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 this month's edition of Janus with its similar collection of items to last month.

I receive little (zero!) feedback on content from readers, so must assume that you continue to find something of interest in it. That said, it would be nice to hear your thoughts – positive or negative – which I am happy to receive in an email to the editor (email address above). I keep meaning to write a piece myself and have a few possible topics in mind. Unfortunately, I've yet to find the time to articulate my thoughts and come up with something worthy of publication…… but this shouldn't deter anyone else who'd like to contribute. So, please don't be shy!

Martin Howes' object of the month is Supernova SN 2023ixf and, once again, the image which forms the central focus of Martin's piece was taken during a recent group observing session at Ranmore Common. These sessions continue to be extremely popular, and I'm sure that those of you who have benefited from them greatly appreciate Steve's efforts in organising them.

The Society had a stand at the Nonsuch Town and Country Show held over the Bank Holiday weekend 30th April – 1st May. The weather was reasonably kind, with periods of sunshine, and the Sun played its part by featuring some sunspots, which visitors to the stand were able to view through the filtered telescopes brought along by Steve and Peter. Most were unaware that such things existed, and amazed when told that they were larger than the Earth! In addition to raising awareness, we ended up with a few new members which made our attendance that much more worthwhile.

John

The Solar System June

MERCURY: begins the month emerging into the morning sky as it approaches greatest elongation W. It is difficult to observe, reaching its highest point in the sky during daytime and being 1° below the horizon at dawn. At the end of the month, it will soon pass behind the Sun and will not be readily observable, being very close to the Sun, at a separation of only 1° from it.

VENUS: is emerging into the evening sky as it approaches greatest elongation E. It begins the month becoming visible around 21:34 BST, 23° above the W horizon, as dusk fades to darkness. It will then sink towards the horizon, setting 3 hours and 23 minutes after the Sun at 00:30. By the end of the month, having passed greatest elongation E, it will become visible around 21:48 BST, 13° above the W horizon, as dusk fades to darkness. It will then sink towards the horizon, setting 2 hours and 1 minute after the Sun at 23:21.

MARS is currently an early evening object and begins the month visible from around 22:24 BST, 20° above the W horizon, as dusk fades to darkness. It will then sink towards the horizon, setting 3 hours and 43 minutes after the Sun at 00:50. By the end of the month, it will become more difficult to observe as it will reach its highest point in the sky during daytime and be no higher than 6° above the horizon at dusk.

JUPITER: recently passed behind the Sun at solar conjunction. It begins the month difficult to see as it will reach its highest point in the sky during daytime and be no higher than 7° above the horizon at dawn. By the end of the month, emerging from behind the Sun, it is visible in the dawn sky, rising at 01:42 BST – 3 hours and 2 minutes before the Sun – and reaching an altitude of 22° above the E horizon before fading from view as dawn breaks around 04:17.

SATURN: is currently emerging from behind the Sun. It begins the month visible in the dawn sky, rising at 01:48 BST – 3 hours and 0 minutes before the Sun – and reaching an altitude of 15° above the SE horizon before fading from view as dawn breaks around 03:48. By the end of the month, it is visible in the dawn sky, rising at 23:55 BST and reaching an altitude of 25° above the S horizon before fading from view as dawn breaks around 03:45.

URANUS: recently passed behind the Sun at 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 20° from it. By the end of the month, it is not observable as it will reach its highest point in the sky during daytime and be no higher than 2° above the horizon at dawn.

NEPTUNE: is currently emerging from behind the Sun. It begins the month very difficult to see, reaching its highest point in the sky during daytime, and being no higher than 2° above the horizon at dawn. By the end of the month, it remains difficult to see as it will reach its highest point in the sky during daytime and be no higher than 17° above the horizon at dawn.

MOON PHASES:

First Quarter	27 May
Full Moon	4 June
Last Quarter	10 June
New Moon	18 June
First Quarter	26 June

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*

June

2 The Great Globular Cluster in Hercules is well placed

3 Close approach of Mars and M44
Lunar occultation of Delta Scorpii
Messier 12 is well placed

4 Venus at dichotomy
Mercury at dichotomy
Venus at greatest elongation East

6 Asteroid 11 Parthenope at opposition
Messier 10 is well placed

9 Close approach of the Moon and Saturn

10 Mercury at highest altitude in morning sky

11 Daytime Arietid meteor shower 2023
Messier 92 is well placed

14 Close approach of Venus and M44
Close approach of the Moon and Jupiter

17 Saturn enters retrograde motion

18 The cluster IC 4665 is well placed

21 June Solstice

22 Close approach of the Moon and Venus
Close approach of the Moon and Mars

23 The Lagoon Nebula is well placed

27 June Bootid meteor shower 2023

29 The cluster NGC 6633 is well placed

30 Neptune enters retrograde motion
Lunar occultation of Delta Scorpii

July

1 Close approach of Venus and Mars
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

Collected Observations (and thoughts) – Gary Walker

Latest Observations - Posted 13 May

As we approach Solar Maximum, the Sun continues to produce numerous spots and

spot groups across its disk. In Ha light, the sun is always active!

Venus continues to be a very prominent object in the early evening sky. In May, it was still officially at gibbous phase, although I saw it as about half-phase, in my telescope.

Mars is still fairly bright, but much faded in comparison with its Opposition splendour in December.

Now it's Spring, the Earth's orbit is pointing towards what astronomers know as the "Realm of the Galaxies" as in the Virgo Galaxy Cluster, as well as more in Leo, Canes Venatici, and Ursa Major.

The Summer objects are now coming into view, and I had my first observations of M57, the Ring Nebula, in Lyra, and M13, in Hercules.

M13 appears spectacular in my telescope, especially at 222X and 300X powers; indeed, at 300X, the cluster was almost filling the field of view! The central core consisted of a large fuzzy ball of unresolved stars, with some resolved stars in front of it, and some outlying stars, well separated from the core. It appears almost 3 – dimensional and appears even larger and better by using the technique of "averted vision", when it suddenly seems to expand!

M92 is also bright, but more common condensed, with fewer stars resolved.

For a challenge, I was trying to find M83, a galaxy low down in the South, which only gets to be about 7 degrees above the horizon, but I was thwarted by trees and hedges! In any case, I probably would not have been able to see it, due to its low surface brightness!

At least another 5 Messier objects are too low down to be seen from my garden. These include M6, M7, M54, M55, M62, M68, M69, M70, and M83!

In all, I have managed to see 101 out of the 110 Messier objects from my garden, and I think my limiting horizon in the South is about 9 degrees.

One Ring to Rule them all..... – Posted 13 May

With seeing Michael Foulkes' excellent lecture on Saturn, last night, along with some very pretty images of the same, I thought that I would relate my experiences of this planet.

I first saw Saturn through my 40 X 40 telescope in 1975, when the rings were wide open. It appeared very small, but beautiful. Somehow, I find that lower magnification views of Saturn are just as beautiful as high magnification views.

Over time, of course, I moved over to a 60mm refractor and, later, to my 8" SCT scope. With the SCT, I found that seeing the Cassini Division is fairly difficult but it is visible at the ansae of the ring system.

In 1995 - 1996, I studied the edge on ring presentations in those years. The Astronomy Now magazine published a letter speculating on whether telescopes smaller than 6" could show the rings. In September 1995, when I looked through my 60mm telescope I could clearly see the thin rings extending either side of Saturn. Only a few weeks earlier, the Rings were invisible in my scope!

Around the end of October 1995, the rings become difficult to see again, but I thought that I could see a faint dot to either side of Saturn, which I thought must be the ansae. I wasn't sure if I could momentarily glimpse the thin rings themselves, or not. Of course, Saturn looks weird without its ring system, just looking like another version of Jupiter!

I have never managed to see any storms upon the planet, although I have occasionally seen a dark belt upon Saturn. I can easily see where the shadow of the planet "cuts" the rings, when away from opposition.

The Moon, Titan, is always easy to see, and I have seen some of the other Moons.

When I was at school, in the 1960's - 1970's, Saturn was known to have 9 Moons. In more recent years, the "body count" for Moons has just gone up and up! Very recently, the count exceeded 100 (last night Michael Foulkes said 145!).

Similarly, many more moons of Jupiter, Uranus, and Neptune have also been

discovered. The Astronomical world of the 1970's was a lot simpler than it is today.

Saturn is undeniably the most beautiful of the planets, and the ring system gives it a 3D appearance!

Incidentally, in the next day's paper after this lecture, the University of Colorado had calculated that the ring system could not be more than 400 million years in age, as they had calculated how much dust had been deposited on the ice of the rings! One astronomer said that it was like seeing how old your house is, by seeing how much dust has built up in it!

If they are about 400 million years old, they must have formed perhaps in the Devonian or Silurian or Ordovician ages.

Latest Observations – Posted 24 & 27 May

In the freakishly long run of clear nights from about May 19th to the 24th, I have been out with my scope. I have been attempting to find the new supernova that only appeared in the galaxy M101 on 19th May. It has been designated as SN2023ixf.

Starting at magnitude 14, it was reported to have brightened to magnitude 11 by about 24th May, so would be visible in my telescope! However, M101, although appearing beautiful in images, exhibits the dreaded "low surface brightness" problem that occurs with face-on galaxies, especially those that are fairly "large" in angular size!

In my telescope, I can only just see the centre of M101, and even that is very faint. I have been unable to see which star (if any!) of those visible in my scope, is the supernova!

It was far easier with the supernova in M82, in 2014; for one thing, that galaxy is far brighter than M101 and, also, the supernova, at magnitude 10, was situated on the galaxy itself, and not out in the "suburbs" as is the case with this one!

I also failed to see Jupiter passing very close to the Moon on 17th May – an event which occurred in daylight. I tried to find the Moon with binoculars but couldn't see it – that's probably not surprising, considering that it was only a 5% waning crescent Moon and, even worse, it was only 25 degrees West of the Sun!

The weird run of clear nights had not ended, even on 27th May!

Venus now appeared quite large in my scope at 222X, and at half-phase. In contrast, Mars appeared very tiny, even at 222X. Its angular size had now shrunk down to only 4.8' arcseconds. As a result, no features were now visible. It is now nearly 6 months since Opposition. It was by now getting fairly low in the West, at dusk, and will soon be gone! At 62X, the disk was barely visible, appearing like a pinhead!

Object of the Month - Supernova SN 2023ixf – Martin Howe

At the end of May we were treated to a (relatively) bright supernova in the nearby galaxy M101, otherwise known as the 'pinwheel galaxy', in Ursa Major. Supernovae are designated by their year of discovery, plus an increasing sequence of letter suffixes – initially using single uppercase letters, A, B, C etc. After the 26th supernova discovery of the year the letters then switch to pairs of lower case letters, then trios of letters, etc. Supernova discoveries have exploded (literally!) in the last few years with the advent of automated sky surveys, for example, surveys to detect potential hazardous objects that may impact the Earth, exoplanet searches, or dedicated supernovae patrols. In the year 2000, just 196 were discovered, but in 2023 the number was 19,297! However, supernovae are still discovered by a dedicated group of amateurs, and in this case, SN 2023ixf was discovered by a Japanese supernovae hunter, Koichi Itagaki on the 17th of May. By my back-of-the-envelope calculation, that makes it the 7,410th supernova of 2023.

Supernovae come in a number of 'flavours', the two most well-known being type Ia and type II. Type Ia is where a white dwarf is part of a binary system, and sucks material off a nearby low mass companion star. The white dwarf is no longer undergoing nuclear reactions and so the star

has collapsed to a small core and has been prevented from collapsing any further under its own gravity by the pressure of its electrons repelling each at the atomic level. However, as the white dwarf accretes more and more matter from its companion, its mass, and hence gravitational potential, increases to the point that it exceeds a critical mass (the Chandrasekhar limit). Above this limit even the electron pressure cannot resist gravity, and it collapses and explodes, leaving nothing behind but an expanding shell of gas and dust.

However, SN 2023ixf was a type II supernova. These result from the collapse of a massive star (greater than 8 times the mass of the Sun) when all its nuclear fuel runs out. The star has so much mass that it breaks through the electron pressure point encountered in the demise of the stars of a smaller mass, until it hits resistance from the neutrons in its collapsed core. The collapsing outer layers hit the condensed core of the star, rebounding off in a massive explosion – the type II supernova. Depending on the mass of the core, aside from an expanding shell of gas and dust, this will leave behind either a neutron star or black hole. A type II supernova explosion can release 10^{44} Joules of energy. Compared to the energy released by the Sun over an entire year of about 10^{35} Joules, this represents an order of magnitude of 9, or a billion, times more energy!

Consequently, these objects are very bright, and SN 2023ixf had an apparent magnitude of +11 on the 24th of May. Although this is quite faint, bear in mind this supernova is 20 million light years away! Based on my rough calculations, if the star Betelgeuse in Orion (in our own galaxy, about 650 light years away) went supernova and had the same absolute magnitude as SN 2023ixf, then it would shine with an apparent magnitude of -12 – the same as the full Moon!

SN 2023ixf should stay moderately bright for several weeks, so you may have an opportunity to see it in early June, but you will need a dark sky and a GoTo telescope of at least 70mm in diameter. You would, however, have more chance of capturing it with a camera and long exposure, which would also bring out some of the detail in the host galaxy itself.

The image below was taken from Ranmore Common on the 24th of May using a 102mm refractor, and 11 x 4-minute-long exposures with a ZWO ASI294MC camera.

The Euclid spacecraft will transform how we view the 'dark universe'

Acknowledgement: This article was written by Robert Nichol, Pro Vice-Chancellor and Executive Dean, University of Surrey, and was published in THE CONVERSATION on 5th May 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/the-euclid-spacecraft-will-transform-how-we-view-the-dark-universe-204245*

The European Space Agency's (ESA) Euclid satellite completed the first part of its long journey into space on 1st May 2023, when it arrived in Florida on a boat from Italy. It is scheduled to lift off on a Falcon 9 rocket, built by SpaceX, from Cape Canaveral in early July.

Euclid is designed to provide us with a better understanding of the "mysterious" components of our universe, known as dark matter and dark energy.

Unlike the normal matter we experience here on Earth, dark matter neither reflects nor emits light. It binds galaxies together and is thought to make up about 80% of all the mass in the universe. We've known about it for a century, but its true nature remains an enigma.

Dark energy is similarly puzzling. Astronomers have shown that the expansion of the universe over the last five billion years has been accelerating faster than expected. Many believe this acceleration is driven by an unseen force, which has been dubbed dark energy. This makes up about 70% of the energy in the universe.

Euclid will map this "dark universe", using a suite of scientific instruments to shed light on different aspects of dark energy and dark matter.

A light in the dark

After launch, Euclid will undertake a month-long journey to a region in space called the second Earth-Sun Lagrangian point, which is five times further from us than the Moon. It's where the gravitational pull of the Sun and the Earth balance out and provides a stable vantage point for Euclid to observe the universe. Euclid will join the James Webb Space Telescope (JWST) at this point and will be the perfect companion to that amazing space observatory.

My involvement in Euclid began in 2007 when I was invited by ESA to participate in an independent concept advisory team to assess two competing mission proposals called SPACE and DUNE.

Both used different techniques, and therefore different instruments, to study the dark universe, and ESA was struggling to decide between them. Both were compelling concepts and our team decided that both had merit, especially to provide a vital cross-check between them. Euclid was thus born from the best of both concepts.

Euclid is designed to study the whole universe so needs instruments with wide fields of view. The wider the field of view of the imaging instrument, the more of the universe it can observe. To do this, Euclid uses a relatively small telescope compared to JWST. In size, Euclid is roughly the size of a truck compared to the aircraft-sized JWST. But Euclid also carries some of the biggest digital cameras deployed in space, with fields of view hundreds of times greater than JWST's.

Shapes and colours

The Euclid VIS (or visible) instrument, built mostly in the UK, is designed to measure the positions and shapes of as many galaxies as possible to look for subtle correlations in this data caused by the gravitational lensing of the light, as it travels to us through the intervening dark matter. This gravitational lensing effect is weak, only one part in a hundred thousand for most galaxies, thus requiring lots of galaxies to see the effect in high definition. Thus, VIS will produce Hubble telescope-like image quality over a third of the night sky.

VIS, however, can't measure the colours of objects. This is needed to measure their distance through the redshift effect, where light from those objects is shifted to longer, or redder, wavelengths in a way that relates to their distance from us. Some of this data will need to come from existing and planned ground-based observatories, but Euclid also carries the NISP (Near-Infra Spectrometer and Photometer) instrument which is specifically designed to measure the infrared colours and spectra, and therefore redshifts, for the most distant galaxies that Euclid will see.

To measure dark energy, NISP will exploit a relative new technique called Baryon Acoustic Oscillations (BAO) that provides an accurate measurement of the expansion history of the universe over its last 10 billion years. That history is vital for testing possible models of dark energy including suggested modifications to Einstein's Theory of General Relativity.

Treasure trove

Such an experiment takes an army of scientists and not everyone is solely working on dark matter and dark energy. Like JWST, Euclid will be a treasure-trove of new discoveries in many areas of astronomy. The Euclid consortium needs hundreds of people to help develop the sophisticated software needed to merge the space data with the ground-based data, and extract, to high accuracy, the shapes and colours of billions of galaxies.

This software has also been checked and verified using some of the largest simulations of the universe that have ever been constructed. After arriving at L2, Euclid will undergo several months of testing, validation, and calibration to ensure the instruments and telescope are working as expected. We are all familiar with such nervous waiting after the recent JWST launch.

Once ready, Euclid will embark on a five-year survey of 15,000 square degrees of the sky with about 2,000 scientists from across the world collecting results along the way. However, the true power of Euclid will only be realised once we have all this data together and analysed carefully. That could take another five years, taking us well into next decade before we have our final dark answers. The SpaceX launch therefore only feels like the half-way point in the Euclid story.

I will travel to Florida this summer to see the launch of Euclid. I will be joined by hundreds of my colleagues who have dedicated their careers to building this amazing telescope and experiment. Seeing the project come together in this way makes me proud to call myself a "Euclidian".

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 9 June – Nonsuch High School

For this year's Maurice Gavin Memorial Lecture our Patron, Professor Ian Morison, will talk about 'Our Island Universe: how we have learnt about the size and structure of our Milky Way Galaxy and its place in time and space'.

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 18 June.

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 9-20 June.

AD HOC OBSERVING AT WARREN FARM:

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