JANUS
THE NEWSLETTER OF EWELL ASTRONOMICAL SOCIETY

March 2026

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Important Reminder:

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.

Editorial

Welcome to the March edition of Janus. This month's meeting on Friday 13 March features a talk by Astha Chaturvedi from the University of Surrey on "Mitigating light pollution due to Artificial Satellites" - a subject of increasing concern to astronomers at all levels.

A recent article in "Space News", written by members of the US National Space Society and US academic astronomy community posed the question: "Is it time to take astronomy off earth?" It was posed from the standpoint that astronomy and commercial space appear to be on a collision course – with the latter apparently winning. As satellite constellations continue to expand, astronomers have raised concerns about trails across images, interference with radio telescopes and the loss of dark skies. At the same time, commercial operators point to the enormous economic, societal, scientific and national security benefits enabled by space-based infrastructure. Both positions are equally valid.

Members of the American Astronomical Society have pushed back on the idea that terrestrial astronomy should be abandoned. They argue that moving astronomy from Earth to space needlessly cedes ground to the mega-constellation operators who they see as polluting and blocking the night sky. Also, in the absence of orbital equivalents to the ground-based facilities operating today, they point out that abandoning them would represent a significant loss for science and, in any case, they claim that moving astronomy to space doesn't solve the underlying problem - merely avoids it.

International organisations such as UNCOPUOS, ITU and IAU are attempting to define acceptable thresholds for RF interference from satellites, and satellite brightness. Closer to home, the European Commission has initiated studies to support standards for protection of dark skies in the context of Space Traffic Management. All these activities could, in time, coalesce into binding standards and regulations. In the meantime, satellite operators continue to expand their operations. SpaceX launched its 500th Starlink satellite of 2026 on 25 February bringing the number of active Starlink satellites in orbit to over 10,000. They have also filed a request to launch **1 million new satellites** that will act as data centres in space to run AI… And that's just one operator! Food for thought indeed.

John

In this edition:

skyUpdate
What's up this month?

The Solar System March

MERCURY: will soon pass in front of the Sun at inferior solar conjunction. It begins the month extremely difficult to see as it is very close to the Sun, at a separation of only 12° from it. By the end of the month, emerging into the morning sky as it approaches greatest elongation west, it remains very difficult to see, reaching its highest point in the sky during daytime and being 0° below the horizon at dawn.

VENUS: recently passed behind the Sun at superior solar conjunction. It begins the month difficult to see, reaching its highest point in the sky during daytime and being no higher than 5° above the horizon at dusk. By the end of the month, soon passing behind the Sun. From Sutton, however, it will become visible at around 19:51, 12° above the W horizon, as dusk fades to darkness. It will then sink towards the horizon, setting 1 hour and 46 minutes after the Sun at 21:17.

MARS: will soon pass behind the Sun at solar conjunction. It begins the month extremely difficult to see, being very close to the Sun, at a separation of only11° from it. By the end of the month, having now passed behind the Sun, it remains extremely difficult to see reaching its highest point in the sky during daytime and being 4° below the horizon at dawn.

JUPITER: is currently an early evening object. It begins the month visible in the evening sky, becoming accessible around 18:00, 49° above the SE horizon, as dusk fades to darkness. Reaching its highest point in the sky at 20:26, 61° above the S horizon, it will continue to be observable until around 03:33, when it sinks below 7° above the NW horizon. By the end of the month, having recently passed behind theSun at solar conjunction, it will become visible at around 19:51, 61° above the S horizon, as dusk fades to darkness. It will then sink towards the horizon, setting at 03:43.

SATURN: will soon pass behind the Sun at solar conjunction. It begins the month difficult to see, reaching its highest point in the sky during daytime and is no higher than 8° above the horizon at dusk. Visibility decreases as the month progresses and, by the end of the month, having recently passed behind the Sun at solar conjunction, it is not visible since it is very close to the Sun, at a separation of only 5° from it.

URANUS: is currently an early evening object, now receding into evening twilight. It begins the month visible in the evening sky, becoming accessible around 18:58, 50° above the SW horizon, as dusk fades to darkness. It will then sink towards the horizon, before setting at 00:52. By the end of the month, having recently passed behind the Sun at solar conjunction, it will become visible at around 20:52 GMT, 26° above the W horizon, as dusk fades to darkness. It will then sink towards the horizon, setting at 23:59.

NEPTUNE: will soon pass behind the Sun at solar conjunction. At the beginning of the month, it will be extremely difficult to see since it will be very close to the Sun, at a separation of only 20° from it. By the end of the month, having now passed behind the Sun at solar conjunction, it remains not readily observable, being even closer to the Sun, at a separation of only 8° from it.

Notable Events:

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

March

2	Lunar occultation of Regulus
3	Total lunar eclipse Full Moon The Theta Carinae cluster is well placed
6	The Moon at aphelion Conjunction of Ceres and Eris
7	Mercury at inferior solar conjunction Conjunction of Venus and Neptune
8	Conjunction of Venus and Saturn
9	The Wishing Well cluster is well placed
10	Lunar occultation of Antares The Moon at apogee
11	Jupiter ends retrograde motion Moon at Last Quarter
13	Lunar occultation of Sigma Sagittarii
14	Conjunction of Mars and Mercury γ-Normid meteor shower 2026
16	The Moon at perihelion
17	Conjunction of the Moon and Mercury Conjunction of the Moon and Mars
18	Comet 88P/Howell passes perihelion
19	New Moon
20	Conjunction of the Moon and Venus March equinox
21	Asteroid 20 Massalia at opposition
22	Neptune at solar conjunction The Moon at perigee Mercury at highest altitude in morning sky
23	Close approach of the Moon and M45
24	Lunar occultation of Beta Tauri
25	Saturn at solar conjunction Moon at First Quarter
26	Mars at perihelion Conjunction of the Moon and Jupiter Close approach of the Moon and Jupiter
28	Close approach of the Moon and M44
29	Lunar occultation of Regulus

April

1	136472 Makemake at opposition
2	The Sombrero Galaxy is well placed Full Moon
3	Mercury at greatest elongation west Mercury at dichotomy
4	Mercury at aphelion Comet C/2026 A1 (MAPS) passes perihelion
5	Messier 94 is well placed The Moon at aphelion
6	The Jewel Box cluster is well placed Comet C/2026 A1 (MAPS) passes perigee Lunar occultation of Antares
7	The Moon at apogee
8	Conjunction of Venus and Ceres
9	Lunar occultation of Sigma Sagittarii
10	Moon at Last Quarter
13	Conjunction of Mars and Neptune
14	Centaurus A is well placed Omega Centauri is well placed The Moon at perihelion
15	The Whirlpool Galaxy is well placed 136199 Eris at solar conjunction Conjunction of the Moon and Mercury
16	Conjunction of the Moon and Mars Conjunction of the Moon and Saturn Conjunction of Mercury and Neptune
17	Messier 83 is well placed New Moon
18	Messier 3 is well placed
19	The Moon at perigee Conjunction of the Moon and Venus Comet C/2025 R3 (PANSTARRS) passes perihelion Close approach of the Moon and M45
20	Conjunction of Mercury and Mars Conjunction of Mercury and Saturn Close approach of Mercury and Saturn Conjunction of Saturn and Mars
21	Lunar occultation of Beta Tauri
22	Lyrid meteor shower 2026 Conjunction of the Moon and Jupiter
23	Close approach of the Moon and Jupiter 136108 Haumea at opposition Comet 141P/Machholz passes perihelion
24	Messier 101 is well placed π-Puppid meteor shower 2026 Moon at First Quarter Conjunction of Venus and Uranus Close approach of the Moon and M44
26	Lunar occultation of Regulus Comet C/2025 R3 (PANSTARRS) passes perigee

Collected Observations (and thoughts) – Gary Walker

Thoughts on TIME - Posted 28 January

It is amazing to think that when I first became interested in Astronomy at the start of the 1970's, events such as the return of Halley's Comet in 1986, and even more so, the Total Solar Eclipse of 11 August 1999, seemed to be so far away in the distant future, that I felt that they would never come.

Now, Halley's Comet is 40 years past, this year, and even the Total Solar Eclipse of 1999 is now over 26 years ago in the past.

It is, of course, a well-known fact that when we are young, time seems to pass very slowly, and things like the school years, or even a normal year, seem like a subjective eternity! Now, when we are adults, time flies past, and even a decade seems to go past in no time at all!

This is probably due to the fact that, as children, our brains are still developing, so time drags, but when we are adults, our brains are fully developed, so time flies past much quicker.

Later this year, we have another big Solar Eclipse, on 12 August. It is not total, anywhere in the UK, but it reaches part of Spain. So, even, here in the UK, the Sun will be over 90% obscured (hopefully, not by cloud cover as well!).

This will be the biggest solar eclipse in the UK since that of 1999! Even if it is cloudy, we should still notice a marked gloom over the landscape. The last big eclipse of 20 March 2015, at 85% obscuration, despite being overcast here, did cause an obvious gloom for about 20 minutes.

Big Sunspot - Posted 4 February

Today, I saw a huge Sunspot on the Sun, accompanied by a "swarm" of smaller spots. This group had clearly grown since 31 January, which was when I last managed to observe the Sun! It was so big that it was visible to the naked eye, and easy to see in binoculars.

Shadow transit of Ganymede - Posted 5 February

Yesterday evening, I watched a Shadow Transit of Ganymede across Jupiter. At about 6.15pm, it was just upon Jupiter, but by around 7.10pm, it was about one third of the way across Jupiter. By this time, the actual moon of Ganymede had moved off Jupiter's disk and was clearly visible just off the limb of Jupiter. Thus, I could now see both Ganymede and its shadow, in line with each other.

By about 8.58pm, the shadow was now around two thirds of the way across Jupiter. All the time, Ganymede's shadow was just below the Southern Equatorial Belt.

The other 3 Galilean moons were to the East of Jupiter, and two of them had formed a close double pair like a double star, as they sometimes do. I could see that they had changed orientation to each other in the space of an hour.

Often when observing Jupiter you can observe events in "real time ", and so can really see the dynamics of the Solar System. Jupiter is now ideally situated in the evening and, best of all, very high up in the sky!

I also saw Saturn, but it is now getting low in the West, after the early evening, so will soon be lost. The rings still appear very edge on.

Big Sunspot Part 2 - Posted 5 February

This big spot and, indeed, the group that it is in, has grown vastly in only a few days. The big spot and its companions form a long, curving, "question mark" chain of smaller spots, stated to be about 200,000 kms long!

It is certainly the biggest Sunspot for some time. The "Space Weather" website has

been full of images of this from amateur astronomers since 2 February. Such sunspots can, on occasion, grow very fast as this one has!

The London Astrofest 2026 - Posted 6 February

I went to this year's Astofest as usual, on the first day, i.e. Friday. All the usual stalls were there, but I also saw at least one stall selling Smart Scopes (SeeStar). This shows how new technology is appearing in Astronomy, and Smart Scopes have often been reviewed in the Astronomy magazines. Surprisingly, I did not see anyone from the Society, there!

The London Astrofest over the years - Posted 8 February

The London Astrofest began in 1992, and I first went to it the following year. It has always been sponsored by the Astronomy Now magazine.

Over the years, various stalls have come and gone. Whilst there are still many stalls, a lot have gone over the years including :

- Earth & Sky - this was a bookstall, which sold many books, and finished when the couple running it retired to Norfolk, sometime after about 2003.
- The Armagh Planetarium
- The Webb Society
- Astronomy of the Pacific.
- Telescope House - yes, even this left Astrofest 10 years ago, in 2016! The Widescreen Centre now occupies the space that they were in, on the Ground Floor.
- Cambridge University Press - This sold numerous books, too! They last came to the Astofest in 2018.
- Starlab - This was an inflatable Planetarium, in which stars could be projected upon its interior!
- Area for local Astronomical Societies to put on their displays, including from this Society!

This, for me, means that there are now fewer books at the Astofest than in the past! My main go-to bookstall now is the Springer Books one, and the British Interplanetary Society, which sells some second-hand books. The BAA stall also sells some publications, along with the Astronomy Now magazine stall.

However, these stands only sell their own books, not like ones like Earth & Sky, that sold books from various publishers.

There are now only 3 stalls remaining from the beginning Astrofest:

- Astronomy Now magazine (which sponsors this event)
- The BAA stand.
- The Popular Astronomy stand.

Doctor Allan Chapman - Posted 8 February

Sad news that Doctor Allan Chapman died on 21 January. He was 79 years old, and a public speaker - often at the London Astrofest. He was a great friend of Sir Patrick Moore, as well as Heather Couper, and Nigel Henbest! Always approachable, I remember him once saying "Hello" to me when I passed by him!

Professor Lucie Green announced his death at the start of this year's lectures.

He specialised in Historical Astronomy, and gave entertaining talks, with his distinctive voice.

In a perfect example of serendipity, a woman friend of mine, bought me his book "The Victorian Amateur Astronomer" for my last Christmas present - only one month before he died!

In the March issue of Astronomy Now, there is a full tribute to him, as he was a frequent contributer to this magazine - indeed, his last ever article written for the magazine has been published in it! The article is entitled, "Lenses, Mirrors, and

Mountings: A History of American Observatories".

More on Astrofest - Posted 10 February

As many will know, the London Astrofest comes in early February each year. Sometimes, however, the timing can vary by up to about a week. For example, in 2020, it was on 31 January - 1 February, whilst in 2013, it was on 8-9 February.

Usually, the Friday of Astofest does not coincide with our meetings, but on 8 February 2013, it did. However, this is quite rare, and the average date of Ewell Astronomical Society meetings, is around 13 February. Of course, meetings always take place on the 2nd Friday of the month although, a few years ago, we actually had one a week later, in April, due to the timing of the Easter Holidays for Nonsuch School.

Quiz Books for Quiz Nights - Posted 10 February

Also, at the Astofest, I saw TWO books on astronomical quizzes which may be good for our Quiz Nights:

- The Quizzers Guide to the Cosmos - 500 Questions about the Universe (with answers) by Steven Webb (Springer Books), published in 2024.
- The BAA Quiz - Questions and Answers, by the British Astronomical Association, published in 2021.

Halley's Comet, 40 years ago in February and March 1986 – Posted 21 February

It is now 40 years since we were all observing (or, trying to observe!) Halley's Comet.

In the UK, I had managed to observe it from 11 November 1985 to 26 January 1986. After that, it became too low in the sky for observing and reached Perhelion with the Sun on 9 February. Although it was supposed to be out of view from the UK in February and March 1986, some books suggested that it could be visible very low down in the SE sky, in the early morning, before dawn. So, I made some trips over the fields at the back of my house to try to see it! I took my 10 X 50 binoculars, and my 60mm refractor telescope with me. This was around 5.30am.

I first made the attempt on the early morning of 26 February but, inevitably, there was low cloud near the horizon. In March, I got up early, on the 3rd, 6th, 8th, and 25th, but couldn't see it, as there was, again, cloud near the horizon! On the 25th, I saw a faint patch of light below a star, low in the SE sky, but that could have been anything!

On the night of 13-14 March, the Giotto space probe made a close pass of Halley's Comet nucleus. BBC1 covered this event from 11pm to 12.30am. The programme was called "Halley's Comet: the Encounter". James Burke was at Greenwich Observatory, and Patrick Moore was at Darmstadt in Germany, where the Control Room was situated. Some Comet veterans such as Jan Oort (he first theorised the existence of the Oort Cloud), Fred Whipple, and Colin Roman, all featured on the programme, which was led by the Horizon programme, along with the Sky at Night. I found the whole programme exciting to watch; Patrick Moore, however, was not pleased with how it turned out as, for one thing, the images from Giotto made no sense whatsoever, as they had been converted into pseudo colours representing brightness levels rather than a true image! He, and others, could not understand what they were seeing. It was a German TV Producer that thought this was a good idea!

It was reported that the Prime Minister, Margaret Thatcher, like Patrick Moore, was not impressed either and said that if this was the best that the ESA could do, they would not be given any more funding from the UK!

One radio DJ said that if his pictures came out like that, then he would send them back to the chemist!

But the Giotto probe was a resounding success, even though it was knocked out of alignment by a fast-moving dust grain, and all following imagery was lost. However, images of the Nucleus were obtained, from within a few hundred miles, showing its shape and size (about 15km), along with features such as hills, and the cometary jets spouting off!

In addition, other countries such as Russia, launched 2 Vega probes to view the Nucleus, (which gave vital information to the Giotto team about exactly where in the dusty environment of the Coma, the Nucleus actually was). In addition, Japan also sent probes into the comet.

The trouble with the Giotto encounter, was that it had to meet the comet head on, so all the dust grains, even though very tiny, had a very high velocity! The designers of the Mission had foreseen this, so they equipped Giotto with a dust shield. Even so, a grain of only a few grams in weight was enough to knock the probe out of alignment.

An Uncle of mine, who lived in Canberra, Australia, sent me some publications and news clippings about the Comet in February and March. He was not impressed with the Comet, remarking that it was "a big fizzer" and it wasn't worth people coming from around the world, to see it!

Although at its brightest in March, and fairly good, it was Halley's Comet's worst apparition, in history! In addition, when at its best, it was deep in the Southern Hemisphere, out of view from the UK!

I did not see it again until it was back in our skies, on 25 April, up to 15 May, when I finally lost it in the moonlight and the encroaching sunset glow. But it did not appear much different from when I last saw it, although I thought that the Coma was a bit larger than before.

In late January 1986, Voyager 2 flew past Uranus (the first ever probe to reach it)! However, the images just showed Uranus appearing featureless, like a smooth billiard ball! Sadly, this triumph was eclipsed only 2 days later, on 28 January, by the tragic explosion of the Space Shuttle, Challenger, about 72 seconds after take-off, killing all 7 astronauts on board.

Latest Observations – Posted 22 February

It is undeniable that the weather has been particularly atrocious this month, with very few windows for observing.

This evening, however, and a few nights ago, I observed the Great Red Spot on Jupiter. I must admit that I found it disappointing, as even at 300X, it only appeared as a tiny "blob". I know that it is supposed to be shrinking in size, but I don't think that it is down to that!

Having said that, the angular size of the Great Red Spot is only about that of Uranus and Neptune, and, of course, they appear minute, even at high powers.

I saw that the Spot appeared roughly orange-brown in colour.

Jupiter is still very well placed, high in the sky, and still close to Pollux and Castor.

We are now losing Saturn and, even early in the evening, it was very low down in the sky. I also tried for Mercury, as it was at its best place in the evening sky, but I failed to find it. Surprisingly, Mercury was in the sky this month, as it is usually visible every March!

For the last 2 days, the Sun has been entirely blank, after an active period in the last few weeks!

The variable star, Mira, was still near its brightest, and easily visible in my 8 X 50 finderscope.

A Spotless Sun – Posted 24 February

After a long period of activity on the Sun, with numerous Sunspots, on the 3 days 22-24 February, I have seen a totally spotless Sun!

According to the Space Weather News website, it has been 4 years since there was last a Spotless Sun (i.e.in 2022). This may indicate that the Solar Cycle is starting to wane!

More Latest Observations – Posted 25 February

Today, the Sun was STILL blank. However, lately, even SEEING the Sun has by a very rare event!

At around 3pm today, I managed to find Venus in my telescope! Of course, as it is only just past Superior Conjunction, reached on 6 January, it still appeared very tiny. At 62X, it appeared as the size of a pinhead but was still visible as a tiny disk. Even at 222X, and 300X, it still appeared small, but clearly visible as a planet!

According to the Astronomy Now magazine, Venus was only 10' arcseconds in angular size. This is about the smallest size that Venus gets down to, but even that is a lot bigger than Uranus and Neptune, which only attain sizes of 3.6' and 2.3'! Mars can get below 4' arcseconds (Indeed, at present, it is exactly 4' arcseconds)!

At present, Venus is at about its farthest distance from the Earth. Its phase today was 98% so, in effect, it was a "Full Venus".

I last observed Venus on 23 November last year, when it was at exactly the same angular size and phase that it is now.

As the weather has been so awful, I have failed to see Mercury this time. I attempted to find it today, as it was very close to Venus, but I could not see it in my telescope. Either Mercury is now just too faint, or else, my telescope did not point accurately enough to find it.

Incidentally, today, is 55 years since I first saw a partial Solar Eclipse on 25 February 1971!
I was at Junior school, but I saw it at breaktime as a crescent. It seemed to me that the sky appeared darker, as if it was early morning, in my memory! I must have seen the Eclipse at around 10.30am or 11am. The Sun was 58% eclipsed from here.

After that, despite a prolific period of 5 Solar eclipses in a 5-year period, I had to wait until 29 April 1976, to see another one (again, at school)!

Occultation of star – Posted 27 February

This evening, I saw the Gibbous Moon occult the star, Kappa Geminorum - a fairly bright star, of magnitude 3.6, so easy to see in the telescope, despite its proximity to the bright Moon.

The star was creeping ever closer to the dark side of the Moon, but because the actual dark side limb was invisible, the star appeared to still be a little way off from the illuminated limb of the Moon, when it was occulted. Thus, it was, in a way, an illusion as the visible limb was not the one that would hide the star!

Kappa Geminorum winked out instantly, at about 9.47pm. Despite some scudding thin cloud, I managed to see the occultation, but more, thicker, cloud came over later, so I could not see the precise time of the reappearance of the star, at the bright limb, at 10.41pm. However, I could see the star, a bit later on.

As I said, the weather was messing about with varying amounts of clouds and, at times, there were even light showers!

Stars will wink out instantly - like a light bulb being switched off - as a star has essentially no angular size, for our observational purposes. Planets, on the other hand, do have a sizeable angular dimension, so the Moon can take up to a number of seconds to blot them out. In addition, tonight, the Moon was only about 4 degrees to the South of Pollux, whilst Jupiter was only a few degrees to the West of the Moon. Jupiter was still only a few degrees from Castor and Pollux.

What's the point of a space station around the Moon?

Acknowledgement: This article was written by Berna Akcali Gur, Lecturer in Outer Space Law, Queen Mary University of London. First published in THE CONVERSATION on 3 February 2026., 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/whats-the-point-of-a-space-station-around-the-moon-274765

The Lunar Gateway is planned space station that will orbit the Moon. It is part of the NASA led Artemis programme. Artemis aims to return humans to the Moon, establishing a sustainable presence there for scientific and commercial purposes, and eventually reach Mars.

However, the modular space station now faces delays, cost concerns and potential US funding cuts. This raises a fundamental question: is an orbiting space station necessary to achieve lunar objectives, including scientific ones?

The president's proposed 2026 budget for NASA sought to cancel Gateway. Ultimately, push back from within the Senate led to continued funding for the lunar outpost. But debate continues among policymakers as to its value and necessity within the Artemis programme.

Cancelling Gateway would also raise deeper questions about the future of US commitment to international cooperation within Artemis. It would therefore risk eroding US influence over global partnerships that will define the future of deep space exploration.

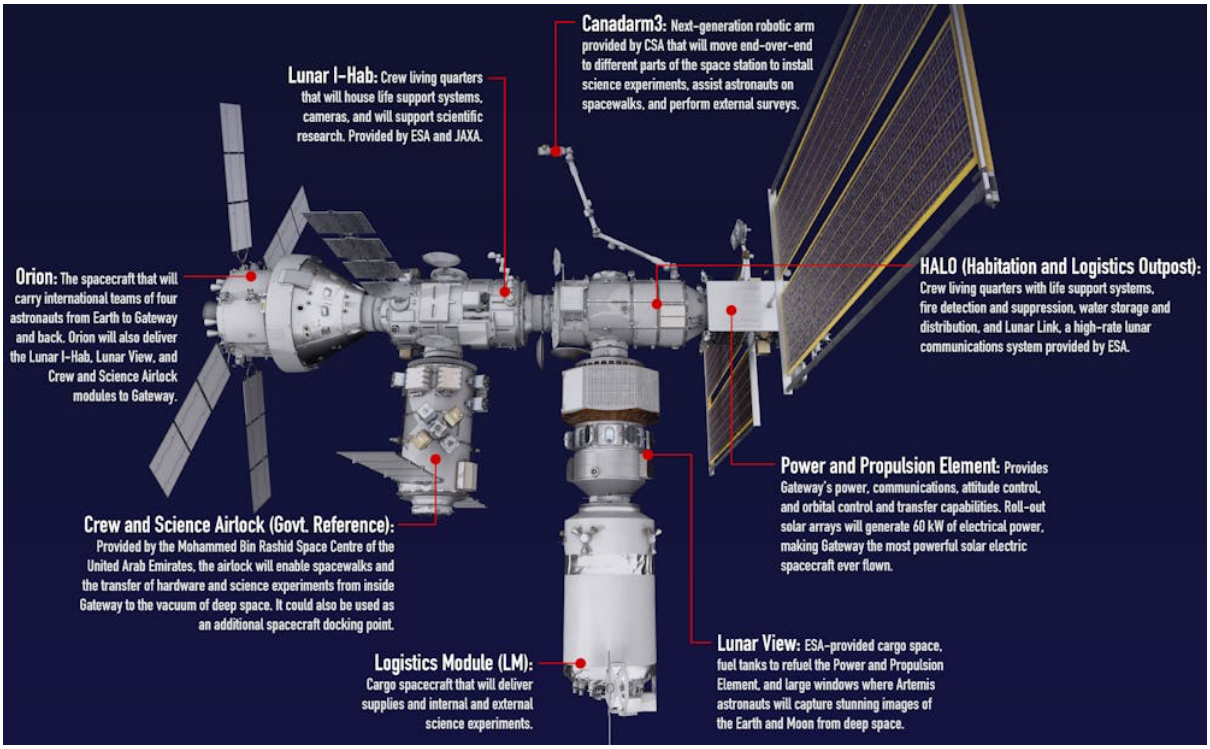
Gateway was designed to support these ambitions by acting as a staging point for crewed and robotic missions (such as lunar rovers), as a platform for scientific research and as a testbed for technologies crucial to landing humans on Mars.

It is a multinational endeavour. Nasa is joined by four international partners, the Canadian Space Agency, the European Space Agency (ESA), the Japan Aerospace Exploration Agency and the United Arab Emirates' Mohammed Bin Rashid Space Centre.

Most components contributed by these partners have already been produced and delivered to the US for integration and testing. But the project has been beset by rising costs and persistent debates over its value.

If cancelled, the US abandonment of the most multinational component of the Artemis programme, at a time when trust in such alliances is under unprecedented strain, could be far reaching.

It will be assembled module by module, with each partner contributing components and with the possibility of additional partners joining over time.



The Lunar Gateway. NASA

Strategic aims

Gateway reflects a broader strategic aim of Artemis, to pursue lunar exploration through partnerships with industry and other nations, helping spread the financial cost – rather than as a sole US venture. This is particularly important amid intensifying competition – primarily with China.

China and Russia are pursuing their own multinational lunar project, a surface base called the International Lunar Research Station. Gateway could act as an important counterweight, helping reinforce US leadership at the Moon.

In its quarter-century of operation, the ISS has hosted more than 290 people from 26 countries, alongside its five international partners, including Russia. More than 4,000 experiments have been conducted in this unique laboratory.

In 2030, the ISS is due to be succeeded by separate private and national space stations in low Earth orbit. As such, Lunar Gateway could repeat the strategic, stabilising role among different nations that the ISS has played for decades.

However, it is essential to examine carefully whether Gateway's strategic value is truly matched by its operational and financial feasibility.

It could be argued that the rest of the Artemis programme is not dependant on the lunar space station, making its rationales increasingly difficult to defend.

Some critics focus on technical issues, others say the Gateway's original purpose has faded, while others argue that lunar missions can proceed without an orbital outpost.

Sustainable exploration

Supporters counter that the Lunar Gateway offers a critical platform for testing technology in deep space, enabling sustainable lunar exploration, fostering international cooperation and laying the groundwork for a long term human presence and economy at the Moon. The debate now centres on whether there are more effective ways to achieve these goals.

Despite uncertainties, commercial and national partners remain dedicated to delivering their commitments. ESA is supplying the International Habitation Module (IHAB) alongside refuelling and communications systems. Canada is building Gateway's robotic arm, Canadarm3, the UAE is producing an airlock module and Japan is contributing life support systems and habitation components.

US company Northrop Grumman is responsible for developing the Habitat and Logistics Outpost (Halo), and American firm Maxar is to build the power and propulsion element (PPE). A substantial portion of this hardware has already been delivered and is undergoing integration and testing.

If the Gateway project ends, the most responsible path forward to avoid discouraging future contributors to Artemis projects would be to establish a clear plan to repurpose the hardware for other missions.

Cancellation without such a strategy risks creating a vacuum that rival coalitions, could exploit. But it could also open the door to new alternatives, potentially including one led by ESA.

ESA has reaffirmed its commitment to Gateway even if the US ultimately reconsiders its own role. For emerging space nations, access to such an outpost would help develop their capabilities in exploration. That access translates directly into geopolitical influence.

Space endeavours are expensive, risky and often difficult to justify to the public. Yet sustainable exploration beyond Earth's orbit will require a long-term, collaborative approach rather than a series of isolated missions.

If the Gateway no longer makes technical or operational sense for the US, its benefits could still be achieved through another project.

This could be located on the lunar surface, integrated into a Mars mission or could take an entirely new form. But if the US dismisses Gateway's value as a long term outpost without ensuring that its broader benefits are preserved, it risks missing an opportunity that will shape its long term influence in international trust, leadership and the future shape of space cooperation.

Home Sweet Globular – John Pillar

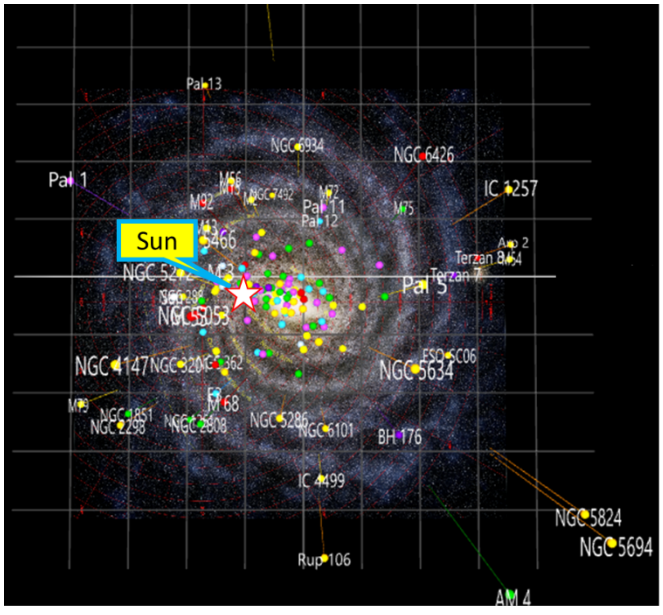
Wake up, draw back the curtains, let in a million stars. Your sun hasn't risen yet, but it's not dark - the sky is filled with points of light... some glowing fiery red, others visibly varying as you watch. The Milky Way, a beautiful grand-design barred spiral, is barely visible through the veil of stars, but you can make it out, stretching across most of the early dawn sky

against the blackness of space beyond. Your view might look like the scene in Figure 1, a computer simulation posted in Astronomy, 2014.

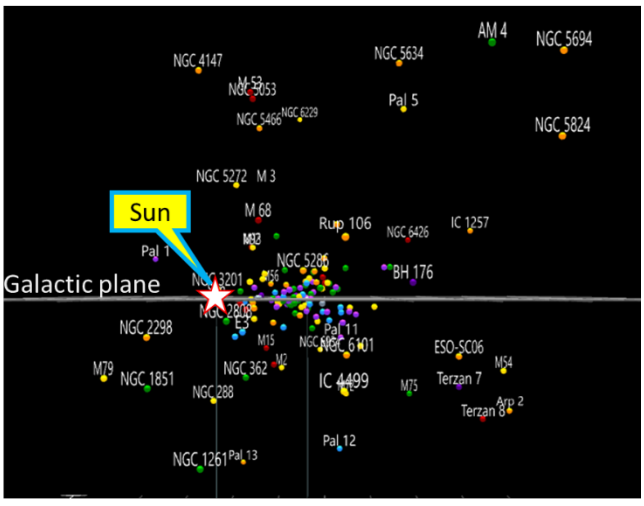
Figure 1:The night sky from a planet in a globular cluster. From a simulation by Harris and Webb, Department of Physics and Astronomy at McMaster University in Hamilton, Ontario. In Astronomy July, 2014.
https://www.physicsforums.com/attachments/life-inside-a-globular-cluster-pdf.79520/

What would it be like to live in a globular cluster? How different would the night sky be? And – what are globular clusters, anyway?

What is a globular cluster?



View from above.



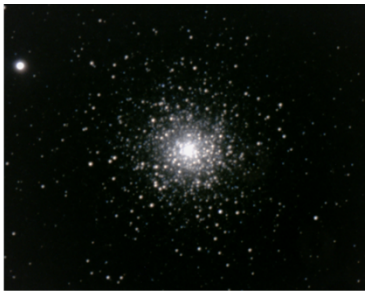
View from the side, on the galactic plane.

Figure 2: Top-down and side view of the Milky Way, showing globular clusters. See https://www.galaxies3d.org/section-download.htm for source

Globular clusters are ball shaped conglomerations of thousands to millions of stars bound together by gravity, orbiting their host galaxy like bees around a honeypot (Figure 2 above). A galaxy may harbour several hundred to thousands of globular clusters … the Milky Way has at least 160 clusters orbiting within its galactic halo – a sphere of stars, gas and dark matter that extends far beyond the extent of the visible Milky Way spiral structure shown in Figure 2. Many are visible through binoculars – they are always a fun target at star-parties - M5, M13, M15, to name just a few.

M5 in Serpens

M13 in Hercules



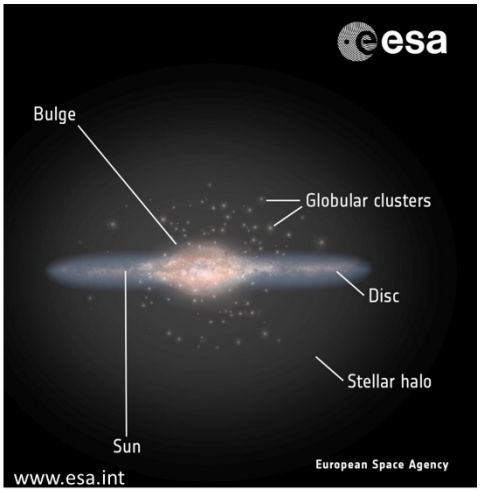
M15 in Pegasus

Some nearby clusters are bright and easy to view, others are distant - an example of which is Palomar-5, which is dimmed by 3 orders of magnitude because it is located in the outer halo of the Milky Way. The number of globular clusters around a given galaxy appears to be related to its mass: Andromeda has about 400 known globular clusters, while the giant M87 galaxy has more than 10,000.

Palomar 5

Most globular clusters are believed to have formed very early in the history of the Universe, at the same time as their host galaxies were forming about 12 billion years ago. The general consensus is that globular clusters formed from intense, short, periods of star formation in large hydrogen/helium gas clouds depleted in heavier elements (astronomers 'metals'). New star formation ceased promptly when all the gas had been used up, and the star population followed a standard aging process – larger stars fading early to leave a population of long-lived small/medium stars as observed today

This process of formation is probably generally correct, but modern observations and studies are revealing a more nuanced history for many globular clusters.



In 1939 a Dutch astronomer, Pieter Oosterhoff, noted that globular clusters appeared to fall into 2 groups based on the periodicity of their RR Lyrae stars – either around 13 hours (type I), or 16 hours (type II) - a subtle but significant difference. The difference in periods of these two types of RR Lyrae stars is correlated to their metallicity (heavy elements) content – type II have more "metals" and are more varied in composition.

The subtle differences in chemistry, together with precise measurements of the movement of globular clusters around their parent galaxy reveal secrets of a cluster's formation and history.

Type I globular clusters are almost as old as the universe and are comprised of population II stars - characterised by very low metals content due to the fact that they formed from pristine clouds of hydrogen and helium before subsequent generations of stars had enriched the interstellar medium with heavy elements. They are found predominantly in the outer galactic halo, commonly following retrograde orbits around the galactic centre. They are thought to have formed around early, dwarf, galaxies which were subsequently captured and incorporated by larger galaxies such as the Milky Way. The Large Magellanic Cloud (LMC) is an example of a local dwarf galaxy - it has 16 known clusters. Approximately 20% of globular clusters are Type I.

RR Lyrae stars are ancient, small (half the suns mass), and vary in brightness on a regular cycle of a few hours. They are more common in globular clusters, but are also found in the galactic halo and bulge.

Type II globular clusters comprise about 80% of the population and are characterised by higher metals content due to the fact that they formed about 2 billion years later than type I when the interstellar medium had been enriched in heavy elements by supernovae explosions. These globular clusters are mainly found in the galactic bulge and inner halo, where gas densities were highest within the host galaxy such as the Milky Way.

A few clusters owe their origin to more recent violent episodes of star formation in transient pressure waves during galactic mergers, in dense star-clusters, or possibly in dark-matter driven gravitational 'gas-sinks' that collapse to form a high concentration of stars.

An example of present-day globular cluster formation is found in the Antennae Galaxies (NGC 4038 and 4039 in Corvus) - a galactic scale collision of gas and dust in the presence of intense magnetic fields.

Figure 3: The Antennae Galaxies - 2 interacting galaxies undergoing intense star and globular cluster formation (Hubble Space Telescope image)

Are Globular Clusters likely to contain planetary systems and life?

Globular clusters contain hundreds of thousands of stars crammed into a very small space. The central core volume of a cluster typically contains many thousands of stars – whereas our nearest stars are several light years away, in the core of a globular cluster the average distance between stars would be only 0.1 to 1 light-year apart. In other words, between the sun and Alpha-Centauri, our nearest star, there could be as many as 5 to 10 intervening stars!!

There are two main difficulties with regard to planet formation and life potential in globular clusters.

1) Because globular clusters typically contain low-metallicity Gen II stars there is less raw material (silicon, iron, magnesium for example) to form rocky planets, unlike our own, Gen 1, solar system.
2) Because star collisions and interactions are so common, planets are likely to only survive around their parent star for a few million years before being captured or ejected into interstellar space by a close stellar encounter. There is therefore less time for life to evolve before the evolutionary process is impacted by a catastrophic inter-stellar event.

Therefore, in reality, our opening scenario of an alien viewing the early morning sky, ablaze with stars, is highly unlikely - unfortunately for them.

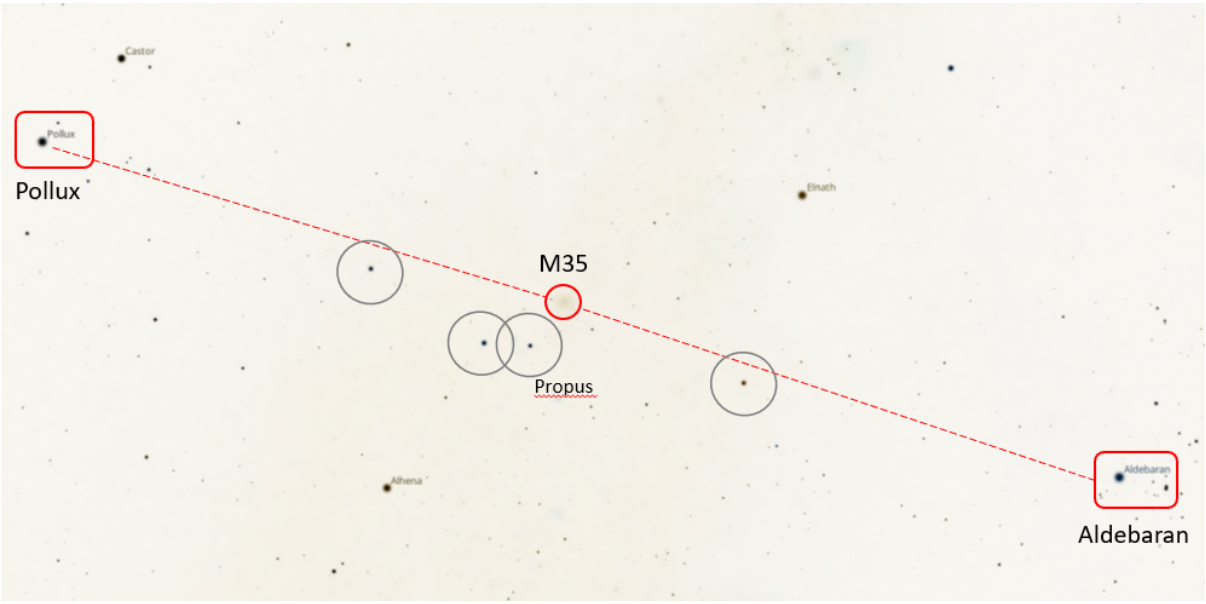
Our star, solar-system and biosphere teeming with highly evolved life is an end-product of a 12 billion year process – the formation and demise of a population 2 star, collapse of a gas cloud enriched in heavy elements, coalescence into a star and planetary system, and finally insertion into a goldilocks zone, not too hot, not too cold, around a stable, long-lived population 1 star, our sun.

Object of the month – Open Cluster M35 in Gemini – Martin Howe

Messier 35 (M35) is an open star cluster located in the constellation Gemini, approximately 2,800 light-years from Earth. M35 has a combined magnitude of +5.2, and so should be just visible with the naked eye under dark skies but readily seen through a pair of binoculars even from inner London as a faint fuzzy patch of light. Although its existence may have been known to ancient astronomers, its discovery has been credited to the Swiss astronomer Philippe Loys de Chéseaux in 1745, but then formally catalogued by Charles Messier in 1764, becoming object number 35 in his catalogue of deep-sky objects. It is thought to contain about 500 stars over an area of about 25 arcminutes in diameter (about the same size as the full Moon).

The cluster is relatively young, with an estimated age of about 150 million years – not too dissimilar in age to what is probably the most well-known open cluster in the skies – M45 or the Pleiades. Most open clusters disperse over time, but some remain bound for much longer – for example, M67 in the constellation of Cancer is thought to be several billion years old.

The M35 cluster is embedded in the plane of the Milky Way, making it appear against a backdrop of a dense starfield, making for a striking view. Although quite faint, M35 is relatively easy to find with binoculars. To find it, take a straight-line joining Pollux (the lower, slightly brighter, of the two main stars in Gemini) and Aldebaran (the distinctive bright red star in Taurus). M35 is located about half-way along this line between these two bright stars. Further guiding stars can be seen on the chart below (from Stellarium) – there are 4 relatively bright stars, all about 3rd magnitude, spread out just below this imaginary line. These should be quite easy to see, even from inner London, as there are no other similarly bright stars in the immediate area. Propous, the third one of these along the line from Pollux, lies about 2^{o} below M35



The image below was taken with an ASI294MC camera attached to a 71mm refractor fitted with an L-Pro light pollution filter. M35 is in the middle of the image, with the much more compact NGC 2158 just above it.

Up Next:

NEXT MEETING: 8pm Friday 13 March – Nonsuch High School

Astha Chaturvedi from University of Surrey will give a talk entitled "Mitigation of Light Pollution due to Artificial Satellites."

The talk will describe the results of a project to assess the potential for ultra-black coatings to bring satellite brightness close to the International Astronomical Union's threshold for light pollution.

As usual, there will also be a presentation on the sky at night for the coming month.

NEXT USER GROUP:

Suspended until further notice.

NEXT OBSERVING SESSIONS

The next sessions, allowing for moon rise & set times and cloud conditions, should be sometime around the new moon which is on 19 March.

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 16 – 22 March.

AD HOC OBSERVING AT WARREN FARM:

These will be at short notice when the weather is favourable, and may replace, or be additional to, sessions at Denbies. Please watch our WhatsApp feed for alerts