JANUS
THE NEWSLETTER OF EWELL ASTRONOMICAL SOCIETY

March 2024 EDITION
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Editorial

Welcome to the March edition of Janus. Our lecture this month will be given by Nick James, Director of the BAA's Comet section, who will talk about Comets.

March, of course, sees the end of GMT and with it a lengthening of daylight hours, which means a later start to observations. It is to be hoped that there will also be an increase in the number of clear nights – February has been as bad as January in this regard!

February was another eventful month for space exploration. On 15 February, the US launched another lunar mission on a SpaceX rocket. Although backed by NASA, the launch was privately funded by Intuitive Machines and carried a lander called Odysseus which, late in the evening of 22 February, landed successfully on the Moon, near the lunar South Pole (about 186 miles from it), near a crater called Malapert. This established the first US presence on the Moon since Apollo 17, more than 50 years ago.

However, in a repeat of the misfortune suffered by the Japanese SLIM lander, Oydesseus tipped over on its side after landing. Apparently, this was because it descended too fast. At first, it appeared to be functioning OK but, whilst it's sending back some data, it has yet to send back any images.

Clearly, my earlier comment that Space missions are challenging still holds – particularly where a landing on the unpredictable, rocky surface of a planet is concerned!

On a brighter note (no pun intended!), it has been announced that the Japanese lunar lander, having survived the week long lunar night (which it wasn't expected to), has woken up again and is providing data!

John

The Solar System March

MERCURY: begins the month, having recently passed behind the Sun at superior solar conjunction, and is extremely difficult to see, being very close to the Sun, at a separation of only 2° from it. By the end of the month, it will soon pass in front of the Sun at inferior solar conjunction. Although observable, it will be difficult to see, reaching its highest point in the sky during daytime and being no higher than 6° above the horizon at dusk.

VENUS: begins the month still just about visible as a morning object, now well past greatest elongation W and returning closer to the Sun. It will be difficult to see, reaching its highest point in the sky during daytime and being no higher than 2° above the horizon at dawn. By the end of the month, it will soon pass behind the Sun, and will not be observable, reaching its highest point in the sky during daytime and being 1° below the horizon at dawn.

MARS: recently passed behind the Sun at solar conjunction. Throughout the month it is not observable, reaching its highest point in the sky during daytime and being on or below the horizon at dawn.

JUPITER: begins the month as an early evening object, now receding into evening twilight, and becoming accessible around 18:01, 45° above the SW horizon, as dusk fades to darkness. It will then sink towards the horizon, setting at 23:14. By the end of the month, soon to pass behind the Sun at solar conjunction, it will become visible at around 19:52, 26° above the W horizon. It will then sink towards the horizon, setting 3 hours and 17 minutes after the Sun at 22:49.

SATURN: recently passed behind the Sun at solar conjunction and, throughout the month, is not readily observable. It begins the month very close to the Sun, at a separation of 1° from it, and ends it reaching its highest point

in the sky during daytime and being 2° below the horizon at dawn.

URANUS: begins the month as an early evening object, now receding into evening twilight. It will become visible at around 18:59, 44° above the SW horizon, as dusk fades to darkness, before sinking towards the horizon, setting at 00:04. By the end of the month, soon passing behind the Sun at solar conjunction, it is not observable as it will reach its highest point in the sky during daytime and be no higher than 19° above the horizon at dusk.

NEPTUNE: begins the month soon to pass behind the Sun at solar conjunction, and is not readily observable, being very close to the Sun, at a separation of only 15° from it. By the end of the month, having recently passed behind the Sun at solar conjunction. It remains not readily observable being very close to the Sun, at a separation of only 12° from it.

MOON PHASES:

Last Quarter	3 March
New Moon	10 March
First Quarter	17 March
Full Moon	25 March
Last Quarter	2 April

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

March

2 The Theta Carinae cluster is well placed

3 Lunar occultation of Antares
Asteroid 3 Juno at opposition

8 Conjunction of the Moon and Mars
The Moon at perihelion
Conjunction of the Moon and Venus
The Wishing Well cluster is well placed

10 The Moon at perigee

12 Asteroid 23 Thalia at opposition

13 Close approach of the Moon and Jupiter

14 Conjunction of the Moon and Jupiter
γ-Normid meteor shower 2024

15 Close approach of the Moon and M45

16 Lunar occultation of Beta Tauri

17 Neptune at solar conjunction
Mercury at perihelion

19 Venus at aphelion

20 March equinox

21 Close approach of Venus and Saturn

22 Conjunction of Venus and Saturn

23 Mercury at dichotomy
The Moon at apogee

24 Mercury at greatest elongation east

25 Mercury at highest altitude in evening sky
Penumbral lunar eclipse

28 The Moon at aphelion

30 136472 Makemake at opposition
Lunar occultation of Antares

April

2 The Sombrero Galaxy is well placed

3 Conjunction of Venus and Neptune

5 Messier 94 is well placed
The Jewel Box cluster is well placed

6 Close approach of the Moon and Mars
Close approach of the Moon and Saturn
Lunar occultation of Saturn
The Moon at perihelion

7 Close approach of the Moon and Venus
Lunar occultation of Venus
The Moon at perigee

8 Asteroid 532 Herculina at opposition

10 Close approach of Saturn and Mars
Conjunction of the Moon and Jupiter

11 Close approach of the Moon and M45
Mercury at inferior solar conjunction

13 Lunar occultation of Beta Tauri

14 Centaurus A is well placed
Omega Centauri is well placed
136199 Eris at solar conjunction

15 The Whirlpool Galaxy is well placed

16 Messier 83 is well placed

18 Messier 3 is well placed

20 The Moon at apogee
Conjunction of Jupiter and Uranus

21 136108 Haumea at opposition
Comet 12P/Pons-Brooks reaches peak brightness
Comet 12P/Pons-Brooks passes perihelion

22 Lyrid meteor shower 2024

23 Messier 101 is well placed
π-Puppid meteor shower 2024

26 The Moon at aphelion
Lunar occultation of Antares

29 Close approach of Mars and Neptune

30 Mercury at aphelion

Collected Observations (and thoughts) – Gary Walker

London Astrofest 2024 – Posted 3 Feb

After missing out for 4 years, I managed to get to this year's Astrofest; the Pandemic wiped it out in 2021 and 2022, whilst last year I was unable to go to it!

I have been going to it, regularly, for over 30 years now! Astofest started in 1992 and, apart from 3 exceptions, has been on for 2 days, on Fridays and Saturdays, in early February, every year!

One was cancelled in about 1995, when the Astronomy Now magazine was in danger of going bust – a major concern as the magazine sponsors the event every year. And, of course, the Pandemic stopped it (and everything else) for 3 years!

My impression was that there seemed to be fewer stalls there (and in the last few years before the Pandemic, too). Some of the stalls that used to be there have, sadly, gone, even Telescope House and Cambridge University books!

Stalls there in earlier years, such as "Earth & Sky", The Webb Society, Orion Optics, Armagh Planetarium, Sky & Telescope, UK SEDS, and Starlab and others have come and gone. Even the Herstmonceux Observatory stand wasn't there this year.

On a brighter note, stalls like Springer Nature books, the British Astronomical Association, the British Interplanetary Society, the society for Popular Astronomy, not to mention the Astronomy Now stands were all there, this year! So was MSG Meteorites.

On looking through my copy of the 1993 Official Show Guide, stands present then, and up to now, include Astronomy Now, the British Astronomical Society, the Society for Popular Astronomy, (then still known as the Junior Astronomical Society!)

I saw Casper there, but no one else from the Society.

Telescope now repaired! – Posted 3 Feb

I am delighted to report that my telescope cable has now been repaired, by Peter Scott, so thank you to him. He had a job getting the cable fixed, not helped by the repair taking place in the middle of one of the gales. Thankfully, my telescope was under cover!

It is now working fine, and I have been able, once again, to observe some Deep Sky objects!

End of the Ingenuity Helicopter – Posted 5 Feb

Well, NASA has managed to "prang " the little Ingenuity helicopter on Mars! This helicopter, the first ever powered flight successfully operated on another planet, arrived with the Perseverance Lander Rover in February 2021, and took its first flight on 19 April 2021.

Flying ahead of the Perseverance Rover, it could scout out the ground ahead, as well as the surrounding area. It had a camera on it, and could image the surrounding terrain, not to mention the rover, too. Indeed, both the Rover and helicopter were bristling with cameras and even managed to film the descent and landing, by parachute, of Perseverance! Previously, only animations of landing sequences of earlier probes could be made!

Unfortunately, the helicopter suffered a hard landing on 18 January 2024 and, due to a bent blade, can now no longer fly!!

However, in its near 3-year career, it managed to make 72 successful flights, covering up to 10.5 miles, reaching a maximum altitude of 78 feet, and used a total of 48 "airfields"!

Originally expected to make only 5 flights, it far exceeded all expectations, just like the Opportunity and Spirit Rovers!

The helicopter certainly made it look very futuristic. Another, much more sophisticated helicopter, Dragonfly, is expected to fly in the atmosphere of Titan, Saturn's largest Moon, in about 2036.

Planetary Imaging and Observing – Posted 10 Feb

Following on from David Arditti's excellent talk on observing and imaging the Planets, it never ceases to amaze me at how far planetary imaging has come over about 60 - 70 years.

I grew up with photos of the planets taken with the 200" Mount Palomar Telescope, which used to be the biggest telescope in the world. However, on seeing modern images, those Mount Palomar images look incredibly crude and blurry, showing only the main features of the planets!

This was down to the atmosphere blurring the images during the time of the exposures, so that fine detail was impossible to photograph. In these cases, the ancient method of sketching at the eyepiece was still the best method of capturing all the details visible with a particular telescope.

In recent years, however, astronomers have overcome this obstacle, by not only launching the Hubble Space Telescope in 1990, but also by the technique of Speckle interferometry, which could mimic the atmosphere, and show when it was at its clearest.

The most astonishing thing, though, is how amateur astronomers, in the last few decades, have managed to take images of the planets that have surpassed those of the Mount Palomar Telescope taken in the 1950's, or so!

As David pointed out, this has been made possible by the ability to take rapid successions of images and then "stack" the best and clearest ones. This results in super sharp images showing fine details on the planets, that cannot be seen visually at the eyepiece end of your telescope!

The noted, amateur Astronomer images, Damien Peach, has obtained spectacularly clear images of the planets, especially Mars, Jupiter, and Saturn, and even capturing features on Uranus and Neptune!

He has even been able to image features on Mars when it was only about 4.5' arcseconds in size!

Some amateur astronomers have even managed to detect Exoplanets.

Having said all this, however, the fact that today's imagers have far outpaced the 200" Mount Palomar Telescope does not mean that professional telescopes have been left behind by the amateur astronomers. Professional telescopes have also been radically upgraded with the new techniques, so they are still ahead of the amateur astronomers, but the amateurs can certainly now give them a run for their money!

As shown by David, amateurs can also keep on imaging the planets in a way that professionals may not be able to - they have the freedom to dedicate as much time as they wish, whereas professional astronomers may not always have the luxury to do so! Thus, amateurs have managed to image impacts on Jupiter, for example.

Often, professionals spend most of their telescope time observing and imaging the Deep Sky objects, such as galaxies, etc, and tend not to necessarily take much notice of the planets!

In my case, I don't have the technology to image planets in the way discussed above, but I have managed to photograph Jupiter through my 8"SCT, which just about showed the Northern and Southern Equatorial Belts upon it, as well as Saturn and its rings. I also photographed the Great Conjunction of Jupiter and Saturn, in December 2020, when they could be seen in my telescope, in the same field of view, even at 222X!

I have also managed to see Venus, either on a day of Inferior Conjunction, or within a day or two of it. Venus is quite easy to photograph in the daytime as, especially when nearing conjunction, it has a large angular size and, of course, a very beautiful location, large, and thin crescent. Photographing the Moon is a lot simpler!

Huge Prominence on Sun – Posted 12 Feb

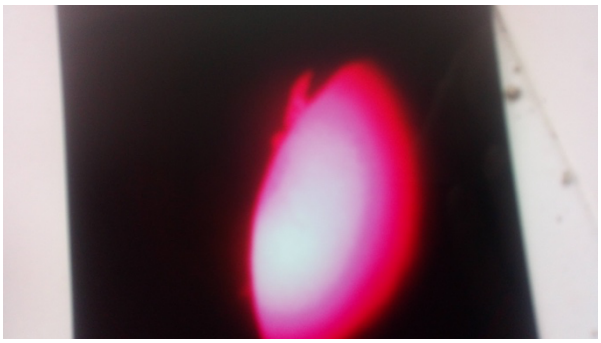
On 12 February, I saw a huge Prominence on the Sun, at the NE part of the limb. I first saw it around 9.40am when it appeared as a huge ribbon or band, just above the Solar limb. It was still there at about 12.45pm, but between then and about 2.15pm, most of the

prominence had disappeared, with only a few pieces of it left!

It was later estimated to be about 350,000 km in length. Prominences of this size are not common!

The first week of February had been really awful. After 1 February, there were no observable conditions until the 10th! Admittedly, the Sun had appeared on a couple of other days in this period, but not for very long!

This is a photo of the huge Prominence taken through my 60mm Coronado SolarMax 11 scope. It's not easy to line up the camera with the eyepiece so, unfortunately, quality is not the best!



America back on the Moon after over 50 Years – Posted 23 Feb

On 15 February, an American privately funded rocket by Intuitive Machines, was launched on a SpaceX rocket. It carried a lander called Odysseus.

Late in the evening of 22 February, it landed successfully on the Moon, near the South Pole (about 186 miles from it), near a crater called Malapert.

I was "watching" it on my phone, and the broadcast showed Mission Control, and occasional animations of the approach and landing sequence as, unfortunately, there was no live imagery available!

The lander needed a 10-11, minute burn to slow it down before landing. After that, there was a long wait before they finally picked up a faint signal from the high gain antenna.

I heard them mention Goonhilly, as one of the tracking stations that was set to find the signal.

The landing occurred on schedule, at 11.23pm GMT.

As yet there are no images from the Moon's surface. Ironically, the Moon, two days before Full tonight, was visible high up in the South, as the sky had cleared after two days of rain!

So, this is significant a significant event for America, being their first landing on the Moon in over 50 years – the last one was Apollo 17! However, as it was an unmanned landing, it is still not yet "Boots on the Ground" (or rather "Boots on the Moon")!

Another one tipped over! – Posted 25 Feb

After the Japanese probe landing on its nose, it has now become apparent that the American Oydesseus lander has tipped over on its side, after landing! This was because it was descending too fast. However, it appears to be working OK!

More on the Luna Landers – Posted 26 Feb

It has been announced that the Japanese lunar lander has survived the week-long lunar night (which it wasn't expected to) and has woken up again!

The American lander isn't doing quite so well – it's sending back data, but still no images, so far.

The brightest object ever observed in the night sky is a black hole that's growing by the equivalent of one Sun a day

Acknowledgement: This article was written by Philip Wiseman, Research Fellow, Astronomy, University of Southampton and was published in THE CONVERSATION on 21st February 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/the-brightest-object-ever-observed-in-the-night-sky-is-a-black-hole-thats-growing-by-the-equivalent-of-one-sun-a-day-224041*

A new study published in Nature Astronomy describes the most luminous object ever observed by astronomers. It is a black hole with a mass of 17 billion Suns, swallowing a greater amount of mass than the Sun every single day.

It has been known about for several decades, but since it is so bright, astronomers assumed it must be a nearby star. Only recent observations revealed its extreme distance and luminosity.

The object has been dubbed J0529-4351. This name simply refers to its coordinates on the celestial sphere – a way of projecting the objects in the sky onto the inside of a sphere. It is a type of object called a quasar.

The physical nature of quasars was initially unknown. But in 1963, the visible light from a quasar called 3C 273 was split into all its wavelengths (known as its spectrum). This showed that it was located nearly 2 billion light years away.

Given how bright 3C 273 appears to us, and how far away it is, it must be extremely luminous – a term in astronomy that refers to the amount of light emitted by an object in a unit of time. The only known power source for such extreme luminosity was through material falling into a supermassive black hole. Quasars are therefore the most actively growing black holes in the universe.

Power source

Supermassive black holes often sit at the centres of galaxies. As with all quasars, J0529-4351 is powered by material, mostly super-heated hydrogen, and helium gas, falling into its black hole from the surrounding galaxy.

Roughly one times the Sun's mass is falling into this black hole every day. Exactly how so much gas can be channelled into the centre of galaxies to increase the mass of black holes is an unanswered question in astrophysics.

At the galaxy's centre, the gas forms into a thin disk shape. The properties of viscosity (resistance to the flow of matter in space) and friction in the thin disk help heat the gas to tens of thousands of degrees Celsius. This is hot enough to glow when viewed at ultraviolet and visible light wavelengths. It is that glow that we can observe from Earth.

At around 17 billion Suns in mass, J0529-4351 is not the most massive known black hole. One object, at the centre of the galaxy cluster Abell 1201, is equivalent to 30 billion Suns. However, we need to bear in mind that because of the time taken for light to travel across the vast distance between this object and Earth, we are witnessing it when the universe was only 1.5 billion years old. Its is now around 13.7 billion years old.

So, this black hole must have been growing, or accreting, at this rate for a significant fraction of the age of the universe by the time it was observed. The authors believe the gas accretion by the black hole is happening close to the limit placed by the laws of physics. Faster accretion causes a more luminous disk of gas around the black hole which in turn can halt any more material falling in.

Story of the discovery

J0529-4351 has been known about for decades, but despite having an accretion disk of gas 15,000 times larger than our Solar System and occupying its own galaxy – which is probably close to the size of the Milky Way – it is so far away, it appears as a single point of light in our telescopes.

This means it is difficult to distinguish from the billions of stars in our own galaxy. To discover that it is in fact a distant, powerful, supermassive black hole required some more complex techniques. Firstly, astronomers collected light from the middle of the infrared waveband (light with much longer wavelengths than those we can see).

Stars and quasars look quite different to one another at those wavelengths. To confirm the observation, a spectrum was taken (much as it was with the quasar 3C 273), using the Australian National University's 2.3 metre telescope at Siding Spring Observatory, New South Wales. And, as with 3C 273, the spectrum revealed both the nature of the object and how far away it was – 12 billion light years. This highlighted how extreme its luminosity must be.

Detailed checks

Despite these measurements, a number of checks needed to be made to confirm the true luminosity of the quasar. Firstly, astronomers needed to make sure that the light had not been magnified by a source in the sky that was closer to Earth. Much like lenses used in spectacles or binoculars, galaxies can act as lenses. They are so dense that they can bend and magnify the light of more distant sources that are perfectly aligned behind them.

Data from the European Space Agency's Gaia satellite, which has extremely precise measurements of J0529-4351's position, was used to determine that J0529-4351 is truly a single non-lensed source of light in the sky. This is backed up by more detailed spectra taken with the European Southern Observatory's Very Large Telescope (VLT) facility in Chile.

J0529-4351 is likely to become a very significant tool for the future study of quasars and black hole growth. The mass of black holes is a fundamental property but is very difficult to measure directly, as there is no standard set of weighing scales for such absurdly large, mysterious objects.

One technique is to measure the effect the black hole has on more diffuse gas orbiting it in large clouds, called the "broad line region". This gas is revealed in the spectrum through wide "emission lines", which are caused by electrons jumping between specific energy levels in the ionised gas.

The width of these lines is directly related to the mass of the black hole, but the calibration of this relationship is very poorly tested for the most luminous objects such as J0529-4351. However, because it is so physically large and so luminous, J0529-4351 will be observable by a new instrument being installed on the VLT, called Gravity+.

This instrument will give a direct measurement of the black hole mass and calibrate the relationships used to estimate masses in other high-luminosity objects.

Object of the month – Martin Howe - Postcard from New Zealand

This month's "object of the month" has, as usual, been provided by Martin Howe, but it is in the form of a Postcard from New Zealand where he is currently on holiday.

To: The Ewell Astronomical Society

Greetings from New Zealand! Despite some rather cloudy weather (clearly the UK does not have a monopoly on this) I have managed to get one night of observing so far. I was staying in a rural location about 80km north of the capital Wellington

which has a Bortle class 3 sky – a large difference from the class 8-9 that I live under in inner London (Google "Bortle sky map" for an interactive Bortle sky map for you location). The sky is so dark it is easy to get lost trying to find your way around the sky as it is hard to identify the constellations due to there being so many stars visible. One of the other big challenges is identifying the location of the south celestial pole in order to do a polar alignment – there is no equivalent of Polaris in the southern hemisphere.

The big advantage in addition to the dark skies is of course a whole host of new constellations to see that are not visible from the UK such as Centaurus, Crux and Carina – although some of the familiar constellations are also visible, such as Taurus and Orion.

The image above is the globular cluster omega Centauri. This is the brightest globular cluster visible from Earth at magnitude 3.9 (compared to the northern hemisphere's stand-out globular cluster, M13, at magnitude 5.8). It is also thought to be the most massive globular cluster containing over 10 million stars within a diameter of about 150 light years. The stars in the core are thought to be only 0.1 light years apart, so the skies from any planets around those stars would be ablaze with stars (although the likelihood of there being any planets would be remote because of the gravitational instabilities from so many nearby stars). The nature of the stars within omega Centauri have led astronomers to believe that it is actually the remnant of the core of a small galaxy that was gravitationally disrupted and absorbed by the Milky Way a long time ago.

The image consists of sixteen 15-second exposures at ISO 1600 with a Canon 80D DSLR and 200mm lens.

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 March – Nonsuch High School

Nick James, Director of the BAA's Comet section, will talk about Comets.

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, should be sometime around the new moon which is on 10 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 4-15 March.

AD HOC OBSERVING AT WARREN FARM:

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