

**“ $\Omega > 1$ ”**

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

**July 2017.**

**Forthcoming Meetings.**

**OUAC Clubnight.**

OUAC “Clubnights” resume on Tuesday 5<sup>th</sup> September.

**BAA meetings.**

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

**Other Meetings.**

None of note during July and August – Holiday season!

**Highlights of the Month.**

2<sup>nd</sup> Asteroid Juno at opposition.

3<sup>rd</sup> Earth at Aphelion.

10<sup>th</sup> Pluto at opposition.

25<sup>th</sup> Daylight Lunar occultation of Mercury.

27<sup>th</sup> Mars in Conjunction with the Sun.

30<sup>th</sup> Mercury at Greatest Elongation E.

Venus prominent object in E predawn sky.

Jupiter. Becoming less well placed in the W evening twilight.

Saturn. Available for late evening through mid-night observation and imaging.

The Noctilucent Cloud season continues.

**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 their website and download it and the associated user manual.

**In the June “Sky-Notes” I stated that Jupiter was located in Leo. It should have stated Virgo. My apologies accordingly.**

# 1. The Solar system.

**Note all times shown are UT.**

## Earth.

**Earth at Aphelion July 3<sup>d</sup> 20<sup>h</sup> 11<sup>m</sup>, 152,092,504km**

### **Aurora.**

Short hours of darkness limit 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.

### **Noctilucent Clouds.**

The Noctilucent Cloud season continues. Scan the NW sky about an hour after sunset and the NE sky an hour before sunrise for possible displays. The clouds are distinctive by their silver-blue appearance and very photogenic.

### **ISS.**

Begins a series of morning passes from the second week of July. 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	03 <sup>h</sup> 46 <sup>m</sup>	12 <sup>h</sup> 06 <sup>m</sup>	20 <sup>h</sup> 26 <sup>m</sup>
08	03 <sup>h</sup> 52 <sup>m</sup>	12 <sup>h</sup> 07 <sup>m</sup>	20 <sup>h</sup> 22 <sup>m</sup>
15	04 <sup>h</sup> 00 <sup>m</sup>	12 <sup>h</sup> 08 <sup>m</sup>	20 <sup>h</sup> 16 <sup>m</sup>
22	04 <sup>h</sup> 09 <sup>m</sup>	12 <sup>h</sup> 08 <sup>m</sup>	20 <sup>h</sup> 07 <sup>m</sup>
29	04 <sup>h</sup> 19 <sup>m</sup>	12 <sup>h</sup> 08 <sup>m</sup>	19 <sup>h</sup> 57 <sup>m</sup>

Produced using “Starry Night Pro”.

## 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 (29<sup>th</sup> June) one low activity sunspot group (AR2664).  
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.

## Moon.

### Phases:

First quarter	01 <sup>d</sup> 00 <sup>h</sup> 51 <sup>m</sup>
Full	09 <sup>d</sup> 04 <sup>h</sup> 07 <sup>m</sup>
Last quarter	16 <sup>d</sup> 19 <sup>h</sup> 16 <sup>m</sup>
New	23 <sup>d</sup> 09 <sup>h</sup> 46 <sup>m</sup>
First quarter	30 <sup>d</sup> 15 <sup>h</sup> 23 <sup>m</sup>



Produced using “LunarPhase Pro”.

## Moon cont.

### Apsides:

Apogee	06 <sup>d</sup> 04 <sup>h</sup>	Diameter. 29' 56"	Distance. 405,931km.
Perigee	21 <sup>d</sup> 17 <sup>h</sup>	Diameter. 33' 05"	Distance. 361,236km.

### For northern observers:

- The waxing crescent Moon is becoming less well placed.
- The waxing gibbous Moon is less well placed.
- The Full Moon is not well placed.
- The waning gibbous Moon is becoming better placed.
- The waning crescent Moon is very well placed.

### Observing and Imaging.

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.

During the third week of July early (very!) risers may wish to take the opportunity (if clear!) to image the terminator and limb of the last quarter and waning crescent Moon in the predawn and dawn skies. Libration plays a key part in what is visible on the limb.

On 21<sup>st</sup> and 22<sup>nd</sup> try locating the very thin crescent Moon very low in the ENE dawn skies **before sunrise**.

On 23<sup>rd</sup> (Very difficult!) and 24<sup>th</sup> try locating the very thin crescent Moon in the W evening twilight **after sunset**.

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

### Lunar Occultations.

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

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. Enter details in your observing log.

A daylight occultation of Mercury (+0.25) takes place on the morning of the 25<sup>th</sup>.

Mercury      Disappears behind the **Dark Limb** at 07<sup>h</sup> 33.8<sup>m</sup>.  
                 Reappears from behind the **Bright Limb** at 07<sup>h</sup> 53.5<sup>m</sup>.

Times for Greenwich so start observations earlier to allow for your location.

Locate the thin crescent Moon first and then locate Mercury to the east. Don't confuse Mercury with Regulus (+1.3) which is about 1° to the east. The Moon passes south of Regulus about 9<sup>h</sup> 45<sup>m</sup>. Although some 24° to the west and higher take care to prevent the Sun inadvertently entering the field of view.

## The Planets.

### Mercury.

Commencing an evening apparition low in the WNW.

Use a line from Castor through Pollux as a pointer on 4<sup>th</sup>.

Greatest Elongation E (27°) on 30<sup>th</sup>.

On 9<sup>th</sup>/10<sup>th</sup> Mercury passes in front of M44 but the star cluster will almost certainly be too faint to be seen very low in the twilight.

A daylight Lunar Occultation occurs on the morning of 25<sup>th</sup>. See notes above.

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

Date.	Mag.	Dia.	Phase.	Rise.	Transit.	Set.
01	-1.1	5.3''	0.90	04 <sup>h</sup> 33 <sup>m</sup>	12 <sup>h</sup> 57 <sup>m</sup>	21 <sup>h</sup> 19 <sup>m</sup>
31	+0.5	7.9''	0.45	07 <sup>h</sup> 06 <sup>m</sup>	13 <sup>h</sup> 52 <sup>m</sup>	20 <sup>h</sup> 36 <sup>m</sup>

### Venus.

Prominent object in E predawn sky.

Moon close 20<sup>th</sup>.

Date.	Mag.	Dia.	Phase.	Rise.	Transit.	Set.
01	-4.1	18''	0.63	01 <sup>h</sup> 27 <sup>m</sup>	09 <sup>h</sup> 01 <sup>m</sup>	16 <sup>h</sup> 36 <sup>m</sup>
31	-4.0	15''	0.74	01 <sup>h</sup> 15 <sup>m</sup>	09 <sup>h</sup> 24 <sup>m</sup>	17 <sup>h</sup> 33 <sup>m</sup>

### Mars.

Too close to the Sun to be observed.

Conjunction with the Sun on 27<sup>th</sup>.

Moon close on 23<sup>rd</sup>.

Date.	Mag.	Dia.	Phase.	Rise.	Transit.	Set.
-	-	-	-	-	-	-

The Mars **Curiosity** and **Opportunity** rovers continue their explorations of the Mars surface and return excellent data and images.

Mission details and progress are on the appropriate NASA websites.

### Jupiter.

Sinking into the W evening twilight.

Moon close on 28<sup>th</sup>.

Date.	Mag.	Dia.	Rise.	Transit.	Set.
01	-2.0	37''	12 <sup>h</sup> 35 <sup>m</sup>	18 <sup>h</sup> 36 <sup>m</sup>	23 <sup>h</sup> 56 <sup>m</sup>
31	-1.9	34''	10 <sup>h</sup> 54 <sup>m</sup>	16 <sup>h</sup> 28 <sup>m</sup>	22 <sup>h</sup> 02 <sup>m</sup>

Spectacular images being returned from NASA's JUNO Spaceprobe. Details at the NASA website.

## Saturn.

Low in the south and available for late evening through mid-night observing and imaging.  
Moon close on 6<sup>th</sup>/7<sup>th</sup>.

Date.	Mag.	Dia.	Rise.	Transit.	Set.
01	+0.1	18''	18 <sup>h</sup> 53 <sup>m</sup>	22 <sup>h</sup> 52 <sup>m</sup>	02 <sup>h</sup> 56 <sup>m</sup>
31	+0.3	18''	16 <sup>h</sup> 48 <sup>m</sup>	20 <sup>h</sup> 47 <sup>m</sup>	00 <sup>h</sup> 51 <sup>m</sup>

The end of the Cassini mission in mid September (15<sup>th</sup>) rapidly approaches so don't forget to visit the websites at <http://saturn.jpl.nasa.gov> and <http://ciclops.org>

## Uranus.

An "early hour" object in the E to S predawn sky.  
Moon close on 16<sup>th</sup>/17<sup>th</sup>.

Date.	Mag.	Dia.	Rise.	Transit.	Set.
01	+5.8	3.5''	00 <sup>h</sup> 12 <sup>m</sup>	07 <sup>h</sup> 09 <sup>m</sup>	14 <sup>h</sup> 06 <sup>m</sup>
31	+5.8	3.6''	22 <sup>h</sup> 11 <sup>m</sup>	05 <sup>h</sup> 13 <sup>m</sup>	12 <sup>h</sup> 10 <sup>m</sup>

## Neptune.

A midnight and "early hour" object in the SE to S predawn skies.  
Moon close on 13<sup>th</sup>/14<sup>th</sup>.

Date.	Mag.	Dia.	Rise.	Transit.	Set.
01	+7.9	2.3''	22 <sup>h</sup> 57 <sup>m</sup>	04 <sup>h</sup> 27 <sup>m</sup>	09 <sup>h</sup> 54 <sup>m</sup>
31	+7.8	2.3''	20 <sup>h</sup> 59 <sup>m</sup>	02 <sup>h</sup> 28 <sup>m</sup>	07 <sup>h</sup> 53 <sup>m</sup>

## Dwarf Planets.

**Ceres.** Lost in NE dawn sky. Moves from Taurus into Gemini during the month.

**Eris (2003 UB313).** An 18<sup>th</sup> mag CCD target located in Cetus. Low in the SE predawn sky.

**Haumea.** A 17<sup>th</sup> mag CCD target located in Bootes.

**MakeMake.** A 17<sup>th</sup> mag CCD target in Coma Berenices.

**Pluto.** Located in Sagittarius close to Pi (+2.9). Mag +14.1 at opposition on 10<sup>th</sup> July.

**Asteroids.** (Approx Mag +10.5 or brighter).

**Vesta (4).** Located in Leo but lost in the W evening twilight.

**Juno (3).** Located in Scutum. Mag +9.5 at opposition on 2<sup>nd</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.

**C/2015 ER61 PANSTARRS.** A morning object moving from Aries into Taurus during the month. Although predicted to be about 11<sup>th</sup> magnitude activity may make it brighter. So worth following.

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 **Ophiuchids.** Weak activity continues from several radiants during July. Not well placed for northern observers.

The **Cygnids.** Weak activity during July and August with two peaks on 21<sup>st</sup> July and 21<sup>st</sup> August, both with ZHR = 5.

The **alpha Capricornids.** Weak activity active during July and August with peak activity on 2<sup>nd</sup> to 3<sup>rd</sup>, all with ZHR = 5.

The **Delta Aquarids.** Active from mid July to mid August with two peaks on 29<sup>th</sup> July and 6<sup>th</sup> August, with ZHR = 20 and 10 respectively. A fine “southern” shower.

The **Persids.** Active from 23<sup>rd</sup> July to 20<sup>th</sup> August. Low rates but increasing with approach to maximum on 12<sup>th</sup> August, ZHR = 80. More in August “Sky Notes”.

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. 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. Low in N “dark sky” so not well placed for observations. Minima at “social hours” occur on 07<sup>d</sup> 21.2<sup>h</sup> and 27<sup>d</sup> 22.9<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.

### 2.2 Double Stars of the month.

**Pi Aql.** See notes below.

**Beta Cyg. Albireo.** See notes below.

**Nu Dra.** See notes below.

**Alpha Her.** See notes below.

**Kappa Her.** See notes below.

**Epsilon Lyr.** See notes below.

**Omicron Oph.** See notes below.

**Alpha Sco.** See notes below.

**Beta Sco.** See notes below.

**Delta SerCp.** See notes below.



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

### Aquila (Aql).

Alpha ( $\alpha$ ) Aql, Altair (0.8)

Pi ( $\pi$ ) Aql. (6.1/6.9, separation 1.4") ds. Pleasing close pair of yellow stars.

11 Aql. (5.2/8.7, separation 17.5") ds. Pale yellow primary, blue secondary.

15 Aql. (5.5/7.2, separation 38.4") ds. Pale yellow primary, yellow secondary.

NGC6709 (6.7) oc. Fine object for small telescopes.

NGC6741 (11.4) pn. Almost stellar at low power. Requires high magnification. Greenish-blue.

NGC6755 (7.5) oc. Another fine object for small/moderate telescopes.

NGC6756 (10.6) oc.  $\frac{1}{2}^\circ$  SSW of NGC6755 and visible in the same low power field of view.

NGC6781 (11.4) pn. Fairly large, almost round object in rich star field.

NGC6790 (10.5) pn. Almost stellar at low power. Requires high magnification. Blue.

Aquila contains a number of moderately bright planetary nebulae for the "collector".

### Cygnus (Cyg).

$\beta$  Cyg, Albireo (3.2/5.4, separation. 34.3") ds. Marking the head of the swan this splendid double star consists of a yellow-orange star (3.2) and a bluish star (5.4) providing a beautiful contrast. Easily photographed.

61 Cygni (5.3/5.9, separation 28.4") ds. Worth locating as it holds the distinction of being the first star to have its distance, 3.4pc, measured. (Friedrich Bessel in 1838 using parallax).

NGC6826 (9.8) pn. This interesting planetary nebula is located about  $6^\circ$  north of  $\delta$ . Nicknamed the "Blinking Nebula" because when viewed directly only the central star (10.4) is seen, but, with averted vision the shell of the nebula springs into view and the central star appears to dim or disappear. Look back at the star and the shell disappears and the star "returns". Hence "blink".

NGC6871 (5.2) oc. Lies in rich star fields of the Milky Way.

NGC6888 (11.0) snr. Southwest of M29 this is object provides a difficult visual challenge. Dark transparent skies are essential and a nebular filter will help. A good target for CCD imagers.

NGC6910 (7.4) oc. Fine open cluster.

NGC6913 (**M29**) (6.6) oc. Large scattered cluster of stars. Surrounding the M29 area and centred on  $\gamma$  Cyg is the vast emission nebula IC1318 separated by dark dust lanes into five major areas.

NGC6960/6979/6992-5 (7.0) snr. One of the most beautiful deep-sky objects can be found in the "east wing" of Cygnus. This is the "Veil/Filament nebula", a supernova remnant (SNR). Although it shows up well in photographs it can be frustratingly difficult to see visually, partly because of its large angular size. A dark, transparent sky is essential and the use of a UHC filter will pay rich rewards. The western "Filament" NGC6960 is located by the star 52 Cygni which should be identified first. Then sweep eastwards to locate the slightly brighter "Veil" NGC 6992-95. The central "wedge" NGC 6979 is rather faint but patience will reap rewards. Once the "Veil" and "Filament" have been recognized identification without a filter becomes easier although the view is less impressive. An 8" telescope with increasing magnification begins to reveal the delicate "lacy" structure. A small telescope using a low power wide-field eyepiece + filter reveals the complete circular outline which is some  $3^\circ$  across.

NGC7000 (4.5) en. From a dark site the ghostly glow of the "North American Nebula", may just be detected east of Deneb (1.3) by the unaided eye. It shows up well in photographs together with the adjacent IC5067/70, the "Pelican Nebula".

NGC7027 (10.4) en. Strange object identified as a star, then a planetary nebula and currently an emission nebula.

NGC7048 (11.3) pn.

NGC7092 (**M39**) (4.6) oc. Compact cluster of stars.

## **Draco (Dra).**

Alpha ( $\alpha$ ) Thuban. Although only a third magnitude object, 5000 years ago Thuban held the distinction of being the Pole Star. Its designation alpha is strange as it is only the seventh brightest star in the constellation.

Mu ( $\mu$ ) ds. 5.6/5.7; separation 1.9". Pair of white stars.

Nu ( $\nu$ ) ds. 4.9/4.9; separation 61.9". Pair of bright white stars.

Psi ( $\psi$ ) ds. 4.9/6.1; separation 30.3". Pair of yellowish stars.

16 & 17 ds. 5.4/5.5; separation 90.3". Pair of bright white stars.

40 & 41 ds. 5.7/6.1; separation 19.3". Pair of pale yellow stars.

Struve ( $\Sigma$ ) 2155 ds. 6.8/10.1; separation 9.8". Pale yellow and blue pair.

NGC4236 (9.6) sg. Seen almost edge and low surface brightness makes it a test for moderate apertures.

NGC4319 (11.9) sg. Elongated haze with prominent core. A Quasar, Makarian 205 (14.5), lies 40" to the south.

NGC5866 (**M102**) lg. Elongated object. One of the missing Messier objects.

NGC5907 (10.3) sg. Thin needle of light. A fine edge-on galaxy.

NGC6503 (10.2) sg. Distinctly elongated.

NGC6543 (8.1) pn. The Cats Eye Nebula. Bright small disc with greenish tint. 11<sup>th</sup> magnitude central star. Draco's "Showpiece object".

## **Hercules (Her).**

Alpha ( $\alpha$ ) ds. 3.5/5.4 separation 4.7". Orange and blue. The primary is a semi regular variable 3.1 to 3.9 approx period 90 days.

Gamma ( $\gamma$ ) ds. 3.8/9.8; separation 41.6". Unequally bright pair of yellow stars. Part of a triple system.

Delta ( $\delta$ ) ds. 3.1/8.2 separation 8.9". White primary with bluish-purple secondary. Part of a multiple system.

Kappa ( $\kappa$ ) ds. 5.3/6.5; separation 28.4". Fine pair of yellow stars. Part of a triple system.

Mu ( $\mu$ ) ds. 3.4/10.1 separation 10.1". Yellow primary. Secondary 1" wide pair of red stars. Part of a quad system.

Rho ( $\rho$ ) ds. 4.6/5.6 separation 4.1". White pair. Part of a triple system.

56 Herculis ds. 6.1/10.6 separation 18.1". Fine contrasting orange and blue pair.

100 Herculis ds. 5.9/6.0 separation 14.2". Matched pair of white stars.

NGC6205 (**M13**) (5.9) gc. Arguably one of the outstanding objects in the northern hemisphere. Just visible to the naked eye from dark sites it appears as a fuzzy blob in binoculars. It stands high power well and the outer edges begin to resolve into individual stars in a 4" (100mm) telescope. Increasing aperture brings greater rewards. Lord Rosse and others using the 72" at Birr Castle in the 19th century observed three dark rifts radiating from the centre. Later visual observers confirmed these. However with the advent of photography the rifts disappeared. In the 1950's the late Walter Scott Houston in his "Sky and Telescope" column revised interest in the "propeller". Responses indicated that visibility of the rifts depended on a careful balance of aperture and magnification. Today a dark sky is probably a key factor.

NGC6207 (11.6) sg. 40" to the NE of M13 and in the same field as a low power widefield eyepiece. This moderately bright galaxy is often overlooked due to the spectacular blaze of the much closer globular cluster.

NGC6210 (9.3) pn. Located about 4<sup>o</sup> NE of beta ( $\beta$ ) Her.

NGC6229 (9.4) gc. Located about 7<sup>o</sup> NW of M13 and well worth locating and imaging.

## **Hercules continued.**

NGC6341 (**M92**) (6.5) gc. Slightly fainter and smaller than M13 this globular cluster deserves equal attention. It starts to resolve in a 6" telescope at high power and becomes increasingly impressive with increased aperture.

The area around M13 contains a number of faint galaxies requiring a large (12"+) telescope to explore. Identity of the objects can prove interesting as some are wrongly labelled on some charts and catalogues.

Abell 2151. The Hercules Galaxy Cluster.

## **Lyra (Lyr).**

Alpha ( $\alpha$ ) Lyr Vega (0.04). The fifth brightest star (Sun excluded) in the sky is worth mentioning as due to the effects of precession Vega will hold the distinction of being the pole-star in about 12,000 years time. Infrared studies indicate that it may be surrounded by a disc of planetary forming material.

Delta ( $\delta$ ) ds.4.5/5.5 separation 10.5" ds. Comprises bluish-white and ruddy orange components. One of the finest double stars for small telescopes.

Epsilon ( $\epsilon$ ) ds/ds. 5.5/6.5 separation 2.8"; 5.0/5.5 separation 2.2". The two pairs are separated by 208". The famous "double-double" star. Splitting the image into the four components with a small telescope provides a good indication of seeing conditions.

Struve ( $\Sigma$ ) 2470 + 2474 ds/ds. 6.6/8.6 separation 13.4"; 6.7/8.8 separation 16.2". White and blue-white pair together with a pair of pale yellow stars. Lyra's other "double-double".

13-R Lyrae vs. 3.8 to 5.0, period 46 days. Fine red-orange semi-regular variable star well suited for binoculars and small telescopes.

NGC6702 (12.2) eg. Diffuse halo with slight central brightening. Locate NGC6703 and move 12' NNW.

NGC6703 (11.4) lg. Located in the northern reaches of Lyra.

NGC6710 (12.8) lg. Located on the southern borders of Lyra.

NGC6720 (**M57**) (9.7) pn. The famous "Ring Nebula" appears as a ghostly smoke ring. Visible as a faint out of focus star M57 at low power it is best seen in telescopes responding well to high powers. The use of filters, UHC and/or OIII, improve contrast. The magnitude 14.8 central star is unlikely to be seen without a large telescope.

NGC6779 (**M56**) (8.2) gc. Often overlooked this globular cluster is located about halfway between  $\beta$  and  $\lambda$  on the borders of the rich star fields of the Milky Way.

NGC6791 (9.5) oc. Requires medium to large telescopes to begin to resolve into individual stars the brightest of which are 13th magnitude.

## **Ophiuchus (Oph).**

Barnard's Star. (9.5). Located at R.A. 17h 58m Dec. +04° 41m. A red dwarf with the largest proper motion of any star in the sky as seen from the Earth.

Lambda ( $\lambda$ ) ds. 4.2/5.2 separation 1.5". White and pale yellow pair. Part of a quadruple system.

Omicron ( $\omicron$ ) ds. 5.4/6.9 separation 10.3". Fine contrasting pair of orange and yellow stars.

Rho ( $\rho$ ) ds.5.3/6.0 separation 3.1". Close pair of blue stars.

NGC6171 (**M107**) (8.1) gc. Granular texture with brighter core in small apertures.

NGC6218 (**M12**) (6.6) gc. Outer reaches resolved in medium apertures showing with a small core.

NGC6254 (**M10**) (6.6) gc. Granular halo with bright core. Outer reaches resolved in small apertures.

NGC6266 (**M62**) (6.7) gc. Bright off centre core with fainter halo.

NGC6273 (**M19**) (7.1) gc. Small bright globular. Outer reaches begin to resolve in small apertures.

NGC6333 (**M9**) (7.9) gc. Large bright core. Nearby is the dark nebula Barnard 64.

### **Ophiuchus continued.**

NGC6356 (8.4) gc. Requires large apertures to resolve.

NGC6402 (**M14**) (7.6) gc. Requires large aperture to resolve. The most distant of the Messier gc's.

NGC6572 (8.1) pn. Fine bright greenish object.

NGC6633 (4.6) oc. Large, bright but loose open cluster well suited for small aperture.

### **Sagitta (Sge).**

NGC6838 (**M71**) (8.3) gc. Almost lost in the foreground stars of the Milky Way. A relatively poor globular which for a time was considered to be a rich open cluster. It is a young cluster containing "metal" rich stars.

### **Sagittarius (Sgr).**

Sagittarius contains many fine objects unfortunately not well seen from our latitudes. The Galaxies centre lies in this direction obscured by intervening stars, gas and dust.

**M24** (4.5) originally thought to be an open cluster is now classed as a star-cloud.

NGC6494 (**M23**) (5.5) oc

NGC6514 (**M20**) (6.3) en & rn. The "Trifid Nebula"

NGC6523 (**M8**) (5.8) en. the "Lagoon Nebula".

NGC6531 (**M21**) (5.9) oc,

NGC6618 (**M17**) (6.0) the "Omega Nebula",

NGC6626 (**M28**) (6.9) gc,

NGC6637 (**M69**) (7.7) gc

NGC6656 (**M22**) (5.1) gc

NGC6681 (**M70**) (8.1) gc. Comet Hale-Bopp was discovered close to M70.

NGC6715 (**M54**) (7.7) gc,

NGC6809 (**M55**) (6.9) gc,

NGC6864 (**M75**) (8.6) gc.

IC4725 (**M25**) (4.6) oc. Pluto currently crossing southern regions of this cluster.

### **Scorpius (Sco).**

Alpha ( $\alpha$ ) Antares ds. 1.2/5.4 separation 2.9". Red-orange primary with fainter greenish companion. Difficult to split requiring very good seeing conditions.

Beta ( $\beta$ ) ds. 2.6/4.9 separation 13.6". Blue-white primary with pale blue companion. Fine object for small telescopes.

Nu ( $\nu$ ) 4.3/6.8 separation 2.3" ds. Pair of white stars requiring good seeing conditions to split.

NGC6093 (**M80**) (7.2) gc. Fine object unfortunately not well seen from the UK.

NGC6121 (**M4**) (5.9) Fine globular unfortunately not well seen from the UK.

NGC6405 (**M6**) (4.2) oc. Unfortunately it briefly creeps above the southern horizon making it very difficult to observe from the UK.

NGC6475 (**M7**) (3.3) oc. Another fine object that unfortunately briefly creeps above the southern horizon making it very difficult to observe from the UK.

### **Scutum (Sct).**

Contains a brighter part of the Milky Way known as the "Scutum Star-cloud".

NGC6705 (**M11**) (5.8) oc. The "Wild Duck" is a fine sight in telescopes and is easily located in binoculars.

NGC6694 (**M26**) (8.0) oc. Fainter than M11 but easily located.

### **Serpens Caput (SerCp).**

Beta ( $\beta$ ) ds. 3.7/9.9; separation 30.6". Pale yellow primary with blue secondary.

Delta ( $\delta$ ) ds. 4.2/5.2; separation 4.4". Fine pair of yellow stars.

5 Serpentis ds. 5.1/10.1; separation 11.2". Yellow primary with reddish secondary. Situated in same field as M5.

NGC5904 (M5) (5.8) gc. Splendid object which stands high magnification.

NGC5921 (10.8) sg. Faint oval halo with bright core.

### **Serpens Cauda (SerCd).**

Nu ( $\nu$ ) ds. 4.3/8.3 separation 46.3". Wide pair of green and pale blue stars.

Struve ( $\Sigma$ ) 2303 ds. 6.6/9.1 separation 2.1". Good optical test for small instruments.

Theta ( $\theta$ ) ds. 4.6/5.0 separation 22.3". Bluish-white pair of stars suitable for binoculars.

NGC6611 (M16) (6.0) oc & en. Bordering naked eye visibility this nebula and its associated star cluster forms one of the most well known HST images - "Pillars of Creation".

### **Vulpecula (Vul).**

Collinder 399 (3.6) oc. Aptly named the "Coat-hanger" this cluster is visible to the naked eye as a hazy patch. A fine site in binoculars.

NGC6853 (M27) (7.6) pn. The "Dumbbell Nebula", is easily seen in binoculars. The "dumbbell" shape becomes more recognizable in telescopes with increasing magnification. In common with other planetary nebulae it responds well to filters especially the OIII type.

PVH.