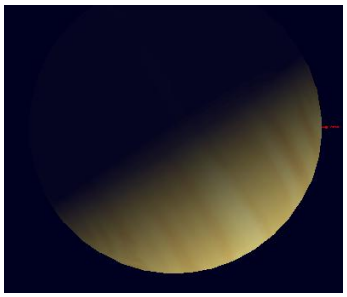
THE SOLAR SYSTEM THIS MONTH

MERCURY rises at 07:00 on 1st March, 06:10 on 15th and 05:30 on 30th it will be visible low in the south west just after sunset during this month. It will reach superior greatest elongation on 3rd March when it will be at its greatest apparent distance from the Sun. It will be observable during the rest of the month close to the western horizon as it draws back towards the Sun. Mercury will be difficult to see and will need a clear view to the south western horizon. DO NOT SEARCH WHILE THE SUN IS VISIBLE.

VENUS rises over the eastern horizon at about 07:45 on 1st March, 07:20 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 -4.5 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 19 arc-seconds to 23 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.



Venus on 1st March



Venus on 31st March

MARS rises at 17:10 on 1st March, 16:10 on 15th and 15:15 on 30th. It is still only 13.9 arc-seconds in diameter and therefore appears quite small even in a larger telescope. It is observable after about 20:00 in the constellation of Leo. It is just about big enough to show some detail on the surface and the south pole ice cap is quite easy to make out. Mars will be at opposition on 3rd March. This means Earth will be overtaking Mars and will be at its closest approach to Earth. As the orbit of Mars and Earth are elliptical the Earth distance varies from one approach to another. In the 2003 approach Earth was at its furthest out from the Sun in its orbit. Mars however was at its nearest to the Sun position therefore the two planets were at their closest to each other. In 2003 the two planets were only 35 million miles apart. This year they are more like 60 million miles so Mars will look a lot smaller than it did in 2003 when it was 25.1 arc-seconds.

Mars imaged by Steve Harris on 19th January 2012

JUPITER rises at 08:17 on 1st March, 07:40 on 15th and 07:05 on 30th. It will be high the south west at sunset and close to Venus. Jupiter will be observable in the constellation of Aries until about 22:00 when it gets too close to the western horizon. The giant planet is now past its best for this year but is still well worth having a look at. The image below shows Jupiter with the moon Io furthest to the left from Jupiter and Ganymede closer to the planet. This image was taken using a simple web camera attached to a Meade telescope.

Jupiter with Io and Ganymede imaged on 19th January 2012

SATURN rises at 21:35 on 1st March, 20:55 on 15th and 20:10 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 is worth waiting up for as the rings are opened up now.

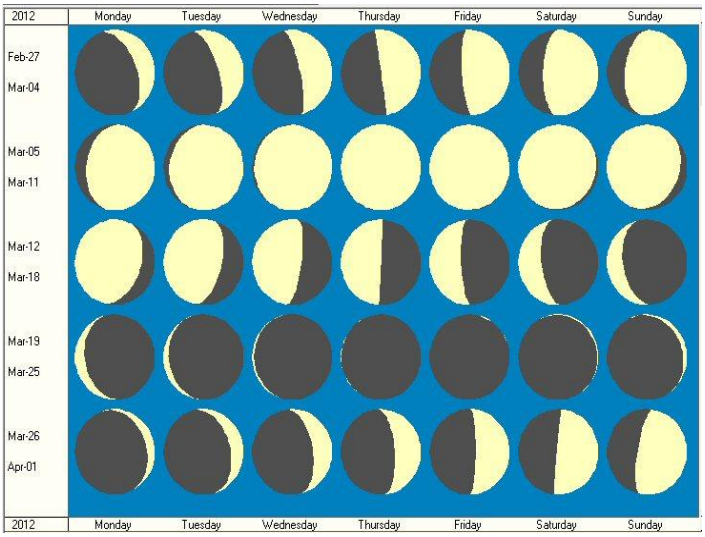
URANUS rises at 06:35 but will not be observable this month as it will be close to the western horizon in the twilight.

NEPTUNE rises at 07:29 and is no longer observable.

THE SUN

There is plenty of activity on the Sun with a good measure of sunspots and prominences.

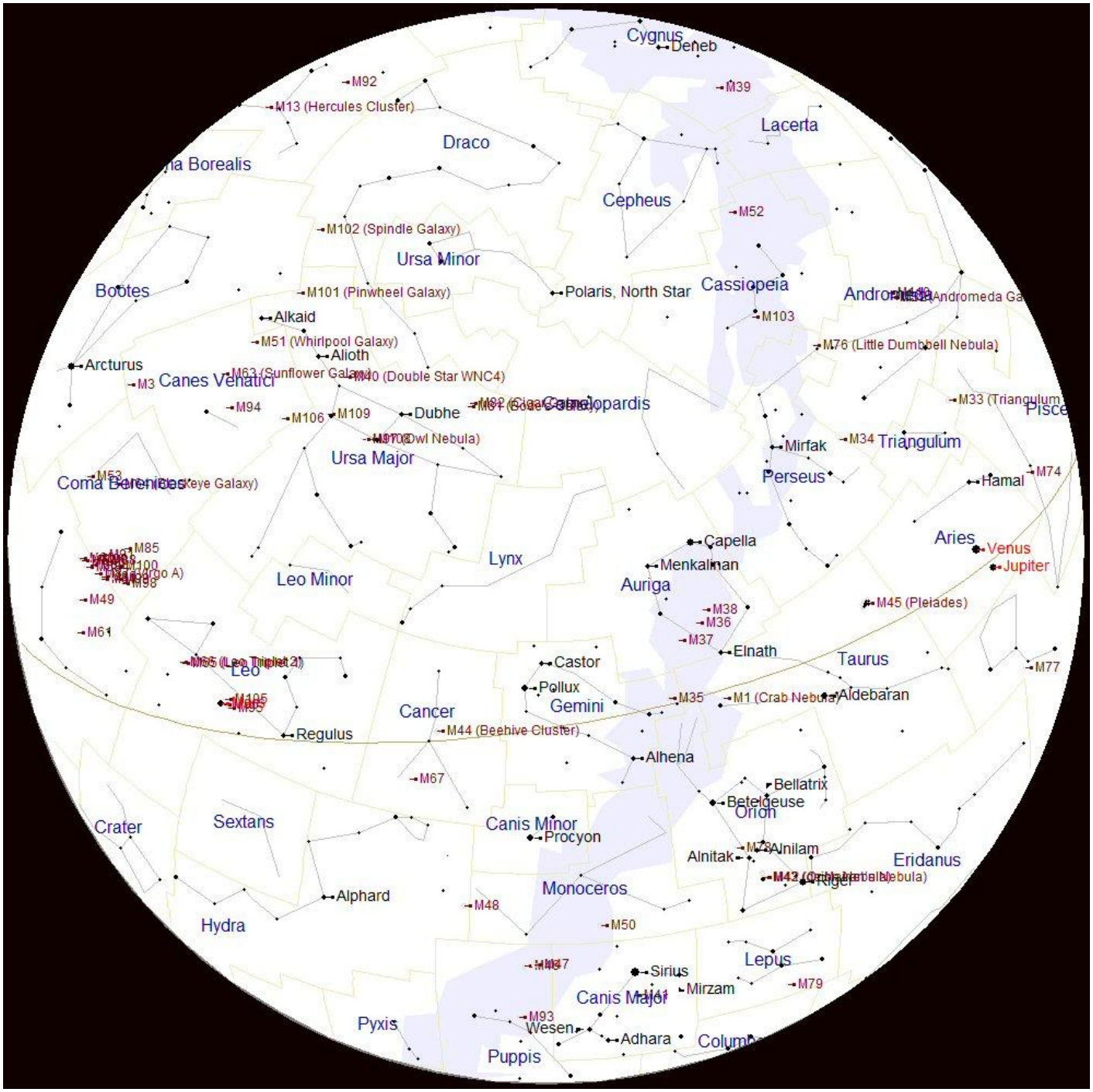
THE MOON's PHASES THIS MONTH



METEORS SHOWERS

There are no significant meteor showers this month.

THE NIGHT SKY THIS MONTH



The chart above shows the night sky as it appears on 15th March at 9 o'clock in the evening Greenwich Mean Time (GMT). 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 GMT at the beginning of the month and at 8 o'clock GMT 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 in the north east. 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.