JANUS
THE NEWSLETTER OF EWELL ASTRONOMICAL SOCIETY

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Editorial:

Welcome to the July edition of Janus which contains items from Gary Walker and myself. If others would also like to contribute, they are more than welcome to do so!

In case you aren't already aware, all routine EAS meetings and observing sessions remain cancelled until further notice. Ad-hoc sessions at Warren Farm may be possible, although they will, currently, have to be restricted to 6 members only, and they will have to observe Social Distancing requirements. As an outdoor event, I guess it might be possible to hold the annual picnic in some form, but numbers would similarly have to be limited. Time will tell, but the likelihood of there being a meeting before Christmas is beginning to diminish. On-line meetings now seem to be the most likely way forward, although the possibility of going down this route will depend upon the willingness of speakers to adopt this format.

The previous (long) spell of good weather also seems to be at an end – hopefully only temporarily. Before it changed, members took maximum advantage of the conditions to continue their observations. The fact that darkness doesn't really arrive until after 22:00 BST has meant sessions extending well into the early morning for some members.

Starlink satellites continue to be visible shortly after launch. The latest launches on 4 June and 13 June bring the total number of satellites launched to 538. A further launch planned for 26 June was postponed due to bad weather and is currently scheduled for 8 July. It will add a further 60 satellites to the total, putting SpaceX firmly ahead in the race to dominate the LEO communications market.

John

The Solar System July

MERCURY: will soon pass in front of the Sun at inferior solar conjunction. At the beginning of the month, it will not be readily observable, being very close to the Sun, at a separation of only 4° from it. By the end of the month, although theoretically visible as a morning object, it remains not observable, reaching its highest point in the sky during daytime and being no higher than 7° above the horizon at dawn.

VENUS: is emerging into the morning sky as it approaches greatest elongation W. It begins the month visible in the dawn sky, rising at 03:11 BST – 1 hour and 41 minutes before the Sun – and reaching an altitude of 9° above the E horizon before fading from view as dawn breaks around 04:22. By the end of the month, it is visible in the dawn sky, rising at 02:10 BST – 3 hours and 15 minutes before the Sun – and reaching an altitude of 24° above the E horizon before fading from view as dawn breaks around 04:59.

MARS: begins the month visible as a morning object rising at 00:47 BST and reaching an altitude of 27° above the SE horizon before fading from view as dawn breaks around 04:12. By the end of the month it is visible in the dawn sky, rising at 23:18 BST and reaching an altitude of 41° above the S horizon before fading from view as dawn breaks around 04:59.

JUPITER: is currently approaching opposition and is visible as a morning object. At the beginning of the month, it becomes accessible around 23:20 BST, when it rises to an altitude of 7° above the SE horizon. It will then reach its highest point in the sky at 02:15 BST, 17° above the S horizon, before being lost to dawn twilight around 04:22, 11° above the SW horizon. At the end of the month, it is visible in the evening sky, becoming accessible around 21:18 BST as the dusk sky fades, 8° above the SE horizon.

It will then reach its highest point in the sky at 23:56, 16° above the S horizon and will continue to be observable until around 02:45, when it sinks below 8° above the SW horizon.

SATURN: is currently approaching opposition and is visible as a morning object. At the beginning of the month, it becomes accessible around 23:57 BST, when it rises to an altitude of 10° above the SE horizon. Reaching its highest point in the sky at 02:40, 18° above the S horizon, it will be lost to dawn twilight around 04:00, 16° above the S horizon. By the end of the month it will become accessible around 21:54, when it rises to an altitude of 10° above the SE horizon. Reaching its highest point in the sky at 00:33, 17° above the S horizon, it will become inaccessible around 03:08 when it sinks below 10° above the SW horizon.

URANUS: recently passed behind the Sun at solar conjunction and begins the month not observable – it will reach its highest point in the sky during daytime and is no higher than 7° above the horizon at dawn. By the end of the month, it is visible in the dawn sky, rising at 23:41 BST and reaching an altitude of 34° above the E horizon before fading from view as dawn breaks.

NEPTUNE: is currently emerging from behind the Sun and begins the month not observable – it will reach its highest point in the sky during daytime and is no higher than 19° above the horizon at dawn. By the end of the month, it is visible in the dawn sky, rising at 22:15 BST and reaching an altitude of 33° above the S horizon before fading from view as dawn breaks.

MOON PHASES:

Full Moon	5 July
Last Quarter	13 July
New Moon	20 July
First Quarter	27 July

Note: There is another Penumbral Lunar Eclipse on 5 July which will last from 04:07 BST until 04:45 which may be partially visible, although the Moon will be low in the sky as it sets around 04:46.

Collected Observations – Gary Walker

I last observed Venus via my scope on 29 May, only 5 days before Inferior Conjunction on 3 June. This was in the late afternoon at around 4 p.m. It was a beautiful wire-thin crescent of only about 1% phase, at most, and 57' arcseconds in size, which is about the absolute largest angular size that any planet can attain. It was so thin that, even in the middle of the length of the crescent, it was barely wider than it was at the "horns".

Unfortunately, it was too close to the Sun at Inferior Conjunction, being less than half a degree from it (that's less than the Sun, or Moon's diameter), so close that even I decided not to attempt an observation! Needless, to say, there's always someone who manages to do it; somebody in France, who made a non-burnable telescope, and managed to see and photograph Venus at Inferior Conjunction! Here, Venus, appeared as a perfect ring, because light is refracted around the entire limb of Venus, due to its dense atmosphere. I saw his experiment on the "Space Weather" website.

I have continued following Comet Panstarrs, but it is now extremely dim - even in my scope.

I tried to observe Comet Swan, but failed to see it, as it was badly placed low in the NW sky, where the sky was brighter, anyway!

On 6 June, I had a first sighting of Notilucent Clouds at around 3 a.m. when they extended from the NW through to the NE horizon. I saw them again in the early hours of 22 June, also at around 3 a.m. The display was wonderful, with the clouds again stretching all the way from the NW to the NE horizon. They consisted of well-defined ripples, similar to cirrocumulus ones, as well as other bands and wisps. They were bright and appeared a beautiful silvery - bluish colour.

Several stars were "caught up" in the clouds, and, inevitably, the star, Capella, was one of them, being situated at the far end of the display, in the NE.

I have heard that Noctilucent clouds seem to be coming further South this year, and that they are appearing earlier too. They are, of course, the only type of clouds that an astronomer will actually welcome!

I managed to continue following Comet Panstarrs until 22 June, but it remained extremely faint, even in my scope, barely visible even with averted vision. By then I had managed to observe it for about 2 months, since late April.

Comet Atlas, has long gone, and Comet Swan, was again a "no show" for two reasons - it is not particularly bright anyway, and it was also extremely low in the Northern sky (where the sky is brightest at this time of year)

I wonder if 2020 will be the year of the Five Comets, as there are another two comets coming up soon!? However, as always, with comets, it is almost impossible to tell if they will blaze away or, as is more often the case, just end up as a damp squib!

On 24 June, I saw the New Moon with my naked eye, in a deep blue sky. This would normally not be worth commenting on, but as it was only a 3-day old Moon, it was a very thin crescent. More to the point, I could sometimes see it clearly with the naked eye, whilst at other times, I could not!

This was not down to passing clouds (there were none in the sky, all day), nor was it down to floaters in my eyes, but was obviously down to the fact that the human eye can go in and out of focus. When it focused on "infinity", the Moon was visible, but when I turned away and tried it again, it had seemingly disappeared.

As a matter of fact, some people have managed to spot Venus, in the daytime sky, because of this phenomenon.

I tried it a few weeks before Inferior Conjunction and found that I could do it. If I first found the position of Venus with binoculars, and if a cloud was passing close to Venus, I could focus my naked eye on the cloud (which would be at the "infinity" position, anyway). Then, I managed to see Venus as a bright dot in the sky whereas, normally, Venus would be invisible without optical aid.

Examples of the effects of this phenomenon have been noted in the past. On one occasion, it was noted that the crowds surrounding the American President, Abraham Lincoln started to spot Venus in the sky. On another occasion, the same thing occurred when Napoleon was at a parade, and he became aware that instead of watching him, people were watching the sky, as they, too, had espied Venus. His Imperial Magnificence was, apparently, not amused by this distraction!

As the night-time temperature was so warm on the night of 25-26 June, I ended up pulling an "all-nighter" out in the garden. Despite the weather not being perfect, due to varying amounts of cirrus clouds, I managed to carry out some observations.

There was a "Shadow Transit" of Ganymede across Jupiter which lasted from 11:35 p.m. until 2:50 a.m. I managed to see the best part of it, with Ganymede well up on Jupiter's disk.

A shadow transit is where a moon of Jupiter casts its shadow upon the cloud deck of the planet, often well ahead of the actual moon. They can appear very striking, as a jet-black dot, slowly transiting Jupiter.

At around12:50 a.m. it was about one-third of the way across Jupiter's disk, and by 1:15a.m. it was about half-way across. The shadow was passing to the N of the Northern Equatorial Belt. By 1:48 a.m. Ganymede's shadow was about two-thirds of the way across Jupiter.

I observed the transit at 166x and 222x, but could just pick it out at 100x power, as well. Incidentally, I saw the moon, Ganymede, itself, very close to the limb of Jupiter, and by 1.15 a.m. it was half on the limb of Jupiter, itself.

For weeks now, Jupiter has been leading across the sky, closely followed by Saturn about 6 degrees behind it.

Later, around 2.20 a.m. I saw Mars rising. It appeared fairly large (at least for Mars) and I could clearly see that it was strongly gibbous in phase. The angular size was 10.9' arcseconds, and the phase was 84%.

Despite less than perfect conditions, I thought I saw a dark feature on Mars, which (according to the "Sky & Telescope" "Mars Profiler" tool) indicated that it was Mare Sirrenium.

Mars is on its way to Opposition this October - let's hope that we don't get a planet-wide dust storm, like we did last time!

On 28 Jun, just as I was going to bed (just after 3 a.m. - don't ask!), I again saw the Notilucent Clouds. At first, I thought that they were just Cirrus clouds, as they didn't appear very bright but, only a few minutes later, they had become much brighter and had acquired the obvious weird bluish colour, that is typical of Notilucent Clouds.

This display consisted of long, thin ribbons, bands, and patches, but I did not see any ripples. Occasionally, some dark clouds, of obviously terrestrial origin, drifted past them, but mostly the sky was clear enough.

This display was not quite as extensive as the one on 22 June. However, these clouds do not form on every night, so predicting them is difficult.

At last, we finally have a decent comet in the sky after the last three duds! On the morning of 6 July, after several abortive attempts, at 3:20 a.m. I suddenly espied Comet NEOWISE very low in the NE sky. Even in my 11x80 binoculars, I could see the bright yellow tiny coma, with an obvious fan shaped tail pointing upwards. Surprisingly, the view in my telescope at 62x-166x, was not much different, with the coma appearing as a bright yellow disk, a few arcseconds in size, with the fan shaped tail above it. The last time that I saw this was with Comets ISON and Panstarrs, both in 2013.

This is one of those rare times that you know that you are seeing a comet, as it appeared exactly how a comet should appear!

This is the 38th comet that I have seen (and the 3rd this year, alone, so far!)

I also saw the Notilucent Clouds again, for the 4th time this season, on the previous evening. This display was quite extensive, extending from the NW to the NE, consisting of long streamers and some ripples. However, they were not visible on the next morning (the morning of the comet), which just confirms how unpredictable they are.

More on LEO Satellite Constellations – John Davey

As I commented last month, Starlink isn't by any means the only large constellation of satellites in LEO that has been deployed or mooted. Details are hard to come by on many of them – more importantly, they seem to change at regular intervals making it difficult to keep up!

I have, however done some further research and come up with the revised table below which, despite a few gaps, highlights that there are, at least for now, really only 2 or 3 that give potential rise for concern – Starlink, Kuiper and OneWeb.

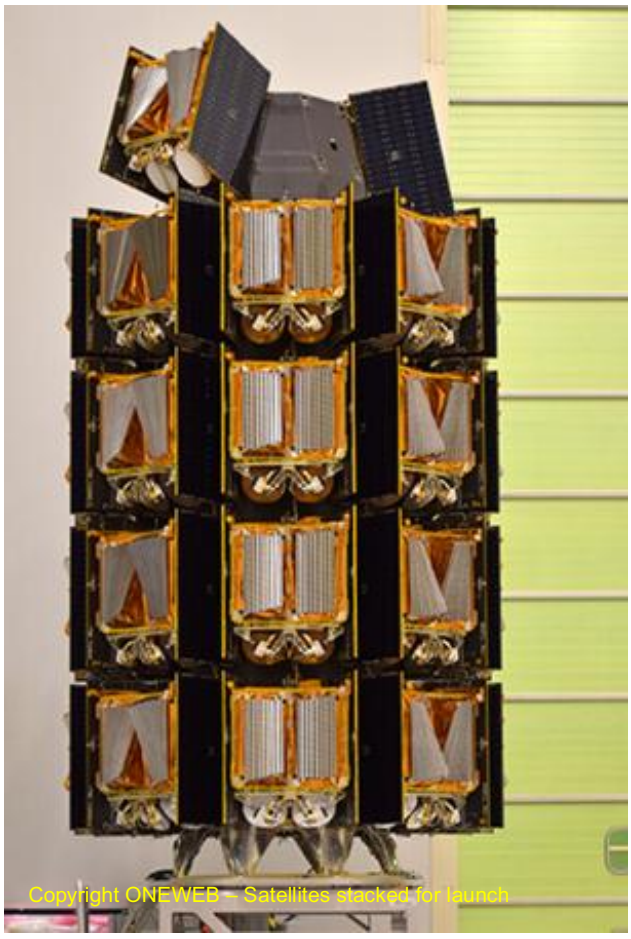
Constellation Name	No. of spacecraft	Orbital Altitude (km)	Mass (kg)	Launches to date/ satellites in orbit	Comments
Starlink (SpaceX)	7518 4409	340 550	230	9 / 538	Application made to increase from 12,000 to 42,000 satellites
Kuiper (Amazon)	3236	590, 610, 630	150	None	Deployment plans unknown
Oneweb	720	1200	175-200	3 /74	Application made to increase to 48,000 satellites
EarthNow	500	?	175-200	None	Earth Observation Probably cancelled
Aleph-1 (Nusat)	300	480	40	8	Small satellites for Earth Observation
Hongyan	320	1,175	10 - 100 Microsatellite	1	54 Primary satellites with 270 smaller coordinating satellites. Possible increase to 864 satellites

Telesat Ka	298 (Ph 1) 1373 (Ph2)	1,000	170	1 (Demonstrator)	Possible increase to 1671 satellites following Ph2
Kepler Constellation	360	550-650	3U or 6U Cubesat	2	Small satellites Possible increase to 360 satellites
Kepler GEN-2	90		3U or 6U Cubesat	None	Small satellites First launch not until 2021
Viasat	288	1,300	?	None	Replaces earlier plan for 20 satellite constellation in MEO
BlackSky Global	60	?	55	None	Small satellites for Earth Observation

Most of the constellations are intended to provide satellite communications – in particular Broadband Internet services - the remainder are for Earth Observation. What really matters when it comes to assessing their likely adverse impact on astronomy is how many are deployed at a time, and at what altitude. I will address this later.

Starlink is currently the front runner in what has become a battle for supremacy in the provision of communications services and is the one which has attracted most of the (unfavourable) attention of astronomers. Assuming another successful launch on 8 July, the constellation size will have reached almost 600 out of the 4409 planned for the higher (550 km) of the two orbits they currently plan to employ. Depending upon future launch rates, they could achieve 1000 satellites in orbit by the end of 2020.

Kuiper, funded by Amazon, has yet to launch any satellites and I have been unable to find any information on how many satellites will be launched at a time or when the first launch will take place. The orbital altitude is similar to the higher of the two orbits planned for Starlink.



The first 6 demonstration satellites from OneWeb were launched on 27 Feb 2019, but it was almost a year before the first launch, on 6 Feb 2020, of a full batch of 34 satellites. This was followed by a further 34 launched on 21 Mar 2020. The plan was to launch further batches of satellites at roughly monthly intervals until a constellation of 650 was in orbit. This plan was, however, brought to an abrupt halt when, only 6 days later, OneWeb announced that the Company had voluntarily filed for relief under Chapter 11 of the US Bankruptcy Code. The Company stated their intention to use these proceedings to pursue a sale of its business in order to maximize the value of the company.

In a further development, on 3 July, the UK Government announced that it had led a successful bid to acquire OneWeb. The Government will invest $500 million and take a 45% equity share in OneWeb alongside Bharti Global Ltd, which is part of a group that controls the third largest mobile operator in the world. Bharti will provide commercial and operational leadership and bring OneWeb a revenue base to contribute towards its future success. The deal - assuming it is ratified (which may well take the rest of 2020) - will enable OneWeb to complete construction of its planned global

satellite constellation whilst also offering the UK strategic opportunities across a wide range of other satellite applications, working with international allies as appropriate. One immediate suggestion has been that the UK might use some of the satellites to deploy a satellite navigation capability to replace the one provided by the EU's Galileo system, but denied to UK post-Brexit. In weighing up the pros and cons of UK involvement in OneWeb, it is worth noting that all OneWeb launches to date indicate that UK is their owner. I assume that this is because UK licenced the launches which would mean UK is already legally liable for any issues with the satellites.

There are no reported instances of OneWeb satellites being bright enough to cause the trails and chains seen with Starlink. Such information as is available suggests they are not as bright as the Starlink satellites; their magnitude is around Mag 5 which is comparable to Starlink satellites which have reached their operational orbit where they appear not to present a problem. During their initial deployment phase, Starlink satellites are around Mag 3, possibly brighter.

The number of satellites launched in each batch is 34 for OneWeb against 60 for Starlink, and the OneWeb satellites are moved from their initial altitude of 450 km to their operational altitude of 1200 km more quickly than Starlink satellites. Starlink satellites also operate at a lower altitude than OneWeb (550 km against 1200 km). Both these factors will affect visibility.

According to the BBC's Jonathan Amos (https://www.bbc.co.uk/news/science-environment-51334423) both OneWeb and Starlink participated in a private RAS meeting held in late January to discuss what impact their operations could have on observations of the universe. The absence of an internationally agreed framework to guide the satellite industry on the brightness of its satellites, giving it some standards to work to, was apparently one of the issues raised at the meeting. Maybe something will eventually be published?!

Finally, perhaps the most amazing development in recent months has been the filing by OneWeb and Starlink of requests to increase their ultimate constellation sizes to (respectively) 48,000 and 42,000 - a total of 90,000 satellites! Given the announcement in April from The United Nations Office for Outer Space Affairs that approximately 8,500 satellites, probes, landers, crewed spacecraft, cargo craft and space station flight elements have been launched into Earth orbit or beyond since 1957, when Sputnik launched, these numbers seem inconceivable, representing as they do a more than tenfold increase in the number of spacecraft launched by humanity. Hopefully this is only posturing, but who knows!

Up Next:

NEXT MEETING:

Date to be advised – check EAS web site.

NEXT USER GROUP:

Date to be advised – check EAS web site.

This is an informal session for members to meet and discuss anything related to their telescopes and sky events and, if weather permits, to go up on the roof for observing. Enter via the Main Entrance opposite the Car Park

NEXT DENBIES OBSERVING SESSION:

Date to be advised – please check EAS web site.

AD HOC OBSERVING AT WARREN FARM:

These will be at short notice when the weather is favourable. Please watch our Whats App feed for alerts.