JANUS
THE NEWSLETTER OF EWELL ASTRONOMICAL SOCIETY

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Editorial

Welcome to the July edition of Janus, written whilst on holiday in the Dordogne! Although a little slimmer than usual, hopefully it still contains something of interest to everyone.

As noted by Gary – and probably obvious to everyone – May's pattern of unusual weather has continued but has frustrated those wanting to take advantage of the warm, albeit short, evenings. The 10 or so consecutive favourable viewing nights in late May were followed by a series of days and nights, from 30th May onwards, where it was often clear in the afternoons, but cloud would then roll in from the North Sea, leading to overcast nights. The mornings were similarly overcast, but the clouds broke up by late morning, as the Sun burned them off. Such a weather cycle may be excellent for observing the Sun but is infuriating if you want to make any night-time observations!

Martin Howes' topic this month is "Imaging the Moon". As well as explaining how to obtain the best images, he points out that, with July occurring soon after the summer solstice, the opportunities for astronomy are very much limited to viewing or imaging only a few of the brighter objects in the night sky. For most of July, the skies do not even get truly (astronomically) dark - which is when the Sun dips further than 18° below the horizon.

I have added an image of my own, taken last week whilst on holiday, which very much supports his point. An alternative target is, of course, the Sun, but this requires additional equipment. So, the message is clear, make the most of what's available for observation during the Summer!

John

The Solar System July

MERCURY: recently passed behind the Sun at superior solar conjunction. At the beginning of the month, it is not readily observable since it is very close to the Sun, at a separation of only 1° from it. By the end of the month, emerging into the evening sky as it approaches greatest elongation E, it is not observable, reaching its highest point in the sky during daytime and being no higher than 0° above the horizon at dusk.

VENUS: begins the month as an evening object, having passed greatest elongation E, and will become visible around 21:48 BST, 12° above the W horizon, as dusk fades to darkness. It will then sink towards the horizon, setting 1 hours and 58 minutes after the Sun at 23:18. By the end of the month, it will soon pass in front of the Sun at inferior solar conjunction, and will not be readily observable as it will reach its highest point in the sky during daytime and be 3° below the horizon at dusk.

MARS: begins the month as an early evening object, now receding into evening twilight. It is not observable as it will 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, it will soon pass behind the Sun at solar conjunction, and remains not observable, reaching its highest point in the sky during daytime and being close to the horizon at dusk.

JUPITER: begins the month emerging from behind the Sun and is visible in the dawn sky, rising at 01:38 BST – 3 hours and 7 minutes before the Sun – and reaching an altitude of 23° above the E horizon before fading from view as dawn breaks around 04:17. By the end of the month, it is visible in the dawn sky, rising at 23:50 BST and reaching an altitude of 44° above the SE horizon before fading from view as dawn breaks around 04:55.

SATURN: begins the month visible as a morning object in the dawn sky, rising at

23:51 BST and reaching an altitude of 25° above the S horizon before fading from view as dawn breaks around 03:46. By the end of the month, approaching opposition, it is visible in the morning sky, becoming accessible around 23:13 BST, when it reaches an altitude of 10° above the SE horizon. It will then reach its highest point in the sky at 02:58, 27° above the S horizon, before being lost to dawn twilight around 04:30, 24° above the SW horizon.

URANUS: recently passed behind the Sun at solar conjunction. It begins the month not observable, reaching its highest point in the sky during daytime and being no higher than 3° above the horizon at dawn. By the end of the month, visible in the dawn sky, it will rise at 00:06 BST and reach an altitude of 30° above the E horizon before fading from view as dawn breaks around 03:33.

NEPTUNE: is currently emerging from behind the Sun. It begins the month not observable, reaching its highest point in the sky during daytime and being no higher than 18° above the horizon at dawn. By the end of the month, it is visible in the dawn sky, rising at 22:26 BST and reaching an altitude of 35° above the S horizon before fading from view as dawn breaks around 03:33.

MOON PHASES:

First Quarter	26 June
Full Moon	3 July
Last Quarter	10 July
New Moon	17 July
First Quarter	25 July
Full Moon	1 August

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*

July

1	Close approach of Venus and Mars Comet C/2023 E1 (ATLAS) passes perihelion Messier 22 is well placed
2	The cluster IC 4756 is well placed
6	The Earth at aphelion
7	Close approach of the Moon and Saturn
9	Venus at greatest brightness
11	Close approach of the Moon and Jupiter
12	Comet 185P/Petriew passes perihelion
20	Conjunction of the Moon and Venus
21	Close approach of the Moon and Mars
22	134340 Pluto at opposition
25	Mercury at highest altitude in evening sky
28	Lunar occultation of Delta Scorpii
29	Piscis Austrinid meteor shower 2023
30	Southern δ-Aquariid meteor shower 2023 α-Capricornid meteor shower 2023

August

3	Close approach of the Moon and Saturn
8	Close approach of the Moon and Jupiter
9	Mercury at dichotomy Close approach of the Moon and M45 Mercury at greatest elongation east
10	Asteroid 10 Hygiea at opposition
13	Perseid meteor shower 2023
14	Messier 15 is well placed
15	Messier 2 is well placed
18	κ-Cygnid meteor shower 2023
24	Lunar occultation of Delta Scorpii
27	Asteroid 8 Flora at opposition Saturn at opposition
29	Uranus enters retrograde motion
30	Close approach of the Moon and Saturn
31	Blue Moon (2nd Full Moon of the month)

Collected Observations (and thoughts) – Gary Walker

The Good Weather Spell - posted 1 June

I remarked in the June issue about the unusually long spell of fine clear nights from 19th May onwards. Well, they continued until 29th May, which meant that there had been a period of 10 consecutive clear or clearish nights! After that, we had a series of days and nights, from 30th May into early June, where it was often clear in the afternoons, but cloud would then roll in from the North Sea, and the nights were overcast! The mornings

were similarly overcast, but the clouds broke up by late morning, as the Sun burned them off.

I have seen this weather cycle before, but not very often. It can be infuriating if you want to observe at night!

Supernova SN2023 ixf again! - posted 8 June

The weird and irritating weather cycle of sunny days, but with cloud cover rolling in just when it gets dark is continuing, as the weather is still coming from the NE, i.e. from the North Sea! This, of course, is fine for solar observations, but not for night-time observing!

It has, however, occasionally still been clear, as was the case on 7th June. I again looked for the M101 supernova. The trouble is that the galaxy of M101 is effectively invisible via my telescope with, at best, only its centre just visible!

There are a few moderately bright stars (as seen in my scope), as well as a few faint ones. But I cannot tell which of these IS the supernova, as a supernova will just appear like any other star!

Of course, all but one of these stars are in the "foreground", as it were, in our galaxy, only hundreds to thousands of light years away at most, whilst the supernova and galaxy of M101 are about 21 million light years away! This means that this star also died 21 million years ago, because of the time taken for light, even at its immense speed, to reach us!

I have tried looking at star charts for this supernova, but I can't recognise anything that I have seen and drawn, so I cannot match it up with the charts, or images!

Just to add to the fun, in addition, one must consider whether the charts and images are depicted the right way up, or upside down, as different types of telescopes will give differently oriented views! I have seen images with some showing the supernova somewhat higher than the centre of the galaxy, whilst others show it below the centre!

My telescope is an SCT, so presents views the correct way up, but mirror reversed left to right! So, the question is which view is the right way up?

M101 also had another supernova in 2011.

In other news, the Sun continues to be very active in both white light and ha light. There are presently 3 - 4 spot groups upon the Sun, and the Sun cycle is close to its peak!

Venus had now reached half-phase and was still very prominent in the evening sky.

Mars and Venus – posted 21 June

I observed Mars and Venus on the evening of 20th June. The two planets were about 5 degrees apart in the Western sky.

Venus was now, obviously, a fat crescent and, from now on, things will go quickly, as it shrinks in phase, but grows rapidly in size!

Mars is now on its "last legs" and is low in the evening sky. Through my telescope, the disk of the planet was scarcely visible at 62X, but visible at 100X. However, even at high magnifications of 222X and 300X, Mars only appeared very small. This was not surprising, as Mars was now only 4.4' arcseconds in size! That size is not much "bigger" than those ever attained by Uranus and Neptune. Mars is now nearly as small as it can get!

It is now over 6 months since the opposition in early December.

Moon and Jupiter Conjunction in Daylight – posted 21 June

On 14th June, at about 9.10 am, I managed to see both a 15% phase crescent Moon, and Jupiter, passing over a degree from each other, through my telescope.

The weather was perfectly clear, with no clouds at all, which is essential for this type of Observation. The two objects were not close enough to fit in the same field of view, even with my lowest magnification of 62X.

Being as it was daytime, Jupiter appeared pale and washed out, but I could still just glimpse one or two of the Equatorial Belts upon it!

I could not see Jupiter via my 11X 80 binoculars.

Brightest cosmic explosion of all time: how we may have solved the mystery of its puzzling persistence

Acknowledgement: This article was written by Hendrik Van Eerten, Reader in Astrophysics, University of Bath and was published in THE CONVERSATION on 7th June 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/brightest-cosmic-explosion-of-all-time-how-we-may-have-solved-the-mystery-of-its-puzzling-persistence-207133*

First detected accidentally by US military satellites in the late 1960s, cosmic explosions known as gamma ray bursts (GRBs) have come to be understood as the brightest explosions in the universe.

Typically, they are the result of the cataclysmic birth of a black hole in a distant galaxy. One way this can happen is through the collapse of a single, massive star.

Astronomers such as myself working in the field are well aware of the massive energy scales involved in GRBs. We know they can release as much energy in gamma rays as the Sun does throughout its lifetime. But every once in a while, an event is observed that still gives us pause.

In October 2022, gamma-ray detectors on the orbital satellites Fermi and the Neil Gehrels Swift Observatory noted a burstknown as GRB 221009A (the date of detection).

This quickly turned out to be a record-setter. It was dubbed the Brightest Of All Time, or the “Boat”, as convenient shorthand among astronomers studying and observing the event. Not only did the Boat start out bright, it refused to fade away like other bursts.

We still do not fully know why the burst was so exceptionally bright, but our new study, published in Science Advances, provides an answer for its stubborn persistence.

The burst originated from a distance of 2.4 billion light years – relatively nearby for a GRB. But even when accounting for relative distance, the energy of the event and the radiation produced by its aftermath were off the charts. It is decidedly not normal for a cosmically distant event to deposit about a gigawatt of power into the Earth’s upper atmosphere.

Observing narrow cosmic jets of gas

GRBs such as the Boat launch a stream of gas moving at very close to light speed into space. How exactly the jet is launched remains something of a puzzle – but most likely, it involves magnetic fields near where the black hole is being formed.

It is the early emission from this jet that we see as the burst. Later, the jet slows down and produces additional radiation, a fading afterglow of light – from radio waves up to (in exceptional cases) gamma rays.

We do not observe jets directly. Instead, like distant stars, we see GRBs as points in the sky. Nevertheless, we have good reason to believe that GRBs do not explode in all directions equally. For GRB 221009A, this would certainly be unreasonable, as it would involve multiplying the amount of energy detected on Earth by all other directions – amounting to much more energy than any star would have available.

Another indication that GRBs come from jets pointing roughly at us is due to special relativity theory. Relativity teaches us that the speed of light is constant, no matter how fast a source moves at us. But that still allows for the direction of light to become distorted. Thanks to this fun-house mirror effect, light emitted in all directions from the surface of a fast-moving jet will end up focused strongly along its direction of motion.

That said, the edges of a jet heading in our direction will be very slightly curved away, meaning their light is focused away from our direction. Only later, when the jet slows down, do the edges normally come into view and does the afterglow start to fade faster.

But here again, GRB 221009A broke the rules. Its edges never showed, and it joined a select group of very bright bursts that refuse to fade normally. Rather than starting to fade slowly and then disappearing quickly, it is steadily fading over time.

In our work, we demonstrate how the appearance of the jet edges can be obscured in a way that matches the observations of the Boat. The key idea is as follows: yes, a narrow jet was launched, but it had a difficult time escaping the collapsing star, leading to a lot of mixing with stellar gas along the sides of the jet.

From simulation to observation

To test whether this was indeed the case, we took a computer simulation result showing this mixing and implemented it in a model that could actually be compared to the Boat data directly. And it showed that what would normally be a quick turnover to a strongly fading signal, now became a drawn-out affair.

Radiation from the dying star’s shock-heated gas kept appearing in our line of sight, explaining why it stayed so bright. This kept happening all the way up to the point that any characteristic jet signature was lost in the overall emission.

This way, GRB 221009A not only confirms expectations from simulation, but also provides a clue to similarly bright events seen in the past, where people had to keep revising the energy estimate upwards while waiting for a jet edge to show.

We calculated that the likelihood of seeing a burst this bright is about one in a thousand years, so we are lucky to have spotted one. But questions remain. What role do magnetic fields play, for example?

Theorists and numerical modellers will be exploring these matters for years, scouring the Boat data while we stay on the lookout for the next big event to arrive.

Imaging the Moon – Martin Howe

July occurs soon after the summer solstice, meaning that the opportunities for astronomy are very much limited to viewing or imaging a few of the brighter objects only. For most of July, the skies do not even get truly (astronomically) dark - which is when the Sun dips further than 18^{o} below the horizon.

However, at this time of year there is always the Moon to keep us company, and the ever-changing phases mean that there is always something different to look at.

Imaging the Moon is also relatively easy, and even a reasonable zoom lens of 200mm focal length or more on a DSLR camera will give good results. The Moon is so bright that exposures can be kept short and so a standard fixed photography tripod can be used.

If, however, you want to take high-magnification images of the Moon, then you will soon run into issues with atmospheric turbulence. Anyone who has had the joy of looking at the Moon through a telescope under high magnification cannot fail to see the turbulent atmosphere making the Moon's surface appear to "boil". Sometimes the image you see is really sharp, but the next second it is blurry. This makes it a challenge to take a nice sharp image of the Moon - how do you know when to press the shutter button at just the right time? The short answer is you can't, and it is just a matter of luck.

We can, however, try and stack the odds more in our favour by taking hundreds of short exposure images and then sort through them to select the best ones.

Fortunately, this is not as tedious as it sounds - we employ a video camera to take the hundreds of short images (a video is after all, just a series of images played back at high speed). Software can take the video, split it into its individual component frames, and then assess each frame to determine which ones are sharpest. The final element is not just to select the single sharpest image from the lot (although we could do that), but to take, say, the best 100 of the frames and use more software to combine the images together to create an even better overall image.

Let me give you an example to demonstrate…

The image on the left is a single frame of a video (effectively the equivalent of a single photograph that you could have taken with a DSLR). This shows particularly bad blurring due to atmospheric turbulence. The middle image was extracted from the same video, about 10 seconds later in the sequence, and is a much clearer image than the first one - demonstrating the transient nature of atmospheric turbulence. The final image on the right has used software to select the best 240 frames from what was a 600-frame video, and then combined these together to create a single consolidated image.

The main target of this image was Rima Ariadaeus - the fault line (or rille) that cuts horizontally across the middle of the image (just above the arrowed crater). This feature is invisible in the left-hand image, and barely noticeable in the middle image. Yet by utilising multiple images, and software to select the best ones of these and stack them, the feature is clearly visible in the right-hand image. The crater arrowed in the right-hand image is the crater Silberschlag A, which is 7km in diameter. Again, this feature is invisible in the left-hand (turbulent) image.

The software I use for video capture is either SharpCap or FireCapture (both free), and the selection of the best images and stacking of these is done with either AutoStakkert or RegiStax (again both free). You will find plenty of tutorials online on how to use these programmes. There is also another great free piece of software (have you noticed a bit of a theme going on here…?!) that I use to identify the features on the Moon, and that is the Virtual Moon Atlas.

So, although there might be some restrictions in what we can see in the summer night sky, all is not lost, and the Moon can provide plenty of entertainment, either just to look at, or to photograph. And what's more, you can do it without putting on five layers of clothes!

Editor's Addition:

Just to emphasise Martin's point in the last paragraph, this image of the Moon and Venus was taken at 22:39 CST (GMT+2 hours) on 24 June at La Nadalie, near Dussac, France. The original digital negative file (i.e. RAW image), taken on an iPhone 14 Pro (1/20s f1.8), was minimally adjusted using Photoshop Elements, before converting to JPEG.

Although the surrounding area is recognised as being good for astronomy (there is a small observatory with a 450mm Newtonian telescope at Nantheuil, some 13 km away), these two bright objects were the only ones visible in the late evening sky.

Mars was to the left of Venus, and slightly above, but I couldn't see it with binoculars, telescope or naked eye!

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 14 July – Nonsuch High School

Our very own David Fishwick will give a talk entitled 'Stars II - How hot, how old, and how we know'.

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 on 17 July.

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 9-17 July, with 17-21 July as an additional possibility.

AD HOC OBSERVING AT WARREN FARM:

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