JANUS
THE NEWSLETTER OF EWELL ASTRONOMICAL SOCIETY

December 2022 EDITION
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Editorial

Welcome to the December edition of Janus. This month sees the last meeting of the year – our AGM (with raffle and quiz!!)

Some good news. NASA's second major mission of 2022 (Artemis-1) finally launched successfully on 16th November, carrying the Orion spacecraft on its journey to the Moon. Now well into its approximately 25-day mission, it has sent back pictures of the Moon's surface, and reached its furthest distance from earth (~270,000 miles) on 28th November. This is the furthest a man-rated spacecraft has been from Earth since Apollo 13. For live updates on the mission go to: *https://www.space.com/news/live/nasa-artemis-1-moon-mission-updates*

Closer to home, there is a possibility that the first ever spacecraft launch from the UK will take place before Christmas from Spaceport Cornwall, located at Cornwall Airport, Newquay.

Unlike traditional vertical launch locations, Spaceport Cornwall is utilising an existing airport and its facilities to launch to space. In its first deployment outside the US, Virgin Orbit's carrier launch system, a modified Boeing 747 called Cosmic Girl, will take off from the runway, climb to an altitude of around 35,000 feet and deploy their Launcher-one rocket, whilst in mid-air. The carrier aircraft will return to land, while the rocket will take its payload of 7 small satellites into space and deploy them into Low Earth Orbit. More information at: *https://www.gov.uk/government/news/spaceport-cornwall-receives-first-ever-uk-spaceport-licence* and *https://spaceportcornwall.com/the-launch*

John

skyUpdate
What's up this month?

The Solar System December

MERCURY: begins the month having recently passed behind the Sun at superior solar conjunction. It will be very difficult to see, reaching its highest point in the sky during daytime and being 1° below the horizon at dusk. By the end of the month, visible as an evening object, having recently passed greatest elongation east it remains difficult to see reaching its highest point in the sky during daytime and being no higher than 2° above the horizon at dusk.

VENUS: recently passed behind the Sun at superior solar conjunction. At the beginning of the month, it is not readily observable, reaching its highest point in the sky during daytime and being level with the horizon at dusk. By the end of the month, it is easier to see, but will still reach its highest point in the sky during daytime and be no higher than 5° above the horizon at dusk.

MARS: is currently approaching opposition and is visible throughout the month as a morning object. It begins the month becoming accessible around 17:12 UT, when it reaches an altitude of 7° above the NE horizon. It will then reach its highest point in the sky at 00:30, 63° above the S horizon, before being lost to dawn twilight around 07:16, 12° above the NW horizon. At the end of the month, it becomes accessible around 16:25 UT, when it reaches an altitude of 24° above the E horizon. Reaching its highest point in the sky at 21:46, 63° above the S horizon, it will continue to be observable until around 05:02, when it sinks below 7° above the NW horizon.

JUPITER: is currently an early evening object, visible in the evening sky. It begins the month becoming accessible around 16:19 UT, 25° above the SE horizon, as dusk fades to darkness. It will then reach its highest point in the sky at 19:15, 36° above the S horizon, and will continue to be observable until around 00:14, when it sinks below 7° above

the W horizon. By the end of the month, it becomes accessible around 16:25 UT, 36° above the S horizon, as dusk fades to darkness. It will then reach its highest point in the sky at 17:25, 37° above the S horizon, and will continue to be observable until around 22:29, when it sinks below 7° above the W horizon.

SATURN: begins the month as an early evening object, now receding into evening twilight. Visible in the evening sky, it becomes accessible around 16:42 UT, 22° above the S horizon, as dusk fades to darkness. It will then reach its highest point in the sky at 16:48, 22° above the S horizon, and will continue to be observable until around 19:55, when it sinks below 11° above the SW horizon. By the end f the month, it will soon pass behind the Sun at solar conjunction. Becoming visible around 16:50 UT, 19° above the SW horizon, as dusk fades to darkness, it will then sink towards the horizon, setting 3 hours and 43 minutes after the Sun at 19:43.

URANUS: having recently passed opposition, is visible throughout the month in the evening sky. It begins the month becoming accessible around 17:23 UT, 23° above the E horizon, as dusk fades to darkness. It will then reach its highest point in the sky at 22:11, 54° above the S horizon, and will continue to be observable until around 03:15, when it sinks below 21° above the W horizon. At the end of the month, it becomes accessible around 17:30 UT, 42° above the SE horizon, as dusk fades to darkness. Reaching its highest point in the sky at 20:09, 54° above the S horizon, it will continue to be observable until around 01:11, when it sinks below 21° above the W horizon.

NEPTUNE: is currently an early evening object, and begins the month visible in the evening sky, becoming accessible around 17:23 UT, 31° above the SE horizon, as dusk fades to darkness. It will then reach its highest point in the sky at 18:52, 34° above the S horizon, and will continue to be observable until around 21:56, when it sinks below 21° above the SW horizon. By the end of the month, still an early evening object, receding into evening twilight, it becomes accessible around 17:30 UT, 34° above the SE horizon, as dusk fades to darkness. It will then sink towards the horizon, setting at 22:38.

MOON PHASES:

First Quarter	30 Nov
Full Moon	8 Dec
Last Quarter	16 Dec
New Moon	23 Dec
First Quarter	30 Dec

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

December

1 Mars at perigee
Asteroid 349 Dembowska at opposition
2 Conjunction of the Moon and Jupiter
3 Neptune ends retrograde motion
5 Lunar occultation of Uranus
6 December φ-Cassiopeid meteor shower 2022
8 Lunar occultation of Mars
Conjunction of the Moon and Mars
Mars at opposition
9 Monocerotid meteor shower 2022
10 1 Ceres at perihelion
12 σ-Hydrid meteor shower 2022
14 Geminid meteor shower 2022
15 81P/Wild at perihelion
16 Comae Berenicid meteor shower 2022
20 December Leonis Minorid meteor shower 2022
21 Mercury at greatest elongation east
December solstice
22 Ursid meteor shower 2022
24 Mercury at dichotomy
26 Conjunction of the Moon and Saturn
Mercury at highest altitude in evening sky
29 Conjunction of the Moon and Jupiter

Collected Observations (and thoughts) – Gary Walker

More on the October Eclipse

As I reported last month, the solar eclipse was not total, or annular, anywhere on Earth, it was a partial eclipse with degrees of partiality from 15% (as was seen locally) up to 85% at maximum.

However, from orbit, the solar satellite, Hinode, was able to view and image it as an annular eclipse! Images of this, are on the NASA website.

Some eclipses are like that, when the central shadow of the Moon just misses the Earth's surface, entirely!

Incidentally, on 21st November 1969, Apollo 12, photographed a Solar Eclipse that was not visible from the Earth at all. They saw it as a total eclipse with a "diamond ring"! This is also on the NASA website.

Dr Stephen Fossey

Our speaker for the November meeting, Dr Stephen Fossey, gave us a talk on exoplanets. He didn't mention at the lecture that he, and his students at Mill Hill Observatory in London, discovered a Supernova in the M82 galaxy in Ursa Major in January 2014. This was just discovered by chance, in a break in the clouds, in a big city!

This supernova reached a magnitude of 10.5, so it was not too difficult to see in a small telescope! I saw it through my 8" SCT, quite easily. The galaxy of M82 itself, is well worth seeing. In my scope, it is fairly easy to see, once you get dark adapted, appearing as a long linear line of light. It is one of the few deep sky objects that actually appears, visually, very similar to its photographic images!

Many of us visited Mill Hill Observatory in 2016, and we were shown the Observatory's telescopes, in their various domes. Inevitably, of course, it was too cloudy to observe anything!

Back to the Moon – 16 Nov

Today, after previous abortive attempts, the Artemis 1 rocket to the Moon, was finally launched (3rd time lucky!).

50 years ago, NASA were about to launch Apollo 17, the last of the manned Moon missions! This mission was launched on 7th December and returned to Earth on 19th December 1972.

Since then, no one has walked on the Moon, although there have been a number of unmanned missions, such as China landing a lander on the far side (the first one to land on that side!). There have also been a number of Orbiter probes, some of which have imaged the Apollo landing sites, which show footprints and Moon Rover tracks, as well as the base of the Lunar Modules!

Of course, the Apollo landings now seem to be legendary, even to those like myself that lived through them, so they must seem even more unreal to those people that are much younger! That was a magical time for those of us lucky to be around in that period!

I was just finishing my Infants School when Apollo 11 went up, and I was in the Junior school for the others.

When people do land on the Moon again, I wonder what the conspiracy theorists will make of them, and whether they will deny them, too! Sadly, I jest not, as that will, undoubtedly, happen.

Mars Attacks – 20 Nov

This evening, I observed Mars. The most prominent feature on the planet, Syrtis Major, was coming onto the Earth-facing side. At about 8.15pm, the "hump" was still foreshortened, as it was still close to the limb, but about two hours later it was placed centrally on Mars. The rotation of Mars was thus clear to see!

Through my telescope, it appeared as a 'hump', or 'peak', with long linear dark features either side of it. These were the "seas" of Mare Cimmerium - Tyrrennum on one side, and Mare Serpentis on the opposite side.

Mars was now nearly at maximum angular size, for this opposition, at 16.9' arcseconds. The dark features were just about visible, even at 62X, and 100X, but I got my best views at 222X. I could see the North Polar Hood, appearing as a beautiful blue colour along the Northern limb. This was only visible in direct viewing, i.e. without a filter. Mars was beautiful, even with the naked eye, as a bright orange star, easily outshining the nearby orange star, Aldeberan.

Artemis passing the Moon – 21 Nov

Today, I was able to watch on my phone, in real time, images of Artemis slowly approaching the Moon, and then going around it. I could see the Moon slowly growing in size, and it was announced that Artemis was about 2000 miles from it. The Earth was visible as a tiny disk in the background.

Artemis must have been passing the Moon's far side, as there were hardly any Lunar Mares visible in the view of the Moon - they are virtually all on the Earth - facing side!

A little later, Artemis was orbiting low over the lunar surface!

Artemis: why it may be the last mission for Nasa astronauts

Acknowledgement: This article was written by Lord Martin Rees, Emeritus Professor of Cosmology and Astrophysics, University of Cambridge and was published in THE CONVERSATION on 23rd November 2022. It is republished in full under a Creative Commons Licence. The original article, with additional links can be found here: *https://theconversation.com/artemis-why-it-may-be-the-last-mission-for-nasa-astronauts-195065*

Neil Armstrong took his historic "one small step" on the Moon in 1969. And just three years later, the last Apollo astronauts left our celestial neighbour. Since then, hundreds of astronauts have been launched into space but mainly to the Earth-orbiting International Space Station. None has, in fact, ventured more than a few hundred kilometres from Earth.

The US-led Artemis programme, however, aims to return humans to the Moon this decade – with Artemis 1 on its way back to Earth as part of its first test flight, going around the Moon.

The most relevant differences between the Apollo era and the mid-2020s are an amazing improvement in computer power and robotics. Moreover, superpower rivalry can no longer justify massive expenditure, as in the Cold War competition with the Soviet Union. In our recent book "The End of Astronauts", Donald Goldsmith and I argue that these changes weaken the case for the project.

The Artemis mission is using NASA's brand new Space Launch System, which is the most powerful rocket ever – similar in design to the Saturn V rockets that sent a dozen Apollo astronauts to the Moon. Like its predecessors, the Artemis booster combines liquid hydrogen and oxygen to create enormous lifting power before falling into the ocean, never to be used again. Each launch therefore carries an estimated cost of between $2 billion (£1.7 billion) and $4 billion.

This is unlike its SpaceX competitor "Starship", which enables the company to recover and the reuse the first stage.

The benefits of robotics

Advances in robotic exploration are exemplified by the suite of rovers on Mars, where Perseverance, Nasa's latest prospector, can drive itself through rocky terrain with only limited guidance from Earth. Improvements in sensors and artificial intelligence (AI) will further enable the robots themselves to identify particularly interesting sites, from which to gather samples for return to Earth.

Within the next one or two decades, robotic exploration of the Martian surface could be almost entirely autonomous, with human presence offering little advantage. Similarly, engineering projects – such as astronomers' dream of constructing a large radio telescope on the far side of the Moon, which is free of interference from Earth – no longer require human intervention. Such projects can be entirely constructed by robots.

Instead of astronauts, who need a well equipped place to live if they're required for construction purposes, robots can remain permanently at their work site. Likewise, if mining of lunar soil or asteroids for rare materials became economically viable, this also could be done more cheaply and safely with robots.

Robots could also explore Jupiter, Saturn and their fascinatingly diverse moons with little additional expense, since journeys of several years present little more challenge to a robot than the six-month voyage to Mars. Some of these moons could in fact harbour life in their sub-surface oceans.

Even if we could send humans there, it might be a bad idea as they could contaminate these worlds with microbes form Earth.

Managing risks

The Apollo astronauts were heroes. They accepted high risks and pushed technology to the limit. In comparison, short trips to the Moon in the 2020s, despite the $90-billion cost of the Artemis programme, will seem almost routine.

Something more ambitious, such as a Mars landing, will be required to elicit Apollo-scale public enthusiasm. But such a mission, including provisions and the rocketry for a return trip, could well cost Nasa a trillion dollars – questionable spending when we're dealing with a climate crisis and poverty on Earth. The steep price tag is a result of a "safety culture" developed by Nasa in recent years in response to public attitudes.

This reflects the trauma and consequent programme delays that followed the Space Shuttle disasters in 1986 and 2003, each of which killed the seven civilians on board. That said, the shuttle, which had 135 launches altogether, achieved a failure rate below two percent. It would be unrealistic to expect a rate as low as this for the failure of a return trip to Mars – the mission would after all last two whole years.

Astronauts simply also need far more "maintenance" than robots – their journeys and surface operations require air, water, food, living space and protection against harmful radiation, especially from solar storms.

Already substantial for a trip to the Moon, the cost differences between human and robotic journeys would grow much larger for any long-term stay. A voyage to Mars, hundreds of times further than the Moon, would not only expose astronauts to far greater risks, but also make emergency support far less feasible. Even astronaut enthusiasts accept that almost two decades may elapse before the first crewed trip to Mars.

There will certainly be thrill-seekers and adventurers who would willingly accept far higher risks – some have even signed up for a proposed one-way trip in the past.

This signals a key difference between the Apollo era and today: the emergence of a strong, private space-technology sector, which now embraces human spaceflight. Private-sector companies are

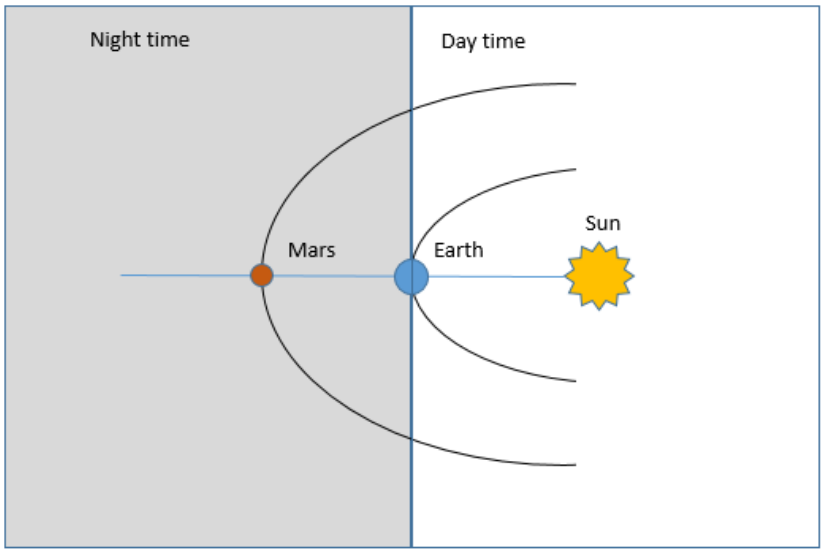
now competitive with Nasa, so high-risk, cut-price trips to Mars, bankrolled by billionaires and private sponsors, cold be crewed by willing volunteers. Ultimately, the public could cheer these brave adventurers without paying for them.

Given that human spaceflight beyond low orbit is highly likely to entirely transfer to privately-funded missions prepared to accept high risks, it is questionable whether Nasa's multi-billion-dollar Artemis project is a good way to spend the government's money. Artemis is ultimately more likely to be a swansong than the launch of a new Apollo era.

Object of the month: Mars – Martin Howe

With Saturn pretty much gone for the year, and Jupiter moving more into the Western hemisphere, it is the time for Mars to assert its dominance in the sky. At the beginning of December, it is already a brilliant and unmistakeable red object at about magnitude –1.83. It reaches opposition on 8th December, by which stage it will have increased slightly further in brightness to magnitude -1.86.

A superior planet, that is, one with its orbit beyond Earth, is said to be at opposition when the planet is on the opposite side of the Sun from the Earth and hence is visible throughout the night. At the beginning of December Mars will be rising about 3:30pm and not setting until about 8:30am.



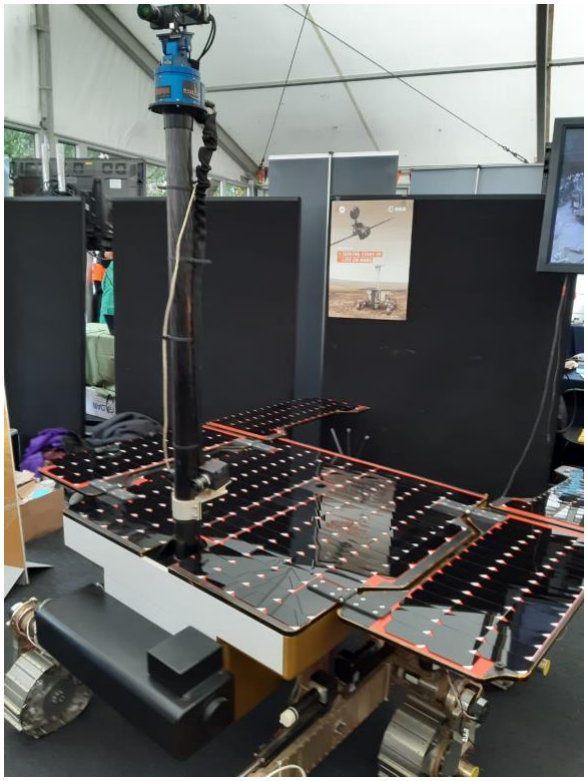
Mars At opposition, 8 December

At the beginning of December Mars will be easy to find towards due East, sitting at about 24 degrees altitude by 7pm. It will be a little over 10 degrees East of the red giant star Aldebaran in Taurus, but Aldebaran will pale into significance at only magnitude +0.85 – it will be interesting to compare the two in the sky.

As Mars crosses the meridian (due South) it will have reached a 63 degree altitude above the horizon, so should be well clear of any murk of the London atmosphere.

The 8th of December also coincides with an occultation of Mars – where the Moon passes in front of Mars. A lunar occultation of any planet is quite a rare event and worth trying to see if you can – it should be readily visible in binoculars. Unfortunately, however, the Moon will be full, making Mars more difficult to see in the glare and also the event occurs about 5am in the morning!

Mars is the most explored planet beyond our own, with about 50 missions attempted, but with many of the earlier missions ending in failure. The first successful mission was the NASA Mariner 4 flyby in 1964, with the first successful landing being the Viking lander in 1975. There are currently about 11 active missions on or in orbit around Mars, including missions from the US, Europe, Russia, India, China and the UAE. There are more planned, including sample return missions by Japan and NASA, as well as the delayed European Rosalind Franklin (ExoMars) rover.



Above is an image I took of a full-scale model, which was on display at UCL a couple of years ago. The UCL Mullard Space Science laboratory in Surrey developed the panoramic camera for this rover (on the top of the mast just off the top of this photo), which was due to be launched by Roscosmos in September this year. The launch was delayed indefinitely due to the conflict in Ukraine, and the search is on for a new launch vehicle and launch window, which may be some years away.

Mars is now about 17 arcseconds in diameter, so not a large object, but a disc should be readily discernible under magnification through a small telescope.

The image above was taken using a ZWO ASI294MC colour CMOS camera attached to a 127mm refractor with a 3x Barlow lens. A video sequence of 800 frames was captured and the best 40% of these were stacked in the freeware AutoStakkert. Sharpening was then performed in the freeware Registax, followed by some minor tweaks, and cropping in Photoshop. Unfortunately, the night this was taken there was a thin haze that slowly increased over the time the images were taken, impacting the sharpness of the final image.

Up Next:

NEXT MEETING: 8pm Friday 9th December – Nonsuch High School

EAS Annual General Meeting.

No lecture, but there will be a quiz.

Ron Canham 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, may be sometime around the new moon on 23rd December. The precise date and timings of any session will be advised by email and WhatsApp a few days in advance

AD HOC OBSERVING AT WARREN FARM:

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

25th October 25th 2022 – Partial Eclipse of the Sun – Ron Johnson

102mm f9.8 OG full aperture solar filter Canon 400D DSLR – Seeing: AIII / IV, Trans. poor. (Thin cloud and contrails passing over the Sun)

09.08UT First Contact

09.19UT

09.24UT

09.34UT

09.44UT

09.58UT Maximum Eclipse (17%)

10.05UT

Cloudy 10.06 – 10.48UT

10.50UT Final Contact

102mm f9.8 OG +Canon 400D DSL