

“ $\Omega > 1$ ”

“Sky-Notes” of the Open University Astronomy Club.

January 2015.

**A Very Happy New Year to all readers!**

**An exciting year lies ahead for astronomers.**

### Forthcoming Meetings.

#### OUAC.

The next “Clubnight” is on Tuesday 6<sup>th</sup> January.

#### BAA.

Full details of BAA meetings at: [www.britastro.org](http://www.britastro.org)

#### Other.

January is a Quiet Month.

#### “European Astrofest 2015.”

Friday 6<sup>th</sup> and Saturday 7<sup>th</sup> February.

Kensington Conference & Events Centre, London.

A few minutes walk from High Street Kensington Underground Station.

Full Details at: [europeanastrofest.com](http://europeanastrofest.com) and the current issue of *Astronomy Now*.

### Highlights of the Month.

4 <sup>th</sup>	Peak of Quadrantids meteor shower. Near Full Moon spoils the show!
4 <sup>th</sup>	Earth at Perihelion.
10 <sup>th</sup> /11 <sup>th</sup>	Very close Conjunction between Mercury and Venus.
14 <sup>th</sup>	Mercury at Greatest Elongation E.
19 <sup>th</sup>	Close conjunction between Mars and Neptune.
24 <sup>th</sup>	Rare Triple Shadow Transit on Jupiter.
30 <sup>th</sup>	Mercury at Inferior Conjunction.
Mercury.	Low in SW evening sky during the first three weeks of the month.
Venus.	Becoming a prominent object low in evening SW twilight sky.
Mars.	Low in WSW early evening sky.
Jupiter .	Very well placed for observation and imaging.

## **Highlights continued.**

Saturn.            Gaining height in SE predawn sky. Rings wide open.  
Uranus.           Well placed for early evening observation.  
Neptune.         An early evening object low in SW.  
Comet C/2014 Q2 (Lovejoy) is becoming well placed and just naked eye at the start of the month and will probably reach 4<sup>th</sup> magnitude mid month.

## **Recent Events.**

If you have any images and/or reports of recent events please contact Sheridan so that he can put them on the Club website.

If you wish to present them at a Clubnight meeting please contact Sheridan or myself before the meeting starts.

## **Software.**

A very useful item of Planetarium software is “Stellarium” and it’s FREE! Go to the website and download it and the associated user manual.

# 1. The Solar system.

**Note all times shown are UT.**

## Earth.

**Perihelion** 4<sup>d</sup> 06<sup>h</sup> 36<sup>m</sup> 147,096,204 km.

### **Aurora.**

Long hours of darkness improve the opportunity for observing potential aurora.

Keep tuned to the [www.spaceweather.com](http://www.spaceweather.com) site for updates.

Subscribe (free) to the UK AuroraWatch website to receive alerts.

### **ISS.**

Go to the “spaceweather” website and click the “Flybys” button and follow the instructions to set-up forecasts for your location. Alternatively go to the “Heavens Above” website and set-up for your location. Add to your “favourites”.

### **Iridium Flares.**

These satellites produce short lived “Bright events”. Some are very bright in the order of magnitude -8. Take a wide-field image of with an exposure of 20 – 30 seconds to capture an event. Regular observing of events brighter than -4 will provide useful practice for estimating the magnitude of very bright meteors and Fireballs. Go to the “Heavens Above” website and set-up for your location for predictions.

## **Sunrise and Sunset.**

### **Bedford.**

**Latitude 52° 6.9’N Longitude 0° 28.1’W**

Date.	Rise.	Transit.	Set.
01	08 <sup>h</sup> 11 <sup>m</sup>	12 <sup>h</sup> 05 <sup>m</sup>	16 <sup>h</sup> 00 <sup>m</sup>
08	08 <sup>h</sup> 09 <sup>m</sup>	12 <sup>h</sup> 09 <sup>m</sup>	16 <sup>h</sup> 09 <sup>m</sup>
15	08 <sup>h</sup> 04 <sup>m</sup>	12 <sup>h</sup> 11 <sup>m</sup>	16 <sup>h</sup> 19 <sup>m</sup>
22	07 <sup>h</sup> 57 <sup>m</sup>	12 <sup>h</sup> 14 <sup>m</sup>	16 <sup>h</sup> 31 <sup>m</sup>
29	07 <sup>h</sup> 47 <sup>m</sup>	12 <sup>h</sup> 15 <sup>m</sup>	16 <sup>h</sup> 43 <sup>m</sup>

## The Sun.

To prevent permanent damage to your eyes avoid looking at the Sun directly and never with binoculars or a telescope unless special (expensive!) filters are used. The safest way is the simplest – project the image of the Sun onto grey or white card.

Currently some moderately active sunspots.

If you have or have access to observe in h-alpha the rewards are much greater.

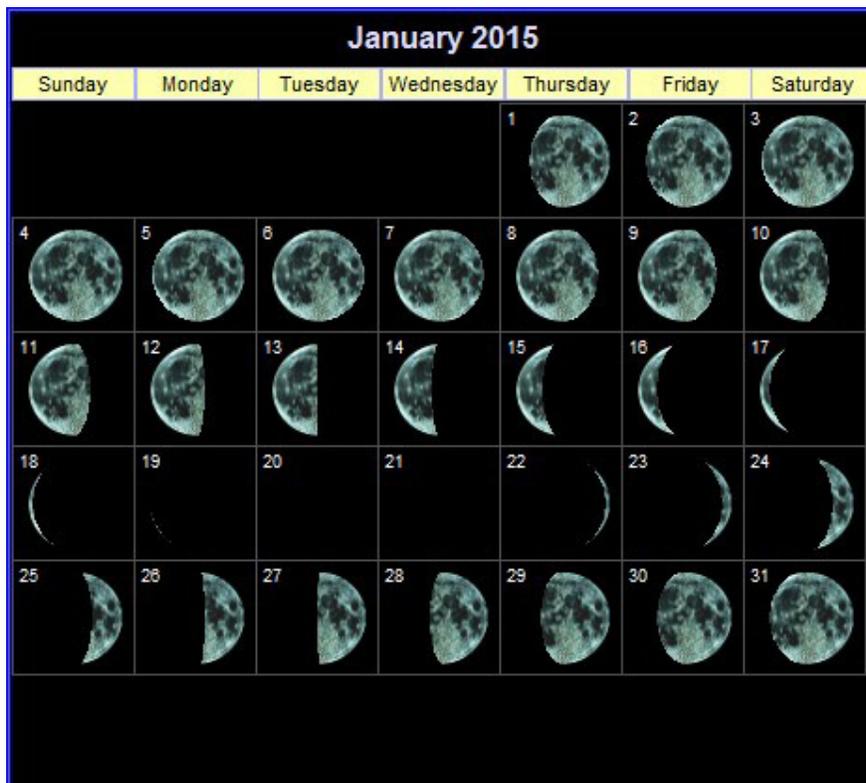
Keep in touch with the Solar Dynamics Observatory satellite at <http://sdo.gsfc.nasa.gov/>

Add the “Spaceweather” and the “Soho Lasco C3” websites to your “favourite” websites.

## The Moon.

### Phases:

Full	05 <sup>d</sup> 04 <sup>h</sup> 53 <sup>m</sup>
Last Quarter	13 <sup>d</sup> 09 <sup>h</sup> 46 <sup>m</sup>
New	20 <sup>d</sup> 13 <sup>h</sup> 14 <sup>m</sup>
New	27 <sup>d</sup> 04 <sup>h</sup> 18 <sup>m</sup>



**Apsides:**

Apogee	09 <sup>d</sup> 18 <sup>h</sup>	Diameter. 29' 28"	Distance. 405,411km.
Perigee	21 <sup>d</sup> 20 <sup>h</sup>	Diameter. 33' 13"	Distance. 359,642km.

**For northern observers:**

The waxing crescent Moon is becoming better placed.

The waxing gibbous Moon is very well placed.

The Full Moon is very well placed.

The waning gibbous Moon is well placed.

The waning crescent Moon is less well placed.

Observe the regions along the terminator (sunrise and sunset on the Moon) where the low angle of the Sun highlights lunar topography. A basic lunar map is all you need to get started. *Sky & Telescopes* "Lunar 100 Card" is another good starting point. If you are starting out on photography and/or imaging the Moon provides an excellent target.

**Lunar Occultations.**

Unlike the gradual disappearance of a planet (small disc) a star vanishes instantly demonstrating that it is a point source of light as viewed from the earth. For all occultation events start observing 10 to 15 minutes before the predicted time to identify the required star and to allow for slightly different time if you are not at Greenwich. Use an accurate watch to record the time that *you* observe the occultation remembering that times are UT not BST. Disappearance is behind the dark limb (DD) of the Moon unless otherwise stated. Enter details in your observing log.

Date. ZC No. Name. Mag. Time.

No "Highlights" this month.

Further details of occultations can be found in current *BAA Handbook* and monthly periodicals such as *Astronomy Now* and *Sky at Night*.

**A Challenge!**

On 18<sup>th</sup> and 19<sup>th</sup> try locating the very thin crescent Moon very low in the ESE dawn skies **before sunrise**.

On 21<sup>st</sup> and 22<sup>nd</sup> try locating the very thin crescent Moon evening twilight **after sunset**.

If you can take images of the above so much the better.

## The Planets.

### Mercury.

Low in the SW evening twilight during first three weeks of the month..

Very close conjunction with Venus on 10<sup>th</sup>/11<sup>th</sup>.

Greatest Elongation E (19°) on 14<sup>th</sup>.

Inferior Conjunction on 30<sup>th</sup>.

Close conjunction 1½° with the Moon on 21<sup>st</sup> with Venus 6° to East. Imaging opportunity if clear!

Date.	Mag.	Dia.	Phase.	Rise.	Transit.	Set.
01	-0.8	5.3''	0.90	09 <sup>h</sup> 15 <sup>m</sup>	13 <sup>h</sup> 06 <sup>m</sup>	16 <sup>h</sup> 57 <sup>m</sup>
21	+0.6	8.4''	0.25	08 <sup>h</sup> 31 <sup>m</sup>	13 <sup>h</sup> 16 <sup>m</sup>	18 <sup>h</sup> 02 <sup>m</sup>

Keep in touch with data and images from the Messenger Spaceprobe at <http://messenger.jhuapl.edu>

### Venus.

Becoming a prominent object low in the SW evening sky during the first week of the month.

Very close conjunction, 40 arcmin at closest, with Mercury on 10<sup>th</sup>/11<sup>th</sup>.

Moon close on 21<sup>st</sup> and 22<sup>nd</sup>.

Date.	Mag.	Dia.	Phase.	Rise.	Transit.	Set.
01	-3.9	10''	0.96	09 <sup>h</sup> 18 <sup>m</sup>	13 <sup>h</sup> 18 <sup>m</sup>	17 <sup>h</sup> 17 <sup>m</sup>
31	-3.9	92''	0.92	08 <sup>h</sup> 44 <sup>m</sup>	13 <sup>h</sup> 50 <sup>m</sup>	18 <sup>h</sup> 55 <sup>m</sup>

### Mars.

Low in SW evening twilight.

Small disc now making surface details difficult to observe and/or image.

Close conjunction with Neptune (+8.0) 16 arcmin to NE on 19<sup>th</sup>.

Moon close on 22<sup>nd</sup> and 23<sup>rd</sup>.

Date.	Mag.	Dia.	Phase.	Rise.	Transit.	Set.
01	+1.1	4.7''	0.94	10 <sup>h</sup> 15 <sup>m</sup>	14 <sup>h</sup> 56 <sup>m</sup>	19 <sup>h</sup> 37 <sup>m</sup>
31	+1.2	4.4''	0.96	08 <sup>h</sup> 57 <sup>m</sup>	14 <sup>h</sup> 26 <sup>m</sup>	19 <sup>h</sup> 55 <sup>m</sup>

The Mars **Curiosity** rover continues to return excellent data and images.

The **Opportunity** rover continues its exploration.

Mission details and progress are on the appropriate NASA websites.

## Jupiter.

Pleasant aspect west of the Sickle of Leo presenting wide-field imaging opportunities.

Well placed for long hours of observation and/or imaging as it moves towards Opposition on 6<sup>th</sup> February.

Rare Triple Shadow Transit on Jupiter 24<sup>th</sup> 06:28 to 06:53. Next one occurs on 20<sup>th</sup> March 2032 (in daylight from UK)! Fingers and anything else crossed for a clear sky. Good article in January *Sky at Night* magazine. January *Astronomy Now* has a double page on January's satellite phenomena.

Moon close on 7<sup>th</sup>.

Excellent target for imaging.

See BAA *Handbook* and/or monthly periodicals for satellite phenomena.

Date.	Mag.	Dia.	Phase.	Rise.	Transit.	Set.
01	-2.5	43''	-	19 <sup>h</sup> 30 <sup>m</sup>	02 <sup>h</sup> 58 <sup>m</sup>	10 <sup>h</sup> 22 <sup>m</sup>
31	-2.6	46''	-	17 <sup>h</sup> 12 <sup>m</sup>	00 <sup>h</sup> 47 <sup>m</sup>	08 <sup>h</sup> 18 <sup>m</sup>

## Saturn.

Gaining height in the ESE dark morning skies.

Rings wide open.

Moon close on 16<sup>th</sup>.

Date.	Mag.	Dia.	Phase.	Rise.	Transit.	Set.
01	+0.6	16''	-	04 <sup>h</sup> 54 <sup>m</sup>	09 <sup>h</sup> 16 <sup>m</sup>	13 <sup>h</sup> 38 <sup>m</sup>
31	+0.5	16''	-	03 <sup>h</sup> 09 <sup>m</sup>	07 <sup>h</sup> 28 <sup>m</sup>	11 <sup>h</sup> 48 <sup>m</sup>

Don't forget to visit the Cassini mission websites at <http://saturn.jpl.nasa.gov> and <http://ciclops.org>

## Uranus.

Well placed for early evening observation.

Moon close 25<sup>th</sup>.

Date.	Mag.	Dia.	Phase.	Rise.	Transit.	Set.
01	+5.8	3.5''	-	11 <sup>h</sup> 44 <sup>m</sup>	18 <sup>h</sup> 05 <sup>m</sup>	00 <sup>h</sup> 30 <sup>m</sup>
31	+5.9	3.4''	-	09 <sup>h</sup> 43 <sup>m</sup>	16 <sup>h</sup> 09 <sup>m</sup>	22 <sup>h</sup> 36 <sup>m</sup>

## Neptune.

Sinking into the SW early evening skies.

About 1½° above Venus on 31<sup>st</sup>.

Moon close 22<sup>nd</sup>.

Date.	Mag.	Dia.	Phase.	Rise.	Transit.	Set.
01	+7.9	2.2''	-	10 <sup>h</sup> 38 <sup>m</sup>	15 <sup>h</sup> 48 <sup>m</sup>	20 <sup>h</sup> 57 <sup>m</sup>
31	+8.0	2.2''	-	08 <sup>h</sup> 42 <sup>m</sup>	13 <sup>h</sup> 53 <sup>m</sup>	19 <sup>h</sup> 05 <sup>m</sup>

## Dwarf Planets.

### Ceres.

Located in Sagittarius. Emerging into the predawn SE sky at the end of the month.

### Eris (2003 UB313).

A CCD target object in Cetus.

### Haumea.

A CCD target located in Bootes.

### MakeMake.

A CCD target in Coma Berenices.

### Pluto.

In conjunction with the Sun on 4<sup>th</sup>. Not observable.

## Asteroids. (Approx mag +10.5 or brighter).

### Vesta (4).

Located in Capricornus. In Conjunction with the Sun on 11<sup>th</sup>. Not observable.

**Hermentaria (346).** Located in Gemini. Mag +10.7 at opposition on 3<sup>rd</sup>.

**Hesperia (69).** Located in Canis Minor. Mag +10.3 at opposition on 16<sup>th</sup>.

**Juno (3).** Located in Hydra (W edge of "The Head"). Mag +8.1 at opposition on 29<sup>th</sup>.

Charts and details of asteroids one month either side of opposition are available at:

[http://britastro.org/computing/charts\\_asteroid.html](http://britastro.org/computing/charts_asteroid.html)

See also the *BAA Handbook* and/or monthly periodicals.

## Comets.

**Comet C/2014 Q2 (Lovejoy).** Begins the month on the borders of naked eye visibility on the W edge of Lepus. It gains increasing N declination brightening to 4<sup>th</sup> magnitude by mid-month.

Very well placed for northern observers especially when the Moon is absent from the evening sky. 11° W of Rigel on 5<sup>th</sup>. 2° SW of Nu Tau (+3.9) on 10<sup>th</sup>. The "V" of Taurus points to the comet 11° to the W on 11<sup>th</sup> to 13<sup>th</sup>. 1° NE of 5 Tau (+4.1) on 14<sup>th</sup>. 9° SW of the Pleiades on 17<sup>th</sup>.

Charts and details of selected comets are available at:

[http://britastro.org/computing/charts\\_comet.html](http://britastro.org/computing/charts_comet.html)

See also the *BAA Handbook* and/or monthly periodicals.

## Meteor Showers.

The **Quadrantids** are active from 1<sup>st</sup> – 6<sup>th</sup> January with peak activity on 4<sup>d</sup> 00<sup>h</sup>, ZHR = 80. Almost Full Moon (5<sup>th</sup>) so very unfavourable to observe.

There are always **sporadic** events and the chance of a brilliant fireball. The latter should be recorded and reported.

## Near Earth Objects.

Please refer to [www.spaceweather.com](http://www.spaceweather.com) for updates.

## Eclipses.

No eclipses this month.

## 2. The Deep Sky.

Abbreviations used.

**M** = Messier object (Shown in **bold**).

NGC = New General Catalogue. IC = Index Catalogue (Extension of the NGC).

ds = double star. ts = triple star. ms = multiple star. vs = variable star.

gc = globular cluster. oc = open cluster. pn = planetary nebula.

en = emission nebula. rn = reflection nebula. sg = spiral galaxy.

eg = elliptical galaxy. lg = lenticular galaxy. ir = irregular galaxy.

pg = peculiar galaxy. snr = super nova remnant. ly = light year.

The magnitude of an object, excluding double, triple, multiple and variable stars, is shown in brackets e.g. (6.5).

All magnitudes are + unless otherwise shown.

### 2.1 Variable Stars of the month.

**Beta ( $\beta$ ) Persei, Algol.** Range 2.2 to 3.4, period 2.7 days. Becoming well placed by mid evening. Favourable minima at “social hours” occur on 10<sup>d</sup> 22.7<sup>h</sup>, 13<sup>d</sup> 19.6<sup>h</sup> and 31<sup>d</sup> 00.5<sup>h</sup>.

**Delta ( $\delta$ ) Cephei.** Range 3.5 to 4.4, period 5.37 days. The prototype for the Cepheid class of variable stars. Their period-luminosity relationship has led them to being used as “standard candles” in measuring distances to nearby galaxies.

**Mu ( $\mu$ ) Cephei.** Range 3.7 to 5.0, approximate period 755 days. A semi-regular variable star famous for its striking red colour being fittingly called “Herschel’s Garnet Star”. It is the reddest naked eye star visible from the northern hemisphere. Its colour may show signs of variability.

**Omicron ( $\omicron$ ) Ceti Mira.** The classic long period variable star. Brightening towards maximum (+3.4) in Apl/May.

**U Ori.** Well placed for nightlong observation. Brightening from min (+12.0) in Nov 2014 to max (+6.3) in Mar/Apl 2015.

### 2.2 Double Stars of the month.

**Beta Cam.** See notes below.

**Alpha Gem (Castor).** See notes below.

**Delta Gem.** See notes below.

**Gamma Lep.** See notes below.

**Beta Mon.** See notes below.

**Beta Ori (Rigel).** See notes below.

**Sigma Ori.** See notes below.

**Theta-1 Ori (The Trapezeium).** See notes below.

**Struve 742 Tau.** See notes below.

## 2.3 This Month's Constellations - Double Stars/Star Clusters/Nebulae/Galaxies.

### Auriga (Aur).

NGC1960 (M36) (6.0) oc. Large bright grouping. In same low power field as M38.

NGC2099 (M37) (5.6) oc. Richest and brightest of the three Messier star clusters in Auriga. At 150 stars brighter than 12th magnitude.

NGC1912 (M38) (6.4) oc. Larger than M36. Many bright stars arranged in pairs. The above are excellent objects for photography. Guided exposures of a few minutes will be necessary. CCD images require much shorter exposures.

NGC1664 (7.6) oc. Fine cluster on the border of Auriga and Perseus.

NGC1778 (7.7) oc. A 6" telescope will show about 20 stars. Larger apertures will reveal more.

NGC1857 (7.0) oc. Hazy patch surrounding an orange 7th magnitude star which interferes with viewing the fainter stars.

NGC1893 (7.5) oc. Fine, though rather sparse cluster. 8"+ telescopes under dark skies may begin to reveal the pale light of the brightest part of the emission nebula IC410 which pervades the star cluster.

NGC1907 (8.2) oc. This small cluster lies just west of M38 appearing as a small smudge of light.

NGC1931 (11.3) en. An 8" telescopes from dark skies should reveal this small pea-nut shaped emission nebula.

NGC 2192 (10.9) oc. Not an easy object probably requiring a 6" telescope to locate and 10"+ to resolve.

NGC2281 (5.4) oc. Handful of stars often overlooked.

IC405 en (6v) The "Flaming Star Nebula". Illuminated by the star AE Aur which is a "runaway star" whose path can be traced back to Orion. At present the star is passing by/through the normally dark dust and gas cloud of IC405 and thus illuminating it. In the future as AE moves away the nebula will again become dark.

### Camelopardalis (Cam).

Beta ( $\beta$ ) ds. (4.0/8.6, sep. 80.8"). Wide yellow and blue pair (AB). From dark sites the system can be seen to be embedded in a streak of dark nebulosity. A third magnitude 11.8", sep (BC) 14.8", component is visible in moderate apertures.

1 ds. (5.7/6.8, sep. 10.3"). White and pale blue pair.

11 & 12 ds. (5.4/6.5, sep, 108.5") White pair. Easy object for binoculars and small telescopes.

29 ds. 6.5/9.5, sep. 25.1". Yellow primary with fainter pale blue secondary.

Struve ( $\Sigma$ )390 ds. 5.1/9.5, sep. 14.8". White primary with fainter purple secondary.

Struve ( $\Sigma$ )1122 ds. (7.8/7.8, sep. 15.4"). Fine pair of equally bright white stars.

Struve ( $\Sigma$ )1625 ds. 7.3/7.8, sep. 14.4". Almost equal pair of yellowish stars.

Struve ( $\Sigma$ )1694 ds. 5.3/5.8, sep.21.6". Easy pair of whitish stars.

NGC1501 (11.5) pn. Bright, large with a blue tint located about 2 degrees south of the open star cluster NGC1502. Resembles the "Eskimo Nebula" in Gemini. NGC1502 (5.7) oc. A fine open cluster. Extending NW of this cluster is a line of 9th and 10th magnitude stars that form "Kemble's Cascade". A beautiful sight in binoculars or a low power wide field eyepiece on small telescopes.

NGC2403 (8.4) sg. Visible in large binoculars. It lies at a distance of 8m light years and is possibly a member of the M81/M82 group.

IC342 (12.0) sg. Once considered to be a member of the Local Group of galaxies. Its low surface brightness makes it a challenge for moderate apertures. This face on spiral galaxy would be an impressive object if it were further away from the plane of the Milky Way.

## Gemini (Gem).

Alpha ( $\alpha$ ) **Castor** ms. 1.9/2.9 sep 4.0". Close visual pair. However each of these is a spectroscopic binary. A more distant ninth magnitude star (red) forms part of an eclipsing binary system. A fascinating family!

Delta ( $\delta$ ) ds. 3.5/8.2 sep 5.8". Yellow primary with bluish secondary.

Kappa ( $\kappa$ ) ds. 3.6/8.1 sep 7.1". Orange-yellow primary with bluish companion.

Lambda ( $\lambda$ ) ds. 3.6/10.7 sep 9.6". Blue-white primary with bluish companion.

$\Sigma$ 1108 (Struve) ds. 6.6/8.3 sep 11..5". Yellow primary with bluish companion.

**M35** (5.1) oc. Just visible to the naked eye from dark sites. It is a superb object in telescopes. On its western edge lies the more distant open star cluster IC2158.

NGC2129 (10.2) oc. Located about a degree SW of IC2158.

NGC2266 (9.5) oc. Located about two degrees north of  $\epsilon$  Gem.

NGC2392 (10.5) pn. The "Eskimo nebula" is a fine planetary nebula located about two degrees SE of  $\delta$ . The nickname is derived from the appearance of a face surrounded by the hood of a parka.

NGC2420 (8.3) oc. Located about two degrees east of the "Eskimo".

Complete this deep-sky tour of Gemini by locating the open star clusters NGC2355 (9.7) and NGC2395 (7.1).

## Lepus (Lep).

Lying beneath Orion Lepus is easily recognized by a quadrilateral of four third magnitude stars and contains a variety of deep-sky objects including one Messier object.

Alpha ( $\alpha$ ) ds; (2.6,11.1; sep. 35.8").

Beta ( $\beta$ ) ds; (3.0/7.5; sep. 2.3").

Gamma ( $\gamma$ ) ds. (3.7/6.3, sep. 96.3"). Fine yellow and pale orange pair.

Kappa ( $\kappa$ ) ds; (4.5/7.4; sep. 2.6"). White and blue companions.

Iota ( $\iota$ ) ds; (4.5/10.8; sep. 12.7").

NGC1974 sg (11.8). Seen almost edge on.

NGC1904 (**M79**) gc (8.0). A fine globular cluster visible as a fuzzy spot in binoculars. Outer edges begin to resolve in 12" (30cm) telescopes.

IC418 pn (10.7). Very small but bright. Central 10.7 mag star surrounded by pale ring. Use a UHC or OIII filter for best results.

## Monoceros (Mon).

This faint and rather indistinct constellation is located between Orion and Canis Minor.

Beta ( $\beta$ ) ts. 4.7/5.2/6.1 Sep. AB = 7.3', sep BC = 2.8". Striking triple of bluish white stars.

Epsilon ( $\epsilon$ ) ts. 4.5/6.5 sep. 13.4". Close pair of pale yellow stars. The third mag 12.7 bluish white member is visible in 12"+ apertures.

NGC2244 oc (4.8). Fine open star cluster surrounded by NGC2237-9 "The Rosette Nebula" which is best seen using a UHC filter. Shows well in photographs.

NGC2261 en (10v). "Hubble's Variable Nebula". Located about 2<sup>o</sup> southwest of NGC2264 this a fascinating object and well worth monitoring for changes in shape and brightness due to the enveloped variable star R Monocerotis. The triangular wedge appears is almost comet like. Detailed star chart available for telescope owners.

NGC2264 oc + en (4.0) The "Christmas Tree Cluster". A fine open cluster with associated nebula that includes the "Cone Nebula".

NGC2323 (**M50**) oc (5.9). Superb open cluster.

There are many other open clusters in this area of the Milky Way - NGC's 2215(8.4), 2286(7.5), 2301(6.0), 2335(7.2), 2343(6.7), 2353(7.1) and 2506(7.6).

## Orion (Ori).

This constellation dominates the winter skies and because it is so easily recognized forms one of the "key constellations" for finding other winter groupings.

Orion's two brightest stars provide a marked contrast. Betelgeuse is distinctly orange in colour. It is a red giant star entering old age. Rigel is a brilliant blue/white star indicating the exuberance of youth. Betelgeuse is slightly variable in brightness, range 0.1 - 0.9 and bears the designation  $\alpha$  (alpha) indicating that it was brighter than Rigel,  $\beta$  (beta) (0.1), when stars were given these designations. Rigel is now the brighter of the two so either early magnitude estimates were wrong or Betelgeuse has dimmed slightly.

Beta ( $\beta$ ) Rigel ds. 0.1/6.8 sep. 9.5". Brilliant bluish white primary with much fainter bluish secondary.

Eta ( $\eta$ ) ds. 3.6/5.0 sep. 1.5". Close pair of white stars.

Delta ( $\delta$ ) ds. 2.0/6.9 sep. 52.6". Blue white primary with pale blue secondary.

Lambda ( $\lambda$ ) ds. 3.5/5.6 sep.4.4". White stars. Part of a quadruple system.

Theta-1 ( $\theta$ ) ms. "The Trapezium". AB: 6.7/7.9 sep. 8.8"; CD: 5.1/6.7 sep. 13.4". Superb object!

Iota ( $\iota$ ) ts. 2.8/7.3 sep. 11.3". White primary with pale blue secondary. The third reddish 11<sup>th</sup> magnitude component is located 50" away.

Sigma ( $\sigma$ ) ms. 4.0/10.3 sep. 11.4. Colourful multiple star. Fainter triple star  $\Sigma$ 761 in same field.

Zeta ( $\zeta$ ) Alnitak ds. 1.9/4.0 sep. 2.3". Bluish white stars. Part of a triple system with the Flame Nebula (NGC2024) in the field of view.

NGC1976 (**M42**) (en). One of the most famous objects in the sky. Marking Orion's sword the "Great Orion Nebula" is visible to the naked eye as a faint misty patch. A pair of binoculars or small telescope will begin to reveal detail. Increasing aperture and low power bring increasing rewards for the visual observer. Embedded in the nebula is **Theta ( $\theta$ ) Ori**. A group of four young stars, mags 5.4,6.3, 6.8 and 7.0, aptly called "The Trapezium". The whole nebula is a stellar nursery with spectacular images being obtained from large Earth based telescopes and the Hubble Space Telescope. M42 is an ideal target for photography.

NGC1982 (**M43**) (en). A small patch of nebulosity on the northern edge of M42.

NGC2024 (en), nicknamed "the Flame Nebula", surrounds  $\zeta$  Ori.

IC434 en is a strip of nebulosity just south of  $\zeta$ . The famous "Horse's Head Nebula" (Barnard 33) is a small dark intrusion seen dramatically in photographs. It provides one of the biggest challenges to visual observers requiring very dark transparent skies. Responds well to a H-beta nebula filter.

NGC2068 (**M78**) (8.0)(rn) is a small patch of nebulosity about two degrees NNE of  $\zeta$ .

NGC2112 (9.1)(oc) is an open star cluster about two degrees east of M78.

Other open clusters worth locating are NGC2186 (8.7), NGC2169 (5.9) and NGC2175 (6.8) which superimposes a small patch of nebulosity NGC2174.

Long exposure photographs reveal a long arc of nebulosity curving up the east side Orion. This is called "Barnard's Loop" which is extremely difficult to discern visually almost regardless of aperture. Remarkably it has been seen with the naked eye (initially by accident!) from dark sites using O III or UHC filters. The "Loop" is a faint ring of hot gas some 14<sup>o</sup> by 10<sup>o</sup> with the western part of the ring being less distinct. The "ring" may be due to radiation pressure from the hot young stars in the region of Orion's belt/sword acting on interstellar material. A less favoured school of thought is that it may be a supernova remnant.

## **Taurus (Tau).**

Lambda ( $\lambda$ ) vs. Eclipsing binary, range 3.4 to 4.1, period 3.95d.

Phi ( $\psi$ ) ds. 5.0/8.4 sep 52.1". Fine contrasting deep yellow primary with blue companion.

$\Sigma$ 495 (Struve) ds. 6.0/8.8 sep 3.8". Fine pair of yellow stars.

$\Sigma$ 742 ds. 7.1/7.5 sep 4". Fine pair in the same wide field as the Crab Nebula (M1) to the E. Often overlooked when locating M1.

47 Tauri ds. 4.9/7.4 sep 1.1". Very close pair of yellow stars.

T vs. Irregular variable, range 9.4 to 13.5, period erratic.

RV vs. Irregular variable, range 9.5 to 13, period 79d.

RR vs. Irregular variable, range 9.9 to 13, period "chaotic".

**M45 - "The Pleiades" or "Seven Sisters"** oc. Probably the most famous star cluster. Test your eyesight from a dark site by counting the number of naked eye stars that are visible. Seven should readily be seen. Keen vision will lead you into double figures. A test for moderate apertures is the nebulosity around some of the other brighter stars of the group, especially Merope. Nebula/UHC filters will help.

**The Hyades** oc. Another naked eye star cluster although more spread out than the Pleiades. The first magnitude star Aldebaran (0.9) is not a member of the cluster and appears brighter as it is closer to us, 21 parsecs - about halfway to the clusters centre. Aldebaran has a faint companion (13.4) separation 30.4". Spotting the companion is not easy even in moderate telescopes.

NGC1514 (10.0) pn. Not an easy object in small instruments. An OIII filter will help.

NGC1554/1555 is a faint variable reflection nebula illuminated by the very young star T Tauri (see above).

NGC1647 (6.4) oc. rich cluster.

NGC1746 (6.1) oc. poorer than 1647

NGC1808/1817 (7.0/7.7) oc. a pleasant "double cluster" when observed at low powers.

NGC1952 (**M1**)(8.5) snr. "The Crab Nebula". One of the most studied astronomical objects in recent decades. A "new star" appeared in 1054 and over a few months faded from view. Centuries later the faint oval patch was discovered by Dr John Bevis in 1731 and independently by Charles Messier on 12<sup>th</sup> September 1758 while observing the comet of that year. Its true nature was not recognized until much later. In 1942 astronomers had speculated that a peculiar star in the nebula might be a neutron star. In 1968 radio astronomers discovered that the central star was a pulsar spinning at 30 times a second i.e. the period of the pulses is 33 milliseconds. The "Crab" is also a strong emitter of X-rays.

Happy and Successful Observing!

P.V.H.