

“ $\Omega > 1$ ”

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

December 2020.

Seasonal Greetings to all our readers!

I’m sure we are all looking forward to the time when we can return to “normal” whenever and in whatever that form will be.
Take care! Stay safe! Stay in touch!

Forthcoming Meetings.

OUAC Clubnight.

Due to Covid-19 “Clubnights” are suspended until further notice.

Highlights of the Month.

13 th	Peak of the Geminids meteor shower. Very favourable!
14 th	See notes for Mercury.
14 th	Total Solar Eclipse. No phase visible from UK.
21 st	Winter (N Hemisphere) Solstice.
22 nd - 23 rd	Peak of the Ursids meteor shower. Quite favourable!
20 th	Mercury at Superior Conjunction.
21 st	Very close conjunction between Jupiter and Saturn!
Mercury.	Very low in SE dawn sky.
Venus.	Prominent object low in the SE predawn/dawn sky.
Mars.	Prominent object in the evening through mid-night sky.
Jupiter.	Low in the SW early evening sky very close to Saturn. See note for 21 st !
Saturn.	Low in the SW early evening sky very close to Jupiter. See note for 21 st !
Uranus.	Well placed for evening through midnight observation.
Neptune.	Well placed for 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.

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 21^d 10^h 02^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.

ISS.

Completes a series of evening passes in the three weeks of the month.

Commences a series of morning passes at the beginning of the fourth week of the month.

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 49 ^m	11 ^h 51 ^m	15 ^h 53 ^m
08	07 ^h 58 ^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 01 ^m	15 ^h 52 ^m
29	08 ^h 11 ^m	12 ^h 04 ^m	15 ^h 58 ^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!

Mid to late November saw the Sun catch measles! New Solar Cycle 25 is underway.

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	08 ^d 00 ^h 37 ^m	
New	14 ^d 16 ^h 17 ^m	Total Solar Eclipse.
First quarter	21 ^d 23 ^h 41 ^m	
Full	30 ^d 03 ^h 28 ^m	

Apsides:

Perigee	12 ^d 21 ^h	Diameter. 33' 02"	Distance. 361,776km.
Apogee	24 ^d 17 ^h	Diameter. 29' 30"	Distance. 405,009km.

The Moon continued.

Observing.

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.

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.

Observing and Imaging opportunities.

On 12th and 13th try locating the very thin crescent Moon very low in the SE dawn skies **before sunrise**.

On 15th and 16th try locating the very thin crescent Moon low in the SW 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*.

The Planets.

Mercury.

Unlikely to be spotted very low in SE dawn sky.

Superior Conjunction on 20th.

Watch for its reappearance low in SW evening twilight at the end of December and early January.

Moon close on 14th. Not observable but run “Stellarium” or similar software to simulate the encounter from approx 09:15 to 10:45. Zoom in on Mercury and repeat!

Date.	Mag.	Dia.	Phase.	Rise.	Transit.	Set.
01	-0.8	4.9''	0.96	06 ^h 51 ^m	11 ^h 08 ^m	15 ^h 24 ^m
15	-1.1	4.6''	1.00	08 ^h 01 ^m	11 ^h 45 ^m	15 ^h 30 ^m
31	-1.0	4.8''	0.98	08 ^h 53 ^m	12 ^h 35 ^m	16 ^h 37 ^m

Venus.

Prominent object low in the SE predawn/dawn sky.

Moon close on 13th.

Date.	Mag.	Dia.	Phase.	Rise.	Transit.	Set.
01	-4.0	12''	0.89	05 ^h 10 ^m	10 ^h 00 ^m	14 ^h 49 ^m
31	-3.9	11''	0.94	06 ^h 39 ^m	10 ^h 36 ^m	14 ^h 33 ^m

Mars.

Prominent object in the evening through midnight sky.

Now fading with decrease in apparent diameter.

Moon close on 23rd.

Date.	Mag.	Dia.	Phase.	Rise.	Transit.	Set.
01	-1.1	14''	0.92	13 ^h 43 ^m	20 ^h 21 ^m	13 ^h 01 ^m
31	-0.2	10''	0.89	11 ^h 57 ^m	18 ^h 59 ^m	02 ^h 04 ^m

Jupiter.

Low in the SW early evening sky.

The gap between it and Saturn continues to decrease with **closest separation of 0.1° on 21st.**

Take advantage of imaging opportunities around this date!

Moon close on 17th.

Date.	Mag.	Dia.	Rise.	Transit.	Set.
01	-2.0	34''	11 ^h 08 ^m	15 ^h 12 ^m	19 ^h 15 ^m
21	-2.0	33''	10 ^h 02 ^m	14 ^h 11 ^m	18 ^h 20 ^m
31	-2.0	34''	09 ^h 28 ^m	13 ^h 41 ^m	17 ^h 53 ^m

Saturn.

Low in the SW early evening sky.

The gap between it and Jupiter continues to decrease with **closest separation of 0.1° on 21st**.

Take advantage of imaging opportunities around this date!

Moon close on 17th.

Date.	Mag.	Dia.	Rise.	Transit.	Set.
01	+0.6	16''	11 ^h 14 ^m	15 ^h 21 ^m	19 ^h 28 ^m
21	+0.6	15''	10 ^h 01 ^m	14 ^h 11 ^m	18 ^h 20 ^m
31	+0.6	15''	09 ^h 25 ^m	13 ^h 36 ^m	17 ^h 47 ^m

Uranus.

Well placed for evening through midnight observation.

Moon on 24th.

Date.	Mag.	Dia.	Rise.	Transit.	Set.
01	+5.7	3.6''	14 ^h 23 ^m	21 ^h 38 ^m	04 ^h 57 ^m
31	+5.7	3.6''	12 ^h 24 ^m	19 ^h 38 ^m	02 ^h 55 ^m

Neptune.

Moving into SW early evening skies.

Moon close on 20th.

Date.	Mag.	Dia.	Rise.	Transit.	Set.
01	+7.9	2.3''	13 ^h 02 ^m	18 ^h 36 ^m	00 ^h 13 ^m
31	+7.9	2.2''	11 ^h 05 ^m	16 ^h 39 ^m	22 ^h 13 ^m

Dwarf Planets.

Ceres.

An 8th mag object moving from Cetus into Aquarius during the month. Very close to the globular cluster NGC7492 (+11.3) on 31st and 1st Jan. Imaging opportunities if clear!

Eris.

A mag +18.7 target located in Cetus.

Haumea.

A mag +17.3 CCD target located in Bootes 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).

Vesta (4).

A 7th mag object, brightening to +6.5, moving through Leo.

Psyche (16).

Located in Taurus. Mag +9.5 at opposition on 7th.

Eurynome (79).

Located in Taurus. Mag +9.9 at opposition on 11th.

Egeria (13).

Located in Auriga. Mag +10.0 at opposition on 20th.

Laetitia (39).

Located in Orion. Mag +9.8 at opposition on 21st.

Europa (52).

Located in Gemini. Mag +10.2 at opposition on 29th.

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 141P/Machholz moving through Aquarius passes 15 arcmin west of Epsilon (+3.8) Aquarii on 11th. The comet is estimated to be about mag +8.8. Imaging opportunity!

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

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 8th to 17th with peak activity on 13th at 20:00, ZHR = 100+. A fine shower with many “bright events” possible. **Very favourable as Moonlight does not interfere!**

The **Ursids** are active from the 17th to 25th with peak activity on 22nd - 23rd, ZHR = 10. An under-observed shower which has produced unpredicted outbursts in the past so worth monitoring. Quite favourable. Some interference from Moonlight until it sets.

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.

A **Total Solar Eclipse** takes place on 14th. No phase is visible from the UK. Sadly there will be no subsequent report/images at a future “Clubnight” as our regular “Eclipse Chaser” will miss the event due to Covid-19 restrictions on foreign travel.

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 9^d 0.6^h, 11^d 21.4^h, 14^d 18.2^h and 31^d 23.1^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.

Omicron (\omicron) Ceti Mira. The classic long period variable star. Fading from maximum in Oct/Nov.

U Ori. Well placed for nightlong observation. At minimum (+12) in December so follow its rise towards max (+6.3) in April/May 2020.

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.

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 Albino 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.

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

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

NGC7789 (6.7) oc.

IC1805 (6.5) oc.

IC1848 (6.5) oc.

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 lead 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.

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 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. 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.

Continued on next page.

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.

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. NGC598

P.V.H.