NEWBURY ASTRONOMICAL SOCIETY
MONTHLY MAGAZINE – November 2016

TELESCOPE WORKSHOP EVENING

Map showing the venue for the Telescope Workshop Evening

The Newbury Astronomical Society will be holding a Telescope Workshop Evening on Monday 14th November. This is an open evening for anyone (members and non-members) to come along and get help with any problems or questions they have about telescopes and binoculars.

Many people may be thinking about buying a telescope as a present for Christmas and would like advice about what sort of instrument to buy. There will be a selection of the various types of telescopes that are available on the market with expert advice about each type describing their attributes and their limitations.

The venue for the meeting has been chosen because it is located in its own small field where telescopes can be set up and used if the sky is clear. This will give anyone considering buying a telescope the chance to judge which type would suit their requirements.

The meeting is also intended to be a source of help for those who have already bought a telescope but have encountered problems setting it up or using it.

Inside the venue light refreshments will be available and members of the Newbury Astronomical Society will be available to chat about all things astronomical.

The meeting will be held on 14th November at:

The Scout Hut, Remembrance Road, Newbury

Post code: RG14 6BA

The evening starts at 07:30 p.m.

The entrance is a little concealed but there will be direction signs and helpers with hi-vis jackets and lights at the entrance to guide cars into the venue parking area.

Children are welcome but must be accompanied by an adult. There is no charge for the evening but a small donation for the use of the Scout Hut would be appreciated. Further details at the websites below.

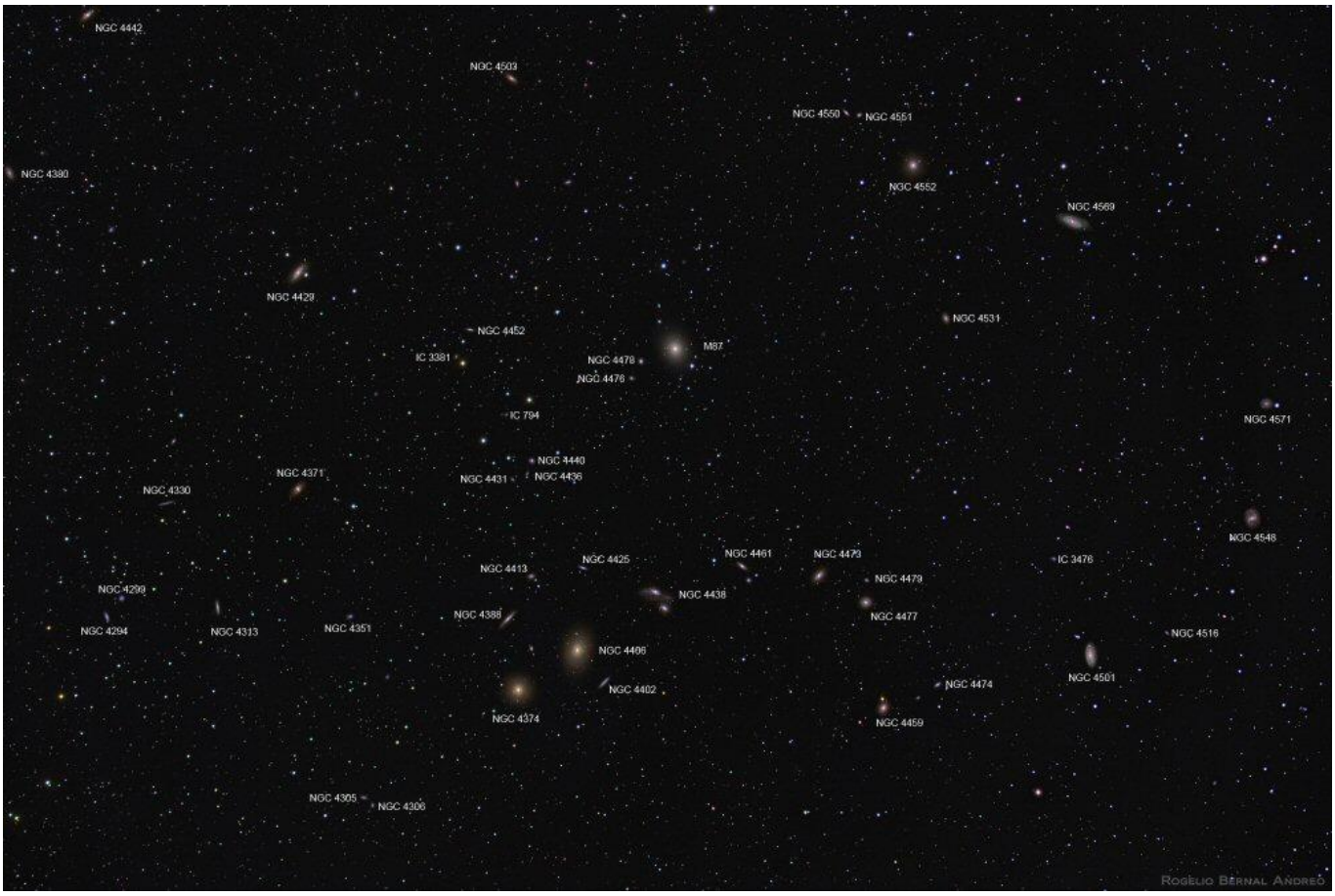
NEWBURY ASTRONOMICAL SOCIETY 2016 - 2017

4th November The Geology of Mercury
Website: **www.newburyastro.org.uk**

NEXT NEWBURY BEGINNERS MEETING

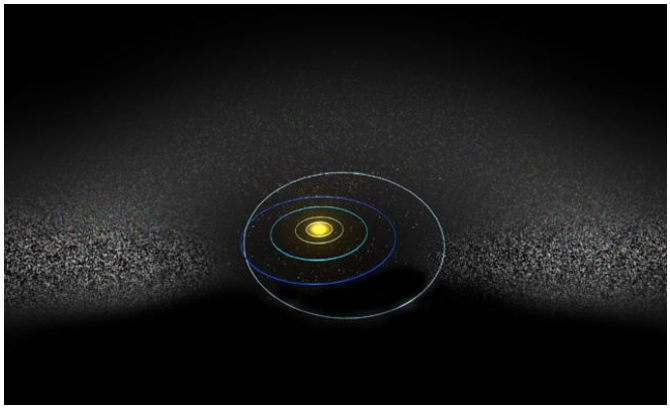
16th November Photometry Made Simple
Website: **www.naasbeginners.co.uk**

OBSERVING THE DEEP SKY



Deep sky galaxies in the Constellation of Virgo

When astronomers talk about the 'Deep Sky' they are referring to the whole of space outside our Solar System. So before we can consider the Deep Sky we must determine the bounds of our Solar System.

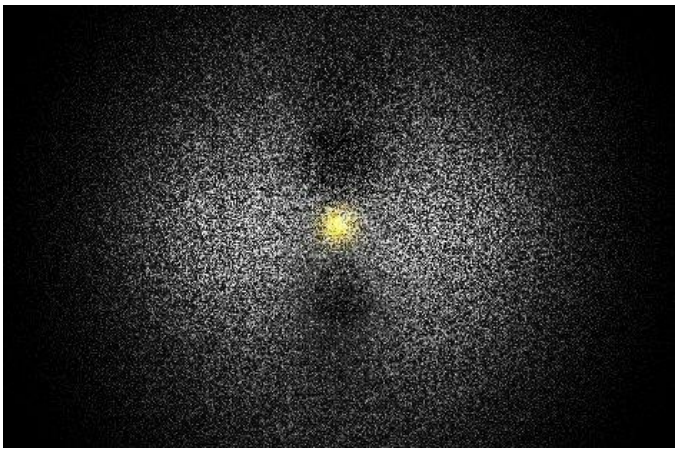


An artist impression of our Solar System

The diagram above shows structure of our solar system looking in from further out in space. In the centre and represented by the yellow disc is the Sun. This is our star around which all the planets of our solar system orbit. The circles around the Sun show the orbital paths of the outer planets: Jupiter (yellow and very close to the Sun), Saturn (orange), Uranus (light blue) and Neptune (dark blue). The inner planets are too close to the Sun to be shown on the diagram. The very light blue circle represents the very odd orbit of the Dwarf Planet Pluto. Until 2010 Pluto was regarded as the outermost of the main planets but is now classified as the first and nearest of the Dwarf Planets.

We now accept that our Sun has eight 'main' planets but our Sun also has a huge number of Dwarf Planets. These are made up from the largest asteroids and icy bodies that orbit the Sun beyond the orbit of the outermost planet Neptune. There are thought to be many thousands of these, including Pluto, that orbit the Sun in what is known as the Kuiper Belt. This is shown as the speckled doughnut around the Sun and planets.

It is now accepted that there is almost certainly another area of icy objects beyond the Kuiper Belt. This area is known as the Oort Cloud.



An artist impression of the Oort Cloud

The Oort Cloud is thought to be like a huge halo comprised of icy objects that extends out for about two light years from the Sun. This is about half way to our nearest stellar neighbour the star Alpha Centauri.

OBJECTS OF THE DEEP SKY

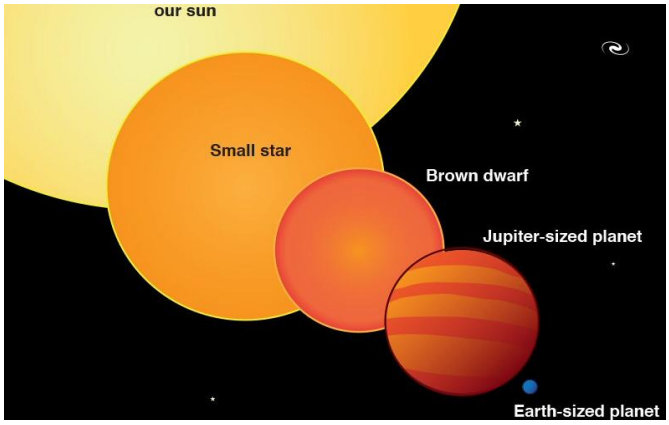
There are many different objects in outer space so we shall consider the broad classes of these objects but will not delve too deeply into the sub-classes.

STARS

All the stars that we can see when we look up into the night sky are just our closest neighbours in our galaxy, see the next column. Our Sun is the centre of our Solar System and is just a normal star. It is pretty much a medium sized star and is just about in the middle of its 'life cycle'. Stars are of course not strictly speaking alive but they are created (born) change as they become older and die when their fuel supply runs out.

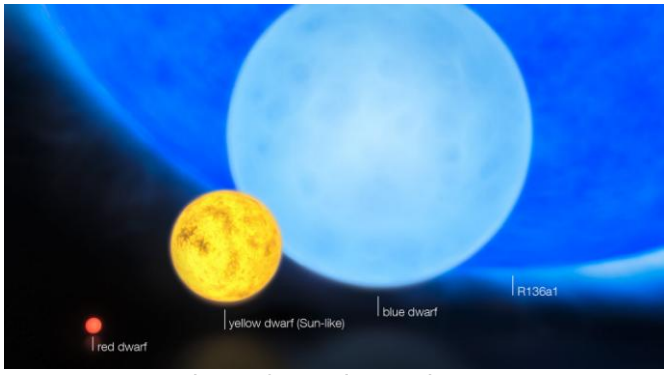
Stars form in vast clouds of gas (mainly Hydrogen) called a Nebula (plural: Nebulae). The gas atoms are drawn together by gravity into denser clouds that draw in more gas until gravity compresses the clouds into dense spheres of gas. The pressure and heat in the centre causes the Hydrogen atoms to be fused together to create heavier Helium atoms. This process is called Nuclear Fusion and releases huge amounts of energy that heats the sphere of gas and it begins to shine as a bright new star.

Small stars are not as hot as larger stars so they appear red in colour and are known as Red Dwarfs. Red Dwarfs may be just one hundredth of the mass of our Sun but Brown Dwarfs are even smaller.



Comparison of stars smaller than our Sun

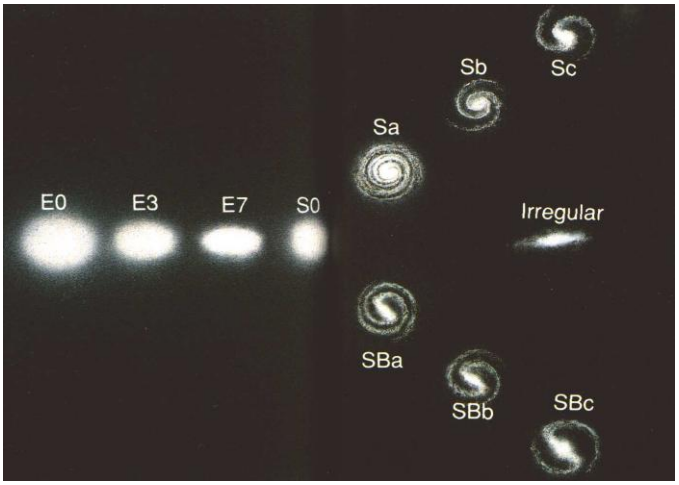
Stars that are a bit bigger shine orange, even larger stars appear yellow and stars similar to our Sun appear white with a slight tinge of yellow. Stars larger than our Sun produce exponentially increasing amounts of energy and become hotter as their size increases. The very largest and hottest stars appear blue and may be up to one hundred times the mass of our Sun.



Comparison of stars larger than our Sun

GALAXIES

As far as we know all stars are formed in Galaxies but some may been thrown out of Galaxies by gravitational forces. Galaxies are huge accumulations of stars that may contain less than a billion stars up to the largest that can contain over a trillion (1000 billion) stars. There are three main types of galaxy these are irregular, Spiral and Elliptical.



Edwin Hubble's diagram of galaxy types

Elliptical Galaxies are the largest and irregular galaxies are the smallest. Elliptical Galaxies may have spiral galaxies orbiting around them and Spiral Galaxies may have smaller Irregular Galaxies orbiting them. Elliptical Galaxies are sub-divided into groups from E0 to E7 depending how elliptical they appear. Spiral Galaxies are sub divided as Sa, Sb and Sc depending on how tightly the spiral arms are wound around the centre. Some Spiral Galaxies have a central bar so these are sub-divided as SBa, SBb and SBc also depending on how tightly the spiral arms are wound. It is thought that our galaxy may be a large Barred Spiral.

Our Sun is a member of a large Spiral Galaxy that we call the Milky Way. The Sun is located about a two thirds of the way out from the centre and on the inside edge of a spiral arm. The picture below shows clearly the shape of our galaxy looking towards the centre.

The Milky Way imaged in a very dark sky from Chile

The Milky Way can be seen in a dark sky away from street lights on a clear night with the unaided eye. Using binoculars millions of stars can be seen.

Some galaxies can be seen using a modest telescope such as a 100mm refractor or a 125mm reflector. The nearest and brightest can just be seen using the naked eye from a very dark location. The image below shows the Great Spiral Galaxy in the constellation of Andromeda and in known as Messier 31 (M31).

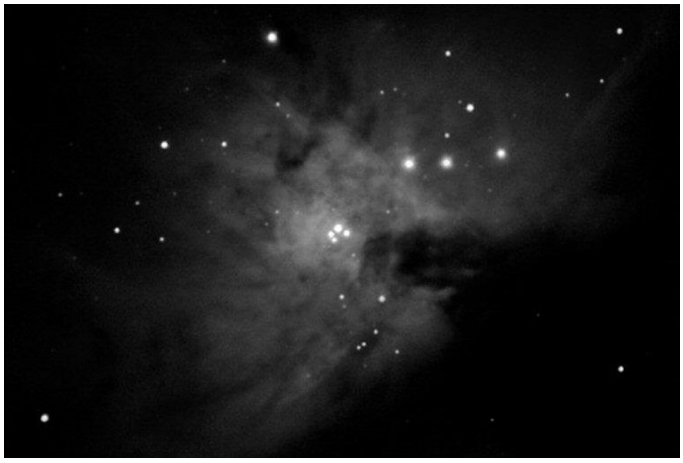
Messier 31 (M31) in Andromeda

Messier 31 (M31) can be seen using binoculars as a small 'cigar' shaped patch of light. Using a telescope it can look similar to the image above but not so bright. A telescope will be required to see the other bright galaxies such as the Leo cluster shown below.

Galaxies M65, M66 and NGC3628 in Leo

NEBULAE

Nebulae (singular Nebula) are huge clouds of gas and dust found in Spiral Galaxies. In fact the gas and dust make up a large proportion of the mass in spiral galaxies. Much of the gas is dark so is largely seen in Silhouette as shown in the image of the Milky Way in the preceding column. The most famous is M42 in Orion.



Messier 42 (M42) The Great Orion Nebula

The bright stars seen at the centre of the Orion Nebula in the preceding column are young stars forming from the gas of the nebula as described in the opening paragraphs on page 3. These stars, known as the Trapezium, have lit up and are now producing powerful Ultraviolet light. The radiation is blowing the gas of the nebula away from the vicinity of the stars and exposing them. Their light is now illuminating the rest of the nebula.

There are other kinds of nebula that can be seen in our night sky. These are called Planetary Nebulae and Supernova remnants.

PLANETARY NEBULAE

Planetary Nebulae are created when a star similar to our Sun reaches the end of its 'life' and runs out of its Hydrogen fuel. As its Hydrogen supply runs out the star expands to become a Red Giant. When our Sun reaches this stage it will expand to reach a diameter approaching or even exceeding the orbit of Mars. When the fuel supply is finally exhausted the star will collapse to become a small but very dense White Dwarf Star. The tenuous outer layers will drift off into space to create a beautiful bubble of glowing gas. They looked like a planet to early astronomers using their small telescopes hence the name.

Messier 57 (M57) The Ring Nebula in Lyra

SUPERNOVA REMNANT

When a large star uses up all its available Hydrogen fuel it will catastrophically collapse and explode as a Supernova. The debris from the explosion expands out to form the nebula that we call a 'Supernova Remnant'.

Messier 1 (M1) A Supernova Remnant in Taurus

STAR CLUSTERS

Star clusters are groups of stars that are physically associated and not just in the same line of sight. This differs from those apparently associated stars that we call the constellations. The constellations are just the brighter stars in the sky that we visually link together to help us find our way around the night sky. See the constellation of the month on page 7.

There are two main groups of star clusters these are Open Clusters and Globular Clusters.

OPEN CUSTERS

Open Clusters occur when stars are formed within nebulae. As the stars form they begin to drive away the unused gas left over from the star formation process. As the gas is driven away the stars emerge from the nebula and the cluster of stars that was created becomes visible. Open clusters typically contain between 30 and 300 stars. One of the brightest open clusters is M45 the Pleiades also known as the Seven Sisters.

Messier 45 (M45) the Pleiades (the Seven Sisters)

GLOBULAR CLUSTERS

Globular Clusters are associated with large Spiral Galaxies and are found in a halo surrounded these galaxies. Around 100 have been identified around our galaxy and about 200 have been found associated with M31 the nearest large spiral galaxy to our galaxy. They are thought to be the central core stars of small galaxies that have ventured too close to a large galaxy and have been captured by the powerful forces of its gravity. In the process the outer stars have been stripped off.

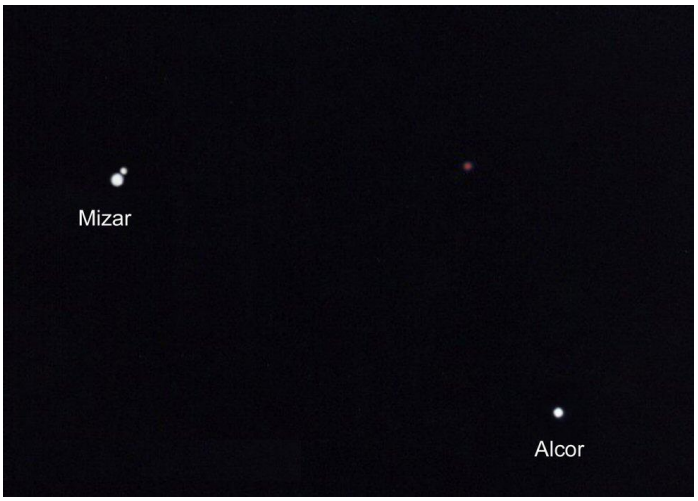
Messier 13 (M13) a Globular Cluster in Hercules

DOUBLE OR MULTIPLE STAR SYSTEMS

Most stars are quite similar and mainly appear different just because of their size (mass). As explained on page 3 small stars appear red because the energy they produce is only sufficient to heat them to a temperature that will cause them to shine with red to orange light. As the mass of stars increase the energy produced by the nuclear fusion process increases very rapidly. Larger stars are hotter and shine with much more energy therefore the light will have a shorter wavelength. Consequently, as the mass of stars increase the light becomes yellow, white and the very largest stars appear blue.

The beautiful double star Albireo in Cygnus

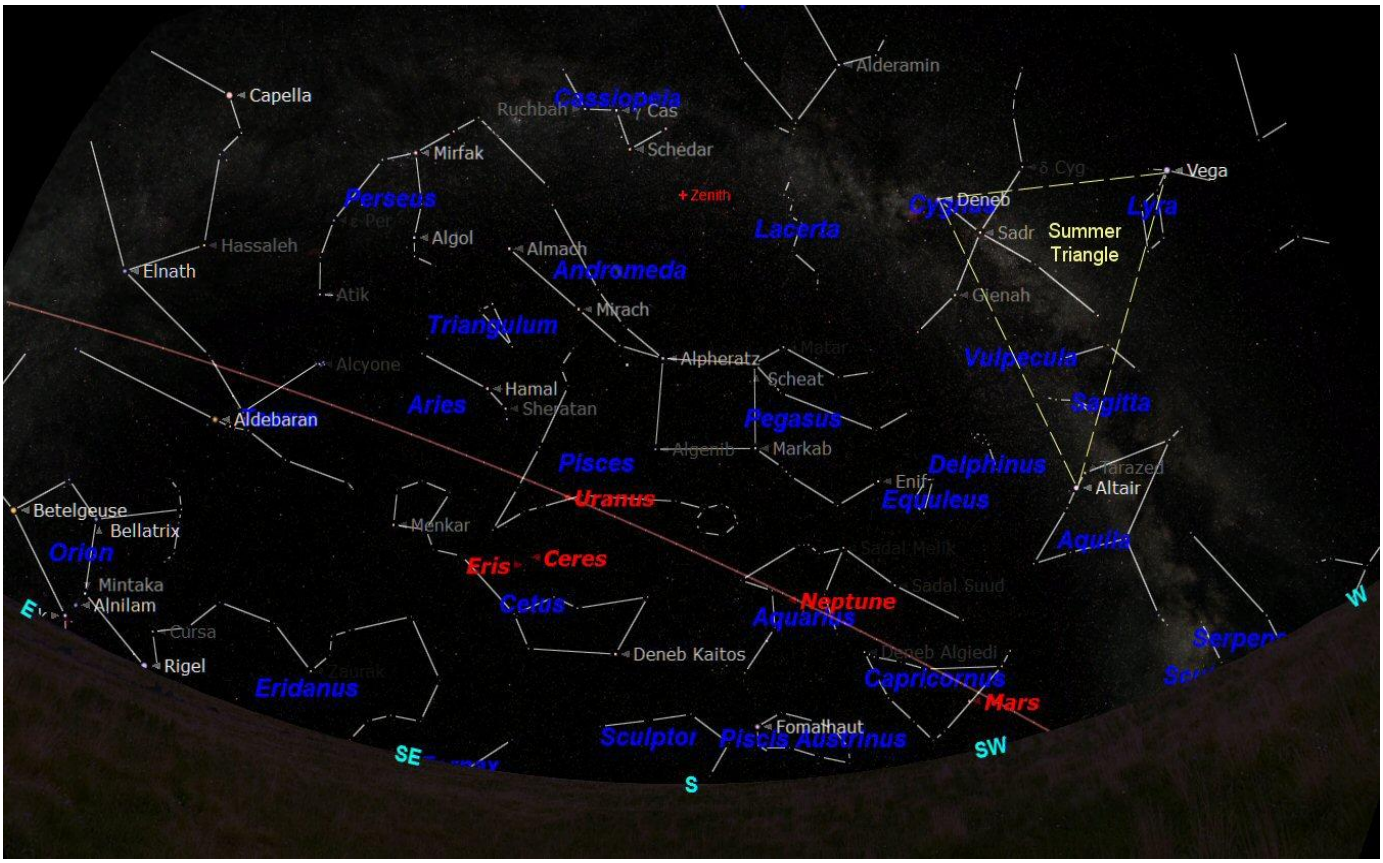
The star Albireo shown in the image above is a beautiful example of a double star. The two stars appear quite different with one being a golden colour and the other blue. The stars are not associated in fact the blue star is actually larger and intrinsically much brighter but a lot further away than the golden star. This is an unusual double star because most double or triple star systems are associated and are gravitationally bound together.



The multiple star system Mizar in Ursa Major

The star Mizar shown in the image above is the centre star in the handle of the 'saucepan' shape of Ursa Major the Great Bear also called the Plough (or the Big Dipper in the USA). On a clear night someone with good eyesight may be able to see a second star close to Mizar, this is Alcor which is Mizar's companion. The telescopic image above shows Mizar has an even closer companion. Amazingly these two stars are also very close double stars making Mizar a five star associated system.

THE NIGHT SKY - NOVEMBER 2016



The chart above shows the night sky looking south at about 21:00 BST on 15th November. 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 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 constellations through which the ecliptic passes are known as the constellations of the 'Zodiac'.

Constellations through which the ecliptic passes this month are: Capricornus (the Goat), Aquarius (the Water Carrier), Piscis (the Fishes), Aries (the Ram), Taurus (the Bull) and Gemini (the Twins) rising over the eastern horizon, just off the chart to the left.

The summer constellations are still prominent in the early night sky with the Summer Triangle still well placed. Its three corners are marked by the bright stars: Deneb in the constellation of Cygnus, Vega in Lyra, and Altair in Aquila. The Summer Triangle is easy to find and can still be used as the starting point to find our way around the night sky. The Milky Way (our Galaxy) flows through the Summer Triangle passing through Cygnus, down through Aquila to the horizon. It also continues up out of the Summer Triangle and into Cassiopeia.

The planet Mars is in Capricornus and just visible very low in the south western evening twilight. Neptune is in Aquarius and Uranus is in Pisces both are in good positions for telescopic observation. Saturn is getting very close to the Sun and not observable but Venus is moving away from the Sun and will be rising higher in the west over the next few months. Jupiter is an early morning object rising just before the Sun in the east. It is low in the brightening sky but easy to find.

On a clear night it will be quite easy to start exploring the night sky from the Summer Triangle. First find the three stars Deneb, Vega and Altair at the corners of the triangle and just look around it to get familiar with it.

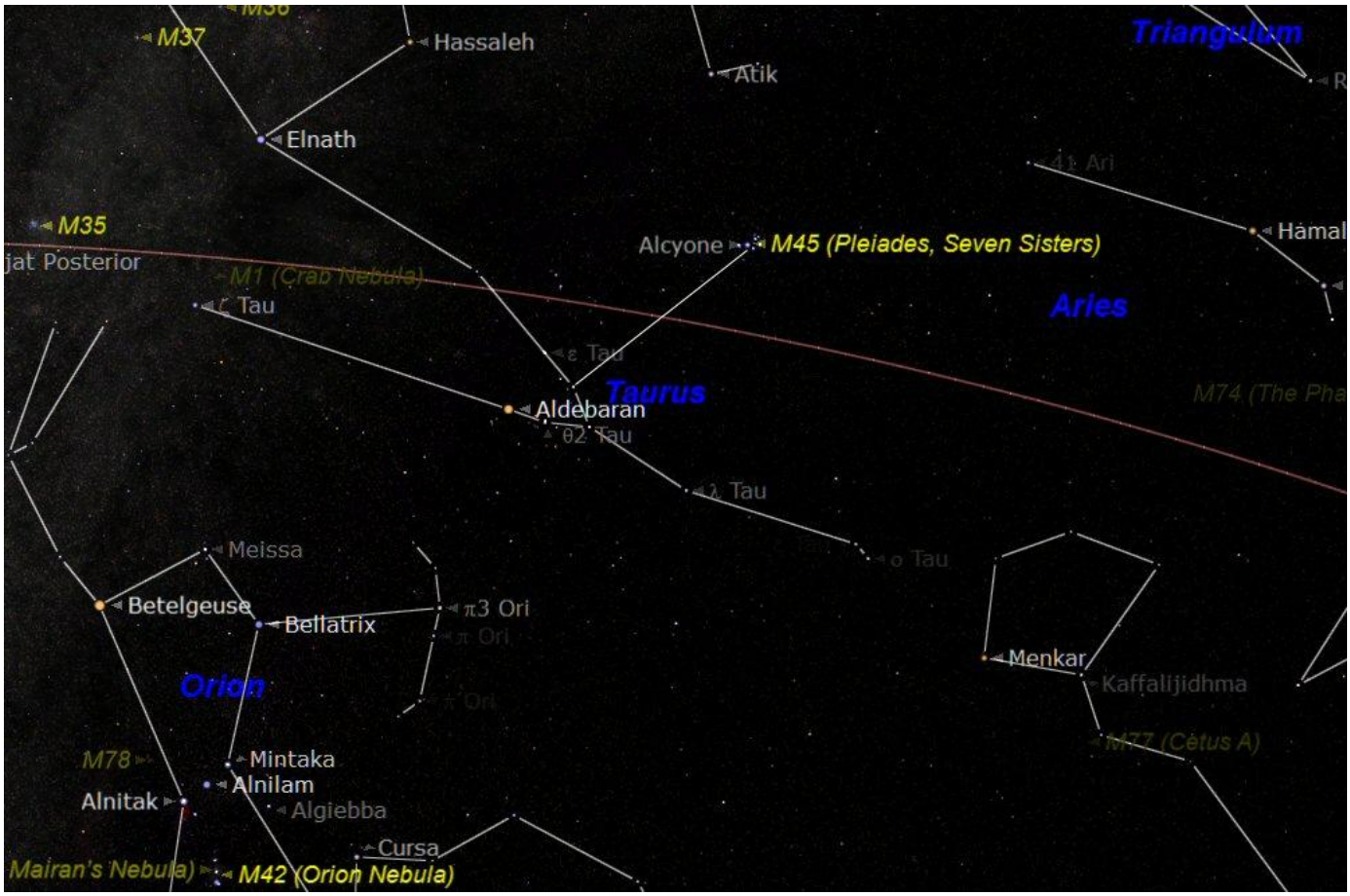
To the East of the Summer Triangle is the constellation of Pegasus (the Winged Horse). The main feature of Pegasus is the square formed by the four brightest stars. This asterism (shape) is known as the Great Square of Pegasus. It was the constellation of the month in the October issue of this magazine.

Joined to Pegasus at the top left star Alpheratz is the elongated shape of the constellation of Andromeda. It is rather odd that Alpheratz is actually the brightest star in Andromeda and is not officially a member of Pegasus. It does obviously form part of the Great Square of Pegasus is regarded as belonging to both constellations.

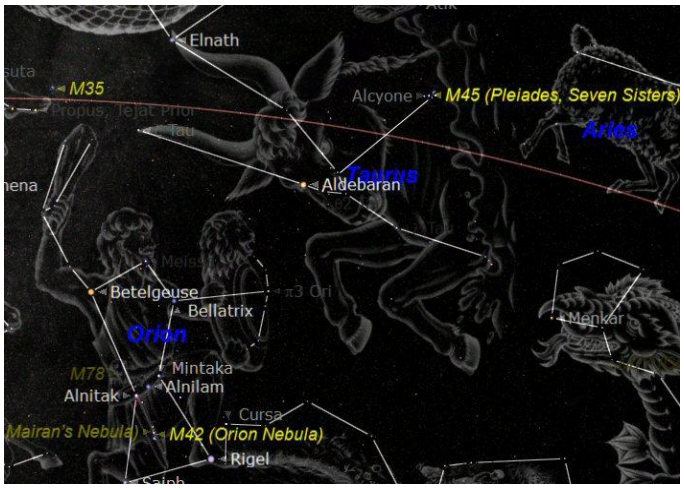
Following the lower and brighter line of stars that define Andromeda, count along two stars (three including Alpheratz) to Mirach. Then count two stars up (three including Mirack) and just to the right of the second star is a small fuzzy patch of light, this is Messier 31 (M31) the Great Spiral Galaxy. It can be seen with the naked eye on a clear dark night but is best seen using binoculars or a telescope. See page 4. The star at the end of the lower line of stars is called Almach and is a beautiful gold and blue double star looking very much like Albireo in Cygnus, shown on page 5.

Sitting astride the ecliptic in the east is the constellation of Taurus (the Bull). The Taurus asterism (shape) looks like a squashed cross 'X'. At the centre of the cross is a faint and dispersed Open Cluster called the Hyades. It has the bright Red Giant star Aldebaran in the centre. The real beauty of Taurus is the naked eye open cluster M45 the Pleiades, see page 7.

CONSTELLATION OF THE MONTH – TAURUS (the Bull)



The chart above shows the constellation of Taurus the Bull. There are many different representations of Taurus but he is generally shown with his horns tipped by the stars at the end of the obvious '>' shape. The bright red star Aldebaran is normally used to show the bull's eye.



An illustration of the constellation of Hercules

With a little imagination Taurus appears to be charging Orion in the illustration above. Taurus sits on the Ecliptic and is one of the star signs of the Zodiac. The basic 'dot to dot' asterism (shape) used to identify Taurus resembles a stretched 'X'.

At the centre of Taurus is a dispersed Open Star Cluster called the Hyades with the bright red star Aldebaran in the centre. Aldebaran is a Red Giant star but is not a member of the cluster. It is much closer to us at a distance of 65 light years, the Hyades is 153 light years.

The real jewel of Taurus is without doubt is the beautiful Open Cluster, Messier 45 (M45). Called the Pleiades or the Seven Sisters. It is visible to the naked eye initially looking like a patch of light. Closer observation will reveal a cluster of seven stars. Using a good pair of binoculars many more stars will be seen. There are in fact about 300 young stars in the cluster that is estimated to be about 100 million years old. M45 is one of the closest open clusters to us at 400 light years.

Messier 45 (M45) the Pleiades (Seven Sisters)

The Pleiades look brighter than the stars of the Hyades because they are very bright large young stars. The largest is Alcyone which is 10 times the mass of our Sun and 1000 times brighter. The larger and brighter stars of the Pleiades are also rotating very fast. The fastest is Pleione which is rotating 100 times faster than our Sun.

THE SOLAR SYSTEM THIS MONTH

MERCURY will not be visible this month.

VENUS is moving out from conjunction with the Sun and may be seen just above the south western horizon as the Sun sets. A very clear view to the south western horizon will be required to see Venus. See the chart below.

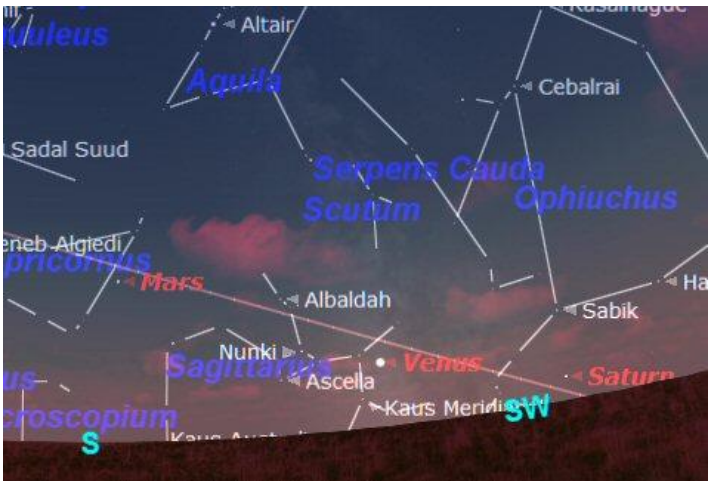


Chart showing Mars, Venus and Saturn at sunset

MARS will be in the south west as the Sun is setting and the sky begins to darken. The Red Planet appears small at just 7.00 arc-seconds in diameter and is fading to magnitude +0.5. Mars is low in the turbulent air near the horizon and will set at 21:00. See the chart above.

JUPITER was in conjunction with the Sun on 26th September and is now steadily moving west away from the Sun. It rises over the eastern horizon at 03:30 and about 4 hours before the Sun rises. See the chart below.

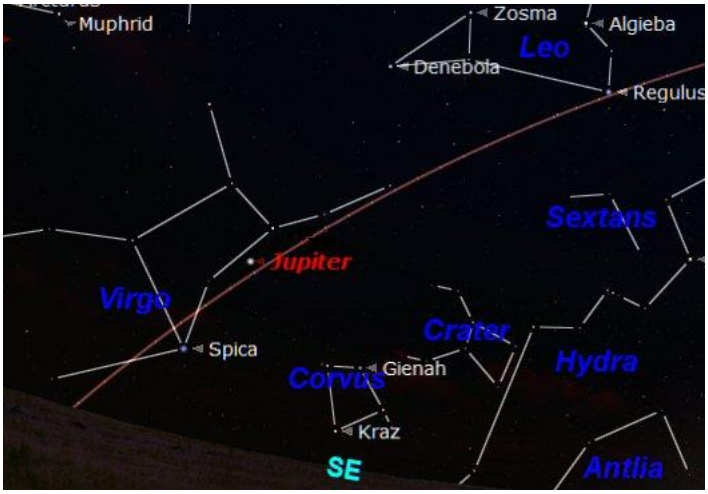


Chart showing Jupiter in the east before sunrise

SATURN is now drawing very close to the setting Sun so will be very difficult to see. The Ringed Planet appears small at 15.2 arc-seconds in diameter but is quite bright at magnitude +0.5. See the Venus chart above.

URANUS will be in a good observable position this month. It will be quite high in the south east as the sky darkens. It will be visible using a good pair of 10x50 binoculars but a telescope at a magnification of 100x or higher will be needed to see it as a small blue/green disc. See page 6.

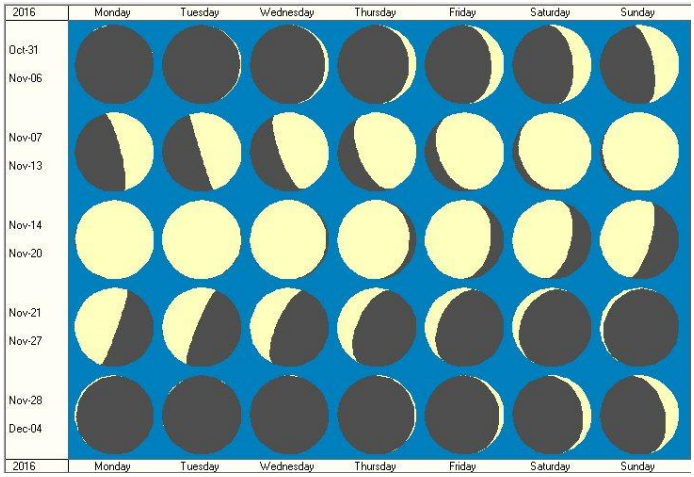
NEPTUNE will be visible in the south as soon as the sky is dark. A telescope with a magnification of 150x will be needed to show Neptune as a small blue/green disc but it is small and difficult to find. See the chart on page 6.

THE SUN

There are still occasional sunspots to see even though the active phase of the Solar Cycle is drawing to a close.

The Sun rises at 07:00 at the beginning of the month and at 07:40 by the end of the month. It will be setting at 16:20 at the beginning and 15:55 by the end of the month. Sunspots and other activity on the Sun can be followed live and day to day by visiting the SOHO website at: http://sohowww.nascom.nasa.gov/ .

THE MOON PHASES IN NOVEMBER



First Quarter will be on 7th November

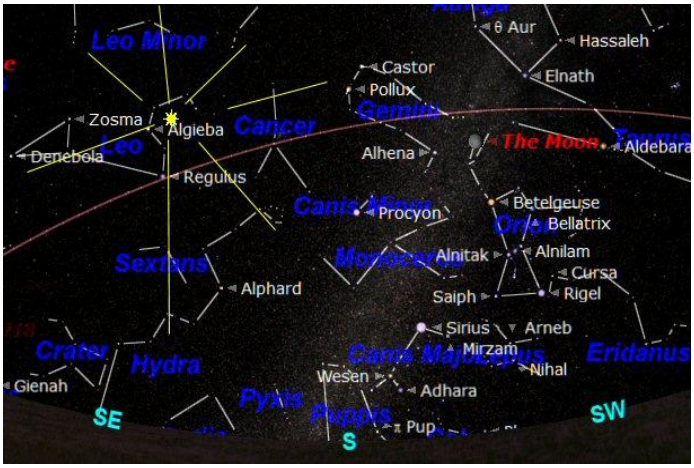
Full Moon will be on 14th November

Last Quarter will be on 21st November

New Moon will be on the 29th November

THE LEONID METEOR SHOWER

Over the period from 15th to 20th November there will be a meteor shower known as the Leonid Meteor Shower. The meteors will appear to radiate from a point in the sky within the 'Sickle' shape of Leo, close the star Algieba.

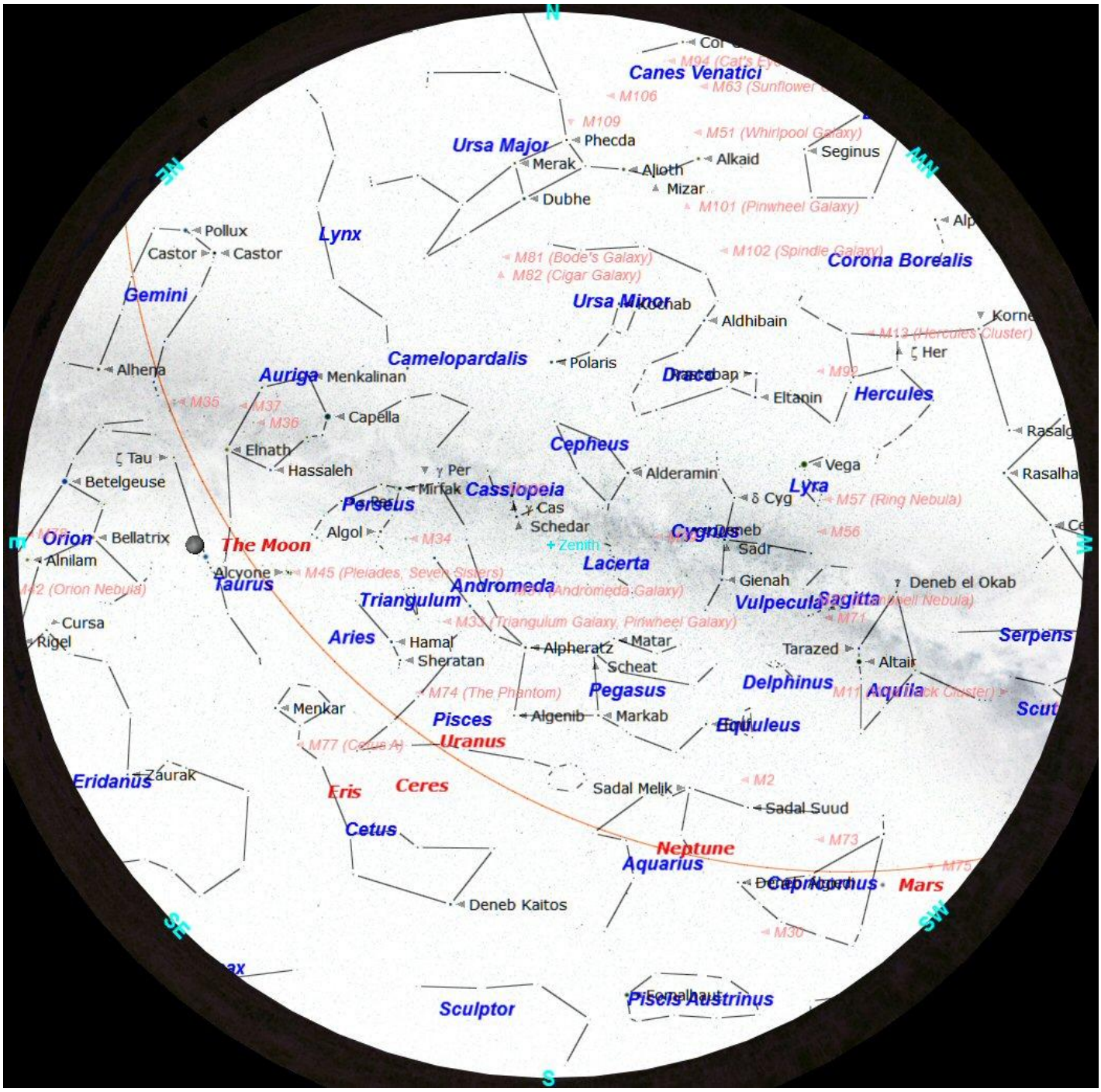


The radiant point in Leo at 04:00 17th November

There should be a noticeable increase in the number of meteors around the peak of activity at 04:00 in the morning of 17th November. Unfortunately there will be a near full Moon that will obscure the fainter meteors.

The meteors are caused by small dust particles released from ice as the comet 55P-Tempel-Tuttle loops around the Sun. There may some bright fast meteors but a spectacular display is not expected this year.

THE NIGHT SKY THIS MONTH



The chart above shows the night sky as it appears on 15th November at 21:00 (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 easy to find. This month it is in the north. 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 this month: Mars and Venus (early evening) with Uranus and Neptune most of the night.

Something a little different this month - A Tribute to Tim Peake

Tim Peake: Yes to Space

Tim Peake an astronaut, on board the ISS
Looks from his window every day, and says a great big YES!
For down below is planet Earth; rocky, blue and snowy white
Up above it's velvet black; space; with twinkling points of light

He's missing friends and family, although there is the crew
He'd rather come back home each day,
And yet; and yet That view!

He would like to go outside right then, and perform an E-V-A
But knows it's wise to wait as planned, and wait just one more day
One day to realise his dream, of floating like the stars
To be looking down or looking up, at Jupiter or Mars

One more day, fifteen thousand gone, Tim knows it's his life's fate
To be inside this metal home
And yes to feel No weight!

The day arrives and with his buddy, a vital spacesuit check
All systems go and helmet on, it's time to go on deck
With doorways sealed and air sucked out, Tim's heart is racing fast
The hatch unbolts and opens up; the great cosmos at last

Hand over hand he clambers out and glimpses earth below
One hundred minus; it's icy cold
And yet and yet No snow!

In fact outside, no rain or wind; though the ISS speeds past
Each day it overtakes our earth, in miles per hour, that's fast
Seventeen thousand or thereabouts its speed is kept the same
Four crew on board and two outside, this day shall have a name

Sergey, Mikhail, Yuri and Scott, inside will keep a note
Tim Peake, Tim Kopra, outside now
Can they? They can! They float!

White polar caps and oceans blue, our Tims' glance down in awe
But time it flies, the sun won't wait; it's seen such sights before
Solar panels need repairing, before our star becomes too bright
So Tim and Tim move quick to fix them, while still bathed in earth-shine light

And then it rises; the sun, our star; its gases squeezed burst into flame
One hundred plus and scorching! Scorching!

Few glimpse it, feel it At such close range

Happy Tims' inside their spacesuits, gold tinted visors shielding glare
Squashy pipes sewn neatly inside, providing cooling, providing air
Unclip the harness from the outside, safety first, one last thing to do
Look back to the international station, one more look at that awesome view

As loudly shuts the metal hatchway. Clang! it goes as the catch is found
The world is looking; Tim listens carefully

And yet, how strange how strange!

No sound?

Hatchway air tight, pressure normal, Tim's work continues in zero gee
Making way for us to follow, helping us, our space to see
A lifetime spent in preparation, to live inside this juggernaut
400 tonnes of floating metal, to live the life of an astronaut

In six short months Tim will answer questions; what was it like on the ISS
Was he nervous did he miss us?

Let's guess his answer

A great big YES!

By Ron Seward Newbury Astronomical Society