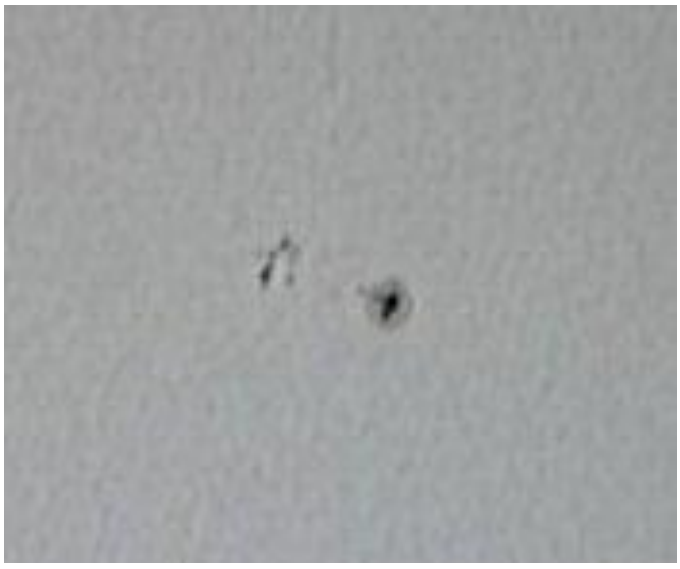
NEWBURY ASTRONOMICAL SOCIETY
BEGINNERS SECTION MAGAZINE – JUNE 2010

SOLAR ACTIVITY DURING MAY

Image of the Sun at 10:59 on 23rd May 2010

The Sun has continued to be unexpectedly quiet over the last month with just a few small sunspots appearing. Probably the most interesting was the group shown in the image above. The group was comprised of a distinct and typical sunspot with a small cluster of much smaller spots close by. The main spot had the typical appearance of a darker centre (Umbra) and a lighter outer area (Penumbra). The picture below shows the sunspot system enlarged.



The umbra and penumbra can be clearly seen in the image above. The cluster of small spots did not develop into another spot and remained more or less the same for the following two days while the sky was clear.

Also visible in the images is the 'mottled' effect on the overall surface of the Sun. This is caused by the 'bubbling effect' as cells of Hydrogen gas in the outer layer of the Sun are heated and rise to the surface. Radiation from the fusion process at the core of the Sun heats the bottom of the outer layer. This initiates a convection cycle that carries the heat to the surface. At the surface the bubbles of hot gas (6300°C) radiate their heat into space as white light and fall back to be reheated.

IMAGING THE SUN

The author's Startravel 102mm fitted with a Vesta Webcam

The image in the previous column was taken using the telescope and web camera shown above. This shows that quite good images can be produced using basic equipment. The telescope is a Skywatcher 102mm Startravel (focal length 500mm) fitted on an EQ1 equatorial mounting (total cost £230). It has a simple 9v battery driven motor for tracking (additional £32).

The camera shown is an 'end of line' Philips Vesta web camera (£20). The camera was adapted by removing the 'screw in' lens and replacing it with an adaptor to fit the telescope focuser (£20). The standard webcam lens has a built in filter to block the infrared light as this causes the image to be blurred. An infrared filter had to be fitted to the adaptor to replace the one removed with the camera lens (£20).

The telescope does need to be fitted with a special solar filter. These can be obtained in two ways. One can be bought from many on-line astronomy shops and these are made to fit your specific telescope type. Alternatively a filter can be made using a special 'Mylar' film. This film is a thin sheet of silvered plastic film. It is designed to reflect nearly all the sunlight hitting the surface and allowing only just enough light through so the Sun can be observed safely.

All that is needed now is a computer and a sunny day. The camera can be plugged into the USB port on the computer and driven by the application supplied with the camera. The telescope is aligned to the Sun and the image centred and focused. The camera takes video pictures for about a minute. The video can then be processed using a free application called Registax. This automatically aligns the each of the individual video images and stacks them to form a single clear jpg image.

NEWBURY ASTRONOMICAL SOCIETY BEGINNERS

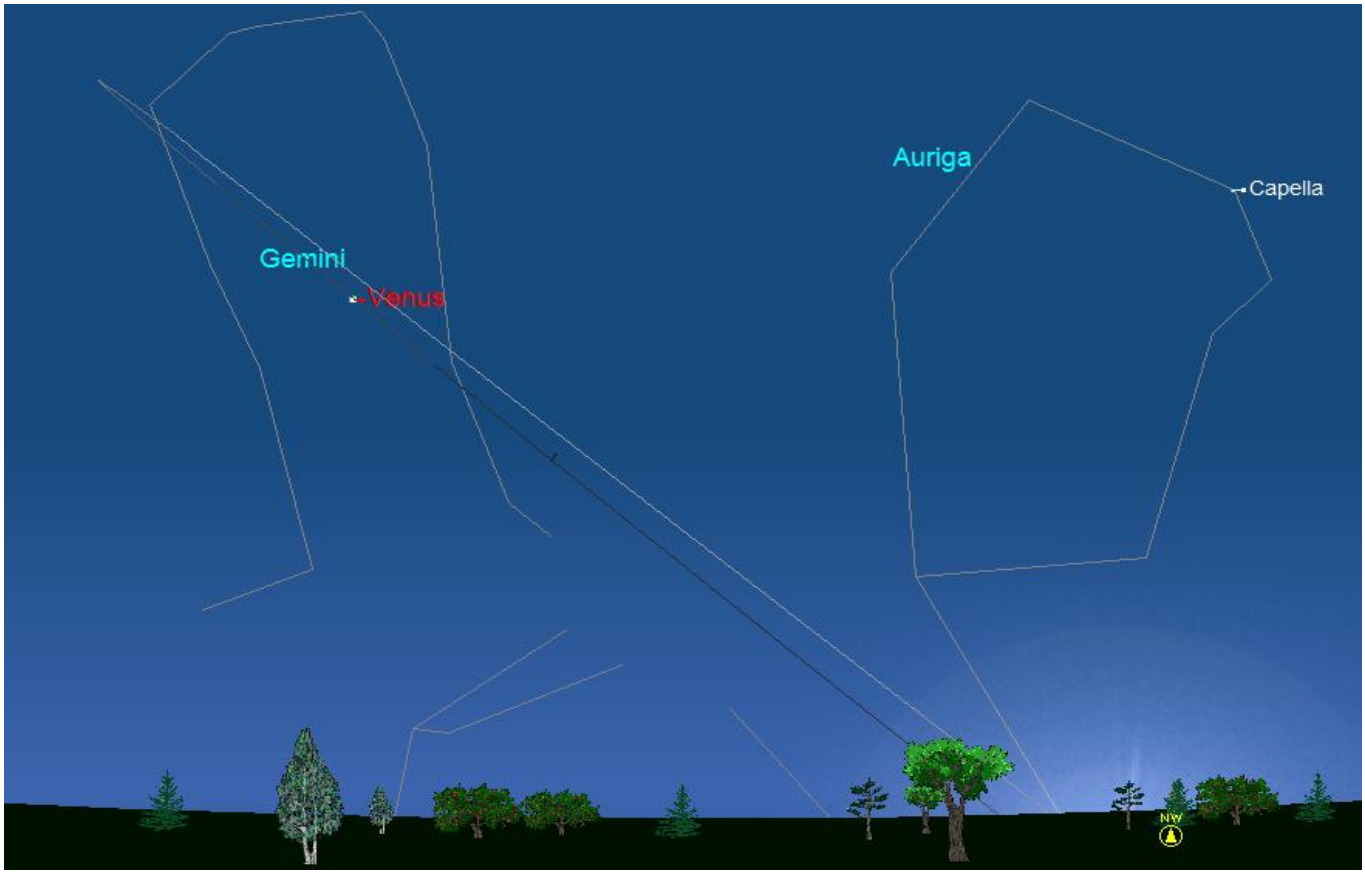
15th September First meeting of 2010-11 session

NEWBURY ASTRONOMICAL SOCIETY MEETING

3rd September First meeting of 2010-11 session

This is the last magazine until September

VENUS 'THE EVENING STAR'



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 before the light begins to fade in the west.

Venus is currently moving further away from the Sun as it makes its way around its orbit. The diagram above shows the orbit with the darker half plotting the passage of Venus as it moved out from behind the Sun. Over the next few months Venus will continue its loop out from the Sun and then begin to move back towards the Sun. The lighter part of the orbit, shown in the diagram above, shows how Venus will eventually pass between the Sun and Earth. It will emerge as the 'Evening Star' shining brightly in the east later in the year.

When Venus emerged from behind the Sun in April it was on the other 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. When Venus reaches the top of the loop of its orbit it will appear larger because it will then be the same distance away as the Sun. However only the half of the planet facing the Sun will be illuminated so we will see it half lit. As Venus moves 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 because the other side of the planet (facing the Sun) will be illuminated and all we will see is a thin crescent (like a small new Moon).

A small telescope presently 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.

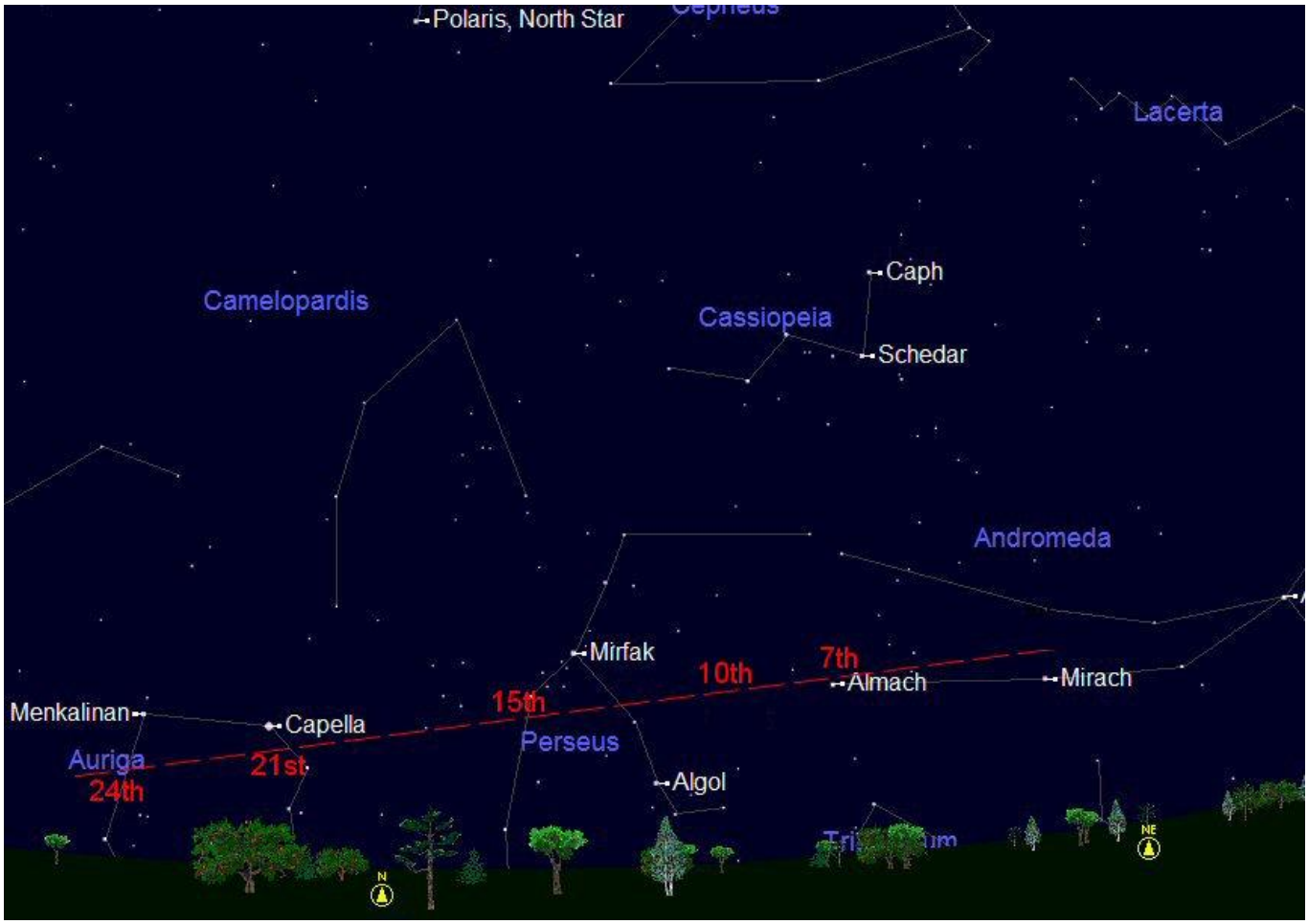
Venus is regarded by astronomers as the twin of Earth but the two planets are defiantly not identical twins. Earth is 12,756km in diameter and Venus is slightly smaller at 12,104km. Both planets have a similar composition but the atmospheres are completely different.

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 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 – the day is longer than the year on Venus.

COMET C/2009 R1 (McNaught)



We have not been blessed recently with the beautiful sight of a bright comet in our night sky. However we may have a small compensation this month with a brief visit by Comet C/2009 R1 McNaught. This will not be a bright comet and it will not be in the best place to observe but it is a comet.

This is a new comet discovered in 2009 by Rob McNaught who has now discovered 51 comets and this is his latest. The comet will be very close to the northern horizon therefore it will be necessary to have a clear view to the north. The best place to be is on top of a hill with a clear view to northern horizon at around midnight. Unfortunately the Sun is only just below the northern horizon at this time of the year so the sky above the horizon will not be dark. The comet may be at almost naked eye brightness and should have a reasonable tail.

The comet moved in towards the Sun out of view from this country but is now looping around the Sun at its closest approach. From our point of view it will appear to move around and above the Sun (which is fortunately just below the northern horizon).

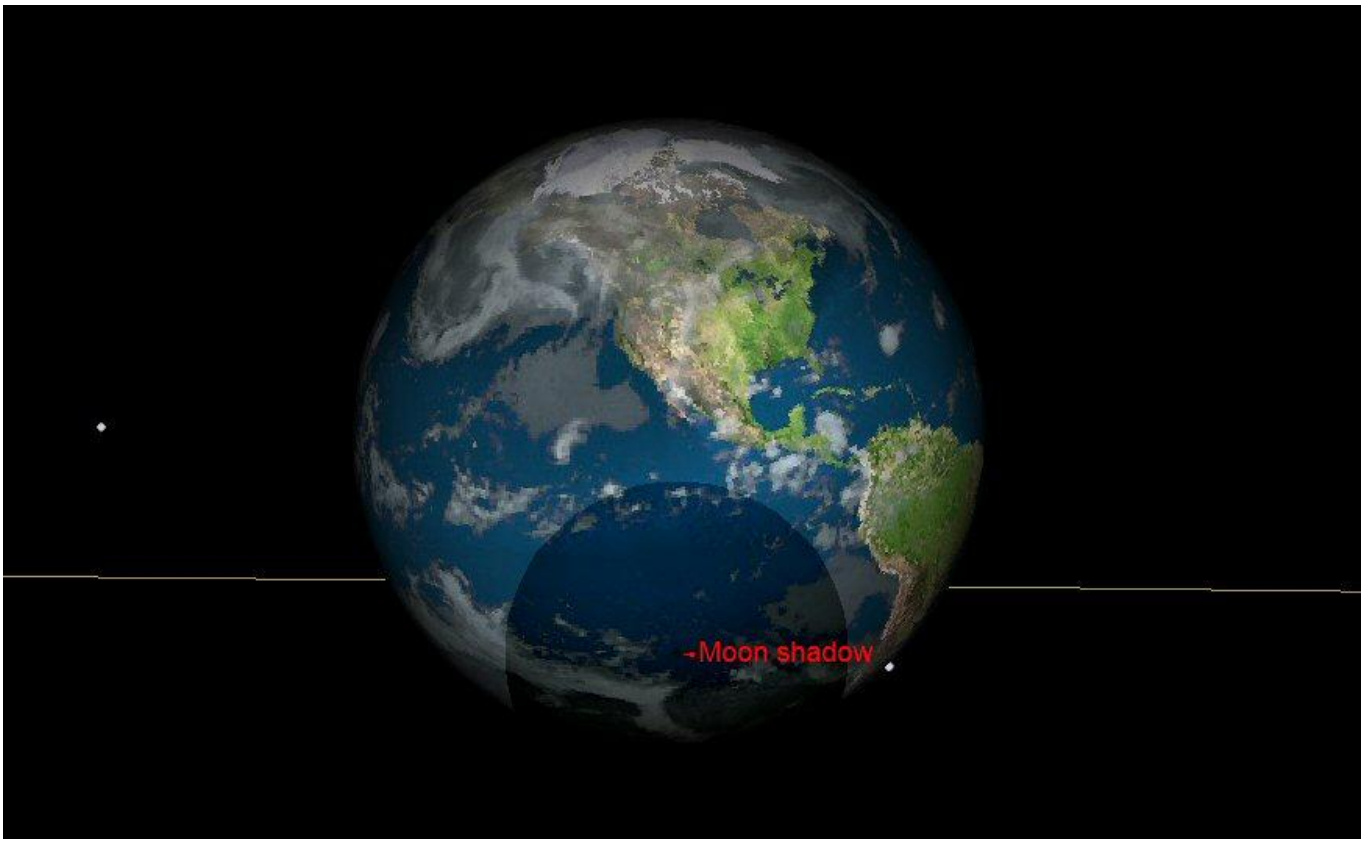
On 7th June the comet may be visible with binoculars just above the beautiful double star Almach in the constellation of Andromeda. It will be moving west (to the left as we look towards the north) and on 10th June will be just one degree north of the open cluster M34. It will then pass through the constellation of Perseus and into the constellation of Auriga. On 21st June McNaught will be two degrees north of the brilliant star Capella. On the 24th it will have moved into position just half a degree north of the star Menkalinan in Auriga. After this encounter the comet will be too close to the horizon to be observed.

A comet is like a giant dirty snowball typically about 25 kilometres in diameter. Millions of comets normally reside in the outer reaches of the solar system far beyond the orbits of the planets in a region called the Kuiper Belt. Sometimes a comet is disturbed in its orbit perhaps by a close encounter with another comet and begins a long journey moving in towards the Sun.

As a comet gets closer to the Sun (at a distance of about the orbit of Jupiter) its surface is warmed by the Sun. As the ice melts it sublimes directly into gas in the vacuum of space. The gas is blown by the radiation from the Sun into a long tail.

Comet 2006 M4 (SWAN)

As the comet approaches the Sun the tail flows out behind the comet but as the comet moves away from the Sun the tail oddly streams out in front of it.



Anyone who is travelling around the South Pacific on 11th July could be lucky and see a total solar eclipse. The image above shows Earth as it would appear when viewed from the Moon as the eclipse is happening. The large shadow is the Penumbra (the outer part of the eclipse shadow). At the centre of the Penumbra is the small Umbra (area of the totality shadow).

When the eclipse is observed from a point through which the Umbra will pass a total eclipse will be seen and the Sun will be completely covered by the Moon. If the Umbra does not pass over the observing position but the Penumbra does then only a partial eclipse will be observed. If you are not going to the south pacific then you might want to wait for the next solar eclipse in the UK. Unfortunately you will need to wait until 3rd September 2081 for the next total eclipse in the Channel Islands.

Another total solar eclipse will occur in the South Pacific on 13th November 2011 but there will be another on dry land in Africa on 3rd November 2013. There will be another crossing the USA on 21st August 2017 so it will be worth taking a holiday in the US that year to see it.

Lunar eclipses are much more common but very likely to be missed by most people except astronomers. Lunar eclipses occur when the Moon passes through Earth's shadow. These occur more often because the shadow cast by Earth is much bigger than the shadow of the Moon.

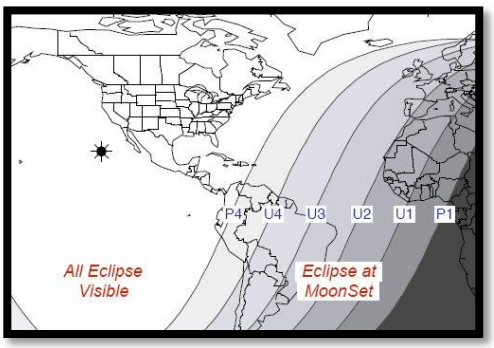
Even though it can be seen from much of the world a Lunar Eclipse largely goes un-noticed because it occurs at night during the full moon and they are not as spectacular as the Solar Eclipse. A partial Lunar Eclipse occurs when the Moon enters penumbra of Earth's shadow and is often difficult to detect even by astronomers. When the Moon is partially crossed by the Umbra the shadow can be seen clearly but is often mistaken for a normal partial phase of the Moon. The total Lunar Eclipse can however be quite spectacular. As the umbra covers the Moon completely the Moon begins to turn red. Sometimes a light red almost orange but on other occasions a deep crimson red.

The depth of the colour depends on the state of Earth's atmosphere. If there has been a recent volcanic eruption that has deposited large amount of dust into the atmosphere then the colour is likely to be a deeper red.

Lunar Eclipse on 3rd March 2007 By Lee Mcdonald

There will be two Lunar Eclipses this year but unfortunately first will not be visible from the UK. The first will be on 26th June and will be centred for viewing on the South Pacific area. Even at the best position for observing it will only be a partial eclipse.

On December 21st There will be a total Lunar Eclipse centred over the eastern Pacific Ocean. It will be total to the whole of the USA. It will also be partial from the UK.



Two images of the Moon taken using the equipment shown on page 1

MERCURY is in conjunction with the Sun and is not visible this month.

VENUS can be seen in the west as the Sun sets with Venus following the Sun over the horizon at 23:45. Venus is very bright and is very obvious in the west. The planet has climbed out from behind the Sun and will move up in the sky in an arc over the next few months. See Page 2.

MARS rises in the east at 11:00 (in the morning) mid month and will be high in the south at 18:00 (in daylight) and sets around midnight. It is in the constellation of Leo close to the brightest star Regulus. See the chart on Page 6. It appears small but will be in a good position for observing until midnight. A large telescope and a clear calm night will be required to see its small 6 arc second rusty coloured disc. Even a larger telescope will struggle to show the more distinctive surface markings and the white polar ice cap.

JUPITER rises at around 01:30 in the east. It will observable to the early riser or late sleeper but is close to the horizon. Jupiter is a great target for a modest sized telescope. It is large, bright and is never the same from one night to the next. The moons appear in different positions as they move around their orbits and sometimes pass in front of the planet and cast a shadow on the surface. The cloud patterns also change continuously as the planet rotates on its axis every 10 hours.

SATURN rises in the east at 17:00 and will be high enough for viewing by dusk. It is well placed in the constellation of Virgo, see the chart above. The ring system is just starting to open out again after appearing edge-on for most of last year. It is just possible to see the Cassini Division (the gap in the ring system) and up to four moons but this does require a larger telescope.

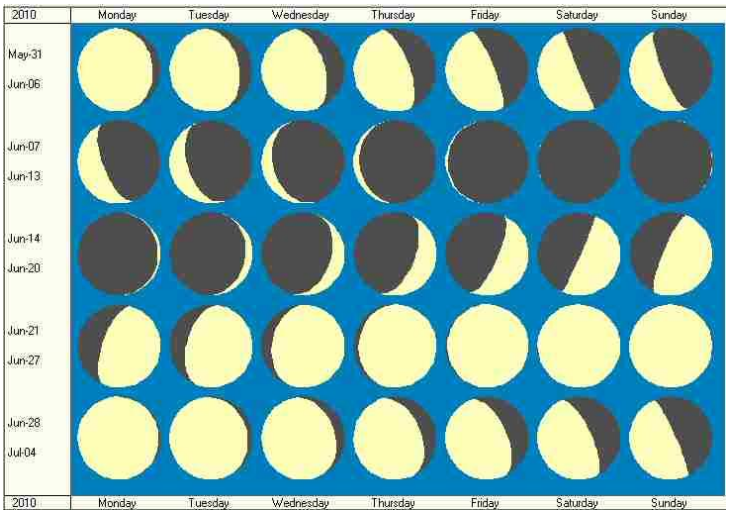
URANUS is close to Jupiter in the eastern early morning sky.

NEPTUNE rises at midnight and will be observable in the east by about 01:30.

THE SUN There has been a few Sunspots appearing over the last few months but they have been small and short lived. The Sun has an eleven year cycle of increasing sunspot activity. We should now be well into a period of maximum activity but the activity has been very sparse until the last few months with just a few spots starting to appear. See the images on Page 1.

A special solar filter must be fitted to a telescope to view sunspots or alternatively the image can be projected on to a screen. **DO NOT LOOK DIRECTLY AT THE SUN AS IT WILL CAUSE BLINDNESS**.

THE MOON The phases of the Moon this month:



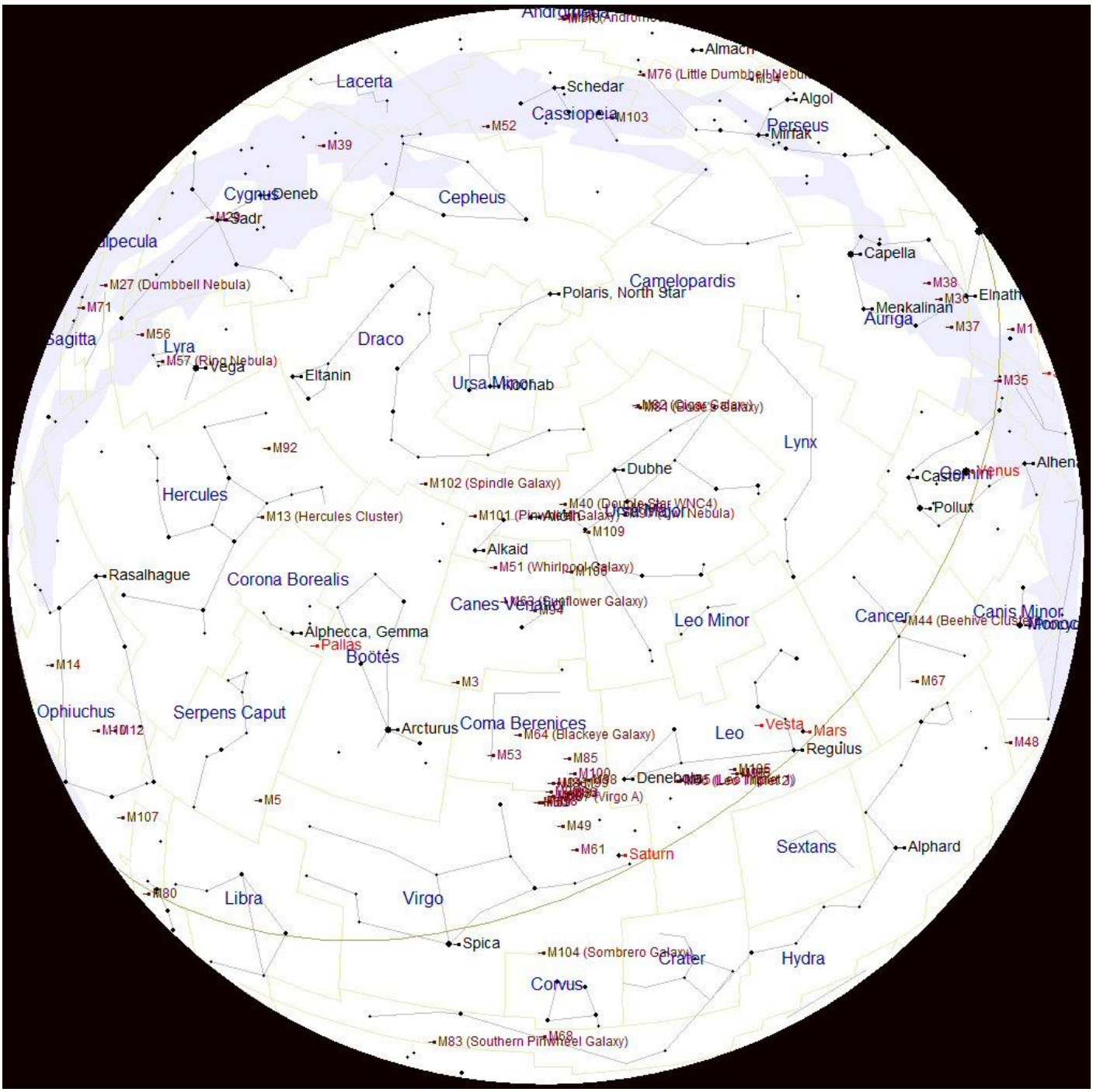
OBSERVING THE MOON

The Moon is the most interesting thing to look at using a small telescope. It is easy to find and because enormous amounts of detail can be seen there is always something new to find. Full Moon is so bright that a mask or a filter needs to be used to reduce the amount of light entering the telescope.

Objects on the 'Terminator' (the line between light and dark) are in the best position to observe because they cast long shadows that give relief to the features. This is the same effect as the long shadows we see at sunset. With the naked eye we can make out dark markings on the surface of the Moon, especially during full Moon. These dark markings are known as seas or mare. They are not seas at all, just areas of darker material.

There are craters of all shapes and sizes. It is interesting to work out the sequence of the formation of craters by the way newer craters cut into the walls of older ones.

THE SKY THIS MONTH



The chart above shows the night sky as it appears on 1st June at 10 o'clock 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 9 o'clock BST at the middle of the month and at 8 o'clock BST at the end of the month. Due to the Earth rotating once every 24 hours, the stars also appear to move 15º (360º divided by 24) each hour from east to west.

The centre of the chart will be the position in the sky directly overhead. 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 directly 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.