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. This month's meeting will be on Friday 14th October, when our speaker will be Emily Charles from the University of Surrey who will give an insight into her research, and talk on the subject of "Dwarf Galaxies of the Local Group - Uncovering Secrets About Dark Matter".

October is when we bid farewell to BST and revert to GMT until the next change back to BST at the end of March 2023. Given the change from GMT to BST happens at the end of March, coinciding closely with the Vernal (Spring) equinox, I often wonder why the change from BST back to GMT doesn't coincide more closely with the Autumn equinox in late September; as it is, we have 5 months of GMT and 7 months of BST!

The 2 NASA missions planned for September (Artemis-1 and DART) met with mixed fortunes. Further problems with hydrogen leaks in the Space Launch System (SLS) rocket resulted in the 3rd September launch attempt of Artemis-1 being scrubbed. A further attempt in early September was ruled out due to the need to re-certify the flight termination system, necessitating the roll back of the rocket and spacecraft to the VAB to reset the system's batteries. The next attempt was planned for 27th September, but the arrival of Hurricane Ian put paid to that. The SLS has now been moved back to the VAB for safety, with November now the most likely month for a further launch attempt. As noted by Gary, the DART mission, involving the use of a probe to attempt to deflect an asteroid, successfully impacted the asteroid on 27th September. The success (or otherwise) of the mission will be evaluated over the coming months as the asteroid's path is monitored.

John

skyUpdate
What's up this month?

The Solar System October

MERCURY: begins the month difficult to see, emerging into the morning sky as it approaches greatest elongation W. It will reach its highest point in the sky during daytime and be no higher than 2° above the horizon at dawn. Visibility improves slightly towards the middle of the month, but by the end of the month, when it will soon pass behind the Sun, it will not be readily observable being very close to the Sun, at a separation of only 5° from it.

VENUS: begins the month approaching the point at which it will pass behind the Sun. It is thus not readily observable since it is very close to the Sun, at a separation of only 5° from it. By the end of the month, having recently passed behind the Sun at superior solar conjunction, it remains not readily observable since it is even closer to the Sun, at a separation of only 2° from it.

MARS: is currently approaching opposition and is visible throughout the month as a morning object. It begins the month visible in the morning sky, becoming accessible around 22:39 BST, when it reaches an altitude of 8° above the NE horizon. It will then reach its highest point in the sky at 05:36, 61° above the S horizon before being lost to dawn twilight around 06:32, 59° above the SW horizon. At the end of the month, it is still visible in the morning sky, becoming accessible around 19:50, when it reaches an altitude of 7° above the NE horizon. It will then reach its highest point in the sky at 03:02, 62° above the S horizon. It will finally be lost to dawn twilight around 06:27, 42° above the W horizon.

JUPITER: begins the month approaching opposition and is visible as a morning object. Becoming accessible around 19:28, when it rises to an altitude of 7° above the E horizon, it will reach its highest point in the sky at 00:34, 38° above the S horizon, before becoming inaccessible around 05:41 when it sinks below 7° above the W horizon. At the end of the month, having recently passed opposition, it is visible in the evening sky, becoming accessible around 16:57 BST, 13° above the E horizon, as dusk fades to darkness. It will then reach its highest point in the sky at 21:20, 37° above the S horizon, and will continue to be observable until around 02:20, when it sinks below 7° above the W horizon.

SATURN: is currently an early evening object, and begins the month visible in the evening sky, becoming accessible around 19:16 BST, 14° above the SE horizon, as dusk fades to darkness. It will then reach its highest point in the sky at 21:44, 22° above the S horizon, and will continue to be observable until around 00:53, when it sinks below 10° above the SW horizon. By the end of the month, it remains an early evening object, now receding into evening twilight. Visible in the evening sky, it becomes accessible around 17:16 BST, 19° above the SE horizon, as dusk fades to darkness. It will then reach its highest point in the sky at 18:45, 22° above the S horizon, and will continue to be observable until around 21:51, when it sinks below 10° above the SW horizon.

URANUS: begins the month visible in the morning sky, becoming accessible around 22:17, when it reaches an altitude of 21° above the E horizon. It will then reach its highest point in the sky at 03:24, 55° above the S horizon, before being lost to dawn twilight around 05:39, 46° above the SW horizon. By the end of the month, now approaching opposition, it becomes accessible around 19:16, when it rises to an altitude of 21° above the E horizon. It will then reach its highest point in the sky at 00:22, 55° above the S horizon, before becoming inaccessible around 05:27 when it sinks below 21° above the W horizon.

NEPTUNE: begins the month approaching opposition and is visible as a morning object. Becoming accessible around 20:48 BST, when it rises to an altitude of 21° above the SE horizon, it will reach its highest point in the sky at 23:55, 34° above the S horizon. It will become inaccessible around 03:03 when it sinks below 21° above the SW horizon. By the end of the month, it is an early evening object, visible in the evening sky. Becoming accessible around 17:56 BST, 22° above the SE horizon, as dusk fades to darkness, it will then reach its highest point in the sky at 20:55, 34° above the S horizon. It will continue to be observable until around 00:00, when it sinks below 21° above the SW horizon.

MOON PHASES:

New Moon	25 Sep
First Quarter	3 Oct
Full Moon	9 Oct
Last Quarter	17 Oct
New Moon	25 Oct

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

1 136472 Makemake at solar conjunction
M110 is well placed

2 M32 is well placed
M31 is well placed

3 NGC 253 is well placed

4 SMC is well placed

5 Close approach of the Moon and Saturn
NGC 300 is well placed

6 October Camelopardalids meteor shower 2022

7 NGC 362 is well placed

8 Mercury at dichotomy
Close approach of the Moon and Jupiter
Mercury at greatest elongation west

9 Mercury at highest altitude in morning sky
Draconids meteor shower 2022

10 Southern Taurid meteor shower 2022

11 δ-Aurigid meteor shower 2022

12 Close approach of the Moon and Uranus
Lunar occultation of Uranus

15 Close approach of the Moon and Mars
M33 is well placed

18 136199 Eris at opposition
ε-Geminid meteor shower 2022

21 Orionids meteor shower 2022

22 Venus at superior solar conjunction

23 Saturn ends retrograde motion
136108 Haumea at solar conjunction

24 Leonis Minorids meteor shower 2022

25 Partial solar eclipse

26 NGC 869 is well placed

27 NGC 884 is well placed

30 Mars enters retrograde motion
British Summer Time ends (02:00)

Collected Observations (and thoughts) – Gary Walker

Planetary Nebulae – 10 September

Unusually, the first meeting of the new "season" was a meeting with no speaker physically present in the room, only shown on Zoom! It was a lecture on observing planetary nebulae by Owen Brazell, from the Webb Deep Sky Society, (who gave a lecture on galaxy clusters last year, also via Zoom).

I particularly love observing planetary nebulae and, just as Owen Brazell pointed out, there are a large range of them, from bright ones easily seen with small telescopes, to those that have only been discovered very recently by people analysing telescopic plates.

My favourite has to be M57, the Ring Nebula, and it certainly looks like it's images, appearing as a clear ring through my 8' SCT. M27, the Dumbell Nebula, is also very bright and I can see its "hourglass" shape with my telescope. I can also see it in binoculars, and it is the only deep sky object that appears better in my 60mm refractor scope than in binoculars!

As Owen also said, some planetary nebulae are bright enough to show colour in telescopes. Indeed, I can see NGC 6543, NGC 7027, NGC 6392, NGC 3242, and NGC 6572 all appear as small bluish disks in my 8' SCT. NGC 3242 is known as the "Ghost of Jupiter" and, in my scope, it appears as a bright, oddly shaped blob, light blue in colour.

Other planetary nebulae are, however, much fainter. The Helix Nebula has a listed magnitude of 7.3, which seems to be bright and easy to see, and magnificent in images, but because it has a large angular size, it means that it suffers from the curse of "low surface brightness". Even in my telescope, despite the use of an Oxygen 111 filter, it is only just visible as a faint disk.

I use the Oxygen 111 filter for many planetary nebulae. For some, like M57, it is not essential to use this filter, but it does make some of them really jump out. These include M97, the "Owl Nebula" - virtually invisible without it - and NGC 2438, in M46. With this filter, I can see M97 as a fairly large disk.

Planetary nebulae come in all shapes and sizes, and some have such small angular sizes that they can easily be mistaken for stars! This is unless they show a blue - green colour that no star has, or else appear slightly larger than a true star.

Planetary nebulae all have a white dwarf at their centre, with some being easily visible in scopes, whilst others, such as the one in M57, at only 16th magnitude, is notoriously hard to see!

One easy white dwarf is in the NGC 6826, in Cygnus.

Like all deep sky objects, planetary nebulae have all acquired monikers, based on their appearance in images; for example, NGC 2392 is known as the "Eskimo Nebula" as in images it appears to show a fur "hood". I see this one as a bright, bluish disk.

They are still called "Planetary Nebulae" although, as Owen said, they are misnamed. It was the great Astronomer, Sir William Herschel, who first coined this term, as many of them appear as disks, like planets, do, but their nature was not understood at this time. Never-the-less, the name has stuck ever since!

Some resemble the planets Uranus and Neptune, both in their blue - green colour, and their tiny angular sizes!

The only trouble with using filters such as the Oxygen 111 one, is that the telescope needs to be refocused. I find I need to focus on a star close to the nebula, as planetary nebulae will invariably appear fuzzy in appearance, so I need to get the right focus. The problem is that the filter dims stars and, unless you have a sufficiently bright one in the field of view, or nearby, it is difficult, as faint stars are useless in this situation!

Some Nebulae such as NGC 6543, (The "Cats Eye" in Draco), and NGC 2392 (the "Eskimo Nebula" in Gemini) DO have a handy 6th magnitude star in the field of view, so these are much easier to focus on.

Clear Skies after our Meetings

It is extraordinary how often the sky proves to be clear, or at least, partially clear, soon after we have come out of our meetings - others have remarked upon this phenomenon!

Sure enough, after the September meeting, the Moon and Jupiter were visible - earlier on, it had been very showery!

Latest Observations – 15 September

I observed Mars in the late evening of 14th September and saw that it was roughly twice as bright as the orange star of Aldebaran, which was only about 6 degrees away from it.

Through my scope, I could just see a dark linear feature, which the "Sky and Telescope Mars Profiler Tool" indicated was Mares Cimmerium and Tyrrhenum. Mars was now 10.7' arcseconds in size - in December, it reaches opposition at 17' arcseconds.

After I put the telescope lens cap on my scope (I had left it on the grass), on taking it off again a few moments later, I found a huge SLUG upon my objective lens – fortunately, something that that has never happened before to me!

A huge prominence - 23 September

On 23rd September, I saw a huge, very complex, Prominence on the western limb of the Sun. It was almost too difficult to draw, as it consisted of numerous pieces. Yet, only one hour later, it had completely disappeared from view - it was a big eruption!

Jupiter – 26 September

Jupiter reached opposition on 26th September. Even the BBC News mentioned it and, predictably for the media, used the "Big Numbers" approach to overawe the general public by saying that it was at its closest since 1963 - 59 years ago!

Of course, this won't make much practical difference, but Jupiter has certainly become very bright, and high, in the evening sky. Despite being over 400 million miles from Earth, it appears large and bright, with about the largest angular size for a planet, at 49' arcseconds in size!

This makes it the easiest planet to observe and, even at low magnification, the planetary disk is very obvious, and the two main Equatorial Belts are easy to see - as are the 4 Galilean Moons of Ganymede, Io, Europa, and Callisto. The planet's disk and some of the Moons are also visible in binoculars. As it presents such a large angular size (for a planet), it means that it is easy to observe with a small to medium sized telescope.

Other planets can be downright awkward to observe. Mars varies greatly in angular size from less than 4' arcseconds, when it is really too small to see surface features, up to an absolute maximum of 25' arcseconds, but it is worth noting that even that is only half the size of Jupiter, at present. Also, it is effectively out of view for about a year, in each orbit, as it goes behind the Sun!

Venus can go from about 10' arcseconds up to a massive 60' arcseconds, but it is permanently cloud - covered and, when at its closest, it is just a thin crescent - although it is a stupendous sight in a telescope!

Mercury is only occasionally well placed, and is always small, never getting above 12' arcseconds, and is usually only about 6 - 7' arcseconds, when seen.

Uranus and Neptune are so remote at 3.8' and 2.3' arcseconds, respectively, that only their disks can be made out, whilst "surface" features are extremely difficult to see, or image.

Saturn, with its beautiful ring system, is easy to see, but due to a haze in its atmosphere, features upon its disk are much harder to see than they are on Jupiter.

As a result of these many issues, Jupiter is the most rewarding planet to observe.

On 27th September, I saw the Great Red Spot on Jupiter, but it was not very easy to see, and was not displaying any obvious colour. The Southern Equatorial Belt was still much thinner, and less prominent, than the Northern Equatorial Belt. When seeing "surface" features on Jupiter, we are actually only seeing the top of its atmosphere, as it is a gas giant! Thus, cloud features on Jupiter can be seen to change and I have seen it at times over the years, when the Southern

Equatorial Belt has entirely faded to nothing for a time.

BBC News was still mentioning the opposition on 27th September!

DART Mission - 28 September

Following the BBC's interest in Jupiter's opposition, the media were certainly interested in the 27th September DART Mission involving the use of a probe to deflect an asteroid. There was quite a good item on the BBC News that day, and it was covered in the newspapers the next day! I just hope that the new direction of travel of the asteroid doesn't leave it pointing towards the Earth…..

Object of the month – Partial Solar Eclipse, 25th October 2022

This month sees a partial eclipse of the Sun observable from London. It will commence at 10:08am, with the maximum eclipse (which will only be 15%) at 10:59am and the last contact at 11:51am. The Sun (at maximum eclipse) will only be 23° in altitude, so you may need to ensure a fairly clear Southeast horizon to ensure seeing the full eclipse duration.

Despite only a relatively small obscuration I would recommend trying to observe it if possible, as solar eclipses seen from London are not very common – the next one is in March 2025, and that is only a 30% obscuration. The one to mark in your diary however is in August 2026 at 91%, although you should consider making the trip to Iceland or Spain to see totality.

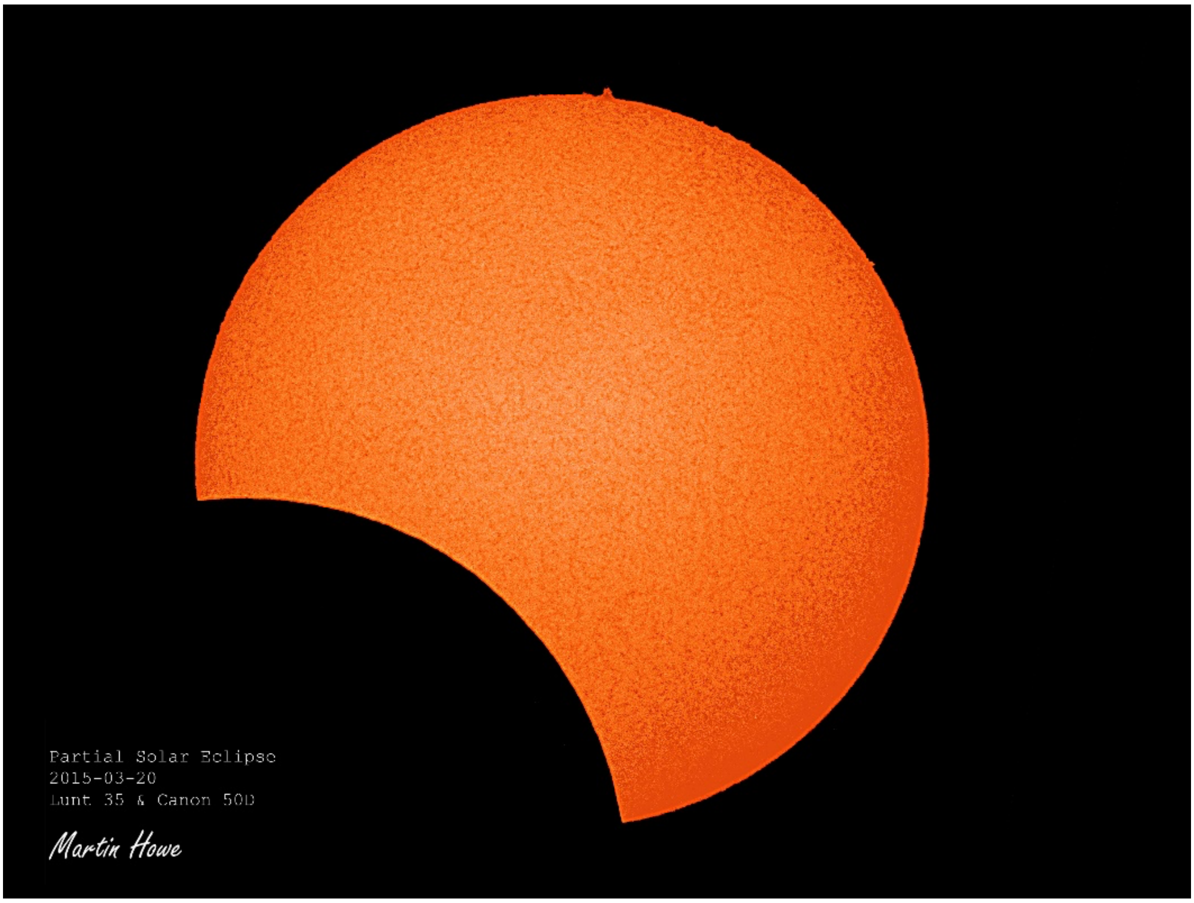
As with any solar observing it is best to seek professional advice and NEVER look directly at the Sun, even during a partial eclipse. Using specialist solar filters or projection onto a white card are some safe options.

How was this photo taken?

The image above was taken from just outside London during the partial solar eclipse of 20th March 2015 - note a number of prominences can be seen on the limb of the Sun.

As the photo caption notes, it was captured through a 35mm Lunt solar telescope with a Canon 50D DSLR.

This image was taken close to the maximum eclipse of 85% on this occasion. An approximate representation of what the 2022 eclipse will look like in terms of amount eclipsed (15%) is shown in the following image, taken at a later phase of the 2015 eclipse:



Can we really deflect an asteroid by crashing into it? Nobody knows, but we are excited to try

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Nasa's Double Asteroid Redirection Test (DART) spacecraft is designed to be a one hit wonder. It will end its days by crashing into an asteroid at 24,000 kilometres per hour on 26th September. Launched from Earth in November 2021, DART is about the size of a bus and was created to test and prove our ability to defend the Earth from a dangerous asteroid.

Landing a direct hit on a target from 11 million kilometres away isn't easy. But while this sounds far, the asteroid was actually selected by Nasa because it is relatively close to Earth. This will give engineers the opportunity to test the spacecraft's ability to operate itself in the final stages before the impact, as it crashes autonomously.

The target asteroid is called Dimorphos, a body 163 metres in diameter that's orbiting a 780 metre-wide asteroid called Didymos. This "binary asteroid system" was chosen because Dimorphos is in orbit around Didymos, which makes it easier to measure the result of the impact due to the resulting change in its orbit. However, the Dimorphos system does not currently pose any risk to the Earth.

Regardless, Nasa is attempting nothing less than a full-scale planetary defence experiment to change an asteroid's path. The technique being used is called "kinetic impact", which alters the orbit of the asteroid by crashing into it. That's essentially what is known as a safety shot in snooker, but played on a planetary level between the spacecraft (as the cue ball) and the asteroid.

A tiny deflection could be sufficient to prove that this technique can actually change the path of an asteroid on a collision path with the Earth.

But the DART spacecraft is going to be completely blown apart by the collision because it will have an impact equivalent to about three tonnes of TNT. In comparison, the atomic bomb dropped on Hiroshima was equal to 15,000 tonnes of TNT.

So, with this level of destruction and the distance involved, how will we be able to see the crash? Luckily, the DART spacecraft is not travelling alone on its quest, it is carrying LICIACube, a shoebox-size mini spacecraft, known as a cubesat, developed by the Italian Space Agency and aerospace engineering company Argotec. This little companion has recently separated from the DART spacecraft and is now travelling on its own to witness the impact at a safe distance of 55km.

Never before has a cubesat operated around asteroids so this provides new potential ways of exploring space in the future. The impact will also be observed from Earth using telescopes. Combined, these methods will enable scientists to confirm whether the operation has been successful.

It might, however, take weeks for LICIACube to send all its images back to Earth. This period will be utterly nerve wracking – waiting for good news from a spacecraft is always an emotional time for an engineer.

What happens next?

An investigation team will look at the aftermath of the crash. These scientists will aim to measure the changes in Dimorphos' motion around Didymos by observing its orbital period. This is the time during which Dimorphos passes in front and behind Didymos, which will happen every 12 hours.

Ground telescopes will aim to capture images of the Dimorphos' eclipse as this happens. To cause a significant enough deflection, Dart must create at least a 73-second orbital period change after impact – visible as changes in the frequencies of the eclipses.

These measurements will ultimately determine how effective "kinetic impact" technology is in deflecting a potentially hazardous asteroid – we simply don't know yet.

This is because we actually know very little of the asteroids' composition. The great uncertainty around how strong Dimorphosis is has made designing a bullet spacecraft a truly enormous engineering challenge. Based on ground observation, the Didymos system is suspected to be a rubble-pile made up of lots of different rocks, but its internal structure is unknown.

There are also great uncertainties about the outcome of the impact. Material ejected afterwards will contribute to the effects of the crash, providing an additional force. We don't know whether a crater will be formed by the impact or if the asteroid itself will suffer major deformation, meaning we can't be sure how much force the collision will unleash.

Future Missions

Our exploration of the asteroid system does not end with DART. The European Space Agency is set to launch the Hera mission in 2024, arriving at Didymos in early 2027 to take a close look at the remaining impact effects.

By observing the deformations caused by the DART impact on Dimorphos, the Hera spacecraft will gain a better understanding of its composition and formation. Knowledge of the internal properties of objects such as Didymos and Dimorphos will also help us better understand the danger they might pose to Earth in the event of an impact.

Ultimately, the lessons from this mission will help verify the mechanics of a high-velocity impact. While laboratory experiments and computer models can already help validate scientists' impact predictions, full-scale experiments in space such as DART are the closest we will get to the whole picture. Finding out as much as we can about asteroids will help us understand what force we need to hit them with to deflect them.

The DART mission has led to worldwide cooperation among scientists hoping to address the global issue of planetary defence and, together with my colleagues on the DART investigation team, we aim to analyse the impact effects. My own focus will be on studying the motion of the material that is ejected from the impact.

The spacecraft impact is scheduled for 26th September at 19:14 Eastern Daylight Time (00:14 British Summer Time on 27th September). You can follow the impact on Nasa TV.

Up Next:

NEXT MEETING: 8pm Friday 14th October - Nonsuch High School

Emily Charles from the University of Surrey will give an insight into her research and talk about Dwarf Galaxies of the Local Group - Uncovering Secrets About Dark Matter.

Ron Canham will also give a presentation on the sky at night for the coming month.

NEXT USER GROUP:

Suspended until further notice.

NEXT DENBIES OBSERVING SESSION:

The next session, allowing for moon rise & set times and cloud conditions, may be sometime around the new moon on 25th October. The precise date and timings of any session will be advised by email and WhatsApp a few days in advance

AD HOC OBSERVING AT WARREN FARM:

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