JANUS

THE NEWSLETTER OF EWELL ASTRONOMICAL SOCIETY

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Editor: ewellastro.editor@gmail.com
Email: ewellastro@gmail.com
Website: https://www.ewellastronomy.org

Editorial

Welcome to the October edition of Janus. Our lecture this month will be given by Professor Adam Amara on a topic to be advised.

Following my observation last month that Lunar missions are hard, even if mission objectives are achieved, long-term operations on the lunar surface are challenging. India's Chandrayaan-3 mission was a success. The spacecraft landed close to the Moon's South pole on 23 August and completed its assignments by 2 September. Then, in a bid to extend the mission's lifespan, ISRO decided to shut down all instruments at this point, a little before sunset on the moon, and put them into "sleep mode." Although the batteries were fully charged, there was only a 50% chance that the instruments would survive the freezing temperatures of the 14-day-long lunar night (as low as -200°C). Having received no signals from the lander or rover since shut down, it appears the bid failed, and instruments did not survive.

On a happier note, on 27 September, NASA astronaut Frank Rubio made history by returning to Earth after an extraordinary 371 days in space. Originally scheduled for a modest six-month mission aboard the ISS, an enforced mission extension meant his journey surpassed the previous record of 355 days for the longest stay in space by a US astronaut, set by NASA's Mark Van de Hei in 2022. Collectively, Rubio and his fellow crewmates covered 157.4 million miles (253.3 million km) completing 5,963 orbits of the earth. However, the ultimate record for the longest duration spent in space remains with the late Russian cosmonaut Valeri Polyakov, who completed 437 continuous days aboard Russia's Mir space station between January 1994 and March 1995.

John

SkyUpdate

What's up this month?

The Solar System October

MERCURY: begins the month soon passing behind the Sun, but is visible in the dawn sky, rising at 05:30 BST – 1 hour and 27 minutes before the Sun – and reaching an altitude of 9° above the E horizon before fading from view as dawn breaks at around 06:37. By the end of the month, having recently passed behind the Sun at superior solar conjunction, it is not readily observable since it is very close to the Sun, at a separation of only 6° from it.

VENUS: begins the month emerging into the morning sky as it approaches greatest elongation W. It is visible in the dawn sky, rising at 02:59 BST – 3 hours and 58 minutes before the Sun – and reaching an altitude of 32° above the SE horizon before fading from view as dawn breaks at around 06:37. By the end of the month, having recently passed greatest elongation W. it is visible as a morning object in the dawn sky, rising at 02:25 (BST) and reaching an altitude of 34° above the SE horizon before fading from view as dawn breaks at around 06:27.

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

JUPITER: is currently approaching opposition. It begins the month visible as a morning object, becoming accessible around 20:48 BST, when it reaches an altitude of 7° above the E horizon. It will then reach its highest point in the sky at 03:10, 53° above the S horizon, before being lost to dawn twilight around 06:37, 34° above the SW horizon. By the end of the month, still visible as a morning object, it becomes accessible around 17:38, when it rises to an altitude of 7° above the E horizon. Reaching its highest point in the sky at 23:55, 52° above the S

horizon, it will become inaccessible at around 06:12 when it sinks below 7° above the W horizon.

SATURN: begins the month having recently passed opposition. Visible in the evening sky, it becomes accessible around 19:18 BST, 13° above the SE horizon, as dusk fades to darkness. It will then reach its highest point in the sky at 22:34, 25° above the S horizon, and will continue to be observable until around 02:09, when it sinks below 10° above the SW horizon. By the end of the month, it is accessible around 17:18, 19° above the SE horizon, as dusk fades to darkness. It will then reach its highest point in the sky at 19:33, 25° above the S horizon, and will continue to be observable until around 23:04, when it sinks below 10° above the SW horizon.

URANUS: begins the month visible in the morning sky, becoming accessible around 22:29, when it reaches an altitude of 21° above the E horizon. It will then reach its highest point in the sky at 03:42, 56° above the S horizon, before being lost to dawn twilight around 05:39, 49° above the SW horizon. By the end of the month, approaching opposition, and still visible in the morning sky, it becomes accessible around 19:28 when it reaches an altitude of 21° above the E horizon. Reaching its highest point in the sky at 00:40, 56° above the S horizon, it will be lost to dawn twilight around 05:28, 24° above the W horizon.

NEPTUNE: begins the month having recently passed opposition, and will become accessible at around 20:55, when it rises to an altitude of 21° above the SE horizon. Reaching its highest point in the sky at 00:09, 35° above the S horizon, it will become inaccessible at around 03:22 when it sinks below 21° above the SW horizon. By the end of the month, it is visible in the evening sky, becoming accessible around 17:57 BST, 22° above the SE horizon, as dusk fades to darkness. It will then reach its highest point in the sky at 21:04, 35° above the S horizon, and will continue to be observable until around 00:16, when it sinks below 21° above the SW horizon.

MOON PHASES:

Full Moon	29 September
Last Quarter	6 October
New Moon	14 October
First Quarter	22 October
Full Moon	28 October

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*

October

2	Close approach of Moon and Jupiter Asteroid 29 Amphitrite at opposition Andromeda Galaxy is well placed
3	136472 Makemake at solar conjunction Close approach of Moon and M45 NGC 253 is well placed
5	Lunar occultation of Beta Tauri The Small Magellanic Cloud is well placed NGC 300 is well placed
6	October Camelopardalid meteor shower 2023
7	NGC 362 is well placed
9	Draconid meteor shower 2019
10	Close approach of Moon and Venus Southern Taurid meteor shower 2023
11	δ-Aurigid meteor shower 2023
14	Annul;ar solar eclipse
15	The Triangulum Galaxy is well placed
18	Lunar occultation of Antares 136199 Eris at opposition ε-Geminid meteor shower 2023 Venus at highest altitude in morning sky
20	Mercury at superior solar conjunction

22	Orionid meteor shower 2023 Comet 2P/Encke passes perihelion Venus at dichotomy
24	Venus at greatest elongation west Close approach of the Moon and Saturn 136108 Haumea at solar conjunction
25	Leonis Minorid meteor shower 2023
27	Perseus Double Cluster is well placed
28	Partial lunar eclipse
29	Close approach of Moon and Jupiter
30	Close approach of the Moon and M45

November

1	Lunar occultation of Beta Tauri Jupiter at perigee
3	Jupiter at opposition
4	Saturn ends retrograde motion
5	Asteroid 18 Melpomene at opposition
9	Close approach of the Moon and Venus Lunar occultation of Venus
12	Northern Taurid meteor shower 2023
13	Uranus at opposition
14	Conjunction of Moon and Mercury
18	Mars at solar conjunction Leonid meteor shower 2023 Pleiades cluster is well placed
20	Close approach of the Moon and Saturn
21	1 Ceres at solar conjunction
22	α-Monocerotid meteor shower 2023
25	Close approach of Moon and Jupiter
27	Close approach of Moon and M45
28	Lunar occultation of Beta Tauri November Orionid meteor shower 2023 Hyades cluster is well placed

Collected Observations (and thoughts) – Gary Walker

First the Moon.... Now the Sun! – Posted 4 Sep

After India successfully landed on the Moon this week, they have now launched a probe to study the Sun. Launched on 2 September, it will proceed to the Lagrange Point 1, to study the Sun's atmosphere and space weather.

In the meantime, images have been received from the lunar surface showing the Rover moving about in the vicinity of the South pole. It has moved about 100 metres from the probe.

Comet Nishimura – Posted 9 Sep

I have not yet seen this comet, as it is what astronomers call "badly placed" in the sky, either lost in the sunset glow, or low down in the sky at dawn!

This is a classic case of a comet that has "caught out" the astronomy magazines, as it was only discovered on 11 August this year! Consequently, neither this nor last month's magazines contain anything about it. The discoverer was Hideo Nishimura; hence this lucky astronomer has gained immortality!

It is certainly a lot better for a person to discover a comet, rather than a robotic telescope system such as ATLAS, or PANSTARRS, as it can get so boring to have yet another comet called ATLAS, or PANSTARRS. Indeed, at present, there are still several ATLAS and PANSTARRS comets crawling around the sky!

This comet, in early September, had reached just under the 4th magnitude, making it theoretically visible to the naked eye, but as comets, unlike stars, are extended objects, they will invariably appear fainter and harder to see, than their given magnitudes suggest. The same problem occurs with Deep Sky Objects such as galaxies, and nebulae.

Its position, low down, and near the Sun, mean it will be even harder to see, than you would think. This is why astronomers refer to these events as being "badly placed"! As it was discovered this year, it's official designation is C/2023 P1.

Sites such as "Space Weather News" have been full of wonderful images of the green coma, with a long tail, although in visual observation, it would just appear colourless, and fainter than it does in images. It is diving close to the Sun, so will soon be even harder to see and, indeed, may not survive its close passage of the Sun! Many such comets fragment, or even disappear entirely at this stage.

Also, of course, all comets are notoriously unreliable in terms of how bright they will get to be. Many fail to live up to expectations, whilst others can be much brighter than expected (which, of course, is what we hope for!). As David Levy, an amateur astronomer, once said, "Comets, are like cats. They do exactly as they please, and they both have tails"!

My hunt for the new comet – Posted 9 Sep

I stayed up all night (as I expect that you all did!) to see Comet Nishimura. The sky was virtually clear. Unusually, it was still quite warm, even around 5am (the time I wrote this post) - and earlier on - and dead calm! However, I could not see it, (I was using my 11 X 80 binoculars) - I couldn't use the GOTO on my telescope as it is still out of order.

I see that the media is calling this the "Green Comet", just like they did for the Comet C/2022 E3 ZTF, earlier this year! Sadly, the green colour would only show up in images, as it would be too faint to register on the human eye.

I DID see Venus, though, appearing now as a beautiful crescent 🌙 like a 2 or 3-day old Moon.

I also saw the constellation of Orion for the first time for months, and I was able to check on Betelgeuse! (there was some excitement/hysteria a few months ago about it being brighter than usual maybe, and whether it about to blow).

I saw that it appeared brighter than Bellatrix, and was about the same magnitude as Rigel, so it seemed, to me, to be normal (at any rate, for Betelgeuse!).

Another failed attempt to see Comet Nishimura! – Posted 10 Sep

Last night (10 September), I made another attempt to see Comet Nishimura! As it was low down, I went over to the fields at the back of my house, in order to get a better horizon.

Again, it was incredibly warm and humid, even at dawn, and dead calm! There wasn't a soul around!

I was watching for it from around 4.30am, to about 5.30am. The comet was stated to rise above the horizon at 4.06am, this morning.

The sky was clear, but there WERE some clouds hugging the NE horizon (just where they weren't wanted!).

Despite scanning the area with my 11 X 80 binoculars, I just couldn't see any sign of the comet. Presumably, it was either stuck behind the clouds - although it would have risen to about 10 degrees or so, by the time that I had finished - or else, it was just too faint to see, anyway. Although, it was in the constellation of Leo, the constellation was too low down to be recognisable!

Venus was about twice as high in altitude as the comet was, so I was using it as a guide. Even further up, there was a beautiful waning crescent 🌙 Moon!

The comet is due to get into the evening sky when it has passed around the Sun. However, at this point, many such comets meet up with a nasty accident; they tend to break up, as Comet ISON did about 10 years ago!

Unlike planets that do "exactly what is said on the tin" and their magnitudes are always known at any given date, or stars (except variable stars), comets can flare up, break up, or just fizzle out, so even astronomers cannot tell how bright (or not!) they are actually going to be!

It is unusual, today, for a comet to be discovered by an amateur, as most of them, these days, are discovered by telescopic robot systems such as ATLAS or PANSTARRS! As such comets are named after the telescopes, it makes for a very confusing situation, in recognising comets!

Jupiter – Posted 23 Sep

During September, Jupiter appeared to be passing near 2 bright stars (in my telescope, anyway!) The stars were also visible in my binoculars. One of them was the magnitude 5.5 star, Sigma Arietis.

On 17-18 September, it was the closest night of this "conjunction". Jupiter, its own moons, and the 2 stars could all be fitted in the same field of view, even at 222X!

Return of Osiris Rex to Earth – Posted 24 Sep

As I noted at the time of the landing of the Indian probe at the Lunar South Pole on 23 August, it's not often that a Space related item reaches the Top Item of the News. However, on 24 September, the space probe Osiris-Rex bringing a sample of the asteroid Bennu, successfully landed in the Utah desert. This too, made the Top Item on the evening news!

Earlier, I was watching the landing on my phone which happened at 3.52pm BST.

Then came the delicate job of recovering the capsule and getting it to a Clean Room, making sure that it didn't become contaminated by the Earth's atmosphere and environment, beforehand, as a pristine sample is essential. The capsule was lifted by a helicopter by a cable to transport it to the Clean Room.

The sample was actually taken about 3 years ago. From the images taken, Bennu is clearly a rubbly asteroid, full of boulders on its surface, and is probably a loosely constructed and fragile asteroid, anyway.

The media were saying that Bennu "is the most dangerous asteroid in the solar system" as there is a 1 in 2,700 chance that it could hit the Earth in September 2182. That's 159 years away, so make a note in your diaries, folks!

The Osiris Rex return was STILL the Top Item on the BBC News at Ten. It's worth noting again that such an occurrence is extremely rare, as usually these stories are confined to the "and finally" end story on the news. It was extremely gratifying to see this happen!

A NASA spacecraft is on course to deliver material from an asteroid to Earth – here's what we could learn

Acknowledgement: This article was written by Monica Grady, Professor of Planetary and Space Sciences, The Open University and was published in THE CONVERSATION on 21st September 2023. It is republished in full under a Creative Commons Licence. The original article, with additional links and images can be found here *https://theconversation.com/a-nasa-spacecraft-is-on-course-to-deliver-material-from-an-asteroid-to-earth-heres-what-we-could-learn-214080*

Around 15 years ago, I was on a European Space Agency (ESA) committee, looking at ESA's strategy for proposed forthcoming space missions. Under consideration was a mission to an asteroid. Over dinner, one of the committee members, an astrophysicist, quizzed me on why we needed to visit one of these objects.

"Nasa has already been to one and the Japanese Space Agency to another. Why do you need to go to another one? They're all the same aren't they, just lumps of rock?" My deliberately less-than-polite response was: "Why do astronomers keep wanting to launch more telescopes into space to look at stars? They're all the same aren't they, just balls of burning gas?" Our meal continued in frosty silence.

The misconception that asteroids are "just lumps of rock" doesn't stand up to scrutiny, given the rich harvest of information about asteroid diversity that has come from studying meteorites. Meteorites have taught us about the origin and evolution of the Solar System.

We can measure the ages of meteorites and identify the volatiles – water- and carbon-containing chemicals – that some contain. Volatiles are important for understanding how the building blocks of life were delivered to Earth.

But there are gaps in our knowledge, so we need to study samples directly taken from asteroids – in part because meteorites are often contaminated with compounds from Earth's environment. This means we can't always be sure that the volatiles in them came from the asteroid itself, or from Earth.

We also don't fully understand the relationship of specific meteorite types to different classes of asteroids. This affects our understanding of how volatiles were distributed in the early Solar System and therefore what types of objects could have delivered life's building blocks to Earth. Hence the need for sample return missions.

On Sunday 24 September, a Nasa spacecraft called Osiris-Rex will fly past Earth and release a capsule containing a haul of dust and rock, which it collected from the surface of the asteroid Bennu in 2020. Under the watching eyes of nervous scientists, the capsule will parachute down to a test range in Utah, where it will be retrieved and taken to a sample-curation facility in Houston.

A rich heritage

The previous missions mentioned by my astrophysicist colleague were NASA's Near-Shoemaker spacecraft, which operated from 1996 to 2001, and the Japanese Space Agency's (JAXA) Hayabusa mission, which lasted from 2003 to 2005.

Hayabusa brought a few milligrams of material to Earth from the asteroid Itokawa. This allowed us, for the first time, to measure an asteroid's age –- an important first step in understanding relationships between asteroids and meteorites.

The two most recent asteroid missions are JAXA's Hayabusa2 mission to the asteroid Ryugu and NASA's Osiris-Rex mission to Bennu. The missions both orbited carbonaceous asteroids, which are rich in volatiles. The orbiting spacecraft helped confirm that Ryugu and Bennu are both water-rich asteroids, with abundant clay and carbonate minerals.

The asteroids have very low densities, suggesting they are objects called "rubble piles". These contain significant amounts of empty space beneath the surface. Rubble piles formed from debris thrown into space when their bigger parent bodies were hit by another object. The rubble eventually came together to form an asteroid of its own.

Watery history

Results from analysis of samples from Ryugu were published in December 2021. They showed that the Ryugu material is very similar in composition to what we call CI meteorites. This is important because CI-related materials are extremely fragile and easily weathered.

As a result, few survive their passage through the Earth's atmosphere. Now that we can link these rare meteorites more definitively to the class of asteroids Ryugu belongs to, we can expand our understanding of the processes that asteroids went through as they evolved.

In the past, temperatures on some asteroids were just high enough for liquid water to exist. The reaction of the original minerals with water transformed them into more complex

mixtures. Evidence suggests the parent asteroid for Ryugu was altered by water between two million and five million years after the Solar System formed.

An important aim of Hayabusa2 was to analyse organics (carbon-containing chemicals) in the sample. There's overlap between organics and volatiles. Both categories include compounds that could have been important for the origin of life.

There were around 20,000 species (types) of organic compound present in the Ryugu material. This opened our eyes to the sheer complexity of organic compounds in primitive asteroids.

So, what's still left to learn from Bennu? For a start, Osiris-Rex observed bright regions on Bennu's surface. These were interpreted as thick veins of the mineral carbonate.

These were not seen on Ryugu's surface, although individual grains were found during lab analysis of the samples. This could suggest that alteration by water took place under different conditions on Bennu.

If the ages of alteration by water are different between Ryugu and Bennu, it could mean one of the asteroids underwent a longer process of alteration. This would suggest that their parent bodies formed in different parts of the Solar System.

Like Ryugu, Bennu is very dark. Analysis of Ryugu from orbit suggested that a process called space weathering may have helped darken and dehydrate the asteroid's surface. However, lab analysis of the Ryugu sample revealed the presence of clay minerals, showing that water was in fact abundant on the asteroid. If the same effect is observed for Bennu, there are implications for the search for water on asteroids.

Bennu is recognised as a potentially hazardous asteroid, meaning there is a one in 3,000 chance of it hitting us in 150-200 years' time.

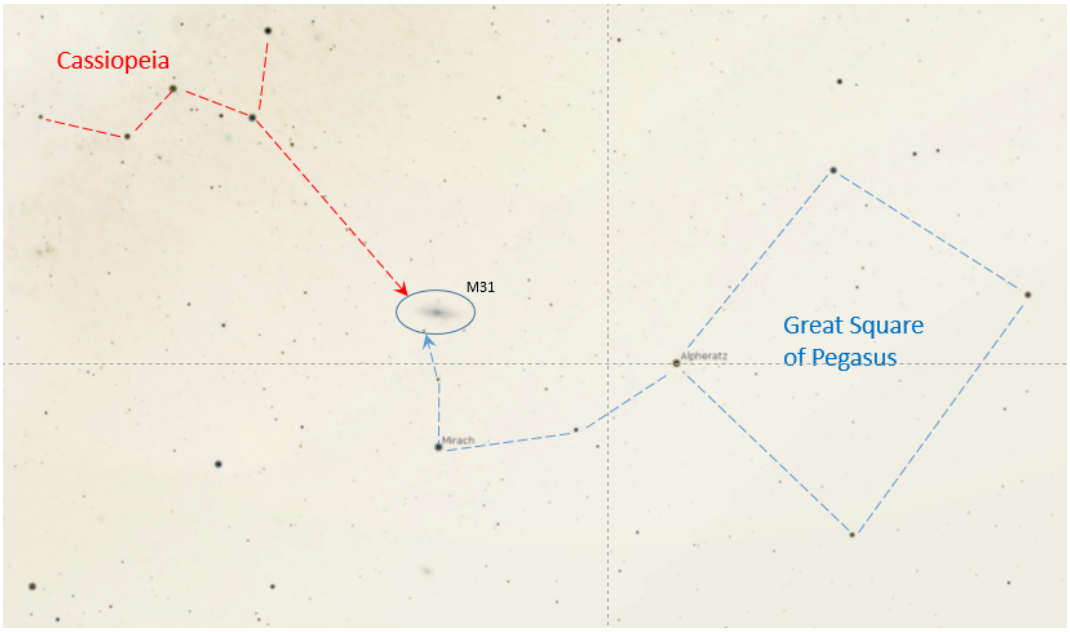
By the time the global community of planetary scientists has analysed all the available material from Bennu, it is unlikely that any aspect of its formation, evolution and orbital history, composition and components will be unknown, allowing an effective "Earth rescue" mission to be launched.

Object of the month – the Andromeda Galaxy (M31) – Martin Howe

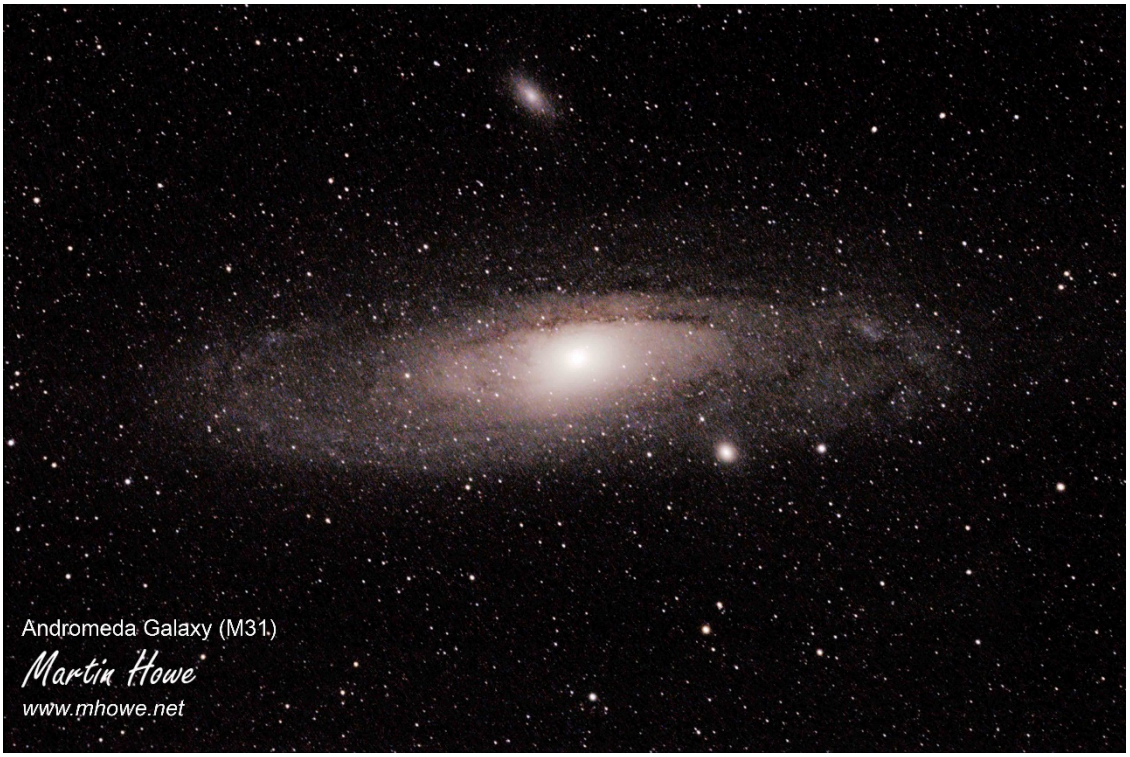
This month's object probably needs no introduction. After the great nebula in Orion (M42), the Andromeda galaxy (M31) is likely to be the next target on amateur astronomers' list of objects to hunt down. M31 is part of the local group of galaxies, which is a cluster of nearby galaxies, most of which are dwarf galaxies apart from the largest three – the Milky Way, M31 and M33 (the Triangulum galaxy). M31 is a little over 2 million light years away, and has a visual magnitude of about +3.4. However, this brightness is spread out over a large area, making it not as bright to the naked eye as the magnitude value might suggest (M31's apparent size is huge – about 3 degrees x 1 degree, although the brightest area is about half that, but even that is about 6 x 2 full Moon diameters in size!). It is the most distant object you can see with the naked eye – so go out and give it a try! I am just able to make it out with the naked eye from a dark sky sight when using averted vision. M31 is now well placed for viewing, being at an altitude of about 45 degrees by 9pm BST. It will continue to rise, culminating at about 80 degrees – well above the murk of the east-north-east, and so should be well placed for viewing from Ranmore Common.

M31 is quite easy to see as a smudge of light in binoculars, and I personally find M31 quite easy to locate in the sky. There are two different routes I use to find M31, per the chart below. The first is

to use the deeper “V” of Cassiopeia as an arrow which points towards M31. Another route, and useful for binocular searches, is to use the Great Square of Pegasus as a starting point. Once you have familiarised yourself with this asterism, it is usually quite easy to find it, and from here, go on to find M31. Extend a line from Scheat through Alpheratz to the next brightest star (a little under 7 degrees away) and again by a similar distance to Mirach. From here make a right angle turn and head up about 3 degrees to the next brightest star and again another 3 degrees to find the magnitude 4.5 star nu Andromedae. M31 will then be less than 1 degree away. This latter method of finding M31 is ideal if you use a pair of 7x50 binoculars, which have a field of view of about 7 degrees.



The image below was captured from a dark sky sight in rural France using a 71mm telescope and Canon 80D DSLR for 8 x 5 minute exposures. Clearly visible in the image are also two small satellite galaxies of M31 – M110 directly above M31 and the smaller M32 to the lower right, on the outskirts of the outer disk of M31 from our line of sight.



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 13 October – Nonsuch High School

Professor Adam Amara from the Institute of Cosmology and Gravitation, Unversity of Portsmouth will speak on a subject to be confirmed.

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 14 October.

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

AD HOC OBSERVING AT WARREN FARM:

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