

“ $\Omega > 1$ ”

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

September 2015.

Forthcoming Meetings.

OUAC Clubnight.

OUAC “Clubnights” resume on Tuesday 1st September.

Welcome return of Dave Eagle to demonstrate the more advanced techniques he uses to produce astronomical images.

BAA meetings.

Details of BAA meetings at: www.britastro.org

Other Meetings.

Friday 2nd & Saturday 3rd October.

The International Astronomy Show.

Stoneleigh Park, Warwickshire.

Full details at www.ukastronomyshow.com

Saturday 24th October.

Federation of Astronomical Societies Convention,
University of Birmingham.

Details at: www.fedastro.org.uk

Highlights of the Month.

1st Neptune at opposition.

5th Lunar Occultation of Aldebaran.

23rd Equinox.

28th Total Lunar Eclipse.

Venus. Brilliant object in predawn skies

Mars. Low in predawn sky.

Jupiter. Reappears low in E dawn sky.

Saturn. Low in SW early evening sky.

Uranus. Approaching opposition on October 12th is well placed for 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 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.

1. The Solar System.

**Note all times shown are UT.
Add one hour when British Summer Time is in operation.**

Earth.

Equinox (Autumnal for the Northern Hemisphere) 23^d 08^h 21^m.

Aurora.

Increasing 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.

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	05 ^h 13 ^m	12 ^h 02 ^m	18 ^h 50 ^m
08	05 ^h 24 ^m	11 ^h 59 ^m	18 ^h 34 ^m
15	05 ^h 36 ^m	11 ^h 57 ^m	18 ^h 18 ^m
22	05 ^h 47 ^m	11 ^h 54 ^m	18 ^h 01 ^m
29	05 ^h 59 ^m	11 ^h 52 ^m	17 ^h 45 ^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.

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

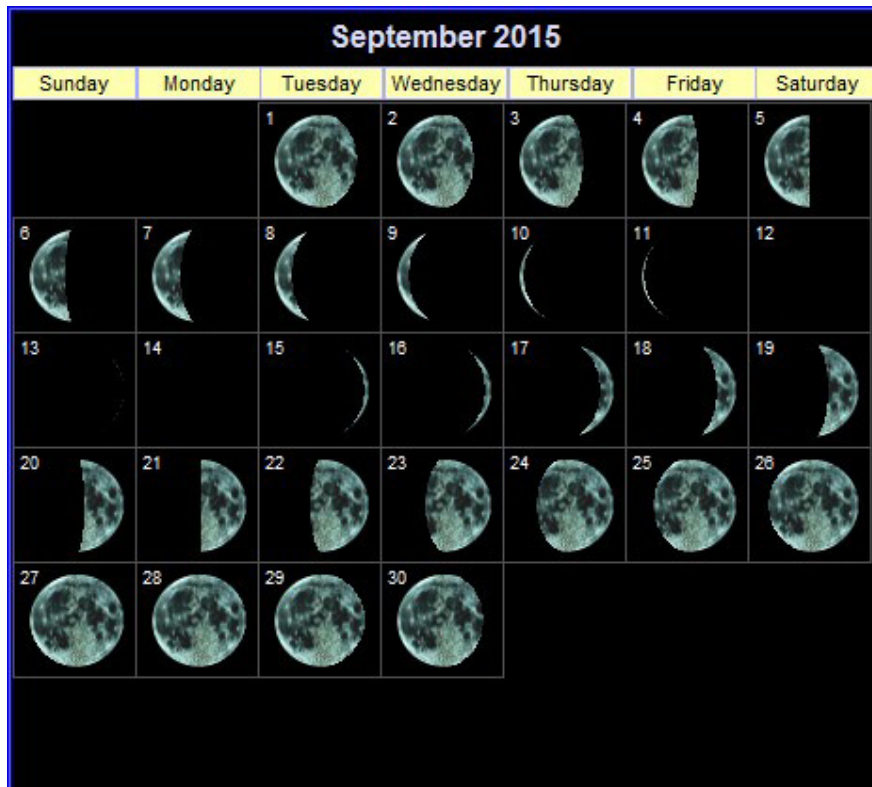
Keep in touch with the Solar Dynamics Observatory satellite at <http://sdo.gsfc.nasa.gov/>
Add the “Spaceweather” and the “Soho Lasco C3” websites to your “favourite” websites.

The Moon.

Phases:

Last quarter	05 ^d 09 ^h 54 ^m
New	13 ^d 06 ^h 41 ^m
First quarter	21 ^d 08 ^h 59 ^m
Full	28 ^d 02 ^h 51 ^m

The “Harvest Moon” is a “Big Full Moon” at Perigee with the added attraction of a Total Lunar Eclipse.



Apsides:

Apogee	14 ^d 11 ^h	Diameter. 29' 23"	Distance. 406,467km.
Perigee	28 ^d 02 ^h	Diameter. 33' 28"	Distance. 356,876km.

For northern observers:

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

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

Observing and Imaging opportunities.

Clear September predawn skies provide excellent opportunities to image the waning gibbous and waning crescent Moon.

On 11th and 12th try locating the very thin crescent Moon very low in the E dawn skies **before sunrise**.

On 15th and 16th try locating the very thin crescent Moon WSW evening twilight **after sunset**.
If you can take images of the above so much the better.

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*.

On the 5th a Lunar Occultation of Aldebaran (alpha Taurus) occurs.

Aldebaran disappears behind the bright limb (DB) at 4^h 50.9^m and reappears from behind the dark limb (RD) at 6^h 8.6^m (Sunrise approx 5^h 20^m). One for early rises but well worth imaging if clear.

ECLIPSES

Total Lunar Eclipse of 2015 Sep 28

Ecliptic Conjunction = 02:51:38.1 TD (= 02:50:30.5 UT)

Greatest Eclipse = 02:48:16.8 TD (= 02:47:09.1 UT)

Penumbral Magnitude = 2.2297

P. Radius = 1.3027°

Gamma = -0.3295

Umbral Magnitude = 1.2765

U. Radius = 0.7707°

Axis = 0.3374°

Saros Series = 137 Member = 28 of 81

Sun at Greatest Eclipse (Geocentric Coordinates)

R.A. = 12h17m08.9s

Dec. = -01°51'21.0"

S.D. = 00°15'57.6"

H.P. = 00°00'08.8"

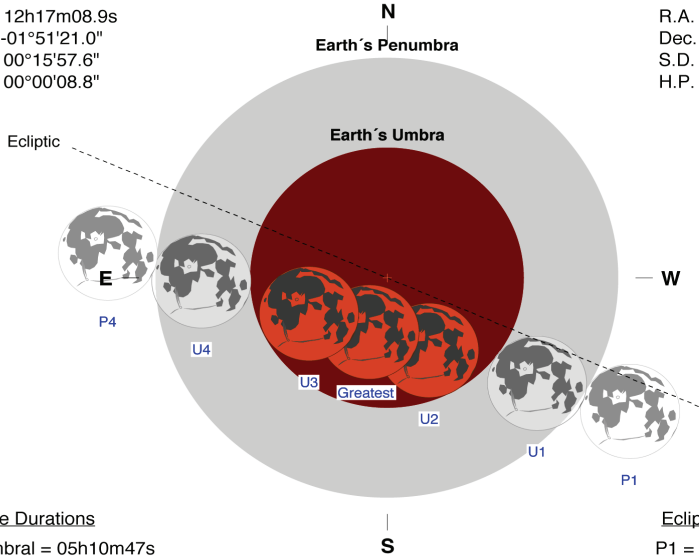
Moon at Greatest Eclipse (Geocentric Coordinates)

R.A. = 00h17m33.6s

Dec. = +01°32'03.8"

S.D. = 00°16'44.5"

H.P. = 01°01'26.6"



Eclipse Durations

Penumbral = 05h10m47s

Umbral = 03h19m54s

Total = 01h11m55s

$\Delta T = 68$ s

Rule = CdT (Danjon)

Eph. = VSOP87/ELP2000-85

Eclipse Contacts

P1 = 00:11:46 UT

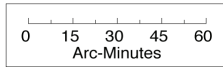
U1 = 01:07:12 UT

U2 = 02:11:11 UT

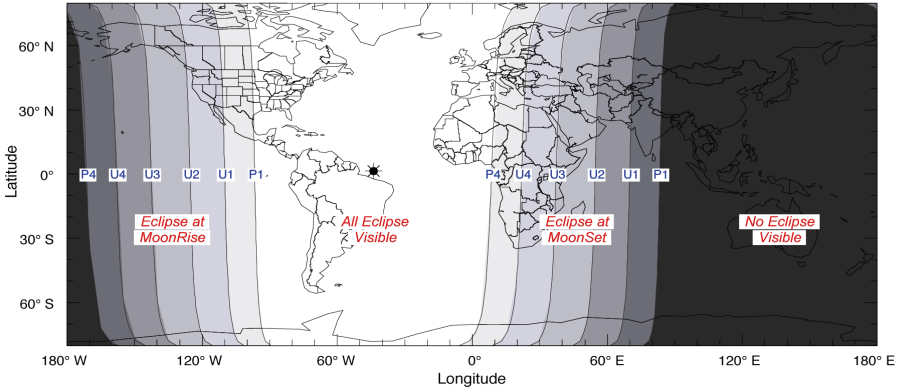
U3 = 03:23:07 UT

U4 = 04:27:06 UT

P4 = 05:22:33 UT



F. Espenak, NASA's GSFC
eclipse.gsfc.nasa.gov/eclipse.html



The Planets.

The predawn and dawn E sky provides interest during the month for early risers with the grouping of Venus, Mars and Jupiter. The waning crescent Moon adds to the scene from 10th to 12th.

Mercury.

Not well placed for northern observers low in WSW evening twilight skies.

Greatest Elongation E (27°) on 4th.

Inferior Conjunction on 30th.

Moon close on 26th.

Date.	Mag.	Dia.	Phase.	Rise.	Transit.	Set.
01	+0.2	6.8''	0.59	07 ^h 55 ^m	13 ^h 38 ^m	19 ^h 20 ^m
15	+0.7	8.7''	0.38	08 ^h 04 ^m	13 ^h 17 ^m	18 ^h 29 ^m

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

Venus.

Brilliant object low in ENE dawn skies. Gaining height as month progresses.

Moon close on 10th.

Date.	Mag.	Dia.	Phase.	Rise.	Transit.	Set.
01	-4.4	51''	0.10	03 ^h 31 ^m	10 ^h 21 ^m	17 ^h 11 ^m
30	-4.5	33''	0.34	02 ^h 07 ^m	09 ^h 06 ^m	16 ^h 05 ^m

Mars.

Low in SW evening twilight.

East of M44 at beginning of the month.

¾° N of Regulus on 25th.

Moon close on 10th.

Date.	Mag.	Dia.	Phase.	Rise.	Transit.	Set.
01	+1.8	3.7''	0.98	02 ^h 53 ^m	10 ^h 32 ^m	18 ^h 11 ^m
30	+1.8	3.9''	0.97	02 ^h 45 ^m	09 ^h 49 ^m	16 ^h 53 ^m

The Mars **Curiosity** and **Opportunity** rovers continue their explorations returning excellent data and images.

Mission details and progress are on the appropriate NASA websites.

Jupiter.

Gaining height in ENE dark morning skies.

Moon close on 11th & 12th.

Date.	Mag.	Dia.	Phase.	Rise.	Transit.	Set.
15	-1.7	31''	-	04 ^h 11 ^m	11 ^h 04 ^m	17 ^h 57 ^m
30	-1.7	31''	-	03 ^h 30 ^m	10 ^h 17 ^m	17 ^h 03 ^m

Saturn.

Soon to be lost low in the SW evening twilight skies.

Moon close on 27th/28th.

Date.	Mag.	Dia.	Phase.	Rise.	Transit.	Set.
01	+0.5	16''	-	12 ^h 45 ^m	17 ^h 09 ^m	21 ^h 33 ^m
30	+0.6	16''	-	11 ^h 02 ^m	15 ^h 23 ^m	19 ^h 43 ^m

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

Uranus.

Well placed for observation as it moves towards opposition on 12th October.

Moon close on 28th/29th when around mid-night the planet will be about 1½° N of the Moon.

Date.	Mag.	Dia.	Phase.	Rise.	Transit.	Set.
01	+5.7	3.7''	-	19 ^h 53 ^m	02 ^h 37 ^m	09 ^h 16 ^m
30	+5.7	3.7''	-	17 ^h 57 ^m	00 ^h 39 ^m	07 ^h 17 ^m

Neptune.

At opposition on 1st.

Well placed for nightlong observation.

At mag +13.5 Triton, Neptune's largest satellite, provides a good challenge for 8'' telescopes under favourable sky conditions and when it 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.

Moon close on 26th.

Date.	Mag.	Dia.	Phase.	Rise.	Transit.	Set.
01	+7.8	2.4''	-	18 ^h 45 ^m	00 ^h 04 ^m	05 ^h 19 ^m
30	+7.8	2.3''	-	16 ^h 50 ^m	22 ^h 03 ^m	03 ^h 21 ^m

Dwarf Planets.

Ceres. Located in Sagittarius east of M55. Mag +7.4 fading to +7.7. Poorly placed very low in the S mid-evening sky.

Eris (2003 UB313). A mag +18.7 target located in Cetus.

Haumea. A mag +17.3 CCD target located in Bootes. Becoming lost in WNW evening twilight.

MakeMake. A mag +17 CCD target in Coma Berenices. Becoming lost in WNW evening twilight.

Pluto. Mag +14.2 object located in Sagittarius. Low in the S mid-evening sky. Spectacular images and data returned from the New Horizons "Fly-By"

Asteroids. (Approx magnitude +10.5 or brighter).

- Vesta (4).** Located in Cetus low in the S around midnight. Mag +5.9 at opposition on 29th.
- Metis (9).** Located in Aquarius. Mag +9.2 at opposition on 6th.
- Kalliope (22).** Located in Sculptor. Mag +10.5 at opposition on 8th.
- Penelope (201).** Located in Aquarius. Mag +10.6 at opposition on 10th.
- Egeria (13).** Located in Cetus. Mag +10.7 at opposition on 13th.

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* and/or monthly periodicals.

Comets.

Comet 67P/Churyumov-Gerasimenko. Accompanied by the ROSETTA spacecraft this comet is a morning object low in the NE moving from Gemini into Cancer and then into Leo towards the end of the month. A telescope will be required to observe the comet which may be of 10th magnitude. Passes about 2° N of M44 Praesepe from 15th to 18th being close (< ½°) to gamma (γ) Cancri on 17th.

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 **Piscids** are active during September and October. Weak activity from with three peaks on 8th September, ZHR = 10; 21st September, ZHR = 5; 13th October, ZHR = ?

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.

13th Partial Solar Eclipse. No part visible from UK.

28th Total Lunar Eclipse all phases visible from UK - if clear.

The Moon enters the Penumbra shadow (P1) at 00^h 11^m 46^s.

The Moon enters the Umbral shadow (U1) at 01^h 07^m 12^s.

Totality (U2) starts at 02^h 11^m 11^s.

Totality ends (U3) at 03^h 23^m 07^s.

The Moon leaves the Umbral shadow (U4) at 04^h 27^m 06^s.

The Moon leaves the Penumbra shadow (P4) at 05^h 22^m 33^s.

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 (β) Persei, Algol. Range 2.2 to 3.4, period 2.7 days. Becoming better placed for observation in the “early hour”. Suitable occur on 5^d 22.5^h, 26^d 00.2^h and 28^d 21.0^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.

2.2 Double Stars of the month.

Zeta Aqr. See notes below.

94 Aqr. See notes below.

Alpha^{1&2} Cap. See notes below.

Delta Cep. See notes below.

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

Struve (Σ) 2840 Cep. See notes below.

Gamma Del. 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.

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

Aquarius (Aqr).

Beta (β) is a triple star (2.9, 10.8 and 11.4, sep 35.4" and 57.2" from primary).

Zeta (ζ) ds (4.3,4.5 sep 2.1". Probably requires a 6" telescope to split this pair of white stars. Larger apertures may show them as yellowish.

ψ^1 ds (4.5,10.8, sep 49.6"). Medium power reveals a wide pair of orange stars. centre. Begins to resolve in apertures greater than 10".

94 ds (5.3,7.2, sep 12"). Fine pale red/pale green.

NGC6981 (**M72**) (9.3) gc. A distant cluster. Rather loose concentration and difficult to resolve.

NGC6994 (**M73**) (8.9) Asterism of 4 stars. Identify for curiosity to add to your Messier collection.

NGC7009 (8.3) pn "Saturn Nebula". Fine blue/green oval object in moderate aperture telescopes. Larger apertures reveal the faint antennae and hence the name. The Central star is visible in 16" telescopes.

NGC7089 (**M2**) (6.5) gc. Showpiece object! Bright compressed halo with bright core.

NGC 7293 (6.5) pn "Helix Nebula". RA 22h 29.6m Dec -20° 29.6m. It is possibly the nearest planetary nebula to us and hence its large angular size of 770". However it requires a dark site when even binoculars/low power small telescope should reveal its ghostly outline.

NGC7606 (10.8) sg. Faint elongated halo with brighter centre. Stellar nucleus visible in 12"+ apertures.

Capricornus (Cap).

α^1 (4.2) and α^2 (3.6) form a fine "line of sight" yellow double star visible to the naked eye and a fine view in binoculars. α^1 has two physical companions (9.2 and 13.7). α^2 has a magnitude 11 reddish companion.

β (4.0, 4.9 sep. 0.3) ds. Visible with small telescope using high power.

γ (4.5, 5.5 sep. 9.6) ds. A fine double. Primary yellow, secondary green.

NGC7099 (**M30**) (7.5) gc. Fine object unfortunately not well seen from the UK.

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. Two types of object for the price of one!

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 1degree field as oc NGC6939.

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

Delphinus (Del).

β (4.0, 4.9 sep. 0.3") ds. Visible with small telescope using high power.

κ (5,1,11.7 sep. 28.8") ts.

γ (4.5,5.5 sep. 9.6") ds. A fine double. Primary yellow, secondary green.

NGC6891 (10.5) pn. RA 20h 10.5m Dec +16° 55m. Central magnitude +12.4 star.

NGC6905 (11.1) pn.

NGC6934 (8.9) gc.

NGC7006 (10.6) gc.

Draco (Dra).

Alpha (α) 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 (μ) ds. 5.6/5.7; separation 1.9". Pair of white stars.

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

Psi (ψ) 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 (Σ) 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. 11th magnitude central star. Draco's "Showpiece object".

Equuleus (Equ).

The second smallest of the 88 constellations. It contains no notable deep sky objects.

Epsilon (ϵ) (6.0,7.1 sep 10.7") ds. Pale yellow primary with blue companion giving pleasant contrast. The primary is itself a close double approaching periastron in 2021. High power may show it as elongated.

Lambda (λ). (7.4, 7.4 sep 2.8") ds. Matched pair of pale yellow stars.

Struve (Σ) 2786 (7.2, 8.3 sep 2.5") ds. Pair of white stars.

Struve (Σ) 2793 (7.8, 8.5 sep 26.6") ds. Yellow primary with blue companion. The primary is an unresolved double.

NGC7015 (11.5) sg. Faint halo with brightening towards the centre.

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 require to see colour of secondary. Herschel's "Pendulum Star" - tap telescope gentle for the effect.

Pi⁻¹/Pi⁻² (π^{-1}/π^{-2}) 5.6/4.3 separation 7'. Fine binocular object. Pi⁻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. Seen almost edge on.

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.

P.V.H.