



August 2024 EDITION

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Editorial

Welcome to the August edition of Janus. Firstly, a reminder that there is no lecture this month; instead, there's the annual summer picnic on Saturday 7 September from 5:30pm to 11:00pm, at Headley Heath. This should provide for a relaxed evening meeting up with other Society members and, hopefully (weather permitting!), viewing the night sky. The gathering also provides an opportunity for a Telescope Surgery where members can get help with any setup or usage issues they may be experiencing. The new season of lectures begins in September when Martin Lumm MBE, FRAS will talk about the "Star of Bethlehem".

Members may have seen the announcement of the discovery of a cave on the Moon, potentially opening-up new opportunities for settlement by humans involved in Lunar exploration. Significantly, it could provide a far more stable environment in which to build a shelter. The lunar surface temperature fluctuates hugely over a period of weeks because of the lack of atmosphere to retain heat. During the lunar day, temperatures can rise to 121°C (250°F) in sunlight, then plummet to -133°C (-208°F) after nightfall. It is likely that the shade of an underground cave system would regulate the temperature to be much more consistent, making building a shelter within one much easier. For more information, see the item later in this edition.

Nights are beginning to lengthen a little, but remain mild, allowing night owls more time for observations without becoming frozen! This happy state of affairs should, hopefully, last for the next couple of months. All I can do is urge you to make the most of it. Hopefully skies will be clear, but I'm afraid that's rather less predictable, and beyond my control!

John

The Solar System August

MERCURY: begins the month having recently passed greatest elongation E. It will be extremely difficult to see, reaching its highest point in the sky during daytime and being 4° below the horizon at dusk. Visibility remains poor throughout the month until, by the end of the month, emerging into the morning sky as it approaches greatest elongation west, it will still reach its highest point in the sky during daytime, and be no higher than 5° above the horizon at dawn.

VENUS: recently passed behind the Sun at superior solar conjunction. Throughout the month, it is difficult to see, reaching its highest point in the sky during daytime and only ever being between 1° and 2° above the horizon at dusk.

MARS: is currently emerging from behind the Sun. It begins the month visible in the dawn sky, rising at 00:42 BST and reaching an altitude of 32° above the E horizon before fading from view as dawn breaks at around 04:26. By the end of the month, it is visible in the dawn sky, rising at 23:51 BST and reaching an altitude of 48° above the SE horizon before fading from view as dawn breaks at around 05:24.

JUPITER: is currently emerging from behind the Sun. It begins the month visible in the dawn sky, rising at 01:05 BST and reaching an altitude of 33° above the E horizon before fading from view as dawn breaks at around 04:58. By the end of the month, it is visible in the dawn sky, rising at 23:23 BST and reaching an altitude of 54° above the SE horizon before fading from view as dawn breaks at around 05:48.

SATURN: begins the month visible as a morning object, becoming accessible around 23:30, when it reaches an altitude of 11° above the SE horizon. Reaching its highest point in the sky at 03:40, 32° above the S horizon, it will be lost to dawn twilight around 04:30, 31° above the S horizon. By the end of the month, approaching opposition, still visible in the morning sky, it becomes

accessible around 21:28, when it reaches an altitude of 11° above the SE horizon.

Reaching its highest point in the sky at 01:35, 31° above the S horizon it will be lost to dawn twilight around 05:26, 13° above the SW horizon

URANUS: is currently emerging from behind the Sun. It begins the month visible in the dawn sky, rising at 00:09 BST and reaching an altitude of 30° above the E horizon before fading from view as dawn breaks at around 03:37. By the end of the month, still visible in the dawn sky, it will rise at 22:12 BST and reach an altitude of 54° above the SE horizon before fading from view as dawn breaks at around 04:43.

NEPTUNE: begins the month visible as a morning object. Rising at 22:23 BST, it will reach an altitude of 36° above the S horizon before fading from view as dawn breaks at around 03:37. By the end of the month, approaching opposition and visible in the morning sky, it becomes accessible around 22:57, when it reaches an altitude of 21° above the SE horizon. Reaching its highest point in the sky at 02:19, 36° above the S horizon, it will eventually be lost to dawn twilight around 04:43, 28° above the SW horizon.

MOON PHASES:

3 New Moon	4 August
First Quarter	12 August
Full Moon	19 August
Last Quarter	26 August
New Moon	3 September

Notable Events:

Some observations will require a telescope, others will be visible with the naked eye. More information at <https://in-the-sky.org>

August

- 5 Conjunction of the Moon and Venus
- 6 Conjunction of the Moon and Mercury
The Moon at perihelion
Asteroid 16 Psyche at opposition
Asteroid 7 Iris at opposition
Conjunction of Venus and Mercury
- 9 The Moon at apogee
- 10 Lunar occultation of Spica
- 12 Perseid meteor shower 2024
- 13 Messier 15 is well placed
- 14 Lunar occultation of Antares

Close approach of Jupiter and Mars
Messier 2 is well placed

- 17 κ-Cygnid meteor shower 2024
- 18 The Moon at aphelion
- 19 Mercury at inferior solar conjunction
- 21 Close approach of the Moon and Saturn
Lunar occultation of Saturn
The Moon at perigee
Lunar occultation of Neptune
- 26 Close approach of the Moon and M45
- 27 Close approach of the Moon and Jupiter
Lunar occultation of Beta Tauri
- 28 Close approach of the Moon and Mars
- 31 Aurigid meteor shower 2024

September

- 1 Conjunction of the Moon and Mercury
Uranus enters retrograde motion
- 2 Asteroid 194 Prokne at opposition
- 5 Mercury at greatest elongation west
Close approach of the Moon and Venus
Lunar occultation of Venus
The Moon at apogee
The Moon at perihelion
- 6 Mercury at highest altitude in morning sky
Mercury at dichotomy
Lunar occultation of Spica
- 8 Saturn at opposition
- 9 September ε-Perseid meteor shower 2024
Mercury at perihelion
- 10 Lunar occultation of Antares
- 15 The Moon at aphelion
- 17 Close approach of the Moon and Saturn
Lunar occultation of Saturn
- 18 Partial lunar eclipse
Lunar occultation of Neptune
The Moon at perigee
- 21 Neptune at opposition
- 22 Close approach of the Moon and M45
September equinox
- 23 Close approach of the Moon and Jupiter
- 24 Lunar occultation of Beta Tauri
NGC 55 is well placed
- 25 Close approach of the Moon and Mars
- 27 Daytime Sextantid meteor shower 2024
Comet C/2023 A3 (Tsuchinshan-ATLAS) passes perihelion
47 Tuc is well placed
- 29 Asteroid 20 Massalia at opposition
- 30 Mercury at superior solar conjunction

Collected Observations (and thoughts) – Gary Walker

Galileo and Saturn's rings virtually edge-on – posted 11 July

As stated in my post last month, when Galileo first noticed appendages to either side of Saturn, his telescopes did not have a good enough resolution to allow him to work out what he was actually seeing. Hence, when he saw unusual things on either side of Saturn, he drew them as small globes.

In addition to his telescopes not being able to resolve the rings properly, the situation was made worse by the fact that the rings then became edge-on, so that they disappeared! Galileo asked the question "Has Saturn devoured his children"? He became even more confused when the rings re-appeared the following year!

In fairness to him though, following astronomers were equally confused, as nobody expected a ring system, anyway! They had never been seen before and, even now, Saturn has the only visible ring system in our solar system.

Sir William Herschel may have once seen a ring around Uranus (and it is now known that all the gas giants have ring systems, although much fainter than those of Saturn).

If Herschel had seen a ring around Uranus, and as he described it as red in colour, then it was obviously quite bright, certainly bright enough to activate the cones in his eyes! These only work when seeing fairly bright objects at night, as the rods in one's eyes are very poor at detecting colour at night.

Equally obviously, if Herschel HAD seen the rings of Uranus, at some point they subsequently faded to the point that they became invisible!

Comet 13P/Olbers – Posted 17 July

I have had a lot of trouble trying to see this comet, as it is low in the NW sky, and is thus hidden by the rooftops of my house and that of one of my neighbours, so is difficult to observe it from my garden!

However, on the night of 14-15 July, I finally managed to see it, as it was now a bit higher

in the sky. Despite its bright magnitude of about 6.7, it was still hard to pick out in my 8" SCT telescope, presumably because the Northern sky wasn't completely dark.

The comet appeared as a moderately bright fuzzy patch in my telescope, brighter in the centre, and with no visible tail.

I saw it again on the late evening of 17 July. Once again, it was difficult to pick it out in the sky through my telescope, presumably because, at this time of the year, due to the Sun, the Northern sky remains the brightest part of the sky.

Once picked out, it was easily seen, as a rather diffuse fuzball, which was brighter towards its centre.

There was a bright gibbous Moon, but at this time of year, in the Summer, it is very low down in the Southern sky, virtually about as far away from the comet that it can be!

This comet, like the last comet of Pons-Brooks, is not a new comet, as it was discovered back in 1815, by Heinrich Olbers. It has a period of 68 years, and last passed the Earth in 1956, so it has a Halley's Comet like periodicity.

It was close to its closest passage to the Earth, which will be on 20 July.

This is the second comet that I have seen this year (and maybe there'll be a third one in October!). It is now the 46th comet that I have seen since I first saw one in 1983!

More Noctilucent Clouds – Posted 19 July

I saw another bright display of Noctilucent Clouds on the early morning of 19 July 19, around 3.40am, which extended along a large area of the low Northern sky.

This, again, consisted of bands, ribbons, a few delicate ripples and a brighter "knot" within it. There were also a few patches and ribbons of terrestrial clouds that appeared dark, against the Noctilucent Clouds, and contrasted wonderfully with them.

There were also dark terrestrial clouds, to the North of the NCs, so they appeared lower down in the sky, than them.

This was the first display of them that I have seen this month, as even when I have looked out for them on other clear nights, there was no sign of them... Like the Aurora, they are unpredictable!

Latest Observations – Posted 26 July

I saw Comet Olbers again this evening. However, despite it being fairly bright (i.e. around magnitude, 6-7), it was still hard to see in my scope, until I “got my eye in”, as it were! This was because it was still low in the NW sky, which – as is usually the case at

this time of the year - wasn't completely dark.

It appeared the same as before, as a fuzzball, brighter in the centre. Tonight, I kept thinking that I could see a tail stretching out to the SW of it, but I couldn't tell whether it was just an illusion!

This week, as usual, the Sun has had several Sunspots, with a long "chain" of them stretching across the Sun. In Ha light, there seems to have been fewer Prominences each day, but there were still plenty of Plages and Filaments visible!

Object of the Month – The Veil Nebula (or at least part of it!) – Martin Howe

With astronomically dark skies returning in August it is time to track down some of the gems of the late summer evenings. High overhead in the late summer is the large and easily recognisable constellation of Cygnus, the swan.

Aside from being a reasonably bright set of stars in their own right, they also trace out a nice asterism known as the northern cross. At the top of the cross (or tail of the swan) lies the bright star Deneb – one of the brightest stars in the summer sky. Deneb can also be recognised from its position of forming one of the corners of the “Summer Triangle”, along with the bright stars Altair and Vega – see the image from Stellarium below, where the Summer Triangle is marked out in a red dashed line:



In last month's Janus we looked at the nebulosity surrounding the central star of the cross, gamma Cygni. This month we dive in to look at some of the detail within the nearby very large Veil nebula. This nebula is actually a supernova remnant. It is thought the progenitor supernova explosion

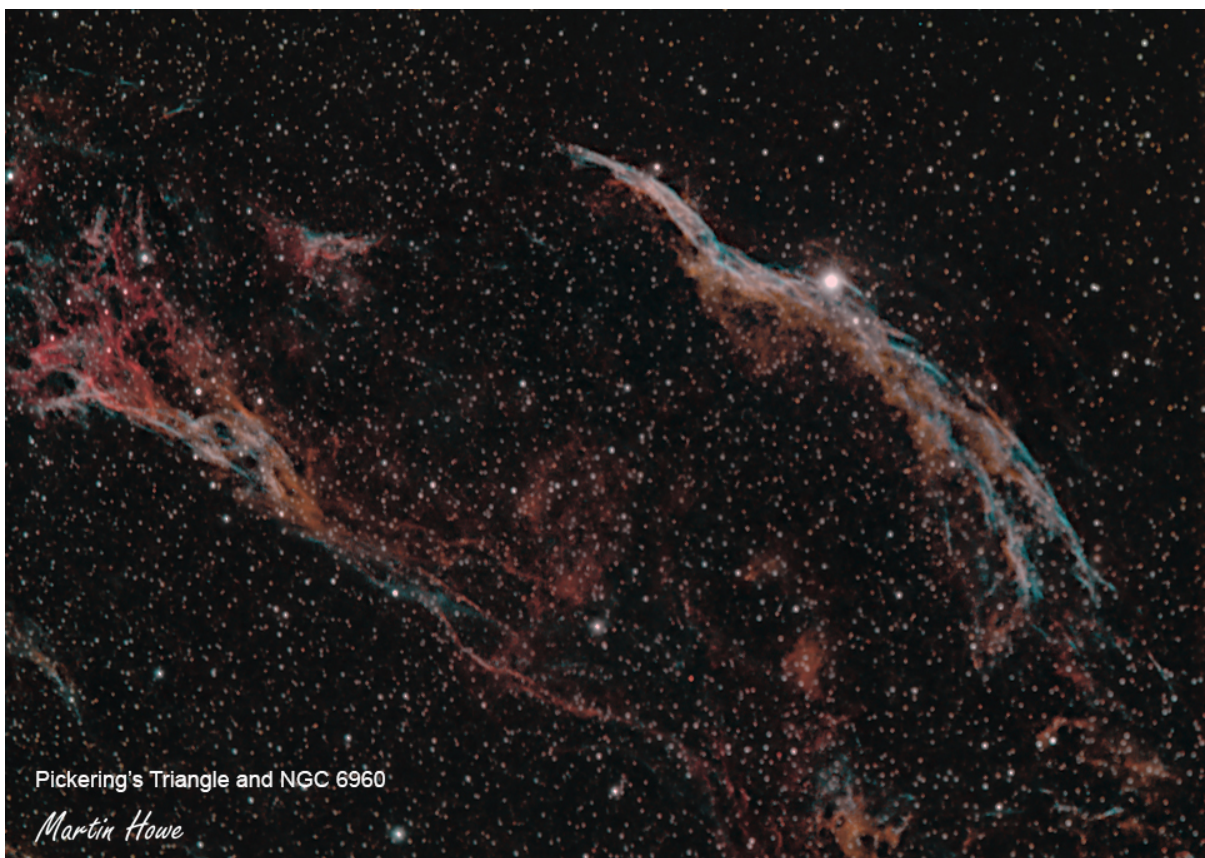
occurred about 10,000 years ago and so the gas and dust forming this nebula has been expanding outwards into space since this time.

This nebula is thought to be about 2,100 light years away, and spans an apparent diameter of about 3 degrees in the sky. With a bit of simple trigonometry, we can multiply the distance (2,100 l.y.) by the tangent of the apparent angle (3°) which gives us an estimated true size of this object of about 110 light years in diameter. Bearing in mind the distance to our nearest star, Proxima Centauri, is a little over 4 light years away, that makes this supernova remnant absolutely gigantic!

This month's image is a small portion of this large nebula, catalogued as NGC 6960, but unofficially known as the witch's broom nebula – see if you can spot it in the image below and make your own decision as to whether this is aptly named! Also in the image to the upper left edge is another region of the wider Veil nebula known as Pickering's Triangle. This portion of the nebula was named after Edward Pickering, who was the observatory director overseeing the work of Williamina Fleming who was the actual discoverer in 1904, but custom at the time was that it was the observatory director who took the credit!

Unfortunately, although relatively easy to image from a dark sky site, the nebula is too faint to see with the naked eye. The location however can be easily found by star hopping from Deneb as shown in the Stellarium image above. From Deneb, follow the shaft of the cross to the next bright star, gamma Cygni (magnitude 2.2), and from here, 'turn left' and hop down the arm of the cross to the next bright star, epsilon Cygni (magnitude 2.45). From here you turn south to reach the moderately bright star 51 Cygni (magnitude 4.2), which is the bright star in the image below sitting astride the "broom"

This image was taken using a mono CCD camera and narrow band filters through a Canon 200mm camera lens for a total of forty 8-minute exposures.



A cave discovered on the Moon opens up new opportunities for settlement by humans

Acknowledgement: This article was written by Christopher Pattison, Researcher at the Institute of Cosmology and Gravitation, University of Portsmouth, and was first published in **THE CONVERSATION** on 22nd July 2024. 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/a-cave-discovered-on-the-moon-opens-up-new-opportunities-for-settlement-by-humans-235248>

Almost 55 years after the launch of Apollo 11 – the first mission to land humans on the Moon – scientists have found evidence of a large cave system near the landing site of those astronauts.

Using radar images taken by Nasa's Lunar Reconnaissance Orbiter spacecraft in 2010, researchers have been able to determine that huge pits, found in images of the Moon, may in fact be "skylights" to large caves and tunnels that sit beneath the lunar surface.

These could be incredibly valuable to future astronauts hoping to settle on the Moon, acting as a convenient shelter for a lunar base.

The cave is accessible through a pit in the well-studied Mare Tranquillitatis (Sea of Tranquility). This is a large basin made mostly of basalt. Neil Armstrong and Buzz Aldrin touched down in this region on 20 July 1969.

While Mare Tranquillitatis isn't likely to be the first place humans try to settle on the Moon, the existence of one cave makes the existence of others very likely, so scientists now expect there to be others in locations more suitable for human settlement.

Mare Tranquillitatis isn't scientists' first choice for a human base because it doesn't have one of the other important ingredients needed for survival. There is no ice at the lunar equator and therefore no easy access to water for astronauts to drink, make oxygen from and to split for rocket fuel. This makes the equator great for landing on and visiting, but a poor choice for setting up camp.

Ice is likely to exist at the lunar poles, though, thanks to shade protecting it from the Sun's harsh rays. So, the poles are our first choice for starting to settle on the Moon as it reduces the amount of water we would need to take with us.

The opening being studied here is simply known as the Mare Tranquillitatis pit, and it's one of about 200 known openings on the lunar surface. It was first imaged back in 2010 and suspected to be a pit that led into a cave or tunnel system, but we had no way of confirming this until now.

In a paper published in Nature Astronomy, Leonardo Carrer, from the University of Trento, Italy, and colleagues report evidence that this pit does indeed lead to a cave below, and possibly to a larger system of tunnels and conduits. The Mare Tranquillitatis pit is about 100 metres (330 feet) wide, with steep walls that stretch down between 130 and 170 metres, making it the deepest known lunar pit.

By re-analysing the radar data and by using computer simulations to reconstruct the pits, scientists were able to determine that a portion of the radar reflected back to the satellite was coming from a subsurface cave conduit that is at least tens of metres long. This suggests that the Mare Tranquillitatis pit leads to an accessible cave below the Moon's surface.

Exciting prospect

This discovery is incredibly exciting, not least because it's a promising potential location for future lunar shelters and bases. As well as providing natural shelter from harmful cosmic rays, a cave system also provides a stable temperature.

The lunar surface temperature fluctuates hugely over a period of weeks because of the lack of atmosphere to retain heat. During the lunar day, temperatures can spike at 121°C (250°F) in sunlight, then plummet to -133°C (-208°F) after nightfall. The shade of an underground cave system is expected to regulate the temperature to be much more consistent, making building a shelter within them much easier.

Similarly, small asteroids often crash into the Moon due to its lack of atmospheric shielding. Being in a shelter that is sturdy enough to survive an impact is important. A cave provides the perfect solution to this.

While having a cave to shelter in might reduce the amount of materials we need to take to the Moon to start to settle there and have a long-term human presence, there are still some obstacles to overcome.

For example, the walls of the pit are a sheer drop and are over 100 metres tall, meaning future explorers will need to find a safe way to descend into the caves and ascend when they are exploring the surface.

This could take the form of ladders, or more complicated systems similar to jet packs. Thankfully, though, the lower lunar gravity means this problem is less severe than it would be on Earth. The structural integrity of the caves will also need to be assessed before we move in.

The study also revealed that the underground system could be between 30 to 80 metres (98 to 262 feet) long and around 45 metres (148 feet) wide. This would make it large enough for several "lunar houses". The floor also appears to be flat enough to build on without any major work or preparation.

The most likely cause of lunar caves is that they are old lava tubes. These are tunnels that formed when the Moon was still volcanically active millions of years ago. Flowing lava can develop a continuous and hard crust, forming a roof above the still-flowing lava stream. A hollow then exists once the lava stops flowing.

Even better than the cave at Mare Tranquillitatis, would be the discovery of other such structures near either of the lunar poles. Astronauts would then have the best of everything – a shelter against the harsh conditions of the Moon and access to the water ice that exists in shadowed craters at the lunar poles. This would be an excellent chance to reduce the cost and difficulty of settling on the Moon for a prolonged period.

The fact that we can spot them from space also allows us to plan missions to use these natural shelters. It could mean that future astronauts live in volcanically formed caves on the Moon.

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:

**ANNUAL PICNIC: 5:30 pm-11:00 pm
Saturday 7 September – Hedley 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 MEETING: 8pm Friday 13
September – Nonsuch High School**

Martin Lumm MBE, Fellow of the Royal Astronomical Society (FRAS) will talk about the "Star of Bethlehem".

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

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 which is on 4 August.

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 29 July – 9 August.

AD HOC OBSERVING AT WARREN FARM:

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