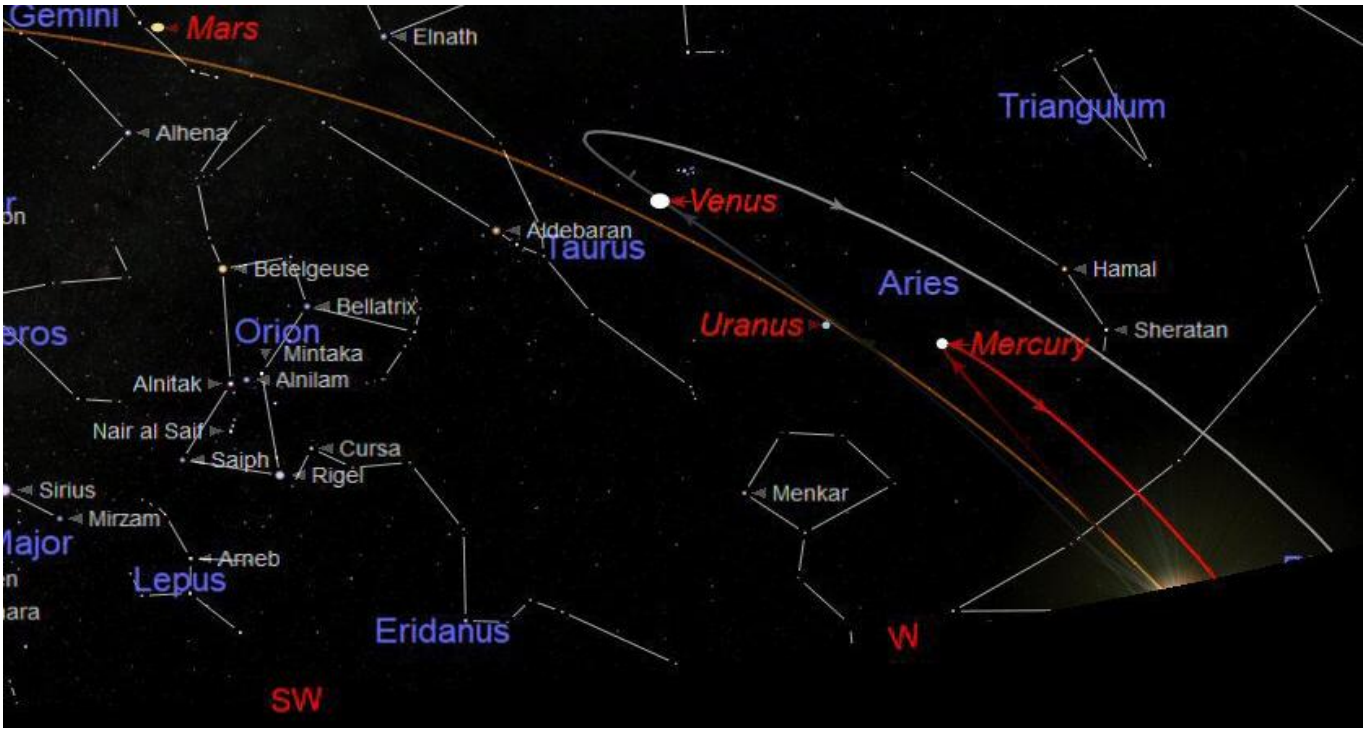
NEWBURY ASTRONOMICAL SOCIETY
MONTHLY MAGAZINE – APRIL 2023

OBSERVING MERCURY AND VENUS THIS MONTH



Orbits of Venus and Mercury in the west at sunset on 11 April 2023

This month will be a good opportunity to observe the two 'Inferior' planets Mercury and Venus especially if a small to medium telescope is available. These two planets are called 'Inferior Planets' because their orbits are inside the orbit of our planet Earth. Planets that orbit outside of Earth's orbit are called the 'Superior Planets'.

As the 'Inferior Planets' have their orbits inside the orbit of our planet they always appear in the same direction as the Sun. That is in the west at sunset or in the east at sunrise. Venus is very bright and easy to locate when it is far enough from the glare of the Sun. Mercury is the closest planet to the Sun and is much smaller than Venus. It is bright but not as bright as Venus and is often difficult to find in the glare closer to the Sun.

Venus and Mercury as seen through a telescope

The brightest of all the planets, Venus, will be visible in the early evening sky as soon as possible after sunset. It will appear at a rather small diameter (for Venus) and will be and just over half illuminated. It is still beyond the Sun from our point of view but will be approaching the point on its orbit where it will appear to be half illuminated on 4th June. This is when Venus will appear at its apparent furthest point from the Sun from our point of view. This is called 'Greatest Easterly Elongation'. This is because it appears to be at its furthest to the east from the Sun.

Mercury will be at its very best on 11th April this year so is well worth seeking out if there is a clear night around this date. A small to medium sized telescope will be required and a high magnification 100x to 200x to see the crescent shape of the planets. A clear view to the western horizon will be required especially for observing Mercury as it will be low in the west.

Venus may be too bright so the Dust Cap can be placed over the end of the telescope and the Moon observing cap removed to reduce the glare. Alternatively a Moon filter can be used. Venus will be close to the thin crescent New Moon on 23rd April that will be an ideal photo opportunity.

NEWBURY ASTRONOMICAL SOCIETY MEETING

31st March Origins of the Solar Wind

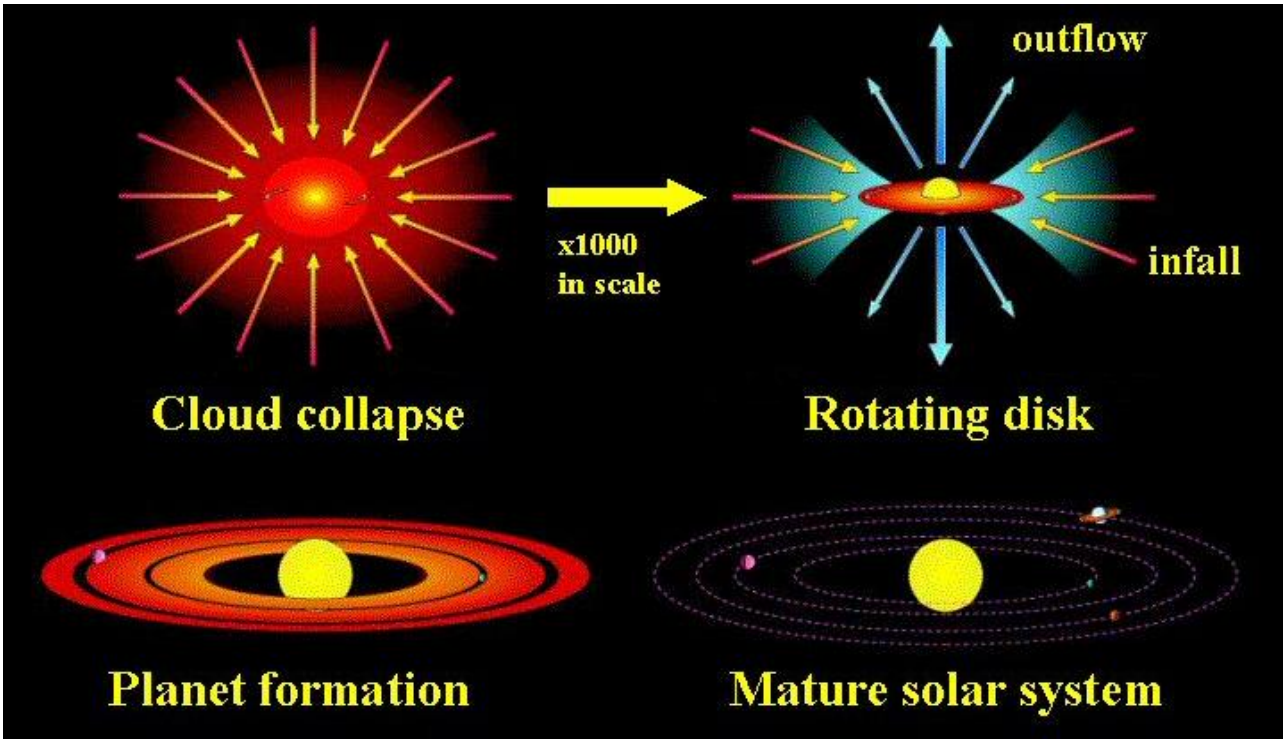
Website: www.newburyastro.org.uk

NEXT NEWBURY BEGINNERS MEETING

19th April Observing our star – The Sun

Website: www.naasbeginners.co.uk

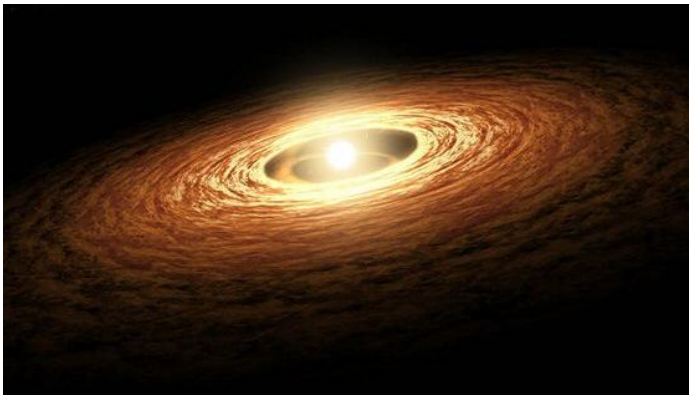
OUR STAR – THE SUN



Stars from in vast clouds of Hydrogen Gas

Starting with the absolute basics we have to say our Sun is a Star. So perhaps we should just consider what a star really is. At the fundamental level we could say a star is just a cloud of gas and that is exactly what it is. All stars are created in vast clouds of Hydrogen gas that constitute a large proportion of what Galaxies are made of. Hydrogen gas is drawn into denser clumps of gas and more material is drawn in by the increased gravity.

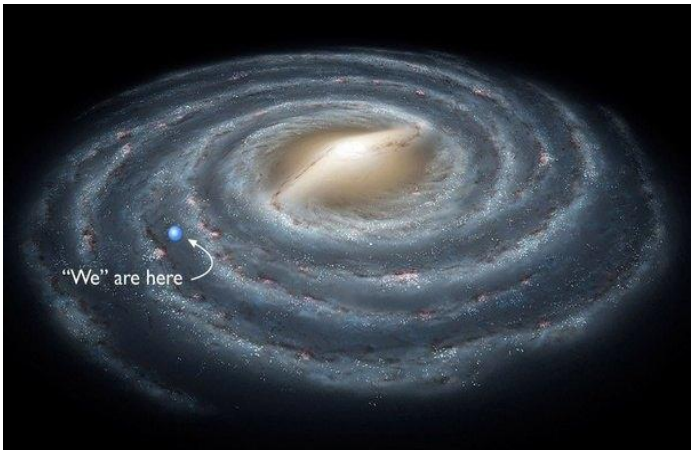
Denser clumps of gas form in the disc as the gas is pulled in by the increasing gravity and this process increases as the clumps accumulate more mass. Eventually gravity compressed the clumps of gas into the smallest possible volume and it became a rotating sphere.



The formation of our Sun from a Nebula

Ever more gas is pulled in as the mass and gravity of the sphere increases. Enormous pressure in the core of the sphere causes the temperature to increase to millions of degrees. The pressure and heat, force the Hydrogen atoms together and they combine (fuse) to create larger and heavier atoms of Helium gas. In the process of this Nuclear Fusion, a vast amount of energy is produced in the form of X-Rays. All this additional energy heats the sphere of gas and it begins to shine and a star is 'born'.

All stars have been created by this process in galaxies throughout the Universe. So our Star (that we call the Sun) is just one of over 200 billion stars in our Giant Barred Spiral Galaxy that we call the Milky Way.



The location of our Sun in the Milky Way Galaxy

All stars are created as described above and all stars are made basically the same. However they develop differently depending how big (massive) they are. Larger stars use up their Hydrogen faster and shine very much brighter. Giant stars (>25x mass of Sun) stars use their fuel up very quickly. Small stars use less fuel and survive for much longer.

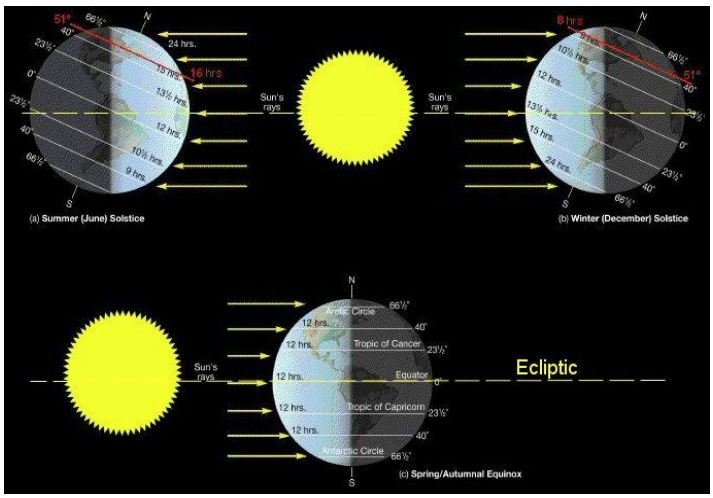
The most common stars are the small and very small ones because they 'live' much longer (some for trillions of years). Larger stars consume their Hydrogen fuel very fast and may survive for only a few billion years. The very largest stars use up their fuel so fast that they may survive for only a few million years then they explode as a Supernova and destroy themselves.

Our Sun is classed as a Yellow Dwarf and will last for about 10 billion years. It is already 4.3 billion years old so it has about 4 to 5 billion years of fuel left.

The Sun changes position in our sky in two ways. First it appears to move across the sky every day due to the rotation of Earth. The Sun rises in the east in the morning and sets in the west in the evening. It appears to follow an arc across the sky so if we trace an imaginary line along its path the arc becomes apparent. We call this arc of the Sun's path 'the Ecliptic'. This arc is caused by Earth being tilted over at 23.4º compared the plane of the Solar System. The planets have their orbits on this plane and the Moon's orbit around Earth on this same plane despite Earth's tilt. Therefore all the planets, the Moon and the Sun appear to move along this Ecliptic arc (the equator of the Solar System.

Our seasons are caused by the 23.4º tilt of Earth's axis of rotation. As Earth orbits the Sun (once per year) the axis of rotation remains pointing at the same angle and direction. This has the effect of the poles being tilted towards the Sun for half of the year and tilted away for the other half of the year. When the North Pole is tilted towards the Sun the Ecliptic and the Sun appear higher in the sky during the day so it will be summer. During the summer nights the Ecliptic will be lower in the sky so the Moon and planets will be lower and closer to the horizon.

The Sun rises at about 06:30 this month as it will be beginning of spring. Midsummer Day (the Summer Solstice) will be on 20th June. This is the time when the Sun appears to reach its maximum height above the southern horizon, it will actually occur at 22:00 (UT/GMT) on 20th June. Until this exact time the Sun will appear to be getting higher in the sky and then after 22:00 it will appear to get lower as we begin to head back towards the next WINTER.



The seasons due to Earth's tilt

The diagram above shows how the length of the day changes due to the tilt of Earth's axis of rotation. The top left diagram shows how the north is tilted towards the Sun in summer and the days are longer (up to 16 hours long for us). During the winter the north is tilted away from the Sun (top right diagram). The days are as short as 8 hours for us in the UK on midwinter day 21st December (UT/GMT).

It can be seen that on summer day (left diagram) there is 16 hours of daylight in the UK and only 8 hours of night darkness. Conversely at midwinter (right diagram) there is only 8 hours of daylight but the nights are 16 hours long. Another effect of the changing seasons is the summer days are warmer than the winter days. The main reason for this is that in midsummer the UK is much closer to the equator of the Solar System (the Ecliptic) and the Sun appears almost overhead. In midwinter the UK is much closer to the North Pole during the day so the Sun appears much lower in the sky. The lower diagram shows the Equinoxes. This is when we are half way between midsummer and midwinter when the days and nights are the same length. (20th March)

So the summer days are good for observing the Sun during the warm days. The summer nights are short and the sky does not get completely dark from mid May to mid August so observing faint deep sky objects is quite difficult. Summer nights might be short but they are warmer so night time observing can be more comfortable and some observing can still be done.

In midsummer the Ecliptic appears low in the south at midnight and appears high during the day. This can be seen by the Moon and planets being close to the horizon at night and the Sun being high in the sky during the summer days. The first chart below shows the night sky in midsummer. The second chart shows how the Sun is high in the south, on the Ecliptic on the same day at 12:00 (GMT) 13:00 (BST).

Midnight on 21st June 2023 Midsummer Day

It can be seen on the midnight chart (above) the planets are located on or near the Ecliptic so they are in the more turbulent and contaminated air close the horizon. Therefore they will be difficult to observe due to movement of the air and its poorer quality. We would also be looking at them through much more thick air close to the horizon (about 300 km) compared to the relatively shallow thickness of the atmosphere directly overhead (our Zenith) marked in red on the charts.

Midday on 21st June 2023 Midsummer Day

OBSERVING THE SUN 'SAFELY'

The ideal thing to observe during the summer is the Sun. Of course we must take great care in how we observe the Sun as it can be very dangerous if not done correctly. A telescope or binocular must never be used to look directly at the Sun. The instrument is designed to gather as much light as possible from faint objects and direct that light into our eyes. However the Sun produces a lot of light and heat so directing all this extra light and heat into the eye will cause permanent damage to the eye and blindness.

There are two ways to observe the Sun safely these are to use a special Solar Filter or to project an image of the Sun on to a screen. If we do have a telescope or binoculars we can use a piece of white card as a screen and project the light from the Sun on to the card.

If binoculars are to be used, cover one of the lenses with the dust cap. Place the card in a suitable supported position so its flat surface is facing the Sun. Hold the binoculars about 300mm above the card in the direction of the Sun. Move the binoculars around until the projected image can be seen on the card. The process can be improved by supporting the binoculars using a stool or improvised stand to support the binoculars and screen.

A simple rig can be assembled to support a screen and attach it to a telescope to allow the image of the Sun to be projected on to a screen. The picture below shows such a homemade rig fitted to the author's refracting telescope.

A Solar Observing Screen attached to a telescope

There will probably be too much light so the Dust Cover can be fitted over the lens of the telescope and the small light reducing cap removed. This will reduce the glare on the screen and help protect the eyepiece from overheating and damage.

Venus Transit 8th June 2004 imaged using the rig above.

For those who are fortunate to have access to a telescope, observing the Sun can be taken a step further. The telescope can be used 'safely' to observe the Sun in more detail. The telescope must be fitted with a fail-proof Solar Filter. This can be bought ready made from an astronomy shop or can be made at home using a sheet of special Mylar Solar Film.

Mylar Solar Filter fitted to a Reflecting telescope

The 'Solar' filtered telescope shown above will allow just a tiny amount of sunlight over the full aperture to enter the telescope. It will be the full spectrum (all wavelengths of light) so it will be the natural white sunlight. This will allow any sunspots to be seen in very good detail. It will also show the 'mottled' surface of the Sun, looking like the texture of orange peel.

WARNING If the telescope has a finder telescope fitted, it must be securely covered or the finder completely removed to avoid accidental burns.

A more advanced type of filter can be bought that will show the activity on the surface and in the atmosphere of the Sun to be seen. These are called Hydrogen Alpha filters. They will allow just one very narrow wavelength of light to pass through. This is the deep red light emitted by excited Hydrogen gas on the Sun.

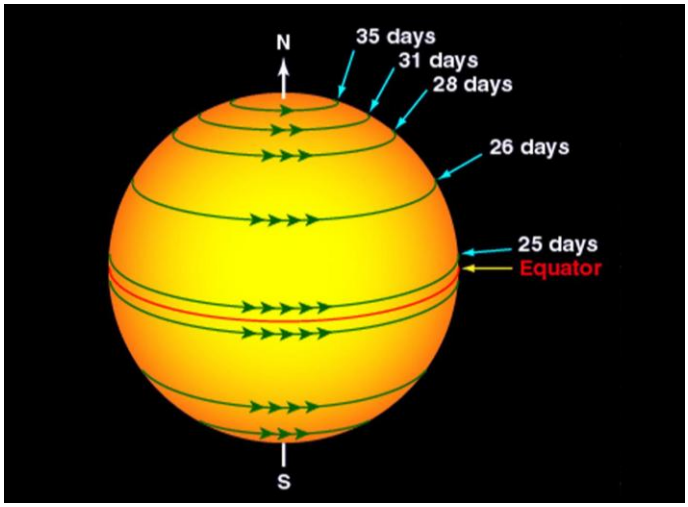
The Hydrogen atoms are able to absorb photons (mainly Ultraviolet light) but this causes the electron in the atom to jump out of its orbit into a higher orbit. The electron will quickly jump back to its natural orbit but to do this it must release the energy from the photon. It does this by releasing a flash of light that is at a discrete wavelength and is always deep red in colour. This wavelength of light is called Hydrogen Alpha (Hα).

A Personal Solar Telescope (PST) Hα telescope

OBSERVING SUN SPOTS

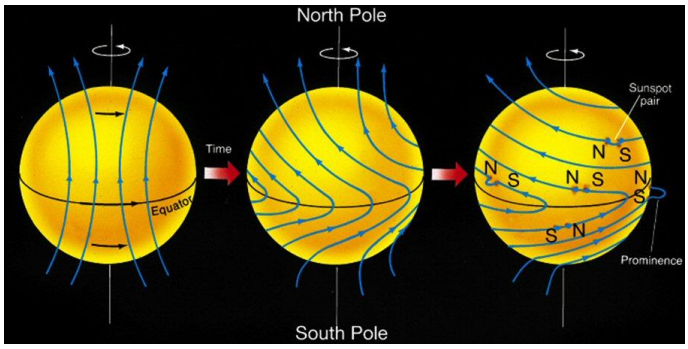
During the summer months the night sky does not get dark enough for deep sky observing so the only objects we can observe are Planets, our Moon and the Sun. The Sun is good because we can observe it during the day and enjoy the warm sunshine while we are doing it. So what is there to look for on the Sun using a telescope?

Strange as it may seem our Sun, like most stars, is spinning on its North / South axis. The Sun as a whole rotates once every ~27 Earth days but it is a little more complicated than that. All normal stars are mainly comprised of Hydrogen. As Hydrogen is a gas the Sun is obviously not solid and behaves as a fluid. As a result, the spin causes the equator to rotate faster than the poles as shown in the diagram below.



Rotation times of different zones on the Sun

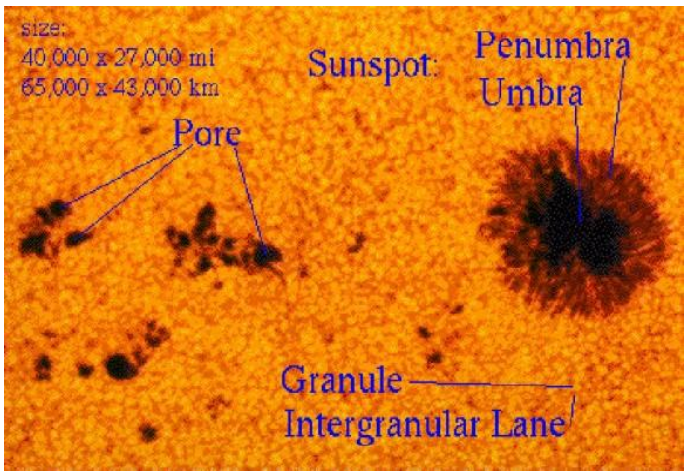
The Sun is a giant magnet with a magnetic North Pole and South Pole just like a bar magnet. Lines of magnetic force between north and south link the poles as all magnets do. The Sun is made of gas and is fluid so its structure is able to flow around freely. This allows the equatorial region to rotate faster than the regions near the poles. Consequently the equatorial region pulls the lines of magnetic force around with it. Over a period of about five years the lines of force become distorted and pulled around the equator until they become tangled.



Magnetic Field stretched around the Sun

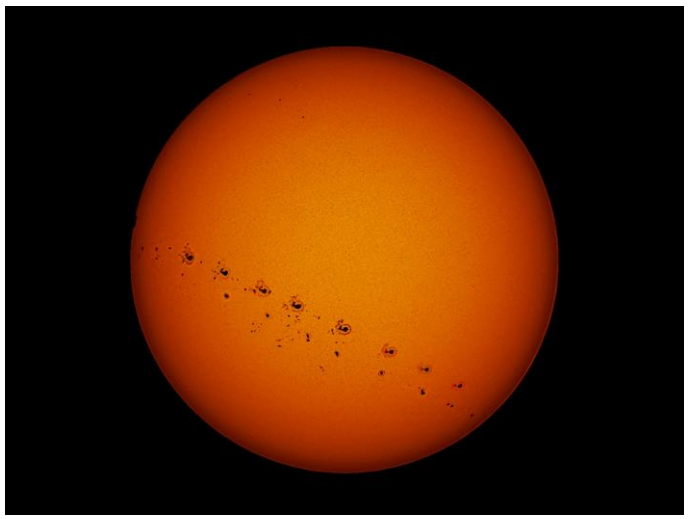
Eventually the stress becomes too great and the lines of magnetic force begin to snap. They often reconnect to other force lines when a north force is attracted to south force. This snapping and rejoining can cause enormous discharges of stored energy. These can cause huge eruptions on and above the surface of the Sun.

Where the magnetic field becomes disturbed the visible surface (called the Chromosphere) is also disturbed and hole is produced. A lower and slightly cooler layer is exposed and the bottom of the hole appears darker than the surface. We call this dark spot a 'Sunspot'.



Features that can be seen on the Sun

The picture above shows a large and well formed Sunspot on the right. It has a dark central region called the 'Umbra' that is surrounded by a lighter area called the 'Penumbra'. These sunspots can be round as shown or may be oblong or even double. They can vary in size and shape and may also appear in groups. Smaller spots may appear singly or may be seen as speckled groups called Pores. On a clear day the granular structure of the surface of the Sun may be seen.



Sunspots move across the Sun daily

Sunspots may last for a few days but larger ones may last for a few weeks. If sunspots are observed over a few days they will appear to move across the surface of the Sun as it rotates. We can make sketches of what we see or it can be photographed. Photographs can be combined to show the daily movement as shown above.

Here are few words of advice for observing the Sun, using a telescope:

Do not point the unfiltered telescope directly at the Sun.

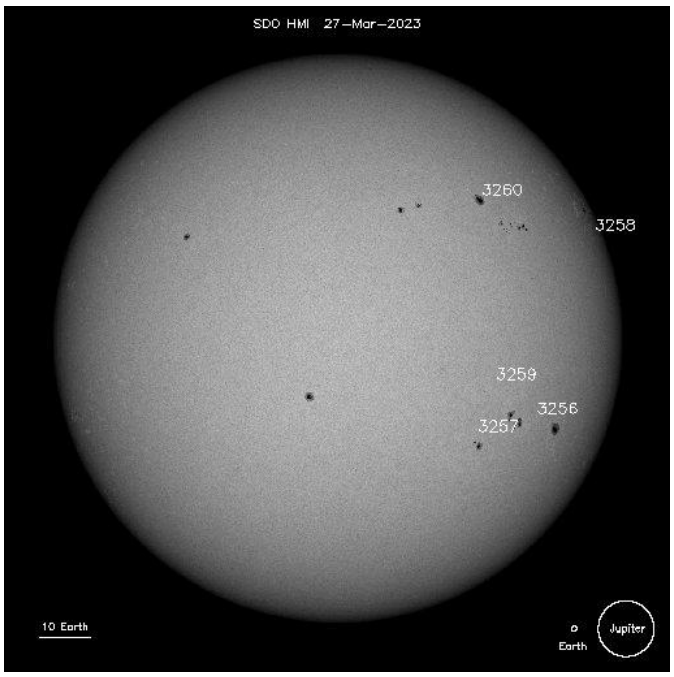
Fit a proper solar filter to the telescope or project the image on to a white card placed behind the eyepiece.

Keep the finder scope covered or remove it completely.

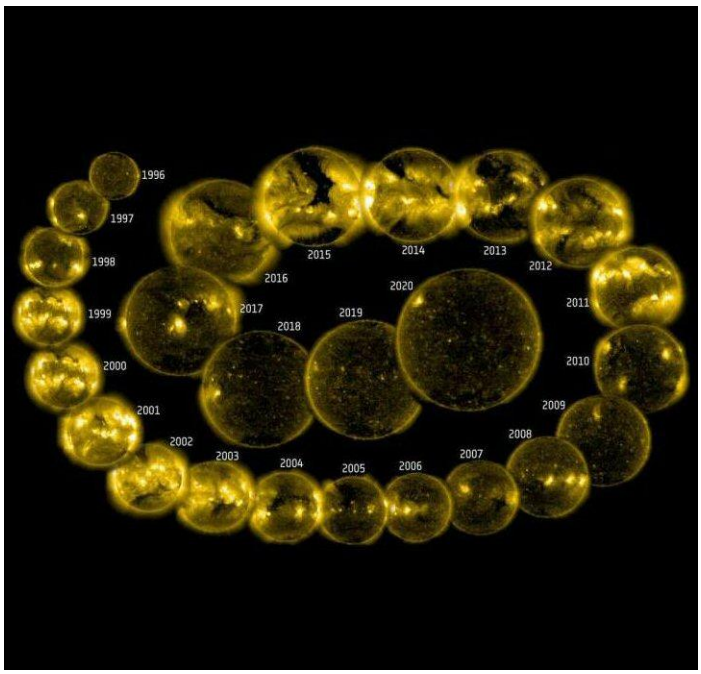
Try to place the telescope looking over a grassed area as this will help to reduce the heat haze distortion.

Use a higher magnification to see detail on sunspots.

SOLAR ACTIVITY AND SUNSPOTS



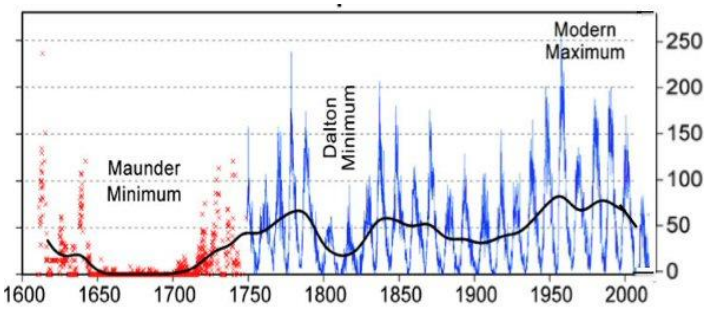
Sunspots seen by SOHO on 27th March 2023



Solar Activity Cycles 23 and 24 (1996 to 2020)

Those of us who observe the Sun and follow the Sunspot Cycles have noticed that the numbers of sunspots appearing on the Sun have started to increase. There is an eleven year cycle when sunspots increase over a period of about five years and then decrease over the following five years.

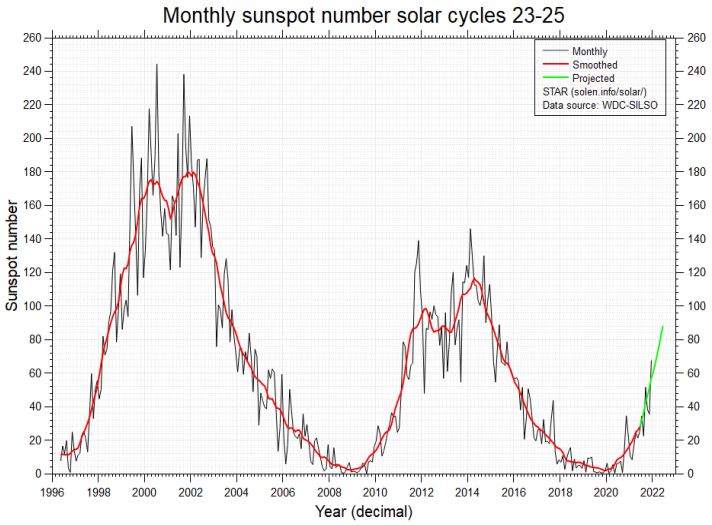
Records have been kept over the last 25 cycles and it has been seen that maximum and minimum of each cycle appear to vary over a number of cycles producing a longer cycle of cycles. The chart below shows graphically the numbers of the Solar Cycles of sunspot numbers over the last 400 years. The numbers recorded in each cycle are shown on the right side of the graph.



Sunspot Cycles 1600 to 2020

The main solar cycle has a period of about 11 years but there is not an exact transition point so the cycle period is just approximately 11 years. The chart above shows the 24 cycles that have been recorded since the early 1600's. The red section (on the left) shows informal records that were available before more formalised records began around 1750.

The peak of the cycles shows an increase of activity on the Sun that is usually manifested by the increase in the appearance of the number and size of Sunspots. Telescopes can be fitted with a special solar filter called a Hydrogen Alpha (Hα) filter. This type of filter allows the surface of the Sun to be seen in great detail. It will also allow flares, known as 'Prominences', to be seen erupting from the edge of the Sun.



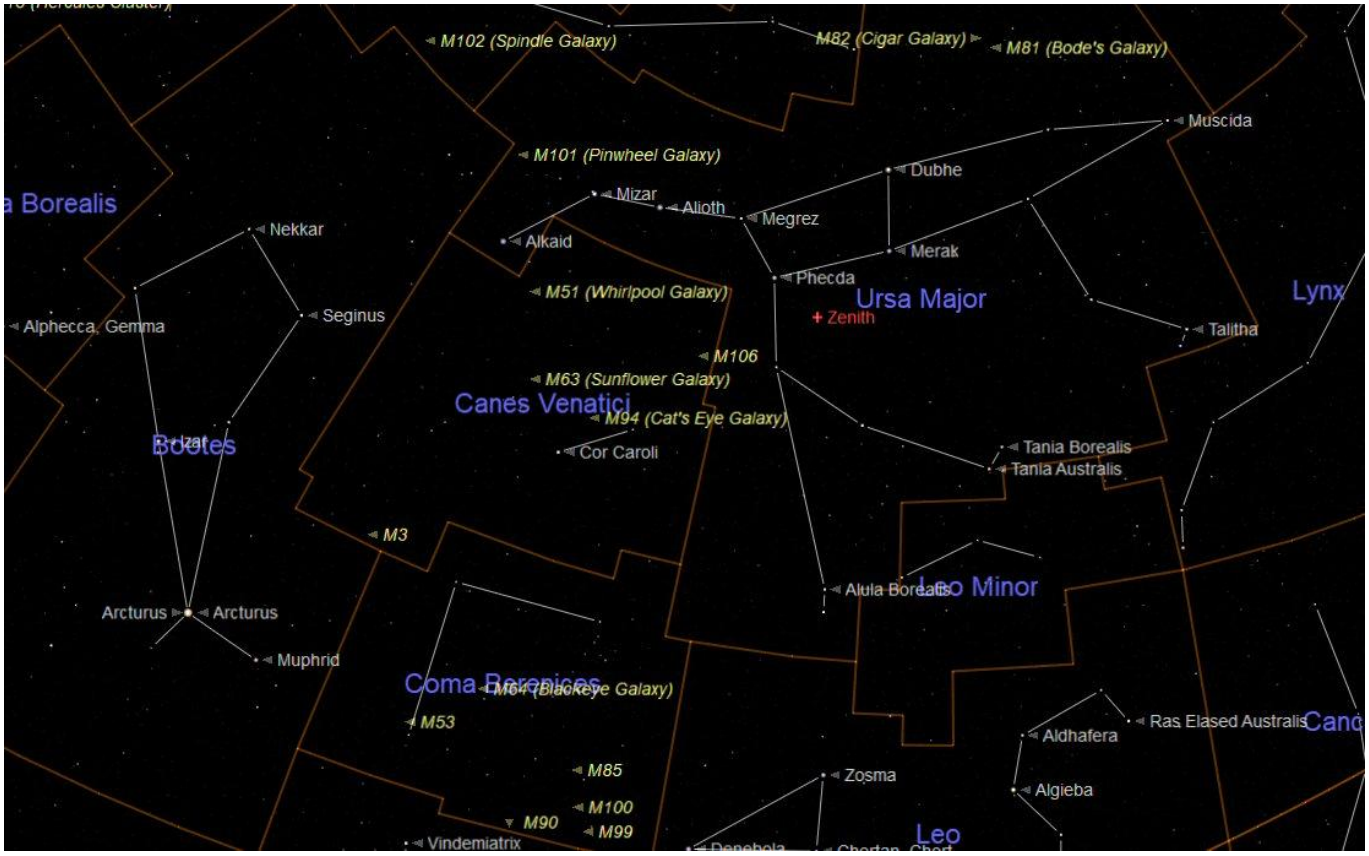
Solar Cycles 23, 24 and 25 (current cycle)

The chart above shows the last two Solar Cycles numbers 23 and 24 and the beginning of the predicted current cycle number 25. Cycles 23 and 24 seem to indicate that we may have been entering a period of lower activity. The trend of the last two peaks shown on the chart in the previous column, appear to indicate a fall in solar activity shown by the black line. However the current prediction (green on the chart above) appears to show increasing activity.

The chart above shows us that there was a solar minimum around 2019 to 2020. After this minimum the solar activity has increased into 2022 and is predicted to increase this year and for the next three years to reach a new maximum 2025. As this will be the 25th maximum that has been formally recorded it will be known as Solar Maximum 25.

Anyone can follow the activity progress even without a telescope. The Sun activity can still be observed by downloading the spectacular daily images online from the NASA orbiting Solar and Heliospheric Observatory (SOHO) at: http://sohowww.nascom.nasa.gov/.

URSA MAJOR and BOÖTES



One of the Constellations of this Month is one of the best known of all the constellations and is certainly the most recognisable. It is Ursa Major (the Great Bear) also known as the 'Plough' or 'the Big Dipper' in the USA. It has very little resemblance to a bear and looks much more like a 'Saucepan'.

Ursa Major is almost overhead at this time of the year as can be seen by the chart on the last page. The point in the sky directly overhead of the observer is called the 'ZENITH' and is shown in red on the chart. The chart shows the sky as it will appear at 22:00 on 15th April.

Ursa Major is a circumpolar constellation, this means it never disappears below the horizon from the UK and so is always visible somewhere in the night sky throughout the year. All the stars in the night sky appear to rotate around a point in the sky that we call the 'North Celestial Pole'. This point is located very close to the star Polaris in the constellation of Ursa Minor (the Little Bear) and called the Little Dipper in the USA.

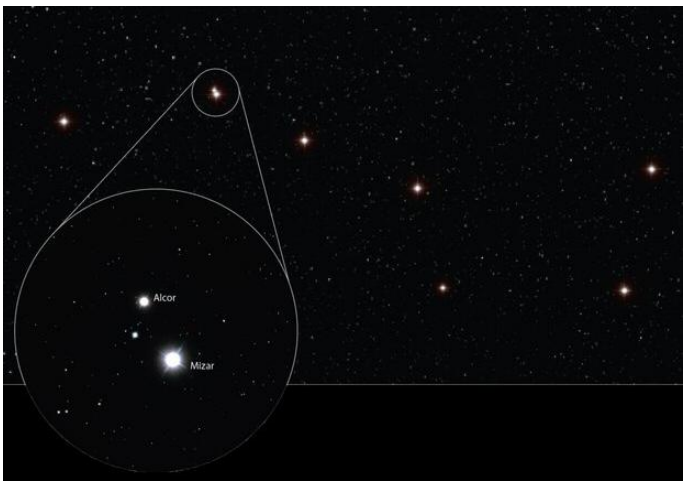
The sky rotates around Polaris once a year due to Earth's orbit around the Sun. Polaris can always be found by first finding Ursa Major. Then by following the two stars opposite the handle of the 'saucepan shape', up and out of the pan and looking about five times the distance between the Pointer Stars. See the chart on page 9.

Ursa Major also rotates around the Polaris (the pole star) so it completes one revolution around Polaris every day. It also rotates around Polaris once every year due to Earth's orbit around the Sun. This means that if it is observed at the same time of the night throughout the year it will have moved all around the sky. In spring (now) Ursa Major appears close to Polaris (and directly overhead). In the summer it will be to the east of Polaris and in the winter it will be low over the northern horizon. So it will move around but will always be visible.

The centre star of the three stars forming the handle of the 'saucepan' is a famous naked eye double star Mizar and its companion Alcor. Anyone with good eyesight or wearing their glasses will be able to see Alcor as a smaller and fainter star close to Miser. In ancient times seeing this pair of stars was used as a measure for good eyesight. So if men were being recruited for an army and they could see Alcor their eyesight was good enough.

Viewed through powerful binoculars or a telescope, Mizar itself can be seen to be a double star. These two stars are quite far apart and orbit around their common centre of gravity. This means Mizar is a double star with Alcor close by so appears as a three star system.

However, this is not the end of the story! When the light from the two component stars of Mizar is examined using a spectroscope each star is found to be double itself. This means the Mizar - Alcor pair is a five star system but the Mizar double / double stars are too close together to be separated and seen using any amateur telescope.



Mizar and Alcol enlarged

INTERESTING OBJECTS IN URSA MAJOR and BOÖTES

There are six Messier objects in Ursa Major although one M40 is disputed and is in fact just a pair of bright stars. M97 is the famous Owl Planetary Nebula. M81, M82, M101 and M108 are all galaxies. The brightest galaxy M81 is a beautiful spiral and is bright enough to be seen using binoculars. Just off the end of the 'handle' in Canes Venatici is M51 the Whirlpool Galaxy

At this time of the year (April) the constellation of Ursa Major is located in the light sky directly overhead. The chart above shows Ursa Major very close to the point in the sky that we call the 'Zenith'. This is the point in the sky directly overhead. This is not a fixed point amongst the stars it is simply the point in the sky directly over head of the observer. In six months time Ursa Major will be located above the northern horizon. This is due the sky appearing to rotate as our Earth has moved halfway round its yearly orbit around the Sun.

M81 a beautiful bright spiral in Ursa Major

Messier 81 (M81) is a beautiful almost face on spiral galaxy that is the brightest of the Messier galaxies to be found in Ursa Major. A dark sky and a medium sized telescope will be required to see M81 and the other galaxies in this beautiful and interesting constellation.

One of the best deep sky objects associated with Ursa Major is Messier 51 (M51) the Whirlpool Galaxy.

Messier 51 (M51) the Whirlpool Galaxy

Messier 51 (M51) is actually a pair of Galaxies that are in the process of colliding. They have already swept past each other and the smaller one is now pulling a trail of stars off the larger one as it moves away. It is likely that pair will be drawn back together for another collision over the next few million years. Our galaxy called the Milky Way will have a similar encounter with M31 the Andromeda Galaxy in about five billion years time.

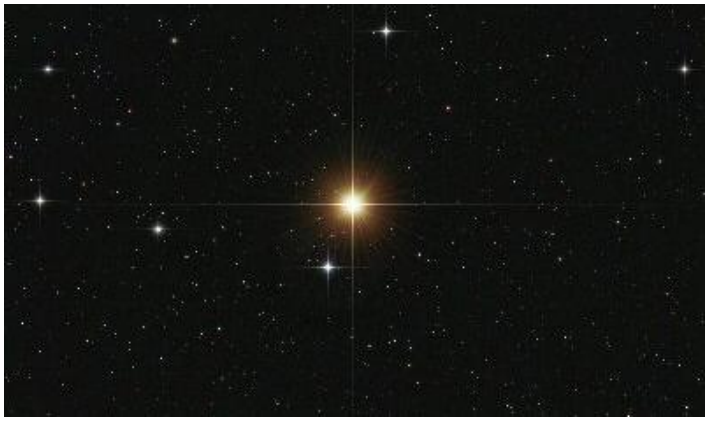
When giant spiral galaxies collide they may pass through each other a number of times before they combine into a larger single galaxy. One would imagine that events like this would be catastrophic with many of the billions of stars being destroyed in the collisions. However the stars are incredibly far apart compared to their physical size so very few stars will actually collide. The two galaxies will pass through each other like ghosts in the night.

The effect of the combined gravity of the galaxies will however cause great changes to the pair. Gas and the movement of stars within their galaxies will be affected and changed enormously. The final outcome of the merging of the galaxies is they will reform as a single merged larger galaxy. Large spiral galaxies may combine to become an Elliptical Galaxy which is the largest of all types of galaxies.

Gas in the arms of spiral galaxies will be violently disturbed by the gravitational forces that will promote enormous amounts of new star formation. Huge areas of star formation will occur in the spiral arms after each pass as the galaxies are inevitably drawn together and eventually combine into one larger galaxy.

If we follow the arc of the handle of the saucepan shape of Ursa Major we come to a bright orange coloured star called Arcturus in the constellation of Boötes the Herdsman. Arcturus is the only bright star in Boötes, the other stars are fainter and form the shape of an old fashioned diamond shaped kite with Arcturus located where the string of the tail would be attached.

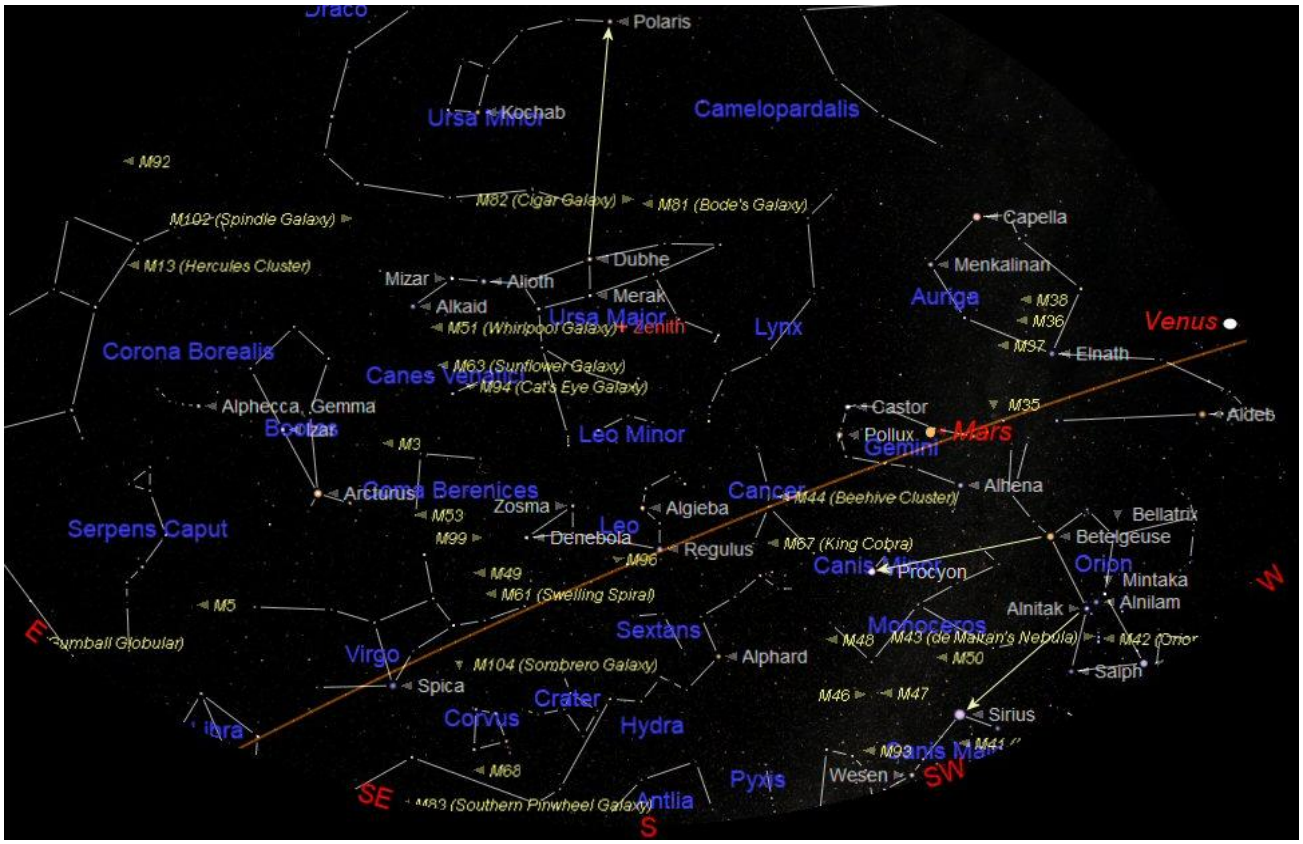
Arcturus is a Red Giant star that is slightly larger than our Sun and older at 7 billion years. It has used almost all of its Hydrogen fuel and has expanded in diameter to around 25x that of our Sun. At the moment it shines 115 times brighter than our Sun but it is destined to collapse to become a White Dwarf and a Planetary Nebula.



The beautiful Red Giant Star Arcturus in Boötes

By looking at the star Arcturus we can see the future of our own star. Our Sun is currently 4.3 billion years old but in about 4 billion years time it too will become a Red Giant as it begins its death as a normal star.

A TOUR OF THE NIGHT SKY - APRIL 2023



The chart above shows the night sky looking south at about 21:00 BST on 15th April. West is to the right and east to the left. The point in the sky directly overhead is known as the Zenith and is shown (in red) at the upper centre of the chart. The curved brown line across the sky at the bottom is the Ecliptic or Zodiac. This is the imaginary line along which the Sun, Moon and planets appear to move across the sky. The brightest stars often appear to form a group or recognisable pattern; we call these 'Constellations'.

Constellations through which the ecliptic passes this month are Aries (the Ram), Taurus (the Bull), Gemini (the Twins), Cancer (the Crab), Leo (the Lion), Virgo (the Virgin) and Libra (the Scales).

Moving over the south western horizon is the winter constellation of Orion (the Hunter). Orion is still easy to find by looking for his very obvious three stars of his belt. Orion has his Hunting Dogs Sirius (the big dog) and Procyon (the little dog) to the east (left) and following him.

Above Orion is the constellation of Taurus (the Bull). The most obvious star in Taurus is the lovely Red Giant Star called Aldebaran. It appears slightly orange to the 'naked eye' but it is very obviously orange when seen using binoculars or a telescope. Aldebaran is located at the centre of the 'flattened' X shape formed by the brightest stars in Taurus. It appears to be in a cluster of stars known as the Hyades but it is not a true member and is much closer to us than the rest of the cluster.

The brightest planet, Venus, is looking very bright in Taurus this month as it moves towards us. At the end of the top right (upper west) arm of the 'X' shape of Taurus is the beautiful 'naked eye' Open Star Cluster Messier 45 (M45) known as the Pleiades (or the Seven Sisters). It is one of the closest open clusters to us and really does look magnificent using binoculars or a small telescope with a low magnification eyepiece.

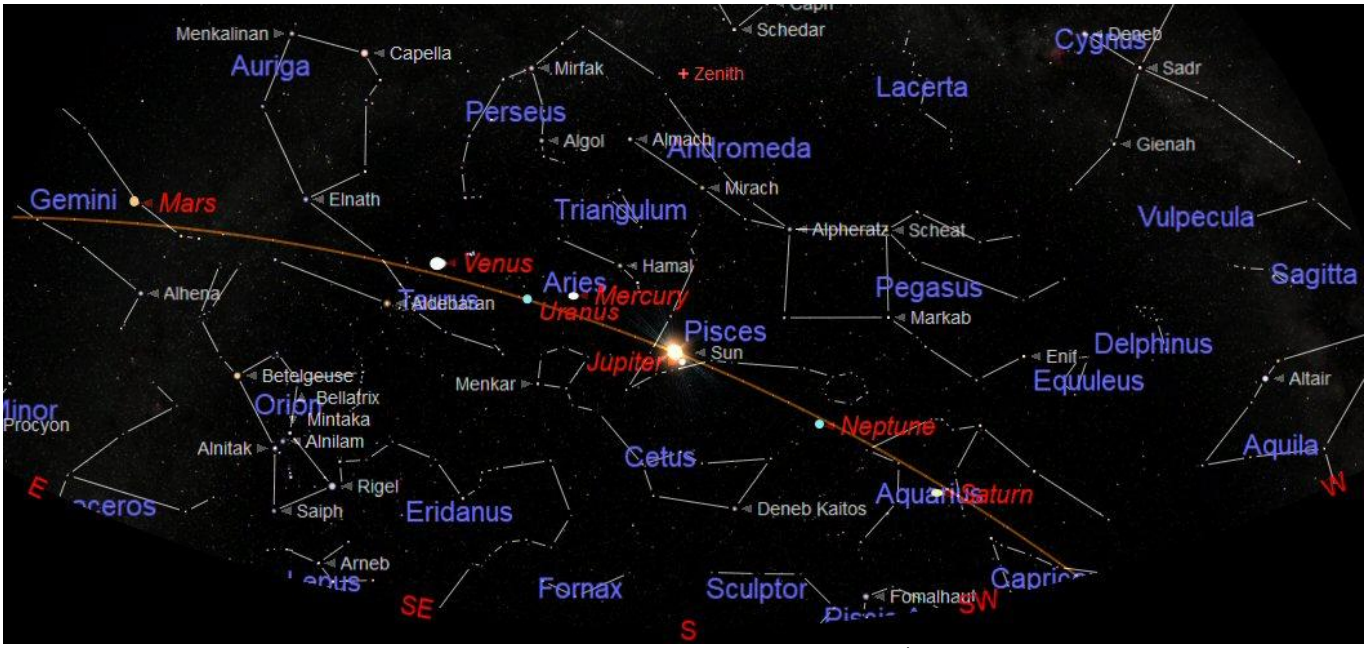
To the east (right) of Taurus is the rather indistinct constellation of Cancer (the Crab). The stars of Cancer are quite faint and can be difficult to discern especially in a light polluted sky. It is really worth searching out Cancer using binoculars or a telescope to see the Open Cluster M44 (the Beehive Cluster). M44 is older and further away than M45 (the Seven Sisters) so is fainter than M45 but still looks lovely. It has a group of stars that resemble an old straw Beehive with bees around it.

Following Taurus is the constellation of Gemini (the Twins). The two brightest stars in Gemini are Castor and Pollux that are named after mythological twins. To the north of Taurus is the odd pentagon shape of Auriga (the Charioteer). Dominating Auriga is the brilliant white star Capella. For those with a telescope there is a line of lovely open clusters in Taurus and Auriga. These are M35 in Taurus and M36, M37 and M38 in Auriga.

The constellation of Leo (the Lion) follows Cancer along the Ecliptic and was the constellation of the month last month. It does actually look a little like a lion or the Sphinx in Egypt. Around and between Leo and the neighboring constellation of Virgo is a cluster of galaxies. Our Milky Way galaxy and our local group of galaxies are members of this larger group of galaxies called the Virgo Cluster. A medium sized telescope (150mm to 200mm) and a dark sky is required to see these faint objects.

To the north of Virgo is the constellation of Boötes with its bright orange coloured star called Arcturus. The stars in Boötes form the shape of an old fashioned diamond shaped kite with Arcturus located where the string of the tail would be attached. Arcturus is one of just a few stars that do actually appear to be coloured and is noticeably orange to the 'naked eye'. It is actually a star with a mass similar to our Sun but is older at 7 billion years (our Sun is 4.3 billion years old). Arcturus is a Red Giant approaching the end of its life.

THE SOLAR SYSTEM - APRIL 2023



The location of the planets at midday on 15th April

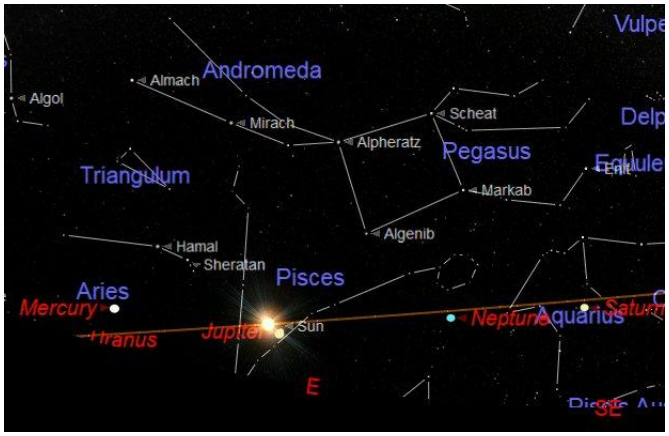
Over the last few months we have been treated to good views of all the planets in the night sky. The chart above shows the location of all the planets this month.

MERCURY will be at its very best on 11th April this year so is well worth seeking it out if there is a clear night around this date. A small to medium sized telescope will be required and a high magnification 100x to 200x to see the crescent shape of Mercury. A clear view to the western horizon will be required for observing Mercury as it will be low in the west. See page 1.

VENUS is moving towards its apparent furthest point from the Sun from our point of view this is called 'Greatest Easterly Elongation'. It is still beyond the Sun from our point of view but will be approaching the point on its orbit where it will appear to be half illuminated on 4th June. It is brightest of all the planets but it will appear with a rather small diameter (for Venus) and will be and just over half illuminated (Gibbous), see page 1.

MARS can be seen high in the evening sky as soon as the Sun has set and the sky darkens. It is looking small at about 6" (arc-seconds). Mars is past its best and is now starting to fall behind Earth and will appear to be getting smaller as it moves further away from us.

JUPITER is in conjunction with the Sun this month and is not observable, see the chart below.



Jupiter Saturn and Neptune after Sunrise 15th April

SATURN has now moved into the bright morning sky just before sunrise but will be very difficult to observe as it is very low in the brightening eastern dawn sky.

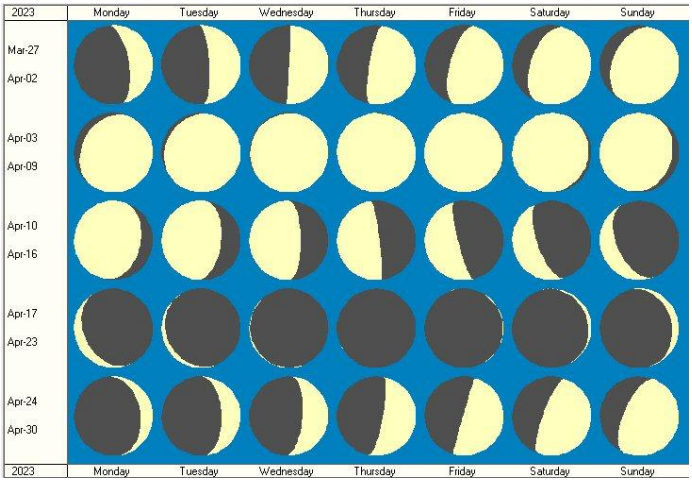
URANUS will be more difficult to find and will really need a telescope. This month it will be in the south west and sets at about 22:00.

NEPTUNE will not be visible this month as it was in conjunction with the Sun on 11th March and is now reappear in the early morning sky before sunrise.

THE SUN

The Sun rises at about 06:27 at the beginning of the month and 05:35 at the end. It sets at 19:40 at the beginning of the month and 20:25 at the end. There have been some very nice Sunspots recently and an aurora seen from the UK on 26th & 27th February. There has been some nice Sunspot activity over the last few months, see page 6.

THE MOON PHASES DURING APRIL



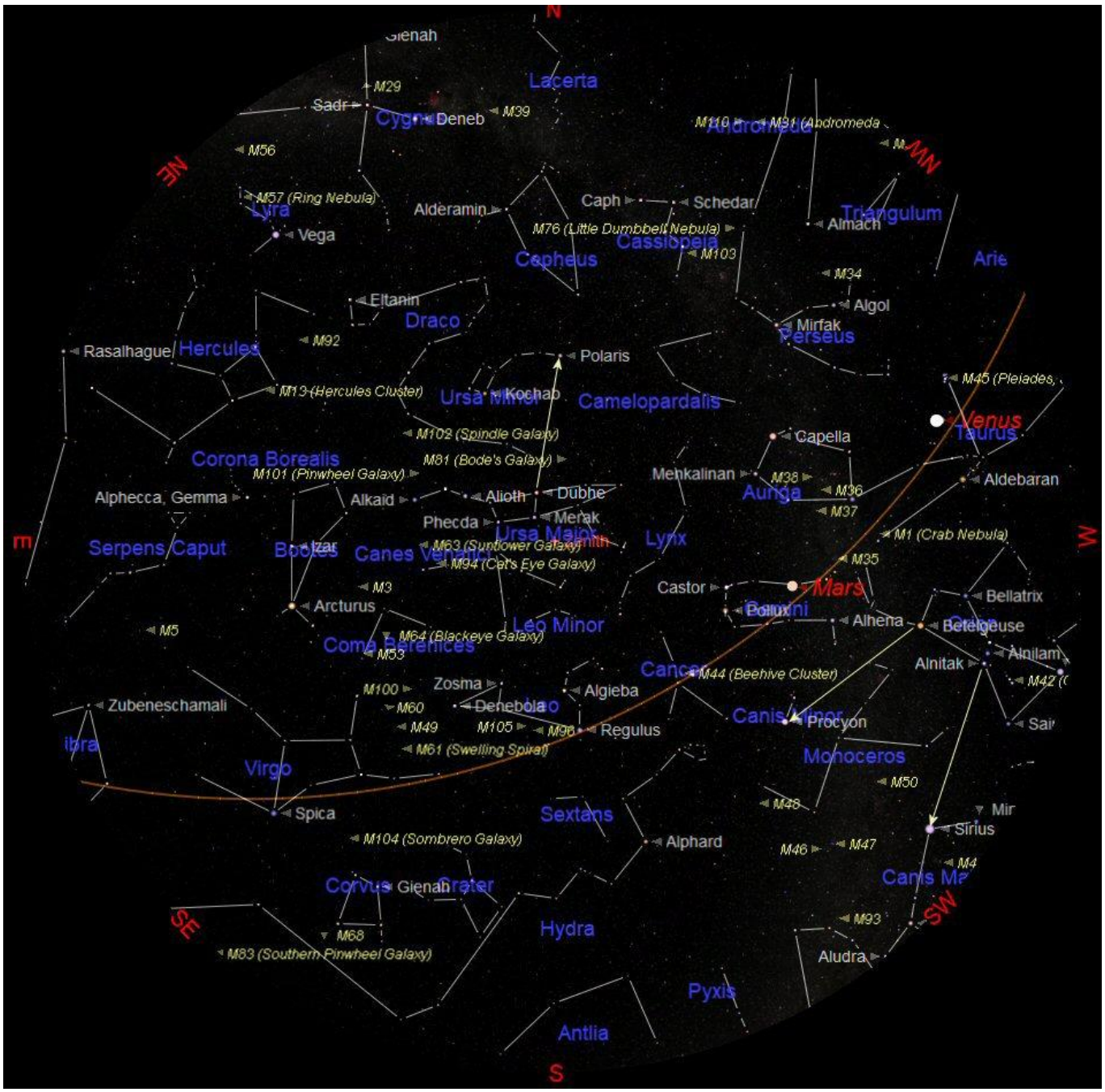
Last Quarter will be on 6th April

New Moon will be on 13th April

First Quarter will be on 20th April

Full Moon will be on 27th April

THE NIGHT SKY – APRIL 2023

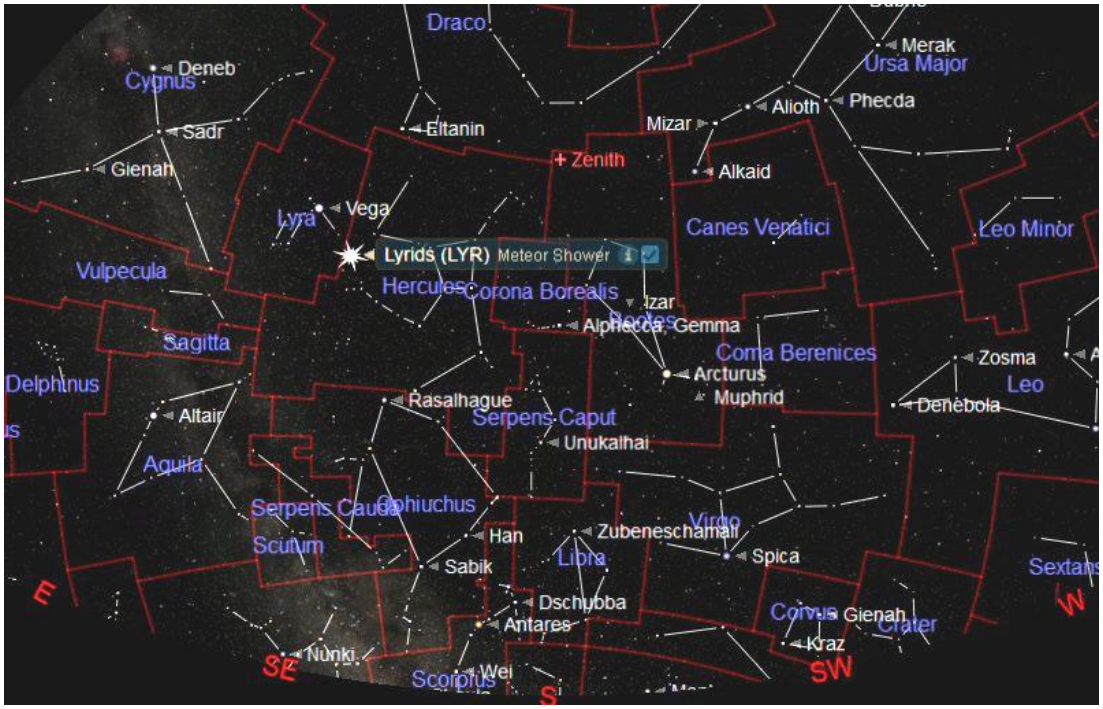


The chart above shows the whole night sky as it appears on 15th April at 21:00 (9 o'clock) British Summer Time (GMT). As the Earth orbits the Sun and we look out into space each night the stars will appear to have moved across the sky by a small amount. Every month Earth moves one twelfth of its circuit 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 8 o'clock BST at the beginning of the month and at 10 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 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.

Planets observable in the evening sky: Mars, Venus Uranus and Mercury (in the early evening).

THE LYRID METEOR SHOWER 23rd APRIL 2023



There will be a meteor shower during the night of 22nd and 23rd April with a peak of activity around 1 o'clock BST (00:00 GMT). This is a minor shower (with just 10 meteors per hour) but does sometimes produce the occasional bright meteor known as a fireball. To observe the shower, look high towards the South East to North East. The Radiant point of the Lyrid meteor shower is always located to the west (right) 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 in the evening of 22nd April, 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.

SOME ADVICE FOR OBSERVING METEORS

Before rushing out into the garden to look for meteors, there are a few things to consider for your own comfort, the first and most important is clothing. The nights, even in summer, can be cold so it is essential to dress in warm clothes. A garden 'lounger' chair is an excellent piece of equipment especially the type that can be reclined into a near horizontal position. This will help avoid neck and back ache when looking up. When sitting in a garden chair a blanket or old quilt can also be used for additional warmth. A sky chart, like the one at the end of this magazine, will be useful to locate the part of the sky where the meteor radiant will be located. To read the star chart in a dark garden will require a torch but a bright white light should be avoided. Turn off any lights that you can and set up a screen to hide street lights to stop them dazzling you.

For the Lyrids, a clear view towards the south east is required so set up your lounger seat with your feet facing east to south east. Use the patio or path if possible, they are more comfortable and less prone to dampness from dew. Obviously try to set up away from trees or buildings but this may not be possible so set up in the best place to view your intended target, you can always move to another position later. Make sure you have everything to hand, a small table or box by your side will provide a convenient place to put your chart, torch, spectacles or even a hot drink and will save fumbling around on the ground for things in the dark.

To start viewing allow about five minutes for your eyes to become adapted to the dark. This period can be used to familiarise yourself with the sky and work out where everything is. Try to turn off all lights around you. If there is a street light bothering you, it may be possible to erect a screen around yourself using garden canes, step ladders, washing poles, string and old sheets, curtains, towels or even newspapers. Even lights which appeared dim when you first began your session seem to get very bright when your eyes are fully adjusted to the dark.

Observing can start before midnight but there will most likely be fewer meteors at this time. There are two reasons for this, first the radiant of the Lyrid shower will be below the eastern horizon until just before midnight so fewer meteors will appear rising up above the horizon. Secondly, after midnight Earth will be crashing head on into the main meteor stream. It is normally best to look up at an angle of around 45° above the horizon and 30° to 90° right or left from the radiant point. It will also be useful to familiarise yourself with the positions of the constellations in the direction you are looking while you are waiting for the meteors.

If you feel quite enthusiastic about observing the meteors, you may wish to make a log of every one you see - this can be done in two ways: Notes can be made on a pad or the path can be marked on a star chart. Remember to include notes detailing the time, direction and brightness of the meteors.