

# NEWBURY ASTRONOMICAL SOCIETY MONTHLY MAGAZINE - FEBRUARY 2014

## VENUS SATURN AND MARS CREEPING INTO VIEW

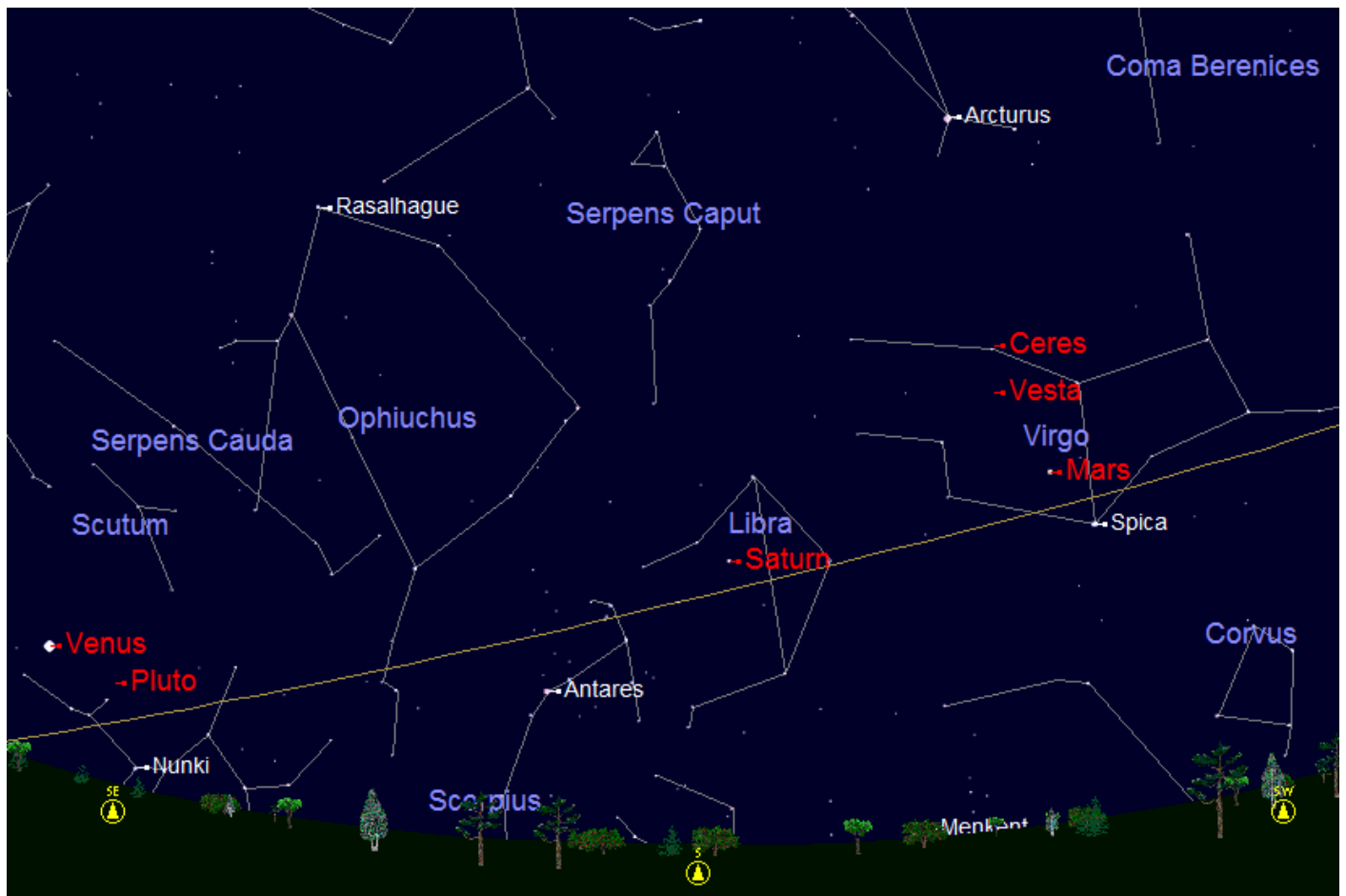


Chart showing Venus, Saturn and Mars at 06:00 in February 2014

For the early riser there is a pleasant treat in the early morning sky before the Sun rises. The planets Mars, Saturn and Venus are all well placed if the sky is clear.

Mars rises over the eastern horizon at 22:00 (10 o'clock in the evening) towards the end of February and will be due south by about 04:00 when it is at its highest in the sky. It will still be visible in the south west as the Sun rises in the east. Mars is bright at magnitude -0.1 and easy to find with the unaided eye in the constellation of Virgo close to the bright star Spica. However the Red Planet will not be greatly rewarding using a telescope this year. This is because Mars will be quite distant from Earth at opposition (when Earth overtakes Mars) on 8<sup>th</sup> April this year. This means Mars will appear small at only about 10 arc seconds in diameter this month. The northern polar cap should be visible as will some of the dark markings on the surface.

Saturn rises over the eastern horizon at around 01:00 and will have climbed high enough in the eastern sky to be observable by about 02:30. For those who venture out for a look at 06:00 to 07:30 Saturn will be well placed in the south but quite low. The view through a telescope will not be as clear as those of Jupiter which is much higher in the sky, in clearer and less turbulent air.

Venus was at inferior conjunction on 11<sup>th</sup> January so around this time it was not observable because it was too close to the Sun. Venus was moving in closer during the early days of January and was initially still visible close to south western horizon at sunset. It then appeared to pass very close to the Sun from our point of view and was not visible. Venus is now creeping away from the Sun in the early morning, close to the eastern horizon before sunrise.

Venus was at its closest to us during its inferior conjunction with the Sun because it was between Earth and the Sun. When it is first spotted after inferior conjunction it will appear large in diameter (about 45 arc-seconds) however it will appear as a very thin crescent. This is because the side facing the Sun is illuminated and the dark side is towards us. As Venus moves away from the Sun the crescent will widen.

### NEXT NEWBURY ASTRONOMICAL SOCIETY MEETING

7<sup>th</sup> February      High Resolution Camera for the ISS  
Website:          [www.newburyas.org.uk](http://www.newburyas.org.uk)

### NEXT NEWBURY BEGINNERS MEETING

19<sup>th</sup> February      How different are the stars?  
Website:          [www.naasbeginners.co.uk](http://www.naasbeginners.co.uk)

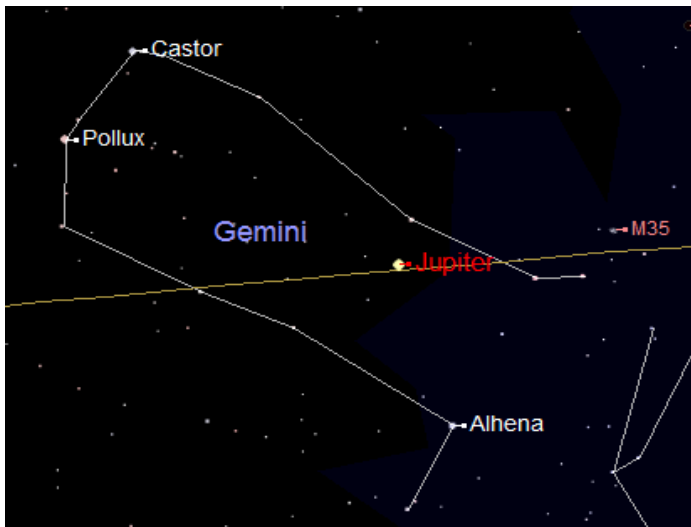
## OBSERVING JUPITER

After passing through its Opposition on 5<sup>th</sup> January 2013, Jupiter is still in perfect position for observing. Opposition was the exact time that Earth was overtaking Jupiter on the respective orbits of the two planets. Earth travels much faster along its smaller orbit around the Sun so catches up and overtakes Jupiter about every 13 months. At opposition the two planets were at their closest at about 628 million kilometres.

At this time of year the 'Ecliptic' (the imaginary line along which the Sun, Moon and planets appear to move across the sky) is high in the sky during the night due to the 23° tilt of Earth's axis. The ecliptic is low during the day which makes the Sun appear very low in the winter sky. With the ecliptic high at night Jupiter appears high in the sky and in relatively clean and stable air away from the murky and turbulent air closer to the horizon.

Jupiter is visible most of the night, rising in the north east in daylight at about 13:00. It will be observable in the east as soon as it is dark and will set over the western horizon at about 05:30. Jupiter is easy to find as it is very bright, in fact it is the brightest object in the night sky except for the Moon.

At 7 o'clock in the evening (19:00) Jupiter will be high in the south east and in the perfect position for observing in the constellation of Gemini (the Twins). Jupiter is located in the middle of the main star pattern of Gemini with the twin stars Pollux and Castor to its east (left). Jupiter is noticeably brighter than the twins.

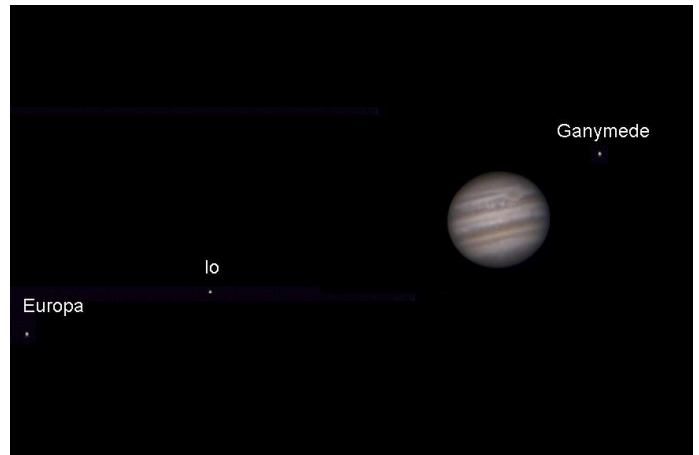


Jupiter located in the constellation of Gemini

A good pair of 9 x 50 binoculars will just about show the four bright moons. The surface of the planet has many bands or 'belts' of different colours two of which can be seen even using a small telescope. The North and South Equatorial Belts are located, as the names suggest, above and below the white Equatorial Zone.

These belts are mainly different shades of browns with variations from yellow through orange to chocolate brown. There are even reds especially in the famous Great Red Spot although it is in fact more pink than red. The Great Red Spot is a massive storm much larger than the size of the Earth. It has been raging since before the invention of telescopes and was observed by early astronomers using primitive telescopes nearly 350 years ago.

Jupiter is the best of all the planets to observe with a small telescope of 100mm aperture or less. It is even possible to make interesting observations of the positions of the moons using a reasonably good pair of 9 x 50 binoculars. A telescope is required to see the coloured cloud belts. A small to medium sized telescope (100mm to 150mm aperture) could give a view something like the image shown below (but not quite as clear).



Jupiter and three Moons imaged in 2010 by Steve Harris

The Galilean Moons can be seen changing position to either side of Jupiter so it is good fun to track them from night to night or even through the night. Sometimes there may be only three or even two moons visible when one or two are passing in front or behind the planet. They can be distributed in any pattern and may even be all gathered to one side at times.

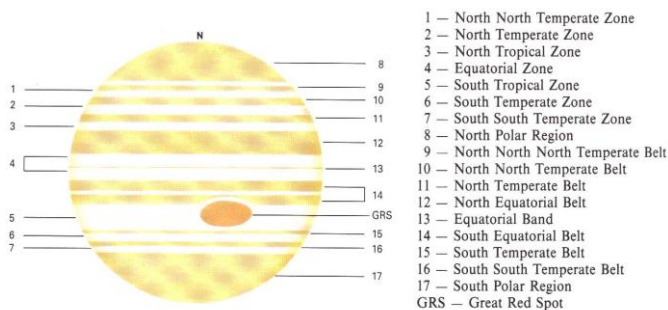
A small telescope (100mm aperture) will be able to show details of some of the interesting features of the movements of the moons around Jupiter. Jupiter has a small tilt angle 3.07° compared to many of the other planets including Earth at 23.45°. Consequently its moons regularly appear to pass in front and behind the planet. This can make observing Jupiter very interesting.

When a moon passes in front of a planet it is said to 'transit' the planet. Most computer planetarium applications will be able to predict these events very accurately. Using an accurate clock the event can be observed and the predicted timings checked. Using a high magnification (100x or more) the moon can be followed as it approaches the edge of Jupiter. As the gap between the moon and Jupiter closes the moon will eventually appear as a 'pimple' on the edge of the planet. The time that the 'pimple' finally disappears can be recorded. The time when the moon reappears on the opposite side of the planet can also be predicted and the timing checked in a similar way. It is very difficult to see the moon as it transits the bright surface of Jupiter but the shadow of the moon is quite easy to see. The [eclipse] shadow can also be predicted using a computer planetarium application. The passage of the shadow can be tracked and timed. See the first image on page 4 the shadow of Ganymede can be seen on Jupiter.

When a moon passes behind a planet it is said to be 'occulted' by the planet. Occultations can be followed in a similar way to transits.

This year Jupiter will appear higher in the night sky than it has been for a few years. On the 5<sup>th</sup> January 2014 Jupiter was at opposition. This means it was directly opposite the Sun in our sky and was therefore due south at midnight Greenwich Mean Time (GMT). When at opposition Jupiter was 61° high and 46.8 arc-seconds in diameter therefore looking very bright. Jupiter always displays an almost full disc but can lose a tiny amount from the edge when it is at greatest elongation (at about 90° from the Sun as we view it from Earth). However Jupiter will appear absolutely full to the untrained eye. For these reasons Jupiter will be as good as it gets this month subject to clear skies.

For those who are lucky enough to have a larger telescope a closer study of the features in Jupiter's cloud system can be achieved. The darker bands on the clouds are known as 'Belts' and the lighter ones known as 'Zones'. The belts are numbered 9 to 16 in the diagram below and the most prominent (North and South Temperate Belts) 12 and 14 can be seen using a small telescope. A larger telescope is required to make out the details of the other less prominent belts.



The cloud markings on Jupiter

The Belts and zones are regions of higher and lower atmospheric pressure. The lighter coloured 'Zones' are regions of rising gas caused by convection of heat from the core of Jupiter. The darker 'Belts' are regions of falling gas and are approximately 20 kilometres lower in altitude than the zones. In the regions where the belts and zones meet huge storms are created as the belts and zones move at different speeds and directions. A larger telescope will allow some of detail of the storm patterns to be seen.

The most famous feature in the cloud system is the 'Great Red Spot' (GRS). This huge storm has been raging for at least 350 years. We know this because it was recorded by astronomers in 1664 using some of the earliest telescopes. The GRS does change colour and shape but it is always there. Its colour may fade from its pink to nearly white when it may almost disappear. The colour is thought to be caused by Phosphorus welling up from deep in Jupiter's atmosphere.

The GRS is not the only storm feature to be seen. There are white spots and even mini red spots. These tend to be transient and last from just a few days or weeks but others may persist for up to fifty years. Spots can combine with other spots as they move along the boundaries between the belts and zones. Some larger spots have even been swallowed up by the GRS. Over the last couple of years there was a lot of turbulence around the GRS with eddies running along the South Tropical Zone and around the GRS.

As Jupiter is so large (for a planet) it is the easiest planet to image through a telescope. The cheapest way to do this is to use a computer web camera. By removing the lens of the webcam and replacing it with a special adaptor (available from astronomy shops for about £20) the webcam can be mounted in place of the eyepiece. With the webcam connected to a computer via a USB port a short video (1 to 2 minutes) of Jupiter can be recorded on to the hard drive.

It is then necessary to download a free piece of software from the internet called 'registax'. This application can automatically align each frame of the video then stack all the images from each frame on top of each other. The result is all the features on the surface of the planet that are in the same place on the Images are added and the features become clearer on the finished single image. The image can even be enhanced using the built in processing screen in registax. The image below was taken using a webcam on 14<sup>th</sup> November 2012 and shows some of the turbulence around the Great Red Spot in the South Tropical Belt. The Tropical Belts are mentioned on the previous page (South is at the top of the image). The moon Ganymede can also be seen to the right of Jupiter.



Jupiter imaged on 14<sup>th</sup> November 2012 by Steve Harris  
 One of the major attractions of observing Jupiter is that its rapid rotation (9.9 Earth hours) allows a whole rotation of the planet to be observed over the course of one night on Earth. The Moons, especially the two inner most, Io and Europa can be seen to move noticeably over short periods especially when they are close to the planet. Io orbits Jupiter in just 1.77 Earth days and Europa takes 3.55 Earth days. So Jupiter is a very dynamic and interesting object to look at and can give hours of exciting and breathtaking views of what is truly the 'King of the Planets'.

Jupiter is always worth looking at just to take in its great beauty and mystique but there are plenty of times during the month to have a special look. The Great Red Spot can be seen to cross the face of the planet in just 5 hours. Features in the clouds and bands can also be seen in a medium sized telescope.

Although the moons are very interesting to observe as they move around Jupiter they are also very interesting as solar system objects. Through an amateur astronomer's telescope the moons appear as small specks of light but no detail can be seen however space probes have shown they are nothing like our Moon and are a lot more interesting.

**SOME INTERESTING EVENTS ON JUPITER THIS MONTH**  
The images below were computer generated using Starrynight

**1<sup>st</sup> February**

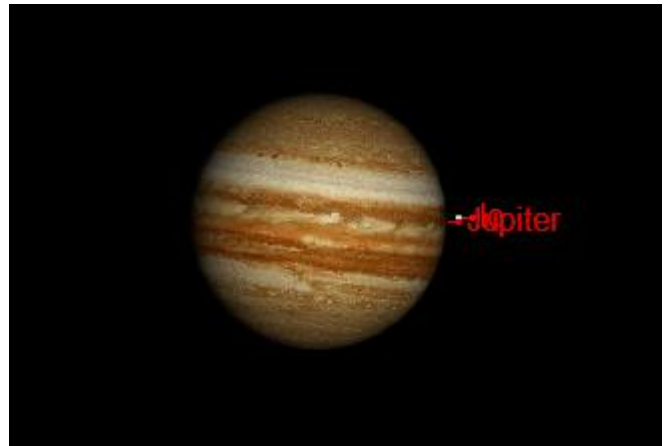
- 19:30 Ganymede starts transit
- 22:05 Ganymede's shadow appears
- 23:30 Ganymede's shadow central



The view at 23:30

**13<sup>th</sup> February**

- 22:05 Io occulted by Jupiter
- 00:23 Io re-appears



Io about to be occulted at 22:00

**2<sup>nd</sup> February**

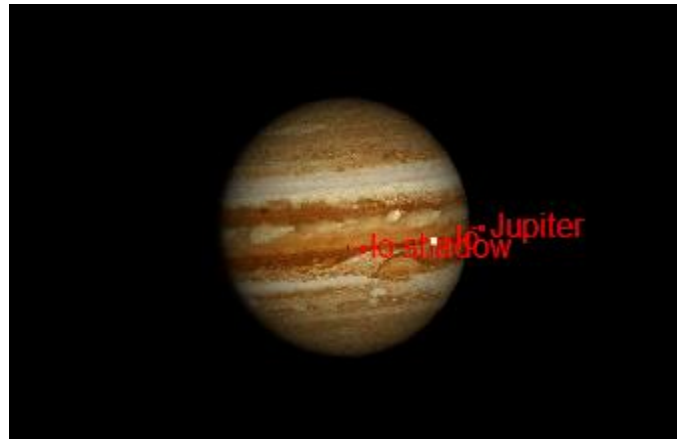
- 19:30 Europa starts transit
- 20:45 Europa's shadow appears
- 22:00 Europa's shadow central



The view at 22:00

**14<sup>th</sup> February**

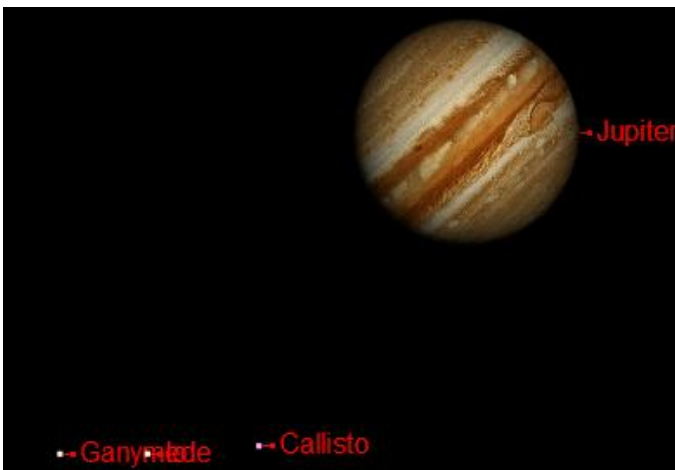
- 19:25 Io starts transit
- 20:15 Io's shadow appears
- 21:15 Io's shadow central



Io's shadow central at 21:15

**5<sup>th</sup> February**

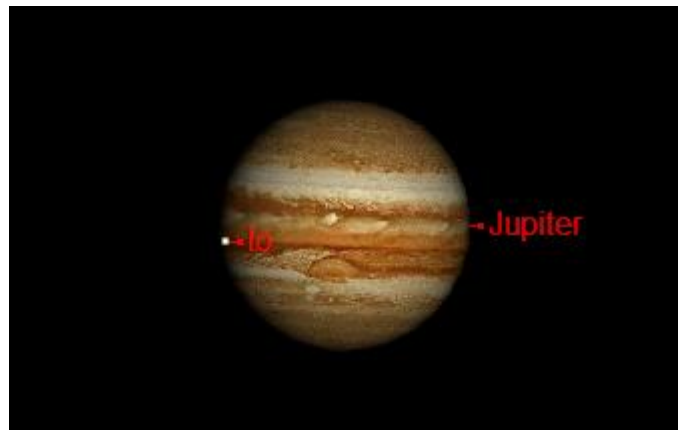
- 19:15 Ganymede, Io and Callisto in a line



Three moons in line at 19:15

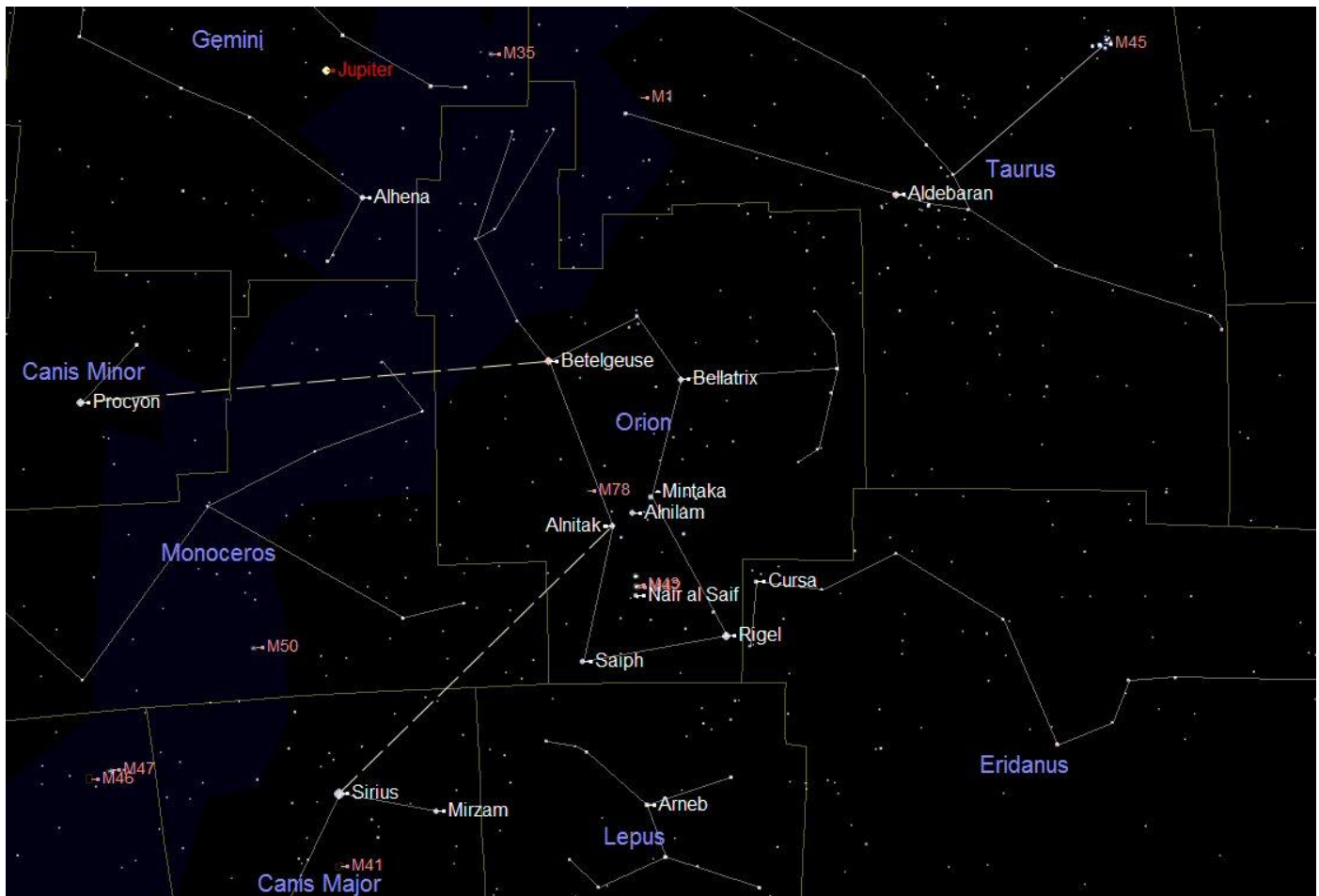
**21<sup>st</sup> February**

- 21:11 Io starts transit
- 22:10 Io's shadow appears
- 23:00 Io's shadow central



Io starting transit at 21:11

## EXPLORING THE NIGHT SKY – ORION AND HIS DOGS



The chart above shows part of the night sky, looking towards the south at about 20:00 (8 o'clock GMT) on the 15<sup>th</sup> February. South is at the bottom, east is to the left and west is to the right.

The southern sky is dominated at this time of the year by the beautiful constellation of Orion (the Hunter). Orion is one of the few constellations that does look (with a little imagination) like what it is named after. The most obvious feature is the line of three stars that make up Orion's belt. From his belt we can see two bright stars called Saiph and Rigel below that define the bottom of his 'skirt like' tunic. Above the belt are two stars Betelgeuse and Bellatrix that denote the position of his shoulders. Above and between his shoulders is a little group of stars that mark out the head. From his right shoulder (Bellatrix) he holds out a shield. From his left shoulder (Betelgeuse) a club is held above his head.

Down from Orion's very distinctive belt there is a line of stars, ending at Nair al Saif that looks very much like a sword attached to his belt. If an imaginary line is traced down from the belt for about six belt length towards the south eastern horizon, a bright twinkling star will be seen. This is Sirius, Orion's Large Hunting Dog in the constellation of Canis Major. It is the brightest and closest star to be seen from the UK, it is just 8.6 light years from us. To Orion's left (east) of Betelgeuse a bright star in a rather large empty area of sky can be seen. This is Procyon in Canis Minor, Orion's Small Hunting Dog. Sirius is a double star but with an invisible 'White Dwarf' companion. Coincidentally Procyon also has an invisible 'White Dwarf' companion.

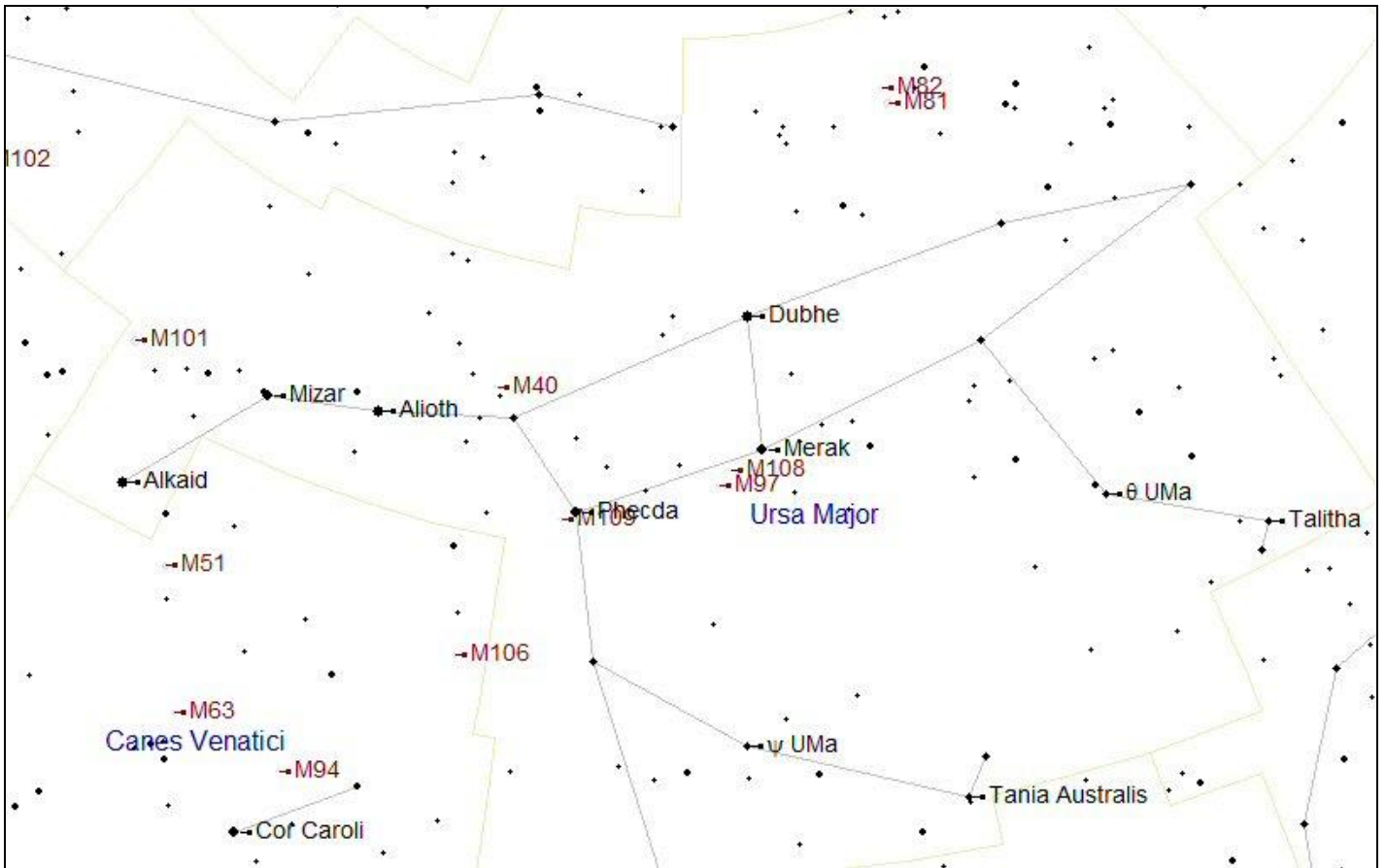
The bright star Betelgeuse looks rather orange even to the naked eye this is because it is a Red Giant. It is in fact the star with the largest diameter in our vicinity. If it was in the position of our Sun it would reach out almost to the orbit of Jupiter. Rigel is also a giant star but unlike Betelgeuse it is in the 'prime of its life'. It is one of the most massive and brightest stars in our neighbourhood and is 50,000 times brighter than our Sun.

Imbedded in Orion's sword is a vast cloud of gas and dust known as a Nebula that can be seen quite easily using binoculars. Within this nebula, known as M42, new stars are being formed. A telescope will reveal a group of four stars known as the Trapezium that are young stars that are illuminating the nebula.

To the west (right) and above Orion is the constellation of Taurus (the Bull). At the centre of Taurus is the bright orange coloured star called Aldebaran. Surrounding Aldebaran is a large dispersed cluster of stars known as the Hyades. This cluster looks best using a pair of binoculars. To the north west (up and to the right) of the Hyades is a smaller and more compact cluster called the Pleiades (Seven Sisters) or M45. The six or seven brightest stars can be seen with the unaided eye but over thirty bright stars can be seen in this beautiful cluster using a pair of binoculars.

To the east (left) of Taurus is the constellation of Gemini (the Twins). The two bright and similar stars Castor and Pollux are the twins. From the twins there are lines of fainter stars that mark out the extent of the constellation. Between these two lines of stars is the unmistakably bright Jupiter (the King of the Planets).

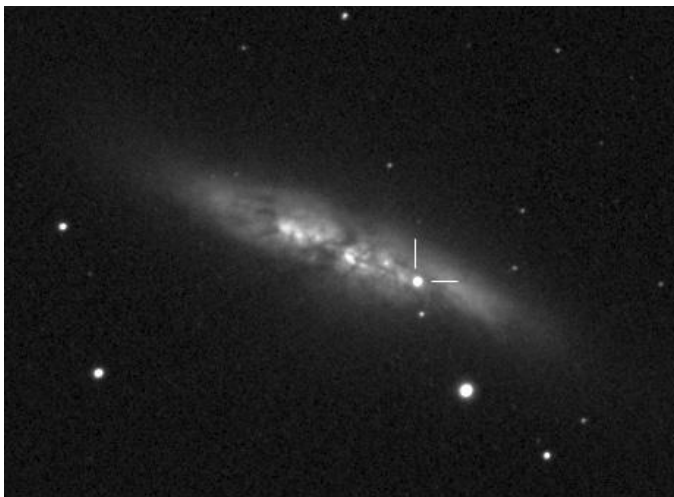
## NEW SUPERNOVA FOUND IN URSA MAJOR



The constellation of Ursa Major with M82 marked at the top

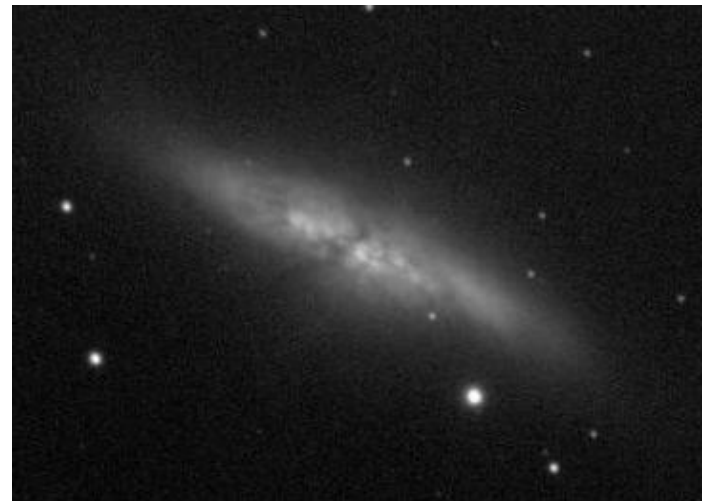
A new supernova was discovered by a group of young students at the University of London on 21<sup>st</sup> January. The discovery was made completely by accident during a 10 minute telescope workshop. The discovery led to a global scramble to acquire confirming images and spectra of a supernova in one of the most unusual and interesting of our near-neighbourhood galaxies.

A supernova is a star that suddenly increases its normal brightness by millions of times due to a massive explosion. There are two ways this happens one is when a very large star reaches the end of its Hydrogen fuel supply. It then collapses under its own gravity and destroys itself in a massive explosion. This is type is known as a Type II supernova.



Supernova SN2014J imaged by David Boyd

The supernova, now designated SN2014J was also imaged by David Boyd, who is a member of the Newbury Astronomical Society, from his garden near Didcot. The supernova had a magnitude of 11.2 and should have been visible using a modest sized telescope. The spectra of the supernova have revealed it to be a Type Ia Supernova (see the next column).

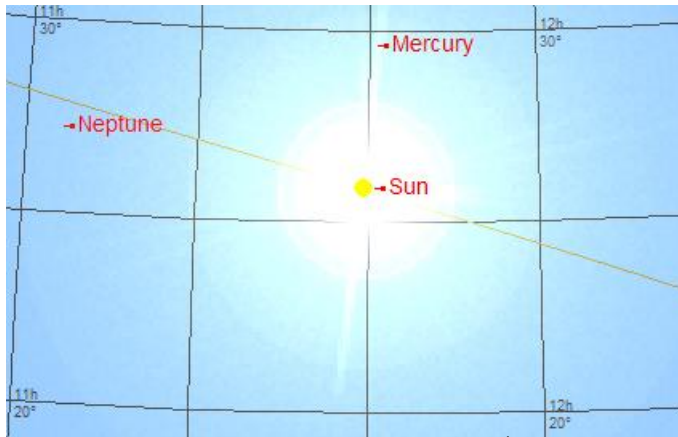


M82 before the supernova appeared

The second type occurs in a close binary star system comprised of two medium sized stars. One star will have collapsed to become a white dwarf. The stars are so close that the white dwarf pulls Hydrogen gas off the companion star. When the accumulated Hydrogen reaches a given mass it detonates a massive thermal nuclear (fusion) explosion called a Type Ia Supernova.

## THE SOLAR SYSTEM THIS MONTH

**MERCURY** will be at inferior conjunction on 15<sup>th</sup> February. This means Mercury will be at its closest position to the Sun as seen from Earth. Because of the relative tilt in the orbits of the planets the inferior planets (those with orbits inside that of Earth) rarely pass directly in front of the Sun in what is called a 'Transit'. On 15<sup>th</sup> February Mercury will pass about 4° above the Sun as shown on the chart below. Mercury will be very difficult to see this month and will not be observable.



Mercury in conjunction at 12:00 on 15<sup>th</sup> February

**VENUS** rises at about 05:15 at the beginning of February and about 04:45 at the end of the month. This means Venus will appear over the south eastern horizon about two hours before sunrise. See page 1.



The phase of Venus on 15<sup>th</sup> February

**MARS** rises at about 22:30 so will be observable in the early morning until sunrise. It will rise progressively earlier in the east as we move into 2014 but will remain distant and looks small at 10 arc-seconds diameter. It will reach its best at opposition on 8<sup>th</sup> April. See page 1.

**JUPITER** rises in the east at around 13:30 at the beginning of the month and 12:00 by the end of the month. It will look large, at 44 arc-seconds in diameter. Its four largest moons are easy to see and Jupiter is observable all night. See pages 1 to 4.

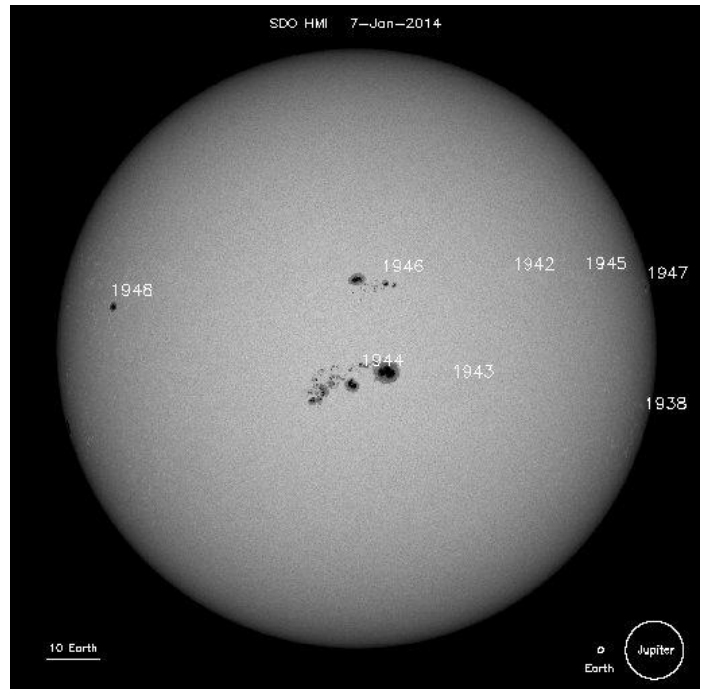
**SATURN** is in the constellation of Libra rising at about 01:00 in the east and will be at a good elevation for observing from 03:00 until sunrise. The ring system is almost fully open and looks magnificent. See page 1.

**URANUS** rises in the east at about 08:30 and will be observable until 21:00 in the constellation of Pisces.

**NEPTUNE** rises at about 07:30 in daylight and will be close to the Sun so it will not be visible.

### THE SUN

The Sun rises at 07:30 at the beginning of the month and at 06:50 by the end of the month. With the winter solstice now past the Sun is beginning to set later at 17:00 GMT on the 1<sup>st</sup> and 17:30 GMT at the end of the month.



Sunspots imaged on 7<sup>th</sup> January by SOHO

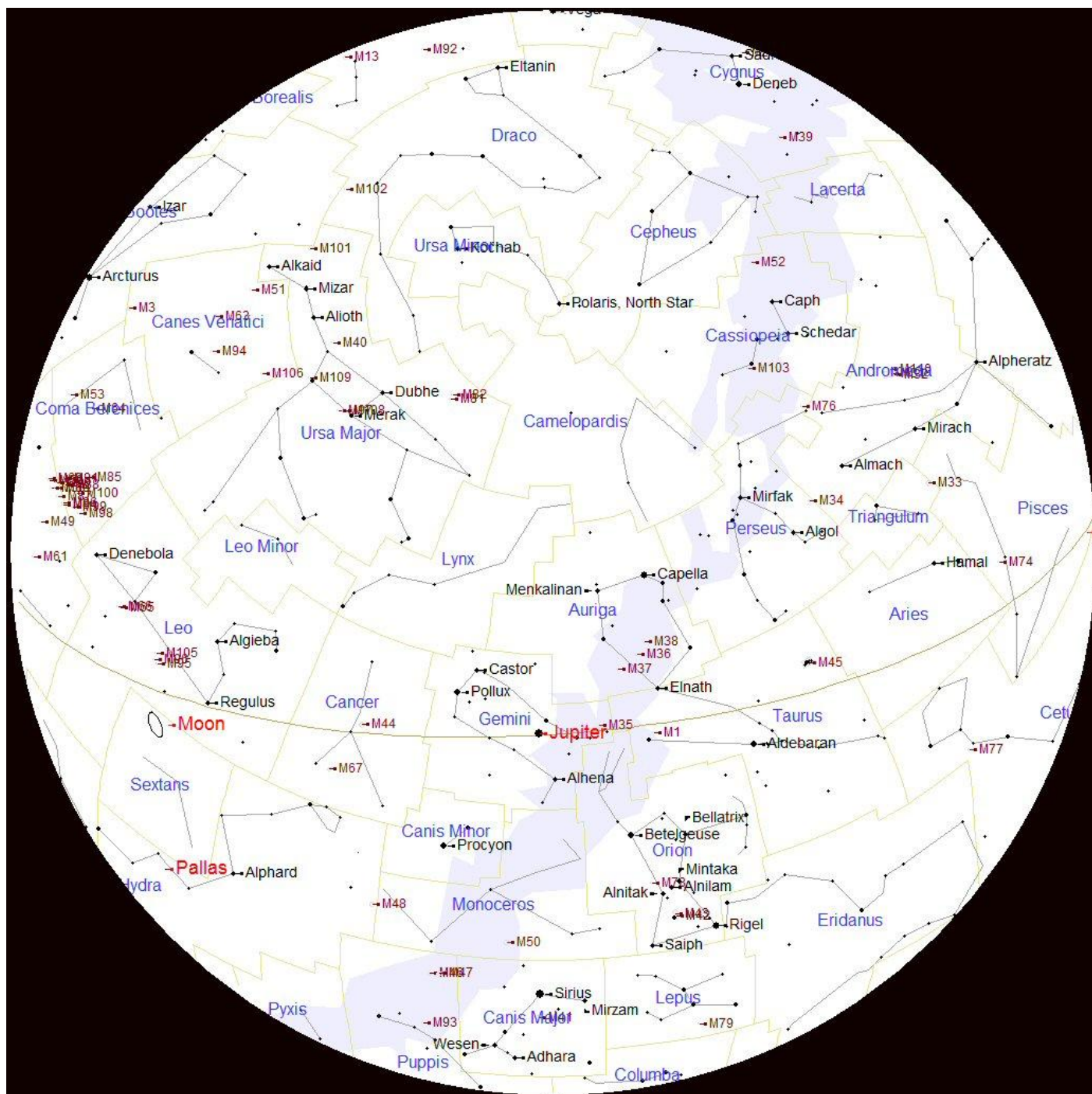
The Sun has an eleven year cycle of increasing and decreasing activity when more sunspots and prominences can be seen on the surface. Solar activity has been relatively low during this cycle with fewer sunspots. However the largest sunspots that have been seen since the last maximum were seen at the beginning of January. There was a very large group of large sunspots as shown in the image above.

### THE MOON PHASES IN FEBRUARY 2014

| 2014   | Monday | Tuesday | Wednesday | Thursday | Friday | Saturday | Sunday |
|--------|--------|---------|-----------|----------|--------|----------|--------|
| Jan-27 |        |         |           |          |        |          |        |
| Feb-02 |        |         |           |          |        |          |        |
| Feb-03 |        |         |           |          |        |          |        |
| Feb-09 |        |         |           |          |        |          |        |
| Feb-10 |        |         |           |          |        |          |        |
| Feb-16 |        |         |           |          |        |          |        |
| Feb-17 |        |         |           |          |        |          |        |
| Feb-23 |        |         |           |          |        |          |        |
| Feb-24 |        |         |           |          |        |          |        |
| Mar-02 |        |         |           |          |        |          |        |
| 2014   | Monday | Tuesday | Wednesday | Thursday | Friday | Saturday | Sunday |

The very thin crescent of the new Moon may be spotted in the west on the evenings of the 1<sup>st</sup> and 2<sup>nd</sup> February. First Quarter will be on 6<sup>th</sup> February and Full Moon will be on 14<sup>th</sup> February.

## THE NIGHT SKY THIS MONTH



The chart above shows the night sky as it appears on 15<sup>th</sup> February at 9 o'clock in the evening Greenwich Mean Time (GMT). As the Earth orbits the Sun and we look out into space each night the stars will appear to have moved across the sky by a small amount. Every month Earth moves one twelfth of its circuit around the Sun, this amounts to 30 degrees each month. There are about 30 days in each month so each night the stars appear to move about 1 degree. The sky will therefore appear the same as shown on the chart above at 10 o'clock GMT at the beginning of the month and at 8 o'clock GMT at the end of the month. The stars also appear to move 15° (360° 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 high in the north east. Look for the distinctive saucepan shape, four stars forming the bowl and three stars forming the handle. Follow an imaginary line, up from the two stars in the bowl furthest from the handle. These will point the way to Polaris which will be to the north of overhead at about 50° 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 night sky: Uranus and Jupiter with Mars and Saturn best in the early morning.