JANUS
THE NEWSLETTER OF EWELL ASTRONOMICAL SOCIETY

September 2023 EDITION
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Editorial

Welcome to the September edition of Janus. Hopefully, after an indifferent Summer, we can now welcome the longer, albeit cooler, nights which should offer longer viewing periods (or earlier nights!).

For our first lecture since the summer break, Prof. Jonathan Tennyson from UCL will talk about “Water in the Universe”. The following day will hopefully bring fine weather, and a clear evening, for our annual picnic.

August was an eventful month for space enthusiasts, including the first flight by Virgin Galactic to carry space tourists. The 3 passengers enjoyed an experience which, including the runway lift-off, Unity spacecraft release, flight, and landing, lasted roughly an hour, and took them to a maximum altitude of roughly 88 km. The next flight carrying fare paying tourists is planned for 8 September.

For astronomers, it’s very definitely been “Moon Month”, with 2 full moons, a failed lunar landing, a successful lunar landing, and a postponed Luna mission. Russia’s attempt to land near the Moon’s South pole ended in failure when the spacecraft crashed into the lunar surface. India fared better, becoming the fourth nation to achieve a soft landing on the Moon’s surface, and the first to successfully land near the lunar South pole. The launch of Japan’s SLIM mission on 28 August was unfortunately postponed due to poor weather. This follows their failed Hakuto-R moon landing mission in April, caused by an altitude miscalculation that meant the spacecraft ran out of fuel.

Luna missions are hard - almost 50% of those attempted have ended in failure. Even more credit to India!

John

The Solar System September

MERCURY: begins the month soon passing in front of the Sun at inferior solar conjunction and is not readily observable since it is very close to the Sun, at a separation of only 11° from it. By the end of the month, it will soon pass behind the Sun, but is visible in the dawn sky, rising at 05:25 BST – 1 hour and 31 minutes before the Sun – and reaching an altitude of 10° above the E horizon before fading from view as dawn breaks at around 06:35.

VENUS: begins the month having recently passed in front of the Sun at inferior solar conjunction. It is visible in the dawn sky, rising at 04:14 BST – 1 hour and 56 minutes before the Sun – and reaching an altitude of 13° above the E horizon before fading from view as dawn breaks at around 05:48. By the end of the month, emerging into the morning sky as it approaches greatest elongation W, it is visible in the dawn sky, rising at 03:00 BST – 3 hours and 56 minutes before the Sun – and reaching an altitude of 32° above the SE horizon before fading from view as dawn breaks at around 06:35.

MARS: will soon pass behind the Sun at solar conjunction. Throughout the month, it will reach its highest point in the sky during daytime making it very difficult to observe – it begins the month 3° below the horizon at dusk and ends the month 5° below the horizon at dusk.

JUPITER: begins the month visible in the morning sky, becoming accessible around 22:48 BST, when it reaches an altitude of 7° above the E horizon. It will then reach its highest point in the sky at 05:13, 53° above the S horizon before being lost to dawn twilight around 05:48, 53° above the S horizon. By the end of the month, approaching opposition, it is visible as a morning object., becoming accessible around 20:52 BST, when it reaches an altitude of 7° above the E horizon. It will then reach its highest point in the sky at 03:15, 53° above

the S horizon, before being lost to dawn twilight around 06:35, 35° above the SW horizon.

SATURN: having recently passed opposition, begins the month visible between 21:04 and 04:24 BST. It will become accessible at around 21:04, when it rises to an altitude of 10° above the SE horizon. Reaching its highest point in the sky at 00:44, 26° above the S horizon, it will become inaccessible at around 04:24 when it sinks below 10° above the SW horizon. By the end of the month, it is accessible around 19:20 BST, 12° above the SE horizon, as dusk fades to darkness. It will then reach its highest point in the sky at 22:38, 25° above the S horizon and will continue to be observable until around 02:13, when it sinks below 10° above the SW horizon.

URANUS: begins the month emerging from behind the Sun and is visible in the dawn sky, rising at 22:01 BST and reaching an altitude of 54° above the SE horizon before fading from view as dawn breaks at around 04:44. By the end of the month, it is visible in the morning sky, becoming accessible around 22:33 BST, when it reaches an altitude of 21° above the E horizon. It will then reach its highest point in the sky at 03:46, 56° above the S horizon, before being lost to dawn twilight around 05:37, 50° above the SW horizon.

NEPTUNE: begins the month approaching opposition and is visible as a morning object, becoming accessible around 22:54 BST, when it reaches an altitude of 21° above the SE horizon. It will then reach its highest point in the sky at 02:09, 36° above the S horizon before being lost to dawn twilight around 04:44, 26° above the SW horizon. By the end of the month, having now passed opposition, it will become accessible at around 20:59 BST, when it rises to an altitude of 21° above the SE horizon. Reaching its highest point in the sky at 00:13, 35° above the S horizon, it will become inaccessible at around 03:26 when it sinks below 21° above the SW horizon.

MOON PHASES:

Full Moon	31 August (Blue Moon)
Last Quarter	6 September
New Moon	15 September
First Quarter	22 September
Full Moon	29 September

Notable Events:

Observation of some of these events may require a telescope, although some will be visible with the naked eye. More information with times at *https://in-the-sky.org*

September

1	Lunar occultation of Neptune Aurigid meteor shower 2023
4	Jupiter enters retrograde motion Close approach of Moon and Jupiter
5	Close approach of Moon and M45
6	Mercury at inferior solar conjunction
7	Lunar occultation of Beta Tauri
9	September ε-Perseid meteor shower 2023
12	Moon at apogee
13	Conjunction of the Moon and Mercury
16	Conjunction of Moon and Mars
17	Moon at perihelion
18	Venus at greatest brightness
19	Neptune at opposition
21	Lunar occultation of Antares
22	Mercury at greatest elongation West
23	Mercury at highest altitude in morning sky
22	Mercury at dichotomy
23	September equinox Mercury at perihelion
25	NGC 55 is well placed
27	Close approach of Moon and Saturn Moon at aphelion 47 Tuc is well placed
28	Daytime Sextantid meteor shower 2023 Moon at perigee

October

2	Andromeda Galaxy is well placed
3	Close approach of the Moon and Jupiter
5	Close approach of the Moon and Saturn Lunar occultation of Saturn
6	October Camelopardalid meteor shower 2019

9	Draconid meteor shower 2019
10	Southern Taurid meteor shower 2019
11	δ-Aurigid meteor shower 2019
13	Asteroid 29 Amphitrite at opposition
15	The Triangulum Galaxy is well placed Mercury at highest altitude in evening sky
17	136199 Eris at opposition
18	ε-Geminid meteor shower 2019
20	Mercury at greatest elongation east
21	Orionid meteor shower 2019
22	Close approach of the Moon and M44
24	Leonis Minorid meteor shower 2019
25	Mercury at dichotomy
26	Asteroid 9 Metis at opposition
27	Perseus Double Cluster is well placed
28	Uranus at opposition
31	Close approach of the Moon and Jupiter

Collected Observations (and thoughts) – Gary Walker

Venus Crescent – Posted 6 Aug

In the afternoon of 6 August, I saw the huge crescent 🌙 of Venus in my telescope, with the Northern "horn" extending further than the Southern "horn".

Venus was now at only 2% phase and 56' arcseconds in angular size! At this time, Venus is actually bigger than Jupiter ever gets to be, and only one week from Inferior Conjunction on 13 August!

Due to the extensive bad weather that we have been having, I have not managed to observe Venus since 19 July. Now is the best time to observe Venus with its beautiful thin, large crescent 🌙. Unfortunately, of course, this period does not last very long - Indeed, for most of its orbit, Venus only appears as a small and boring gibbous phase of about 10' arcseconds! Even at 62X power, the crescent is easy to see in any telescope.

That's One Small Step for Space Tourism!! – Posted 10 Aug

On 10 August, I watched the BBC live feed of the first flight by Virgin Galactic for space tourists. I watched it on my phone.

The passengers included Keisha and Anastatia Mayers, her 18-year-old daughter from Aberdeen University, who won their tickets in a competition! The other passenger was Jon Goodwin, who is 80 years old and suffers from Parkinson's Disease. He has had a long wait to fly, as he bought his ticket in 2005, for £250,000. He is also an Olympian.

The plane took off from the New Mexico desert at 8.30am local time (3.30pm UK time). The. Mission was called Galactic O2. The spacecraft, VSS Unity, was released at 4.17pm, after a 47-minute climb to 40,000 feet. It shot up vertically for 60 seconds, at Mach 3 (over 2000 mph), and the passengers became weightless for about 3 minutes at apogee. They reached the edge of Space, at 55 miles up, (300,000 feet). Mind you, that depends on how you define where the edge of Space actually starts! This is because it has been officially stated that the edge of Space starts at 62 miles up. It landed back at base at 4.30pm.

The live feed showed the plane taking off and climbing up, viewed through telescopic lenses, and then the release of the spacecraft itself. The carrier plane appeared a bizarre sight, with twin booms on its two tails, and a long wing in between them, supporting the spacecraft itself. We also saw views from inside the spacecraft cabin, which could be clearly seen to have big windows, to enable fantastic views of the Earth. Well, it makes a change from the usual "portholes" that you get in normal aircraft!

As they reached weightlessness, one could see the women's hair all billowing out. Another good view showed the scene behind the carrier plane and the twin jet contrails.

The cost of a ticket is astronomical - about £356,000! That said, I wonder if anyone from this Society will one day take such a trip – I will, of course, put their report in Janus!

In more UK news, it is expected that the spaceport in the Shetland Islands will be fully licensed for use, a week or two from now!

India Lands on the Moon – Posted 23 Aug

It is very rare that any space or astronomical related story reaches the top of the News, but on 23 August, it did! This was for two reasons: firstly, a space probe had, for the first time, managed to land successfully at the South Pole of the Moon; secondly, it was the first successful Moon landing by India. India has now become the 4th Space Power, after the USA, Russia, and China, to successfully land on the Moon.

The unmanned probe is called Chandrayaan 3, and it was the Vikram lander that touched down. It carries a rover called Pragyan (Sanskrit for "Wisdom"), that will move about on the lunar surface.

This area is of special interest as there is probably lunar ice in craters that the Sun never shines into! These deposits could provide water and fuel for future missions.

Only three days earlier, the Russian probe, Luna 25 attempted to land in the same area, but unfortunately crashed into the Moon, instead! No doubt, they will claim Ukraine sabotaged it!

I watched this landing on my phone, and it was also featured on the 1pm News, but not as the top item!

The only other times that I recall a space or astronomical story has made "top billing" were with Apollo 11 and 13, the Space Shuttle disasters of 1986 and 2003, and the British Total Solar Eclipse of 11 August 1999. Doubtless, there could have been other instances, but it is very rare! Usually, astronomical stories end up as the dreaded "and finally....." item on the News! 🎉

Jupiter, Saturn, and other Planets – Posted 31 Aug

By late August, both Jupiter and Saturn were strongly in evidence in the late evening and early morning. I saw that both of Jupiter's Equatorial Belts appeared equally prominent (the Southern Equatorial Belt does tend to fade from time to time, particularly after passing behind the Sun).
Saturn is rising earlier than Jupiter and soon gets round to the Southern sky, whilst Jupiter rises in the East, well North of Saturn.

As I have said before, Saturn's rings have closed up noticeably since last year.

Mars has now vanished into the sunset glow, and I haven't seen it since June!

I saw Venus on 6 August, about a week before Inferior Conjunction, where it appeared as a beautiful, large, very thin crescent. It was now only about 2% phase and 56' arcseconds in angular size - even larger than Jupiter ever gets!

Lastly, the Sun is still active with several big sunspots in white light and, of course, is even more active in Ha light.

Telescope only manual at present – Posted 31 Aug. 23

I have had problems with the battery cables and contacts on my telescope over recent months, and at present have no one to fix it. So, I have had to do "Old School" observing as the GOTO is presently out of operation!

Of course, it doesn't matter when observing the Sun, or Moon, as they are easy to find! So, I normally don't use the GOTO for them, anyway! This is also because tracking them is not necessarily essential. Planets can be observed in the same way, even though GOTO tracking would be better, in order to keep them in view.

However, for finding Deep Sky Objects, it is a different matter, especially for those that are hard to locate if there are no decent "landmarks" (should that be "skymarks"?) nearby! In addition, many of these objects may be extremely faint anyway, so precise locating of them is essential.

I did, however, manage, with some difficulty, to find some objects with my telescope - the ones, that are close enough to stars. I saw M31 (the Andromeda Galaxy), with one of its satellite galaxies, M32. I also found M57, the Ring Nebula in Lyra, which is conveniently situated between two naked eye stars close to Vega! I also located the Perseus Double Cluster, which is between Cassiopeia and Perseus. I saw the beautiful double star, Albireo, in Cygnus, as well.

We could soon be getting energy from solar power harvested in space

Acknowledgement: This article was written by Matteo Ceriotti, Senior Lecturer in Space Systems Engineering, University of Glasgow and was published in THE CONVERSATION on 14th August 2023. It is republished in full under a Creative Commons Licence. The original article, with additional links and images can be found here *https://theconversation.com/we-could-soon-be-getting-energy-from-solar-power-harvested-in-space-210203*

The idea of space-based solar power (SBSP) – using satellites to collect energy from the sun and "beam" it to collection points on Earth – has been around since at least the late 1960s. Despite its huge potential, the concept has not gained sufficient traction due to cost and technological hurdles.

Can some of these problems now be solved? If so, SBSP could become a vital part of the world's transition away from fossil fuels to green energy.

We already harvest energy from the sun. It's collected directly through what we generally call solar power. This comprises different technologies such as photovoltaics (PV) and solar-thermal energy. The sun's energy is also gathered indirectly: wind energy is an example of this, because breezes are generated by uneven heating of the atmosphere by the sun.

But these green forms of power generation have limitations. They take up lots of space on land and are limited by the availability of light and wind. For example, solar farms don't collect energy at night and gather less of it in winter and on cloudy days.

PV in orbit won't be limited by the onset of night. A satellite in geostationary orbit (GEO) – a circular orbit around 36,000 km above the Earth – is exposed to the Sun for more than 99% of the time during a whole year. This allows it to produce green energy 24/7.

GEO is ideal for when energy needs to be sent from the spacecraft to an energy collector, or ground station, because satellites here are stationary with respect to the Earth. It's thought that there's 100 times more solar power available from GEO, than the estimated global power demands of humanity by 2050.

Transferring energy collected in space to the ground requires wireless power transmission. Using microwaves for this minimises the energy lost in the atmosphere, even through cloudy skies. The microwave beam sent by the satellite will be focused towards the ground station, where antennas convert the electromagnetic waves back into electricity. The ground station will need to have a diameter of 5 km, or more at high latitudes. However, this is still smaller than the areas of land needed to produce the same amount of power using solar or wind.

Evolving concepts

Numerous designs have been proposed since the first concept by Peter Glaser in 1968.

In SBSP, the energy is converted several times (light to electricity to microwaves to electricity), and some of it is lost as heat. In order to inject 2 gigawatts (GW) of power into the grid, about 10 GW of power will need to be collected by the satellite.

A recent concept called CASSIOPeiA consists of two 2km-wide steerable reflectors. These reflect the sunlight into an array of solar panels. These power transmitters, approximately 1,700 metres in

diameter, can be pointed at the ground station. It is estimated that the satellite could have a mass of 2,000 tonnes.

Another architecture, SPS-ALPHA, differs from CASSIOPeiA in that the solar collector is a large structure formed by a huge number of small, modular reflectors called heliostats, each of which can be independently moved. They are mass-produced to reduce cost.

In 2023, scientists at Caltech launched MAPLE, a small-scale satellite experiment which beamed a tiny amount of power back to Caltech. MAPLE proved the technology could be used to deliver power to Earth.

National and international interest

SBSP could play a crucial role to meet the UK's net-zero target by 2050 – but the government's current strategy does not include it. An independent study found that SBSP could generate up to 10GW of electricity by 2050, one-quarter of the UK's current demand. SBSP provides a secure and stable energy supply.
It will also create a multi-billion-pound industry, with 143,000 jobs across the country. The European Space Agency is currently evaluating the viability of SBSP with its SOLARIS initiative. This could be followed by a full development plan for the technology by 2025.

Other countries have recently announced the intention to beam power to Earth by 2025, moving to larger systems within the next two decades.

A massive satellite

If the technology is ready, why is SBSP not being used? The main limit is the enormous amount of mass that needs to be launched into space, and its cost per kilogram. Companies such as SpaceX and Blue Origin are developing heavy-lift launch vehicles, with a focus on reusing parts of those vehicles after they have flown. This can bring the cost of the venture down by 90%.

Even using SpaceX's Starship vehicle, which can launch 150 tonnes of cargo into low Earth orbit, the SBSP satellite will require hundreds of launches. Some components, such as long structural trusses – structural elements designed to span long distances – could be 3D-printed in space.

Challenges and risks

An SBSP mission will be challenging – and risks still need to be fully assessed. While the electricity produced is fully green, the impact of the pollution from hundreds of heavy-lift launches is difficult to predict.

Additionally, controlling such a large structure in space will require substantial amounts of fuel, which involves engineers working with sometimes very toxic chemicals. The photovoltaic solar panels will be affected by degradation, reducing efficiency over time from 1% to 10% per year.

However, servicing and refuelling could be used to extend the satellite's lifetime almost indefinitely.

A beam of microwaves powerful enough to reach the ground could also harm anything that got in the way. For safety, then, the power density of the beam will have to be restricted.

The challenge of building platforms like this in space may seem daunting, but space-based solar power is technologically feasible. To be economically viable, it requires large-scale engineering, and therefore long-term and decisive commitment from governments and space agencies.

But with all that in place, SBSP could make a fundamental contribution to delivering net zero by 2050 with sustainable, clean energy from space.

Object of the month – the Dumbbell Nebula (M27) – Martin Howe

The skies continue to darken earlier as we head into September, with the Sun setting just before 8pm (BST) at the beginning of the month. I always look forward to September and October as the sky becomes dark at a more sociable hour, and the evenings are not usually too cold. Unfortunately, in my experience, the months of September and October are often very cloudy, although that said, most of the summer has been like that anyway!

Early September is also a good time to see the summer constellations and deep sky objects, which are still riding high in the darker sky. In last month's feature, I talked about many of the namesake objects that astronomers like to refer to – last month's object was the North American nebula. This month it is the dumbbell nebula, or M27.

This unofficial moniker is derived from the shape of this planetary nebula, as the brighter parts of the nebula can be seen to have the appearance of a weightlifting dumbbell. A planetary nebula is a glowing sphere of gas and dust puffed off in the dying stages of a low to intermediate mass star such as our own Sun. Often appearing circular (in the two-dimensional plane of the sky) these were given the somewhat misleading name of planetary nebulae by William Herschel as he thought that their appearance resembled planets.

The dumbbell nebula lies in the constellation of Vulpecula (the fox) at a distance of about 1,300 light years. It is due south, at a very healthy altitude of about 60o, around 10:30pm (BST) early in the month, so well above the murky atmosphere near the horizon. Being south it is also good for us south Londoners, as we can look at it in the opposite direction to the glare of the central London lights. It has a listed magnitude of about +7.5, but is quite small, at about 7 arcminutes in diameter (for reference the full Moon is about 30 arcminutes across). However, it should still be visible in a good pair of binoculars from a dark sky site such as Ranmore Common, but the real challenge will be finding it, as it lies in the rich star fields of the Milky Way, but not near any very bright stars to lead you the way to it. It does however form an almost perfect equilateral triangle with a base line of the bright summer triangle stars Vega and Deneb, and M27 at the apex 23o away in the direction of the third member of the summer triangle, the bright star Altair, towards the southern horizon. This should at least get you within the general vicinity of M27.

The image below was taken with a 127mm refractor and a mono-CCD camera, with 6x10 minute exposures through a hydrogen-alpha filter and 6x10 minutes through an oxygen-III filter. The final RGB colour image was then created by setting the hydrogen alpha image to red and the oxygen-III image to green and blue images, with the three images then being merged to give the final result.

Important Note:

To allow sufficient time to compile Janus and place it on the EAS Website by the 1st of the month any submissions for publication are required at least 3 days before the end of the month. Any items received after this date will be held over until the following month.

Up Next:

NEXT MEETING: 8pm Friday 8 September – Nonsuch High School

Jonathan Tennyson from University College London will talk about 'Water in the Universe'.

Ron Canham will also give a presentation on the sky at night for the coming month.

ANNUAL PICNIC: Saturday 9 September 5:00 pm-11:00 pm – Headley Heath

Bring a picnic for a relaxed evening, meeting up with other Society members and viewing the night sky (weather permitting). We will also take the opportunity for a Telescope Surgery where we can help with any setup or usage issues you may be experiencing.

NEXT USER GROUP:

Suspended until further notice.

NEXT DENBIES OBSERVING SESSION:

The next session, allowing for moon rise & set times and cloud conditions, should be sometime around the new moon on 15 September.

The precise date and timings of any session will be advised by email and WhatsApp a few days in advance but should be within the period 8-16 September.

AD HOC OBSERVING AT WARREN FARM:

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