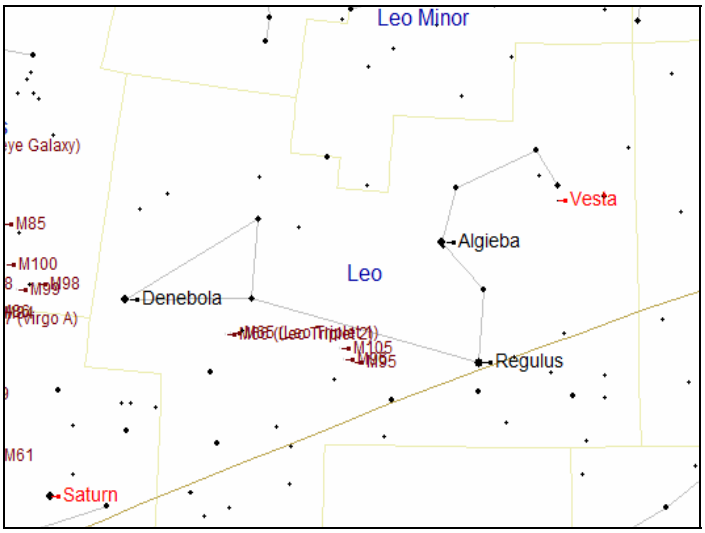
NEWBURY ASTRONOMICAL SOCIETY
BEGINNERS SECTION MAGAZINE – APRIL 2010

THE CONSTELLATION OF LEO



With Orion now moving towards the western horizon, Leo is moving in to become the most prominent constellation in the southern night sky. 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. When viewed through a small telescope a smaller companion star can be seen close by making Regulus a double star. Regulus sits virtually on top of 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. Regulus is occulted by the Moon every month for a period of 18 months every 18 years. The last series of occultations occurred around 2007 and the next series will be around 2024.

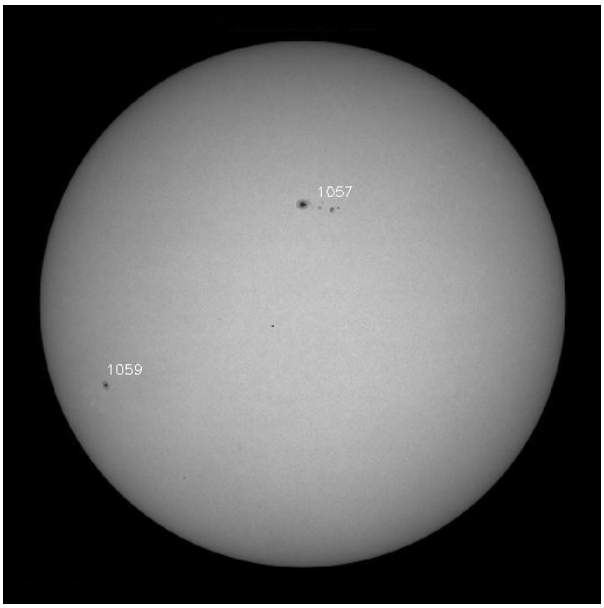
Spring time is regarded as the season of galaxies and Leo is on the edge of a large group of galaxies. The main group is located in the neighbouring constellation of Virgo to the east (left) of Leo. However Leo does have five bright galaxies of its own, these are M65, M66, M95, M96 and M105. These can be found directly below Leo shown on the chart above. A 150mm aperture telescope will be required to see the faint 'misty' outline of these galaxies.

Although not actually within the bounds of Leo the ringed planet Saturn is close by in the constellation of Virgo. Saturn is moving into a good observing position and is visible for most of the night. The ring system is still closed up with a tilt of just 2° this means that a large telescope will be required to see any trace of the Cassini Division or even the gap between the rings and the planet.

The second largest asteroid Vesta is actually in Leo and close to the star at the opposite end of the 'Sickle' to Regulus. Vesta is slowly moving westward (to the right). Its movement can be monitored from night to night and is a good way of identifying the asteroid as it moves against the stationary background stars.

SUN SPOTS ARE BEGINNING TO APPEAR

During the last week of March 2010 some large sunspots crossed the face of the Sun. There have been relatively few sun spots and those have all been quite small. The image below was taken by the Solar and Heliospheric Observatory (SOHO).



Sunspots seen by SOHO on 30th March 2010

These large sun spots are amongst the first of what had been forecast to be a particularly active solar maximum predicted for 2010 to 2012. The Sun passed through its last period of minimum activity in 2005 to 2006 and should now have built up to a period of significant activity on the surface.

Although our Sun is a very stable star it is slightly variable and has cycles of activity. The main sunspot cycle is about 11 years. Over this period sunspot intensity builds up over about 5 years then declines over the following 5 years before building again. The predicted exceptionally highly active maximum may now turn out to be the lowest for a very long time.

It will be very interesting over the next year or two to follow the activity on the Sun and record its progress (or lack of). It is of course very dangerous to observe the Sun if not done correctly. Solar observing can be done safely and simply by projecting the image of the Sun on to a card or using special solar filters. This can even be done with binoculars or a very modest telescope.

The last prolonged period of very low solar activity lasted for about 70 years from 1600 to 1670 and is known as the Maulder Minimum. This period of extremely low solar activity was accompanied by a prolonged period of very cold winters that is known as the Mini Ice Age but this may just be a coincidence.

NEWBURY ASTRONOMICAL SOCIETY BEGINNERS

21st April Equatorial Telescope Mountings

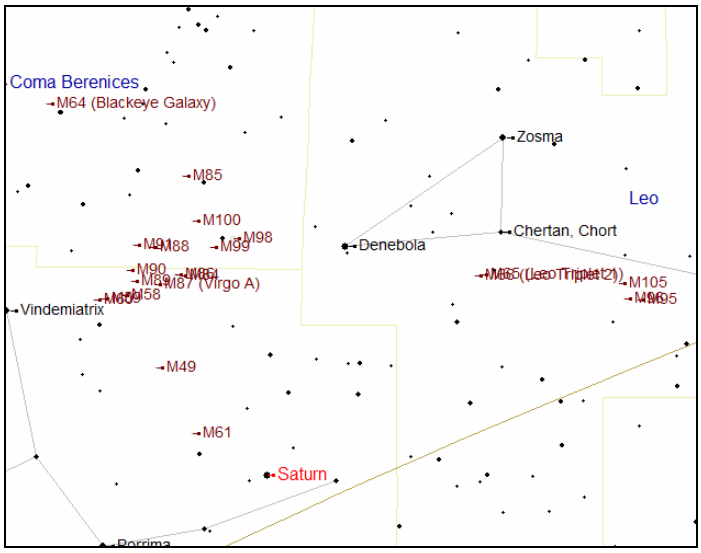
NEWBURY ASTRONOMICAL SOCIETY MEETING

7th May The Latest Results from Galaxy Zoo

For all the latest news, don't forget to visit the website on: **www.naasbeginners.co.uk**

SPRING – THE SEASON OF THE GALAXIES

Astronomers often think of this time of year as being the time to search out the many galaxies that are on view. The chart below, the chart showing the constellation of Leo on Page 1 and the 'all sky' chart on page 6 give the location of what is referred to as the Virgo Galaxy Cluster.



The Virgo Galaxy Cluster

The brighter galaxies are included in the Messier Catalogue and are shown in the chart above but there are also many fainter galaxies in the area. Although the cluster is known as the Virgo cluster it does spread across into neighbouring Coma Berenices and Leo. The constellation of Virgo is to the lower left of the chart above but the label is not shown. The planet Saturn is also shown at the bottom of the chart.

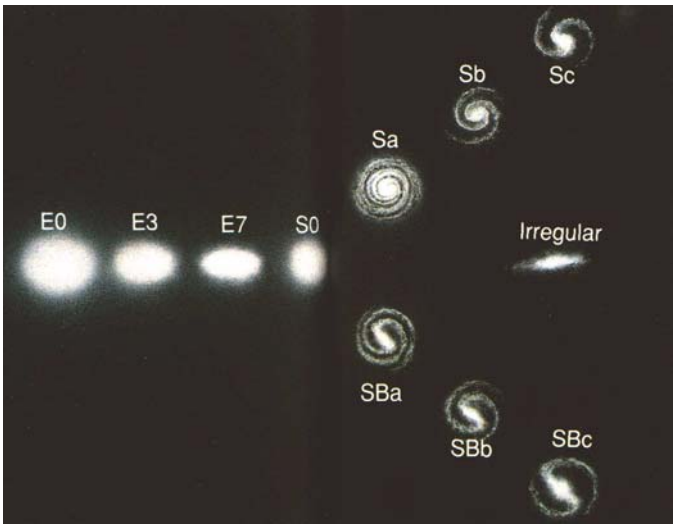
There are two reasons why we see more clusters in this region of the night sky. Firstly and quite obviously there is a near by cluster of galaxies there so there are more galaxies than average. Secondly, from our vantage point in our own galaxy, the Milky Way, we are looking out of the top of the galactic disc so there is less gas, dust and stars to obscure the faint objects outside the galaxy. The chart on Page 6 shows the position of the main disc structure of the Milky Way as it crosses the sky from Canis Major, through the constellations of Gemini, Auriga, Perseus, Cassiopeia and Cygnus.

Now what are Galaxies? They are vast clouds comprised of millions to billions of stars, gas and dust. There is still much debate about the exact mechanism of how the galaxies formed but we do know for certain that they began to form very soon after the universe was created in what is called the 'Big Bang'. Deep space images taken by the Hubble Space Telescope have revealed fully formed galaxies at distances of 12 billion light years. This means that when the light left those galaxies 12 billion years ago they looked much like the more modern galaxies we see within just 5 million light years of our position in the universe.

As gravity began to pull the matter of the universe into huge 'spider web' like filaments the forming galaxies were drawn closer together. Within the fledgling galaxies vast clouds of Hydrogen gas (mixed with a little Helium) was drawn by gravity into hot dense balls and stars burst into life. These first stars were massive compared modern stars being up to 300 times more massive than our Sun. They burned fiercely and in a just a few million years consumed their Hydrogen fuel and destroyed themselves in titanic supernova explosions.

In these explosions all the heavier elements we see around us today were created and blown out into the clouds of Hydrogen. They were mixed in by the colossal shock waves from millions of exploding giant stars. More stars formed in the clouds but these were contaminated with the debris from the earlier exploding stars. These later stars could not grow so large because of the heavier elements mixed with the Hydrogen so they became smaller and lasted longer. It appears that there was not a chicken and egg argument over whether stars formed before or after the galaxies they appear to have developed in their own way and at the same time.

When we look closely at galaxies we can see there are many different types and sizes so why are they different. Edwin Hubble proposed a theory of galaxy development and devised a diagram that linked the different types of galaxies in what is known as the 'Tuning Fork' diagram.



Hubble's 'Tuning Fork' diagram of galaxy types

In Hubble's diagram the horizontal line prefixed with 'E' are Elliptical Galaxies. The upper fork with the prefix 'S' are Spiral Galaxies. The lower arm with prefixes 'SB' are spiral but with the spiral arms originating from a central bar, these are called Barred Spiral Galaxies. Galaxies that have the characteristics of both Elliptical and Spiral are classified as Type S0. The final group in the middle of the fork are smaller Irregular Galaxies with no specific shape.

Spiral Galaxies have a suffix of a, b or c to define more tightly wrapped spiral arms around the central 'bulge'. Barred Spiral Galaxies have a similar sub-classification. Elliptical Galaxies have a numerical suffix from 0 to 7 with 0 being spherical through to 7 being 'cigar' shaped.

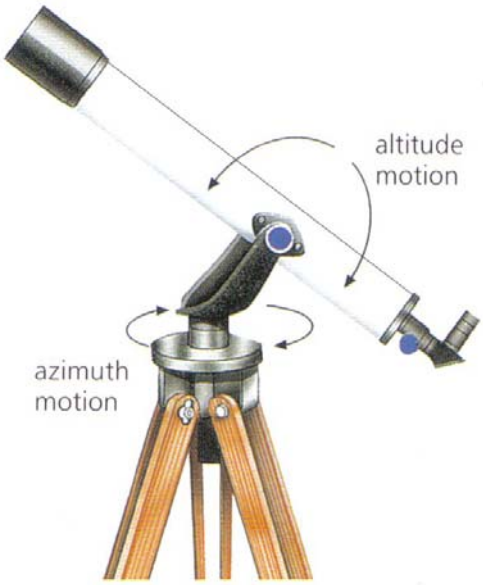
It is now thought that spiral galaxies grow by cannibalising smaller irregular galaxies and often collide with other spiral galaxies to form larger spirals. When large spiral galaxies collide they often form into larger Elliptical type Galaxies. Very large Elliptical Galaxies are often found in the centre galaxy clusters with spirals and irregulars orbiting around them.

Our galaxy the Milky Way was originally thought to be a spiral galaxy by recent study results have indicated that it may be a barred spiral. It is very difficult to determine the exact nature of our galaxy because we are inside it. The latest information suggests there may be 200 billion stars in it.

THE EQUATORIAL TELESCOPE

Last month this magazine featured an article on Dobsonian telescopes which explained that they are very much a visual observing instrument. In this article we will be moving on to consider how to use an 'EQUATORIAL' mounted telescope to observe or take images using an attached camera.

The Dobsonian mount is a very simple version of the wider range of telescope mounts known as the Alt-Azimuth. This simply means the mount has one vertical axis that allows rotation around the horizon known as the 'AZIMUTH'. It also has a horizontal axis that provides 'ALTITUDE' of the tube assembly from the horizontal position to vertical. The typical example of this type of mount is the seaside telescope.

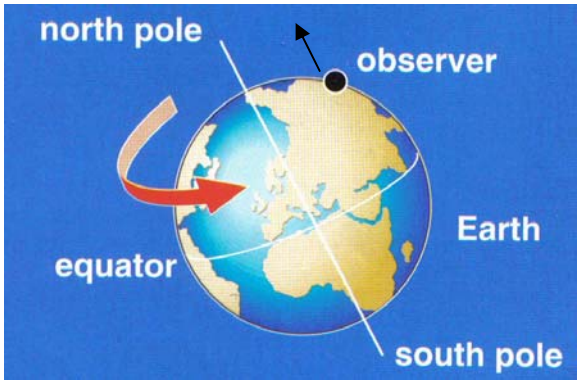


An Alt - Azimuth Mounting

An Alt-Azimuth Telescope can have a telescope tube assembly very similar to the Newtonian usually used with a Dobsonian mount. There is however no reason why any one of the many telescope tube assembly designs can't be used with any of the Alt-Azimuth or Equatorial Mount designs.

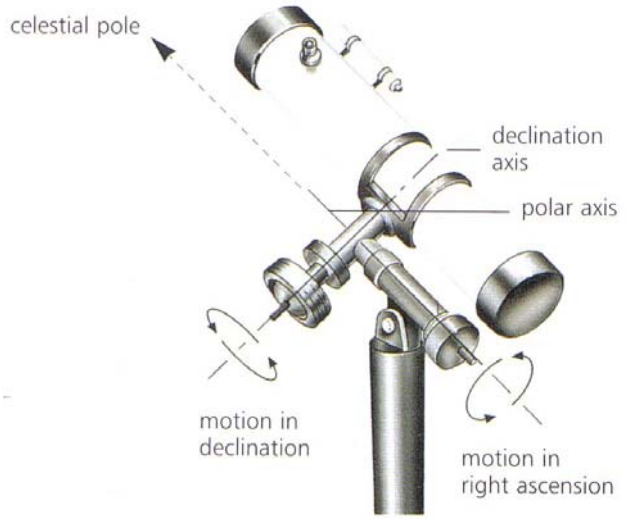
THE EQUATORIAL MOUNTING

The Alt-Azimuth Mount is a simple design with its most simplified version in the form of the Dobsonian. It does however have one major drawback in that it is quite difficult to use with a powered drive. Astronomical targets such as stars, planets and deep sky objects appear to move across the sky in an arc from east to west. This arced track is caused by the rotation of Earth on its tilted axis.



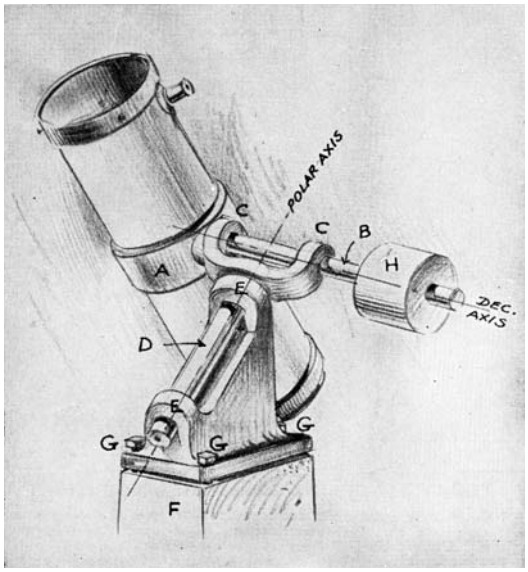
As Earth rotates, the tilt causes the stars to rise in an arc from the east. The highest point is reached as the stars are in the south. They then follow the arc down into the west.

By setting the 'Azimuth' axis of the telescope mounting at an angle equal to the tilt of the Earth, the telescope can be made to trace the same arc across the sky as the stars follow. The 'Azimuth' axis which is known as the Right Ascension (RA) will now be pointed towards the same point in the sky as does the north axis of Earth, this point is known as the Celestial Pole. We in the northern hemisphere are very lucky to have a fairly bright star close to the north celestial pole. This is the star called Polaris (The North Star or Pole Star) in the constellation of Ursa Minor (The Little Bear).



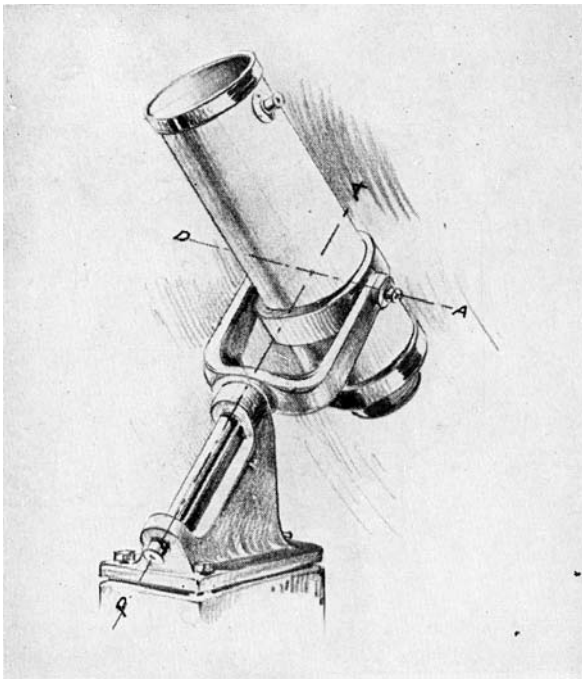
The major advantage of the Equatorial mounting is in its ability to be driven on just one axis to track objects across the sky. By driving the axis with a motor that will give one rotation every 24 hours the telescope will rotate at the same speed as Earth. This type of drive is essential if the telescope is going to be used for photographs or digital imaging with exposure times exceeding 30 seconds.

There are a number of different designs of equatorial type mountings. The beautiful hand drawn pictures below are taken from a very famous book written in 1937 by Rev. Albert G. Ingalls called Amateur Telescope Making.



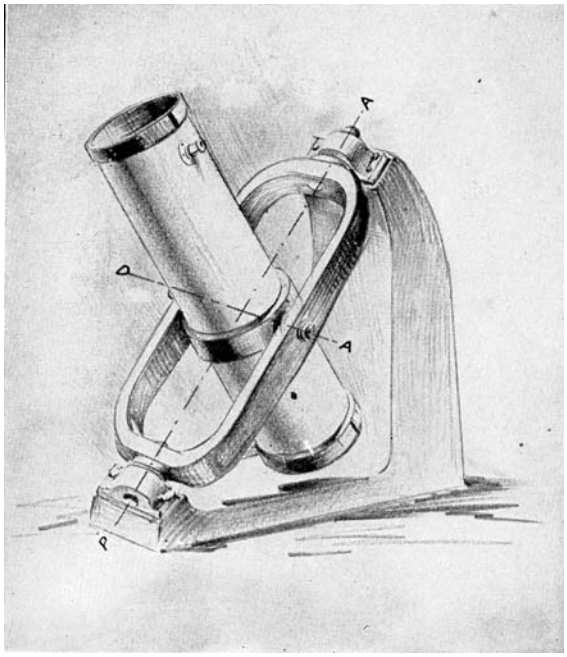
The German Equatorial Mounting

The German Equatorial Mounting design is the most common equatorial mounting used by modern amateur astronomers. The 120mm Skywatcher Refractor shown on Page 4 is mounted on a typical mounting of this type.



The English Fork Type Equatorial Mounting

This design is often used to mount large professional telescopes. A similar set-up is achieved by fitting a Schmidt Cassegrain Telescope (SCT) such as a Meade on an Equatorial Wedge. The Newbury Astronomical Society's SCT (Daran's Telescope) is shown in the next column mounted on an equatorial wedge.

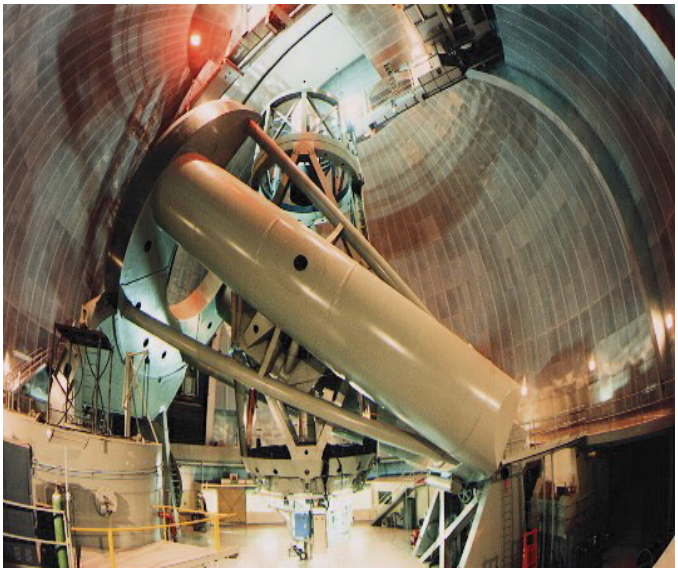


The Double Yoke Equatorial Mounting

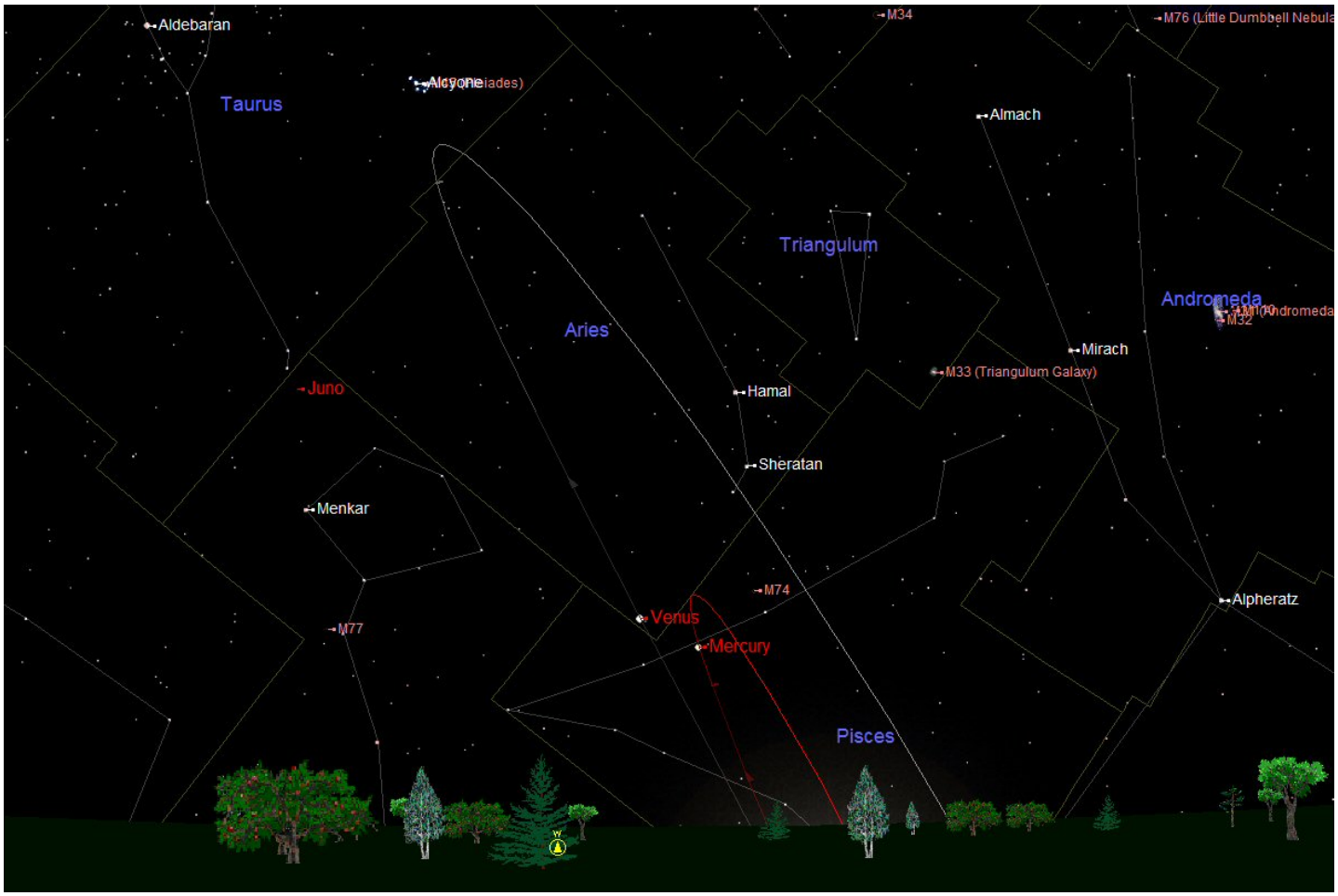
This design is also used to mount many large professional telescopes. There are a number of variations on this theme that will allow access to the area of sky around the poles. The upper yoke is often greatly enlarged into a 'horse shoe' shape so that the telescope tube can be pointed through the upper bearing to gain access to the sky close to the pole. The picture of the Hale 200inch Telescope shown in the next column shows the upper yoke bearing enlarged and cut away as described above. The Hale was for many years the largest telescope in the world.

A 120mm Skywatcher Refractor on a EQ5 Mounting

Daran's 200mm SCT Mounted on an Equatorial Wedge



The 200inch Hale Telescope on Mount Palomar



The paths of Mercury and Venus and their positions on 31st March 2010

MERCURY will be in its best observing position of the year from the end of March to Middle of April. It will be visible low over the western horizon close to Venus. Mercury begins its appearance brighter but low around 20th March. It climbs up from the horizon but moves further from us and therefore appears ever fainter. On 8th April it will reach it highest point in the sky and then begin to move back towards the horizon.

VENUS can be seen in the west as the Sun sets at 19:40 with Venus following the Sun over the horizon at 22:00. Venus is very bright and close to the fainter Mercury from 28th March to 8th April when they begin to move further apart.

MARS rises in the east at midday mid month and will be high in the south at 20:00 in the constellation of Virgo. It appears small but will be in a good position for observing for most of the night. A large telescope and a clear calm night will be required to see any detail on its small 8 arc second rusty coloured disc. A larger telescope will just show some of the more distinctive surface markings and the white polar ice cap.

JUPITER is still too close to the Sun to be seen this month.

SATURN rises in the east at 17:00 and will be high enough for viewing by 20:00 and very well placed in the south by midnight. 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) but it does require a larger telescope.

URANUS is behind the Sun and not observable this month.

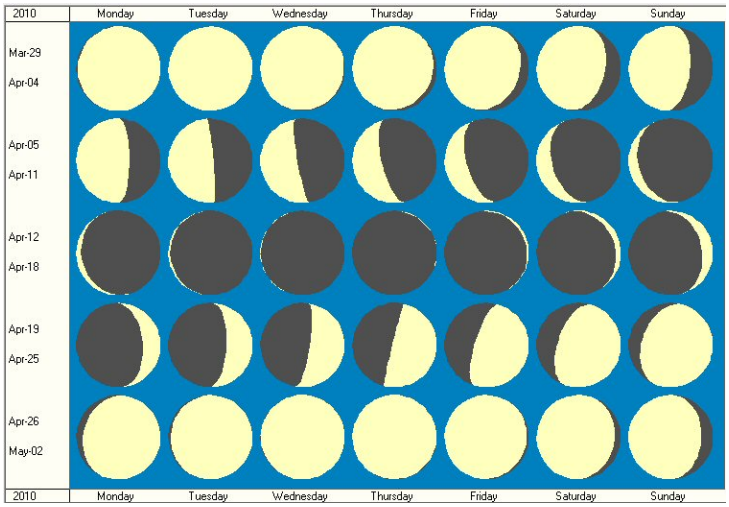
NEPTUNE is now is moving out from behind the Sun and will not be observable this month.

THE SUN There has at last been some Sunspots appearing recently to enlighten the hitherto bland views of the Sun. 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 have started to appear.

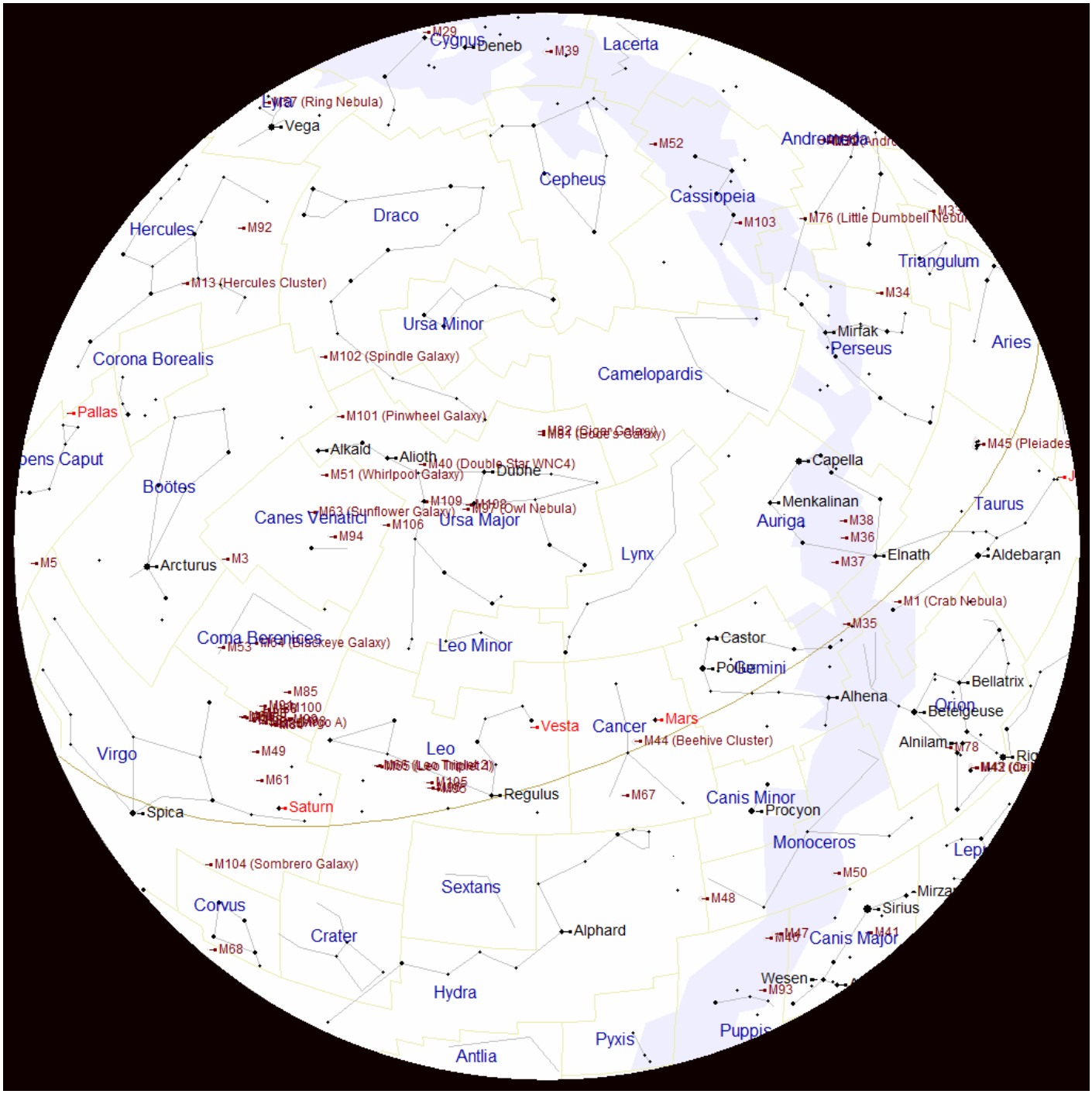
See the special article on Page 1.

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

THE MOON The phases of the Moon this month:



THE SKY THIS MONTH



The chart above shows the night sky as it appears on 1st April at 10 o'clock British Summer 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 9 o'clock BST at the middle of the month and at 8 o'clock GMT 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 almost 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.