

“ $\Omega > 1$ ”

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

December 2023.

Seasonal Greetings to all our readers!

Forthcoming Meetings.

OUAC Clubnight.

The next “Clubnights” will be held on **Tuesday 5th December 2023** and **Tuesday 9th January 2024**.

Highlights of the Month.

4 th .	Mercury at Greatest Eastern Elongation.
13 th /14 th .	Peak of the Geminids meteor shower. See notes below.
21 st .	Asteroid Vesta at Opposition. See notes below.
22 nd .	Winter (N Hemisphere) Solstice.
22 nd .	Mercury at Inferior Conjunction.
23 rd .	Peak of the Ursids meteor shower. See notes below.
Mercury.	Very difficult to observe.
Venus.	Brilliant object in E predawn/dawn sky.
Mars.	Not observable.
Jupiter.	Prominent object for evening to early hour observation.
Saturn.	Low in the S to SW early evening sky.
Uranus.	Well placed for evening to early hour observation.
Neptune.	Well placed for early evening observation.

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 Adrian 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.

1. The Solar system.

Note all times shown are UT.

Earth.

Winter (N Hemisphere) Solstice 22^d 03^h 27^m.

Aurora.

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

Keep tuned to the www.spaceweather.com site for updates.

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

Artificial Satellites.

For details of the ISS and other “Bright Satellites” go to the “Heavens Above” website and follow the instructions to set-up for your location.

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

Add to your “favourites”.

Sunrise and Sunset.

Bedford.

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

Date.	Rise.	Transit.	Set.
01	07 ^h 48 ^m	11 ^h 51 ^m	15 ^h 54 ^m
08	07 ^h 57 ^m	11 ^h 54 ^m	15 ^h 50 ^m
15	08 ^h 04 ^m	11 ^h 57 ^m	15 ^h 50 ^m
22	08 ^h 09 ^m	12 ^h 00 ^m	15 ^h 52 ^m
29	08 ^h 11 ^m	12 ^h 04 ^m	15 ^h 57 ^m

Produced using “Starry Night Pro”.

The Sun.

Observing.

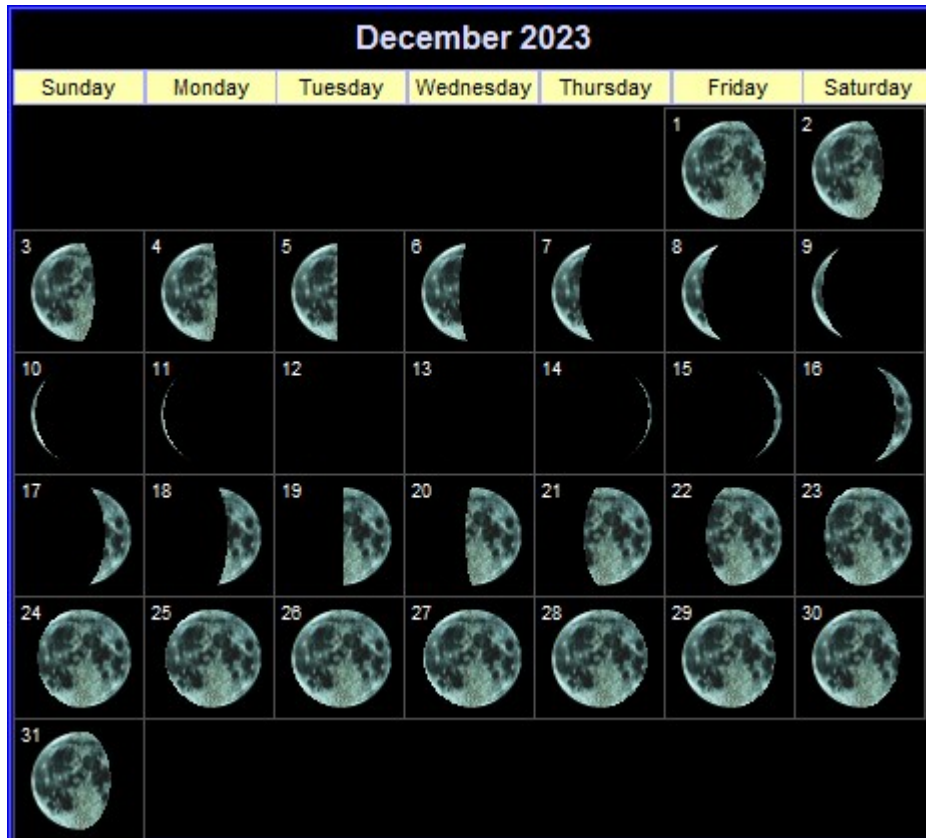
To prevent permanent damage to your eyes avoid looking at the Sun directly and never with binoculars or a telescope unless special (expensive!) filters are used. The safest way is the simplest – project the image of the Sun onto grey or white card. Take care if your telescope has any plastic components.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

Solar Cycle 25 continues to produce good activity.

Keep in touch with the Solar Dynamics Observatory satellite at <http://sdo.gsfc.nasa.gov/>
Add the “Spaceweather” and the “Soho” websites to your “favourite” websites.

The Moon.

Phases:



Produced using “LunarPhase Pro”.

Last quarter	05 ^d 05 ^h 49 ^m
New	12 ^d 23 ^h 32 ^m
First quarter	19 ^d 18 ^h 39 ^m
Full	27 ^d 00 ^h 33 ^m

Apsides:

Apogee	04 ^d 18 ^h	Diameter. 30' 03"	Distance. 404,347km.
Perigee	16 ^d 18 ^h	Diameter. 32' 59"	Distance. 367,901m.

Observing.

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 astronomical photography and/or imaging the Moon provides an excellent target.

The Moon continued.

Observing and Imaging opportunities 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 very well placed.

The waning crescent Moon is becoming less well placed.

On 10th and 11th try locating the very thin crescent Moon very low in the SE dawn skies **before sunrise**.

On 13th and 14th try locating the very thin crescent Moon low in the SW evening twilight **after sunset**.

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. Enter details in your observing log.

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

You can run simulations before events using “Stellarium” or similar software.

The Planets.

Mercury.

Completes a poor evening apparition low in the SW evening twilight for northern observers.

Greatest Elongation (21.3°) E on 4th.

Inferior Conjunction on 22nd.

Reappears low in SE dawn sky at the end of the month.

Do not sweep the area with binoculars until the Sun has completely set or when sunrise is imminent!

Moon close on 14th.

Date.	Mag.	Dia.	Phase.	Rise.	Transit.	Set.
04	-0.4	6.6''	0.63	09 ^h 51 ^m	13 ^h 24 ^m	16 ^h 57 ^m
31	+0.7	8.8''	0.25	06 ^h 40 ^m	10 ^h 51 ^m	15 ^h 02 ^m

Venus.

Brilliant object dominating the Predawn/dawn E sky.

Waxing gibbous disc with decreasing apparent diameter.

Moon close on 9th.

Date.	Mag.	Dia.	Phase.	Rise.	Transit.	Set.
01	-4.2	17''	0.68	03 ^h 39 ^m	09 ^h 01 ^m	14 ^h 23 ^m
31	-4.1	14''	0.78	05 ^h 02 ^m	09 ^h 24 ^m	13 ^h 46 ^m

Mars.

Now a morning object but too close to the Sun to be observed.

Moon close on the 12th.

Date.	Mag.	Dia.	Phase.	Rise.	Transit.	Set.
31	+1.4	3.9''	0.99	07 ^h 24 ^m	11 ^h 10 ^m	14 ^h 55 ^m

Jupiter.

Prominent object available for evening to early hour observation.

Moon close on 22nd.

Date.	Mag.	Dia.	Rise.	Transit.	Set.
01	-2.8	48''	14 ^h 31 ^m	21 ^h 40 ^m	04 ^h 54 ^m
31	-2.6	44''	12 ^h 29 ^m	19 ^h 36 ^m	02 ^h 48 ^m

For satellite phenomena refer to monthly periodicals and/or the BAA Handbook.
Simulate events on "Stellarium" or similar software.

Saturn.

Low in the S to SW early evening.
Moon close on 17th.

Date.	Mag.	Dia.	Rise.	Transit.	Set.
01	+0.9	17''	12 ^h 40 ^m	17 ^h 36 ^m	22 ^h 32 ^m
31	+0.9	16''	10 ^h 45 ^m	15 ^h 45 ^m	12 ^h 46 ^m

For satellite phenomena refer to monthly periodicals and/or the BAA Handbook.
Simulate events on "Stellarium" or similar software.

Uranus.

Well placed in Aries for evening to early hour observation.
Moon close on 23rd.

Date.	Mag.	Dia.	Rise.	Transit.	Set.
01	+5.6	3.8''	14 ^h 53 ^m	22 ^h 32 ^m	06 ^h 14 ^m
31	+5.7	3.7''	12 ^h 53 ^m	20 ^h 30 ^m	04 ^h 11 ^m

Neptune.

Well placed for evening observation.
Moon close on 19th.

Date.	Mag.	Dia.	Rise.	Transit.	Set.
01	+7.9	2.3''	13 ^h 17 ^m	19 ^h 04 ^m	00 ^h 54 ^m
31	+7.9	2.3''	11 ^h 19 ^m	17 ^h 06 ^m	22 ^h 53 ^m

At mag +13.5 Neptune's largest satellite, Triton, provides a good challenge for 8" telescopes under favourable sky conditions and when Triton is at max elongation E or W of Neptune. Use a high magnification - x200 or greater.
Use "Stellarium" (Freeware!) or similar software to determine favourable E and W elongations.

Dwarf Planets.

- Ceres.** A 8th mag emerging into the SE predawn sky at the end of the month.
- Eris.** A mag +18.7 target located in Cetus.
- Haumea.** A mag +17.3 CCD target located in Boötes about 5° W of Arcturus.
- MakeMake.** A mag +17 CCD target in Coma Berenices. Low in the E predawn skies.
- Pluto.** Mag +14.5 object located in Sagittarius. Becoming lost in SW evening twilight.

Asteroids. (Approx magnitude +10.5 or brighter).

- Fides (37).** Located in Auriga. Mag +9.8 at **Opposition on 18th**.
Vesta (4). Located in NE Orion and easy to observe in binoculars.
Mag +6.4 at **Opposition on 21st**.
Metis (9). Located on the borders of Taurus and Auriga.
Mag +8.4 at **Opposition on 23rd**.
Astraea (5). Located in Gemini. Mag +9.4 at **Opposition on 28th**.

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

http://britastro.org/computing/charts_asteroid.html

See also the *BAA Handbook*, monthly periodicals and “Heavens above” website..

Comets.

The “Heavens above” website gives very useful details of comets currently available for observation/imaging.

Charts and details of selected comets are available at:

http://britastro.org/computing/charts_comet.html

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

Meteor Showers.

The **Geminids** are active from 4th to 17th with peak activity on 14th from 14^h to 19^h, ZHR = 100+. A fine shower with many “bright events” possible. **Observe on nights of 13/14 and 14/15 as very favourable if clear as no interference from moonlight!**

The **Ursids** are active from the 17th to 26th with peak activity on 23rd, ZHR = 10.

An under-observed shower which has produced unpredicted outbursts in the past so worth monitoring. Unfortunately moonlight interferes.

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

See earlier note for using Iridium Flares as magnitude comparisons for “Bright Events”.

Near Earth Objects.

Please refer to www.spaceweather.com for updates.

Eclipses.

No lunar or Solar 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 is shown in brackets e.g. (6.5).

All magnitudes are + unless otherwise shown.

2.1 Variable Stars of the month.

Beta (β) Persei, “Algol”. Range 2.2 to 3.4, period 2.7 days. Well placed for nightlong observation. Minima at “social hour” occurs on 17^d 22.6^h and 20^d 19.4^h.

Delta (δ) 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 (μ) 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.

U Ori. Well placed for nightlong observation. At minimum (+12) in December so follow its rise towards max (+6.3) in May/June 2024.

2.2 Double Stars of the month.

Gamma And. See notes below.

Gamma Ari. See notes below.

Struve (Σ) 326 Ari. See notes below.

Alpha Cas. See notes below.

Iota Cas. See notes below.

Eta Cas. See notes below.

Sigma Cas. See notes below.

Delta Cep. See notes below.

Struve (Σ) 2816 & 2819 Cep. See notes below.

Struve (Σ) 2840 Cep. See notes below.

Gamma (γ) Ceti. See notes below.

66 Ceti (Σ 231). See notes below.

84 Ceti. (Σ 295). See notes below.

8 Lac. Quadruple system. See notes below.

Eta Peg. See notes below.

Pi^{1&2} Peg. See notes below.

57 Peg. See notes below.

Zeta Psc. See notes below.

35 Psc. See notes below.

51Psc. See notes below.

Iota Tri. See notes below.

Struve (Σ) 239 Tri. See notes below.

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

Andromeda (And).

Gamma (γ) (2.2, 5.1) is a fine double star. The brighter component is golden-yellow with its companion a greenish-blue. Arguably second only to Albiro in Cygnus.

NGC205 (**M110**) (8.0) eg. A satellite galaxy of M31 visible as an elongated "smudge" in small telescopes.

NGC221 (**M32**) (8.2) eg. A satellite galaxy of M31. Visible as a fuzzy star in small telescopes.

NGC224 (**M31**) (3.5) sg. The Great Andromeda Spiral Nebula. Increasing aperture reveals more and more detail although increasingly smaller areas of the galaxy fill the eyepiece. 8" telescopes should reveal NGC206 as a hazy patch. It is a large area of star formation. 12" scopes will reveal one or two of M31's large population of globular clusters.

NGC404 (11.9) lg. Located 6' NW of β And. The 2nd magnitude star tends to drown the faint glow of the galaxy. Use high power to push the star out of the field of view for best results.

NGC752 (5.7) oc This large open cluster is located about 4 degrees south of γ .

NGC891 (10.1) sg. Located about 3 degrees east of γ is seen almost edge on. Bright central bulge. Moderate apertures will reveal a narrow dust lane bisecting the long axis. A fine object.

NGC7640 (12.5) sg. Seen nearly edge-on.

NGC7662 (8.6) pn. "The Blue Snowball". Rather small making it difficult to distinguish from nearby faint stars. High magnification on an 8" telescope will reveal an elliptical ring with a dark centre. Large apertures will show a faint second outer ring of nebulosity and the 13th magnitude central star.

Aries (Ari).

Gamma (γ) (4.8/4.8 separation 7.7") ds. Fine equally bright bluish-white pair of stars. Accidentally discovered by Robert Hooke in 1664 while searching for a comet.

Lambda (λ) (4.9/7.7 sep. 37.4") ds. Wide pair of pale yellow and pale blue stars.

Struve (Σ)326. (7.6/9.8 sep. 5.9") ds. Beautiful orange and dull red pair of stars.

NGC772 (10.3) sg. Located almost 2° ESE of γ .

NGC877 (11.9) sg.

NGC972 (11.4) sg.

Cassiopeia (Cas).

Alpha (α) (2.2/8.9 sep. 64.4") ds. Fine orange and blue pair. Part of a multiple system.

Iota (ι) (4.6/6.9/8.4 sep. AB 2.5", AC 7.2") ts. Beautiful white, yellow and blue triple system.

Eta (η) (3.4/7.5 sep. 12.9") ds. Superb gold and garnet pair. The colours are very subjective. What do you see?

Sigma (σ) (5.0/7.1 sep. 3.0") ds. Bluish white and yellow pair in a superb field.

NGC129 (+6.5) oc.

NGC147 (+9.3) eg. A satellite galaxy of M31.

NGC185 (+9.2) eg. A satellite galaxy of M31.

NGC278 (+10.9) eg. Located a few degrees SE of NGC185.

NGC457 (+6.4) oc. "The Owl Cluster". Fine object.

NGC581 (**M103**) (+7.4) oc. Fine object.

NGC654 (+6.5) oc, NGC663 (+7.1) oc and NGC659 (+7.9) oc. A north to south line of open clusters in the same 1° field about 1° east of **M103**.

NGC7789 (6.7) oc. "Caroline's (Herschel) Rose".

NGC7790 (8.5) oc.

NGC7654 (**M52**) (+6.9) oc. Fine rich cluster.

Cepheus (Cep).

Delta (δ) Cephei, 3.5 to 4.4 over a period 5.37 days, is the prototype for the Cepheid class of variable stars which because of their period-luminosity relationship has led them to being used as "standard candles" in measuring distances to nearby galaxies. Pale blue +6.1 companion.

Mu (μ) Cephei 3.7 to 5.0 approximate period 755 days is a semi-regular variable star. It is more 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.

Struve (Σ) 2816 ts (5.7/7.5/7.5, sep 12"/20"). Fine triple with Struve (Σ) 2819 ds (7.4/8.6, sep 13") in same field. All contained in the large, sparse and nebulous open cluster IC 1396!

Struve (Σ) 2840 ds (5.6/6.4, sep 18"). Very fine greenish/bluish pair.

Open clusters - NGC188 (8.1), NGC6939 (7.8), NGC7510 (7.9), NGC7762 (10.0). Planetary Nebula NGC40 (10.7).

Spiral galaxy NGC6946 (8.9) in the same 1° field as oc NGC6939. Two types of object for the price of one!

The faint reflection nebula NGC7023 and emission nebula IC 1396 provide a challenge to the observer. A dark clear sky is essential.

Cetus (Cet).

Gamma (γ) (3.5/7.3) ds. Separation 2.8". White and yellow pair. A third red component is located 14' away.

66 Ceti (Σ 231) (5.7/7.5 sep. 16.5") ds. Fine pair of yellow and blue stars.

84 Ceti. (Σ 295) (5.8/9.0 sep. 4.0") ds. Fine pair of yellow and reddish stars.

Omicron (\omicron) Ceti **Mira** the classic long period variable star.

NGC45 (10.4) sg. Located about 8° SW of β . Faint oval with a brighter centre.

NGC157 (10.4) sg. Slightly oval shape.

NGC246 (8.0) pn. Located about 6° north of β . One of the largest pn in the sky. Appears as an incomplete ring structure with a 12th magnitude central star.

NGC247 (8.2) sg. Located about 4° SSE β . Highly inclined to our line of sight. Low surface brightness. A great shame that it never rises high in the sky from UK.

NGC578 (11.5) sg. Roundish mottled haze.

NGC908 (10.9) sg. Similar appearance to NGC578 but slightly brighter.

NGC936 (10.1) sg. Fine barred spiral. Nebulous knot surrounded by a faint haze.

The following are located in the same area of sky as NGC936.

NGC1055 (10.6) sg. Almost edge-on. Large amateur telescopes reveal broad equatorial dust lane.

NGC1068 (**M77**) (8.8) sg. Located about a degree SW of δ . Worth locating as it is the brightest Seyfert galaxy - a class of active galaxy. Same area of sky as Mira.

NGC1073 (11.0) sg. Seen face-on and hence low surface brightness.

NGC1087 (11.1) sg. Slightly elongated. Appears brighter than NGC 1073.

Lacerta (Lac).

Struve (Σ) 2876 (7.8, 9.3 sep 11.8") ds. Fine blue and white double.

Struve (Σ) 2894 (6.1, 8.3 sep. 15.6") ds. Yellow primary, blue secondary.

Struve (Σ) 2902 (7.6, 8.5 sep. 6.4") ds. Yellow and white double.

8 Lacertae = Struve (Σ) 2922 (5.7, 6.5 sep. 22.4") Multiple star. Brightest four components are white/blueish white. Has been described as a poor open cluster.

O Struve (Σ) 475 (6.8, 10.8 sep. 15.5") ds. White primary with faint blue companion.

BL Lacertae (14 to 17). Prototype for class of quasi-stellar object (QSO).

Pegasus (Peg).

Eta (η) 2.9/9.9 separation 90.4". Binocular object. Yellow and blue components but telescope required to see colour of secondary. Herschel's "Pendulum Star" - tap telescope gently for the effect. π^1/π^2 (π^1/π^2) 5.6/4.3 separation 7". Fine binocular object. π^1 is a multiple system with 4 companions of 10th to 12th magnitude.

57 Pegasi. 5.1/9.7 separation 32.6". Beautiful orange primary with blue companion.

NGC7078 (**M15**) (6.3) gc superb object.

NGC7331 (9.5) sg. A fine galaxy seen almost edge on. Strange as to why it is not in Messier's catalogue.

About half a degree south is the fascinating group of galaxies "Stephan's Quintet". The brightest member of the group is NGC7320 (12.7).

Many happy hours can be spent wandering around "The Square" to locate many moderately bright galaxies. Use a star atlas such as the excellent "Sky Atlas 2000" to plan your journey.

Pisces (Psc).

Alpha (α) (4.2/5.1 sep.1.5") ds. Requires a large aperture telescope using high magnification to split this pair of bluish-white stars.

Zeta (ζ) (5.6/6.2 sep. 23") ds. Fine white and yellow pair of stars.

35 (6.0/7.6 sep 7.6") ds. Fine yellow and blue pair.

51 (5.7/9.5 sep.27.5") ds. Glorious bluish and greenish pair of stars.

65 (6.3/6.3 sep 4.4") ds. Fine matched pair of pale yellow stars.

Wolf 28 (12.3). Van Maanen's Star. One of the few white dwarf stars visible in amateur telescopes.

NGC128 (11.8) sg. Brightest of a group of five galaxies.

NGC488 (10.3) sg. Elongated halo with brighter core.

NGC628 (**M74**) (9.4) sg. Seen face on and hence low surface brightness.

NGC7541 (11.7) sg. Elongated oval with bright core. 3' to the SW is NGC7537 (13.0)

Sculptor (Scl).

Unfortunately this constellation never rises very high for UK observers so that only brief opportunities are presented to track down some deep-sky gems which unfortunately are not seen at their best even from a dark site. I have taken declination -30° as the southern limit for objects. This is almost the declination of the first magnitude star Fomalhaut (+1.16) which will give you a marker as to how low these objects are even at their highest when due south. The suitable observation window is thus fairly restricted!

NGC24 (11.5) sg. Located about two-thirds the way between NGC253 and β Cet.

NGC253(7.1) sg. Seen highly inclined to our line of sight. Increasing magnification reveals mottling due to dust lanes. Head south for the best view of this gem.

NGC288 (8.1) gc. A loose globular which resolves readily with high power. The South Galactic Pole is about a 1° to the SW.

NGC613 (10.0) sg. Elongated and fairly bright.

Continued on next page.

Triangulum (Tri).

Iota (ι) (5.3/6.9 sep. 3.9") ds. Fine contrasting yellow and blue pair of stars.

Struve (Σ)239 (7.0/8.0 sep. 13.8") ds. Fine pale yellow and pale blue pair of stars.

NGC598 (**M33**) (5.7) sg. Viewed face-on and hence has a low surface brightness making it an elusive object. A good test for sky conditions using binoculars. From dark sites and under good seeing conditions it is just visible to the naked eye and vies with M31 as the most distant object visible to the naked eye. With 8"+ scopes try to locate the vast star cloud NGC604.

NGC672 (11.6) sg. A bright barred spiral galaxy seen somewhat edge-on.

NGC925 (12.0) sg. Steeply inclined to our line of sight makes it fairly bright.

P.V.H.