JANUS
THE NEWSLETTER OF EWELL ASTRONOMICAL SOCIETY

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Editorial

Welcome to the first edition of Janus in 2022. Let's hope that we manage a full year of face-to-face meetings, ideally dispensing with the need to also offer participation via Zoom.

At the time of writing, our January speaker, Professor Brad Gibson from the University of Hull's Centre of Astrophysics, has not provided details of the topic for his talk, but this meeting will be held as a "hybrid" one with the option to attend either in person or via Zoom.

For comet watchers, December offered the opportunity to observe 3 different comets - Comets 67P, Atlas and Leonard - possibly all on the same night! Gary Walker was successful - were any other readers?

Astronomers around the world got their ultimate Christmas present when the James Webb Space Telescope (JWST) was finally launched on 25th December, providing a long overdue replacement for Hubble. After a successful launch, JWST is now en-route to the second Sun-Earth Larange point (L2), a gravitationally stable spot 1.5 million km above the earth, taking 29 days to get there. The L2 point of the Earth-Sun system is ideal for astronomy because a spacecraft located there is close enough to readily communicate with Earth, whilst keeping Sun, Earth and Moon behind it for solar power and (with appropriate shielding) providing a clear view of deep space for its telescopes.

Finally, in response to my request for images to include in Janus, I'm delighted to be able to publish one this month. "Object of the month - Pleiades" comes courtesy of new member Martin Howe who hopes to provide more in future editions.

John

The Solar System January

MERCURY: is difficult to observe throughout the month. At the beginning of the month, it will reach its highest point in the sky during daytime and is no higher than 4° above the horizon at dusk. As the month progresses it becomes more difficult to observe until, at the end of the month, it reaches its highest point in the sky during daytime and is no higher than 0° above the horizon at dawn.

VENUS: begins the month soon to pass in front of the Sun at inferior solar conjunction. It will not be observable; as well as being close to the Sun, it reach its highest point in the sky during daytime and be no higher than 5° above the horizon at dusk. By the end of the month, having passed in front of the Sun, it will be visible in the dawn sky, rising at 05:24 (GMT) – 2 hours and 15 minutes before the Sun – and reaching an altitude of 13° above the SE horizon before fading from view as dawn breaks around 07:19.

MARS: has recently passed behind the Sun at solar conjunction. Throughout the month, it will be difficult to see, reaching its highest point in the sky during daytime, and being no higher than 5° or 6° above the horizon at dawn.

JUPITER: will soon pass behind the Sun at solar conjunction. It begins the month visible from around 16:30, 24° above the S horizon, as dusk fades to darkness. It will then sink towards the horizon, setting at 20:27. By the end of the month, it will become visible around 17:11, 15° above the SW horizon, as dusk fades to darkness. It will then sink towards the horizon, setting 2 hours and 17 minutes after the Sun at 19:08.

SATURN: will soon pass behind the Sun at solar conjunction and begins the month visible from around 16:50, 12° above the SW horizon, as dusk fades to darkness. It will then sink towards the horizon, setting 2 hours and 41 minutes after the Sun at 18:43. As

the month progresses, it will become progressively more difficult to observe until, by the end of the month, it will be extremely difficult to see as it will be very close to the Sun, at a separation of only 4° 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 17:34, 44° above the SE horizon, as dusk fades to darkness. It will then reach its highest point in the sky at 19:48, 53° above the S horizon. It will continue to be observable until around 00:43, when it sinks below 21° above the W horizon. By the end of the month, it will become visible around 18:11, 53° above the S horizon, as dusk fades to darkness. It will then sink towards the horizon, setting at 01:12.

NEPTUNE: begins the month as an early evening object, receding into evening twilight. It will become visible around 17:34, 32° above the S horizon, as dusk fades to darkness. It will then sink towards the horizon, setting at 22:21. By the end of the month, it will be extremely difficult to observe, reaching its highest point in the sky during daytime and being no higher than 19° above the horizon at dusk.

MOON PHASES:

Last Quarter	27 Dec
New Moon	2 Jan
First Quarter	9 Jan
Full Moon	17 Jan
Last Quarter	25 Jan

Notable Events:

Observation of some of these events may require a telescope, although some will be visible with the naked eye. More information at *https://in-the-sky.org*

January

3 Quadrantid meteor shower 2022.
4 The Earth at perihelion
6 Conjunction of the Moon and Jupiter
7 Mercury at greatest elongation east
9 Mercury at dichotomy - reaches half phase in the evening sky.
10 C/2019 L3 (ATLAS) at perihelion
12 104P/Kowal at perihelion
Mercury at highest altitude in evening sky
13 Asteroid 7 Iris at opposition
18 104P/Kowal reaches its brightest
Uranus ends retrograde motion
19 γ-Ursae Minorid meteor shower 2022
20 19P/Borrelly reaches its brightest
25 Conjunction of the Moon and Mars

Collected Observations (and thoughts) – Gary Walker

Comet Atlas - 6 Dec

In late November and early December, I managed to observe both Comet C/2019 L3 Atlas and Comet 67P. These two comets were only a few degrees apart in the region of Gemini.

I thought that Comet Atlas appeared somewhat brighter than Comet 67P, but as Comet Atlas was a little higher in the Eastern sky, it was hard to be sure whether the lower altitude of Comet 67P would make it appear a bit fainter, anyway. Comet Atlas is now the 40th comet that I have observed, in all!

If anyone is thinking that Comet Atlas seems to bring on a feeling of deja vu, they would be correct. This is because several comets have been discovered by the Atlas asteroid robotic detection system, known in full as the Asteroid-Terrestial Impact Last Alert System - ATLAS for short!

Other robot detection systems are PanStarrs, Linear, and Neowise (remember last year's bright comet? - that was discovered by the last named of these!). This means that there are a lot of comets in the sky, called PanStarrs, Atlas, Linear, and Neowise - which gets a bit boring and silly, not to mention confusing, as the same names keep on cropping up again and again, although each new comet will, of course, have a different designation, to identify it uniquely.

However, it can still be confusing as, for example, last year, there were TWO separate Comet Atlases in the sky at the same time, although only one of them was relatively bright! As a matter of fact, on one night, I actually entered the coordinates for the WRONG Comet Atlas into my telescope's GOTO before I realised my error! Still, an easy mistake to make.

The night of the 3 Comets - 8 Dec

On the night of 7th - 8th December, I observed Comets 67P and Atlas. Again, I found that Atlas was somewhat brighter and more condensed than 67P, whilst 67P was more diffuse, and fainter. Both were now moving very little from night to night.

Also, I finally found Comet Leonard, having waited up on two previous nights, only to find, of course, that it clouded over by early morning! On the morning of 8th December, it was clear.

Comet Leonard appeared quite bright in my 8"SCT, and it appeared with a strong central condensation, (a disk, or ball, shape) which was surrounded by a larger fuzzy area. I could even see the comet with my 11 X 80 binoculars too, and it was still fairly distinct, appearing as a fairly "large" fuzzy ball. I did not manage to see a tail. This comet was only a few degrees to the NE of Arctures.

Thus, I observed 3 Comets in the same night, which was most satisfying! However, despite popular opinion that Comets are rare, at any given time there are usually quite a few of them trundling around the sky. The problem is that most comets, like these three, are fairly faint, whilst the really spectacular naked eye comets like Hale-Bopp, or last year's Neowise comet are rare, and appear at random intervals. In addition, most comets, are even fainter, so well beyond the reach of my telescope, or else really badly placed, e.g. only in the Southern Hemisphere!

I estimated the magnitude of Comet Leonard as being about +4, as it appeared similar in magnitude and size to the galaxy of M31 (the Andromeda galaxy).

Unfortunately, this comet is what astronomers call "badly placed", as it first only rose in the early hours (i.e. at least 1:30 am), so it needed several more hours to reach a high enough altitude to make it observable. Even then, it would be visible in the early evening sky, but extremely low down, before it dove down into the Southern Hemisphere!

I have seen images of it showing a strong green colour and a tail. Unfortunately, although images always show these features, the visual observer generally cannot see them. This is because the human eye is very poor at picking up colour in dim objects in the sky, as the eye receptors are not very sensitive to colour. Cameras, however, can image such an object over a period of time, allowing them to pick up the colours and other faint details. In this regard, seeing a comet is very similar to seeing Deep Sky objects, such as galaxies and nebulae. Only really bright comets or nebulae can show colour that is detectable by the human eye, such as M42, and some of the brighter and smaller Planetary Nebulae.

Venus - 9 Dec

On 9th December, I saw Venus in the late afternoon and it was, by now, becoming a very beautiful and large crescent (at just over 20%). The phase was easily seen at even the lowest magnification.

This period is the best ever to observe Venus, as it is at its largest angular size, and in its beautiful crescent form! This crescent phase period does not last very long, as Venus soon moves in towards the Earth, and then away again. Venus is usually unrewarding to observe as, for most of the time, it is fairly small, and isn't doing much! In addition, as it is permanently cloud-covered, no surface features are visible, and only vague grey shadings of the clouds are ever visible!

AGM - 11 Dec

On 10th December, we held our first AGM for 2 years.

I had been concerned that it would be cancelled as, only the previous day, the latest edict from the authorities had decreed new restrictions, due to the latest Covid variant now circulating in the UK. Fortunately, it was OK, but this time, nearly everyone was wearing face masks, except for those exempt from wearing them.

However, it must have been the lowest turn-out in the history of the Society, as only 13 people physically attended, and only another 4 attended on Zoom! Thankfully, for those that attended, it was still business as usual and fun-filled, what with the quiz and raffle!

We never have a Speaker at the AGM, but Ron Canham gave his usual Sky at Night presentation, and Ron Johnson showed some images that he had taken of the Sun, Moon, and planets. David Fishwick won the quiz, with a score of 21 out of 25, whilst I "only" got 17 out of 25!

The Raffle had 6 prizes and, as one man remarked, due to the low turn-out, there was a good chance of winning. It became hilarious, as people's ticket numbers kept on coming up twice, or even three times. Mine came up twice, and I got one of the books as a prize.

Due to the Covid risk and restrictions, the windows had to be kept open. As a result, it became quite chilly in there, and some of us had to put our coats on again!

Astrology and Astronomy - 11 Dec

At the AGM, Ron Canham made a good point about how much maligned Astrology can be. Astrology is now discredited by astronomers, but in ancient times, the science of Astronomy has its roots in astrology.

Ancient observers would watch the skies, and they invented star constellations, (as the human brain tends to easily see patterns in nature), and all civilisations had their own versions of them. Constellations are less important today than they were then, but they are still very useful to show where astronomical objects are. It is much easier if you can say that such and such an object is "in" a certain constellation - for example, the galaxy M31 is in Andromeda (and, hence, is often known as the Andromeda Galaxy). Otherwise, you may have to use coordinates. Whatever system one uses, one always needs a reference point, in order to know where something is.

The ancient observers, particularly the Chinese, would also note eclipses, and comets. Comets were, of course, usually seen as bad omens. Thus, it was important for them to keep good observations and records of the skies! One consequence of not doing so, is where two Chinese astronomers failed to predict an eclipse, and were promptly executed by the emperor!

The Chinese also saw spots on the Sun, and noted that the tails of Comets always pointed away from the Sun (although they didn't know why!). Due to their appearance, they called comets "Hairy Stars", "Bushy Stars", or "Broom Stars". Supernovas were known as "Guest Stars".

It is possible for modern astronomers to examine the old records and extract good data from them about past events, especially eclipses and comets.

In time, science and modern astronomy took over from astrology although, even in ancient times, there was some good astronomical science being undertaken, especially by the Greeks.

As Ron pointed out, our constellations originated from the Babylonians and, later, from the Greeks, where many of our constellations are from Greek myths (e .g. Perseus, Pegasus, Cassiopeia, Cepheus, Orion, and others).

Even in later times, the German astronomer, Johann Bayer, in 1603, used the Greek alphabet to designate stars in each constellation, with the first letter, Alpha, usually designating the brightest star in that constellation, whilst other, fainter stars were known (and still are!) by other letters. These include beta, delta, omicron (sound familiar!) epsilon, gamma, zeta, sigma, phi, omega, and others!

The frustrations of being an amateur astronomer - 22 Dec

For much of December we had a high-pressure zone stuck over the UK, which you would think is ideal for observing - wrong! In winter, they are often just full of cloud, as was the case this time. There were at least 11 overcast days with no sun at all, and hardly any clear nights either! I last observed the Sun on 10th December! The weather was virtually the same every day, and night, with no wind. The sky finally cleared in the evening of 21st December.

In the early evening I saw Venus as a beautiful, large, and thin crescent 🌙 (it was only 11%).

Comet Leonard just rose later and later in the morning, so observations become impossible very quickly after my one observation of it. Then, in mid-December, it was in the early evening sky, but very low down, even at the start of twilight. To add insult to injury, on 20th-

21st December it flared up from magnitude 5 to about 2; of course, the Southern Hemisphere would get the best view of that event and I didn't see it! Also, in the late evening, there was a bright gibbous Moon right close to Comets Atlas and 67P, so it was useless to try and observe them! Just to add to the fun, there was also extensive cirrus cloud over the sky!

Finally, to top it off, the GOTO on my telescope was playing up, for no apparent reason, so the telescope was behaving erratically. As usual, it occurred during the alignment procedure. Instead of moving and going up to the alignment stars, the scope was just going around to the area of the star, in a flat circle, and not rising up to the star. Then it just stopped and did nothing more. Naturally, I switched the power on and off repeatedly, as you do with computers, to try and get rid of whatever loop it had decided to get stuck in this time, but to no avail!

GOTO is great when it works, but when it doesn't, it just means that a computer is getting in the way of your observing. I can, of course, use the scope manually, but I am not very good at star - hopping and, for finding faint, or obscure, Deep Sky objects or Comets, use of a GOTO is great!
Eventually, the GOTO did start working properly, but I still don't really know WHY it wasn't earlier on. That's the problem with computers - they can never tell you what the exact problem is, and how to deal with it!

Material from asteroid Ryugu starts to give up secrets of early Solar System

Acknowledgement: This article was written by Monica Grady, Professor of Planetary and Space Sciences at the Open University and was published in THE CONVERSATION on 21st December. It is republished in full under Creative Commons Licence. The original article can be found here: *https://theconversation.com/material-from-asteroid-ryugu-starts-to-give-up-secrets-of-early-solar-system-173884*

Just over a year ago, material from the Japanese Hayabusa 2 mission to Asteroid (162173) Ryugu arrived back on Earth. And this week, the first two papers reporting analysis of the material have been published in Nature Astronomy.

Excitingly, they suggest we may be on the brink of discovering whether water and organic material, which enabled life on Earth, really came from asteroids like it.

The Hayabusa 2 mission orbited Ryugu for 18 months between June 2018 and November 2019, returning fascinating images and data from the spinning-top-shaped body. One of the most important aims was to collect material from its surface, which it did in two tricky manoeuvres. The separate touch-downs were designed to collect material from different layers of the asteroid.

The first fired a small bullet into the asteroid near its equator, collecting some of the surface dust that was distributed. A second, larger impact produced a crater, with material collected from it in a second touchdown. This was important, as these grains had not been exposed to the outside space environment.

In total, Hayabusa 2 collected almost 5.5g – about a teaspoonful – of dust. This doesn't sound much, until you consider that there are several thousand individual grains, each of which could be analysed by special instruments on Earth.

Ryugu is a C-type asteroid – rocky and dark bodies that are rich in carbon and water. Crucially, they have survived since the birth of the Solar System without losing their primitive composition. This, however, does not mean that they are unchanged. "Carbonaceous chondrites", meteorites that have been found on Earth and are thought to have come from C-type asteroids, have many features that indicate that they have been altered by fluids.

These bodies, thought to have formed at the outer reaches of the asteroid belt, contained ice mixed in with the rock. Some of the ice, however, has melted – leading to the production of clay minerals and carbonates (salts). One of the aims of the Hayabusa 2 mission was to investigate the link between C-type asteroids and carbonaceous chondrites. Were C-type asteroids really the parent bodies from which carbonaceous chondrites originated?

This is important because carbonaceous chondrites are probably the sort of objects that brought water and organic compounds to Earth, enabling life to emerge here.

New insights

As they were irreplaceable samples, the analyses started with non-invasive and non-destructive observations and are being followed by complex measurements that require specimens to be manipulated and prepared, an ongoing process.

So what are the preliminary results? The bulk density of Ryugu was measured by Hayabusa 2 to be around 1,190 kilograms per cubic metre. This was as expected, since the asteroid is assumed to be a rubble pile of material that has come together following the collision of a larger body. It, like most asteroids, has a high porosity – lots of void spaces between the rocky components.

But it was a surprise that the density of the collected material was similarly low in density, at around 1,300 kilograms per cubic metre. This is surprising because the collection process should have collapsed the voids and leave a denser heap of particles. These particles would also have been further shaken together during transit and atmospheric entry. The density is also much lower than that of the meteorites presumed to be similar to Ryugu.

The authors speculate on two complementary reasons for this. Meteorites that ended up on Earth were once removed by collision from their parent asteroid. Unlike the Ryugu material, which was protected by its capsule, their final dramatic plunge through Earth's atmosphere had a direct effect on them – causing break-up and fragmentation. So the meteorites that arrive on Earth have had at least one additional event that could cause their porosity to decrease. Ryugu may also contain more low-density material, such as organic molecules, than such meteorites.

This is extremely important because it implies that the material from Ryugu has preserved a component of carbonaceous material that we have not been able to study before. This should allow us to learn more about the primordial building blocks of life.

The composition of many of the Ryugu grains has also been evaluated by spectroscopy – a technique that shines light on a sample and measures the wavelength of the light reflected back. This is not the most usual of techniques for preliminary compositional analysis – but it has been employed because it is non-destructive, requires no sample preparation, and enables direct comparison of the grains with measurements taken of the surface of Ryugu by Hayabusa 2.

As would be anticipated, the spectra of the grains (from both touchdowns) and the asteroid surface are very similar, and all contain the same fingerprint for water (as OH, hydroxide). The more detailed laboratory analysis, at higher wavelengths than measured at the asteroid, found additional features, one of which is identified as from a nitrogen-bearing component, which, the authors suggest, might be from ammonium-bearing clay minerals or nitrogen-rich organic material. That said, we don't yet know how abundant organic compounds might be in the samples – that must wait for a different analytical technique.

The authors also found a huge carbonate grain about half a millimetre long that could be iron-rich – very characteristic of this type of meteorite.

This is, however, preliminary analysis. The papers have achieved two things: the first is that they have shown us that the material from Ryugu is primitive and sufficiently different from known

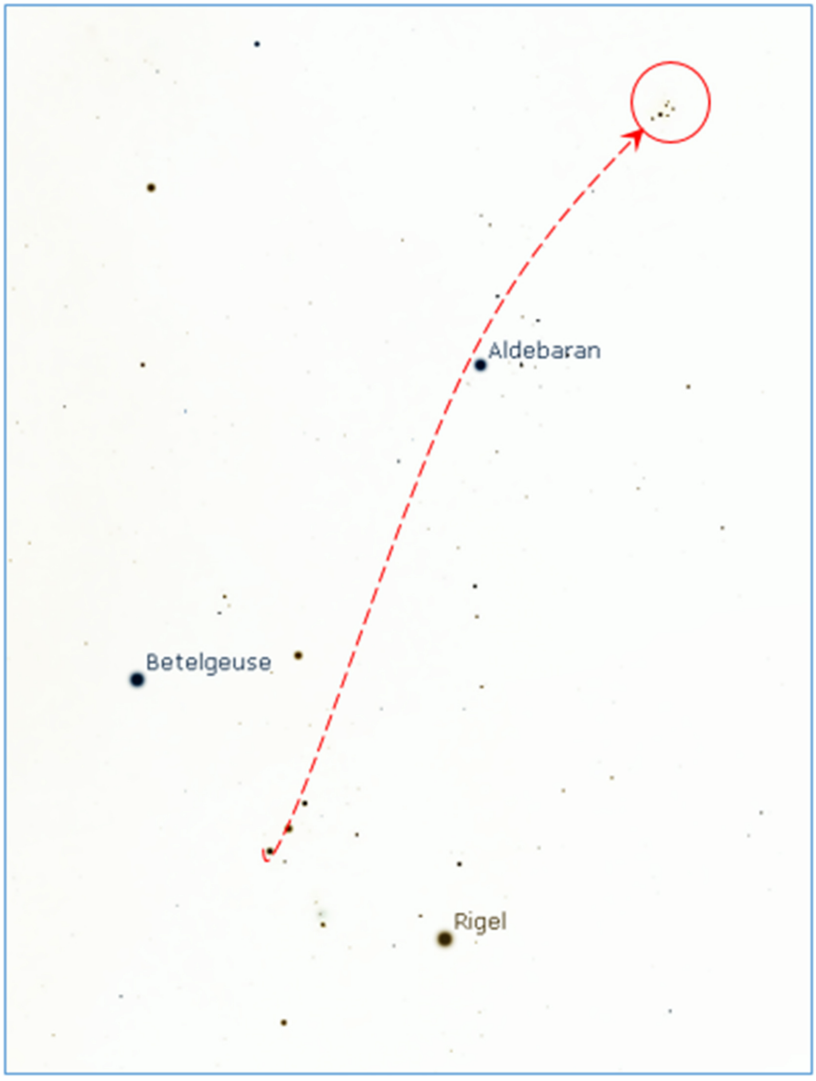
meteorites to make us think again about how representative meteorites are of asteroids. This might come to change some aspects of our view of early Solar System history.

And the second thing? They have left us – okay, me – desperate to learn more about these precious materials. I await eagerly the next set of papers and – even more keenly – an opportunity in the future to analyse a sample myself.

Thank you JAXA and thank you Hayabusa 2 team. You have brought at least one planetary scientist some real festive joy at the end of a difficult year. And a great deal to look forward to in 2022.

Object of the month - Pleiades - Martin Howe

The Pleiades (M45) is one of the showpiece objects in the northern hemisphere's winter sky, and readily visible to the naked eye even from the light polluted skies of London. It can be located very easily by following a line, eastwards, along the belt of Orion, to the bright red star Aldebaran in Taurus, and extending the line out by a similar distance (see the accompanying finder chart).



It is a well-recognised grouping globally, known informally as the seven sisters from Greek mythology; Subaru in Japan (and a stylised version of the cluster is used as the badge for the Subaru motor company); and Matariki to the Maori where its first appearance in the southern hemisphere's spring skies heralds the planting season.

The seven sisters' name refers to the seven sisters of the Titan Atlas (and the proper names of the stars are taken from the seven sisters' names). There are several variations of the myth as to how they were placed in the sky by Zeus such as in sympathy of their grief in the death of their sisters, the Hyades (the larger open cluster of which the aforementioned Aldebaran is a line-of-sight member), through to protecting them from the unwanted attention of Orion, who now perpetually chases them from east to west across the sky.

The cluster is about 400 light years away and formed of relatively young hot blue stars, probably no more than 100 million years old, and whose energetic radiation provides the illumination for the reflection nebula that we see today. The accompanying image is a composite of twelve 5-minute exposures (at ISO 2500) taken with a Canon 50D DSLR attached to the prime focus of a 102mm f/7 refractor from a dark sky site in Northumberland.

Up Next:

NEXT MEETING: 8pm Friday 14 January 2022 - Nonsuch High School

Professor Brad Gibson from the University of Hull Centre of Astrophysics will speak on a subject to be confirmed. Attendance via Zoom will also be possible for those members preferring not to attend in person.

Ron Canham will also deliver his Sky at Night presentation for the month to come.

NEXT USER GROUP:

Suspended until further notice.

NEXT DENBIES OBSERVING SESSION:

To be advised.

Meet at "Stepping Stones" Pub at West Humble at 7:30 pm before going on up to Steers field at about 8pm if the sky clears.

AD HOC OBSERVING AT WARREN FARM:

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