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The Elephant Trunk Nebula in Cepheus

The magazine of the Irish Astronomical Society

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Contents

On the cover

Marty McCormack took this fabulous image of the Elephant Trunk Nebula in Cepheus. The area is part of a much bigger stellar nursery that is catalogued as IC 1396 and lies about 3,000 light-years away. The snout is about 20 light-years long and ends in a dark cometary globule where the stellar winds of some infant stars has created a cavity. The rim is illuminated by the harsh ultraviolet light from HD 206267, a very bright and massive star which lies outside the field of this image. The radiation from this star eats away at the gas and dust, possibly even stifling the ability of some of the proto-stars to fully evolve into proper suns.

Marty is a founder of Astrophotography Club Ireland which has many members countrywide who are taking amazing photos of the skies from these shores. More details at www.astrophotographyclubireland.com

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IAS News

The Society was very saddened to learn of the death of member Máire Ní Chearbhaill in March after a short illness. Máire was a very dedicated member of the IAS and contributed much in her short time on the Committee, including proof-reading our annual calendar before publication. Máire gained her PhD in History in 2008 from NUI Maynooth and was active in many areas researching the history of Irish organisations such as the Sisters of Mercy and the Society of St Vincent De Paul. The IAS was represented at Máire's funeral by Val Dunne.

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IAS meeting details will be notified to members in due course but take place on the last Monday of each month (except in December or if a bank holiday) in Ely House, 8 Ely Place, Dublin 2. This season we are very grateful to Dr Donnacha O'Driscoll of UCD who has very kindly arranged for meetings to be streamed online. A link to the broadcast is posted with the meeting details on our website www.irishastrosoc.org

- Our next meeting on April 24th will be a joint event with a number of astronomy clubs in Poland.
- May's meeting will be our last before the summer break and is traditionally our AGM. We will let everyone know the date of the meeting in advance, and will have our annual reports available then too.

News notes

JUICE to Jupiter

The European Space Agency are targeting an April 13th launch date for their JUICE (Jupiter Icy moons Explorer) spacecraft which is the first large-class mission in their Cosmic Vision 2015-2025 programme. The mission will make multiple flybys of Jupiter's satellites Ganymede, Callisto, and Europa and then orbit Ganymede. The science goals focus on Jupiter and its system, with particular emphasis on Ganymede as a planetary body and potential habitat. Each of the three Galilean moons (excluding Io) may have sub-surface water.

JUICE is scheduled to be launched on an Ariane 5 from the European Spaceport in Kourou, French Guiana. After a 7 to 8 year cruise to Jupiter, utilizing Earth and Venus gravity assists, JUICE will go into orbit around Jupiter in 2031. DIAS have an involvement through Prof. Caitriona Jackman.

ExoMars is a go for 2028

The ExoMars Rover mission is back on track for its mission to Mars, but Russia won't be a part of it this time.

Now, the mission is targeted for a 2028 launch to Mars. In anticipation of that launch date, the ESA is busy testing the Rosalind Franklin rover and its mission-defining drill.

The ExoMars program was a partnership between the ESA and Roscosmos. It started with the 2016 launch that put the Trace Gas Orbiter (TGO) in orbit around Mars and attempted to land the Schiaparelli EDM lander on the Martian surface. The TGO succeeded, but unfortunately, Schiaparelli crashed and was destroyed. The next part of the ExoMars program was supposed to involve a Roscosmos lander that would've delivered the Rosalind Franklin rover to the surface of Mars.

The Rosalind Franklin rover is unique. It'll collect samples like NASA's Perseverance rover can, but while Perseverance's samples are from the surface, Rosalind Franklin's drill can penetrate to a depth of two metres to obtain samples.

If all goes well, the Rosalind Franklin rover will land at Oxia Planum in October 2030. About one month after that, after calibration of its instruments, it'll begin drilling.

A new source for lunar water

Beads of glass could become a key source of water for future crewed settlements on the moon, researchers say.

That claim is based on an assessment of the water contained within a sampling of glassy beads that were created over the course of millennia by cosmic impacts on the moon, and ended up being brought back to Earth in 2020 by China's *Chang'e-5* sample return mission.

A spectroscopic analysis determined that the beads contained more water than the researchers expected based on past studies. They surmised that interactions between hydrogen ions in the solar wind and oxygen-bearing materials in lunar soil created H_2O molecules that could be trapped within the glass — and then diffused under the right conditions.

Based on an extrapolation of such findings, the research team estimates that glass beads in lunar soil may contain up to 270 trillion kilograms of water.

In brief...

Using the Atacama Large Millimeter/submillimeter Array (ALMA), astronomers have detected gaseous water in the planet-forming disc around the star V883 Orionis. This water carries a chemical signature that explains the journey of water from star-forming gas clouds to planets, and supports the idea that water on Earth is even older than our Sun.

Astronomers using the NASA/ESA Hubble Space Telescope have for the first time directly measured the mass of a single, isolated white dwarf star – the surviving core of a burned-out sunlike star. Researchers found that the white dwarf is 56 percent of the mass of our Sun. Until now, previous white dwarf mass measurements have been gleaned from observing white dwarfs in binary star systems and calculating their individual masses. The new observation relied on the technique of micro-lensing to precisely measure how light from a distant star bent around the white dwarf.

A team of astronomers have discovered one of the biggest black holes ever found. They used gravitational lensing and supercomputer simulations to investigate how light was bent by a black hole inside a galaxy hundred of millions of light years away.

This is the first black hole found using the technique, whereby the team simulates light travelling through the Universe hundreds of thousands of times. The study opens up the astronomers can discover far more inactive and ultramassive black holes than previously thought, and investigate how they grew so large.

A spin around the planets

by Matt Williams

Here on Earth, we tend to take time for granted, never suspecting that the increments with which we measure it are actually quite relative.

While we count a day as being about 24 hours from sunup to sunup, the length of a single day on another planet is quite different. In some cases, they are very short, while for others they can last longer than years – sometimes considerably!

Mercury (spins at 10.9 km/h at its equator): Things will be weird for future residents of the innermost planet. Never mind requiring factor 5000 sunscreen, it is how the Sun behaves in the Mercurian sky that will confuse first-time settlers.

Mercury is the closest planet to our Sun, ranging from 46,001,200 km at perihelion to 69,816,900 km at aphelion. It takes 58.646 Earth days for Mercury to rotate once on its axis but this is not to say that Mercury experiences two sunrises in just over 58 days.

Mercury circles the Sun in 87.969 Earth days, and that rapid orbital speed, coupled with the planet's slow rotation, means it takes the equivalent of 175.97 Earth days for the Sun to reappear in the same place in Mercury's sky. Hence, while the planet rotates once every 58 Earth days, it is roughly 176 days from one sunrise to the next on Mercury, or twice the length of its year.

The situation gives rise to an unusual phenomenon. From a particular location on the planet you would see the Sun partly rise in the east and then stop before reversing direction and setting. It then rises fully after a while and proceeds across the local sky. At sunset the reverse happens, with the huge solar disk partly dipping below the western skyline, only to briefly rise again, before finally setting fully.

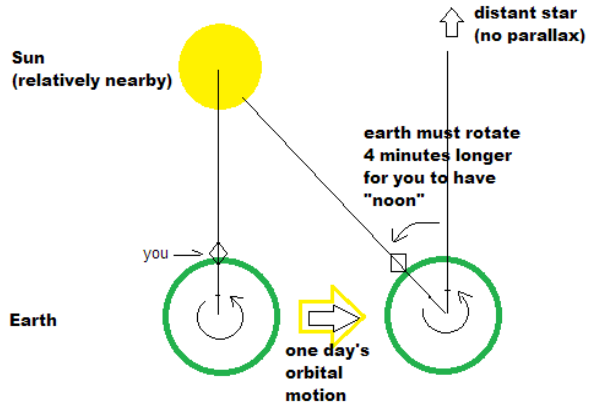
Venus (spins at 6.5 km/h): Venus is the second closest planet to our Sun - ranging from 107,477,000 km at perihelion to 108,939,000 km at aphelion and takes 224.701 Earth days to orbit our star.

It's very slow rotation of just 6.5 km/h leads to a sidereal rotation period of 243.025 days. Technically, it is -243.025 days, since Venus' rotation is retrograde. This means that Venus rotates in the direction opposite to its orbital path around the Sun.

However, much like Mercury, Venus' orbital speed and slow rotation means that a single solar day – the time it takes the Sun to return to the same place in the sky – lasts about 117 days.

So while a single Venusian (or Cytherean) year works out to 224.701 Earth days, it experiences less than two full sunrises and sunsets in that time. In fact, a single Venusian/Cytherean year lasts as long as 1.92 Venusian/Cytherean days.

Why a sidereal day is 4 minutes shorter than a 24 hour solar day.



Why the peculiar retrograde spin of Venus? Astronomers once suspected a massive impact reversed the planet's rotation but it is now thought its thick atmosphere coupled with the Sun's gravity slowed down the planet and caused it to spin backwards. The Venusian atmosphere swirls around the planet in only four days, or 60 times faster than it rotates, and that strong drag may be the culprit.

Earth (spins at 1670 km/h): When we think of a day on Earth, we tend to think of it as a simple 24 hour interval. In truth, it takes the Earth exactly 23 hours 56 minutes and 4.1 seconds to rotate once on its axis. This is called the **sidereal day**.

Meanwhile, on average, a **solar day** on Earth is 24 hours long, which means it takes that amount of time for the Sun to appear in the same place in the sky. Between these two values, we say a single day-night cycle lasts an even 24. The reason for the longer value is because the Earth has to turn an extra 1°, or 4 minutes of time, for the Sun to be on the meridian.

*To find Earth's speed at Dublin, get the cosine of its latitude by 1670 km/h = Cos(53) * 1,670 = 1005 km/h*

The precise measurement of time on Earth with atomic clocks has revealed subtle changes to the length of the day, which can even be due to powerful earthquakes - the 2011 event in Japan, for example, shortened Earth's day by 1.8 microseconds due to a slight shift of our planet's mass.

Our day is also lengthening partly because of the Moon's tidal influence. Earth's day was only 21 hours long a couple of hundred million years ago, and five hours long after the impact that formed the Moon.

Mars (spins at 867 km/h): In many respects, Mars can also be called "Earth's Twin". In addition to having polar ice caps, seasonal variations , and water (albeit frozen) on its surface, a day on Mars is pretty close to what a day on Earth is. Essentially, Mars takes 24 hours 37 minutes and 22 seconds to complete a single rotation on its axis. This means that a day on Mars is equivalent to 1.025957 days.

The seasonal cycles on Mars, which are due to it having an axial tilt similar to Earth's (25.19° versus Earth's 23.4°), are more similar to those we experience on Earth than on any other planet.

However, seasonal variations last twice as long on Mars, thanks to Mars being at a greater distance from the Sun. This leads to the Martian year being about two Earth years long – 686.971 Earth days to be exact, which works out to 668.5991 Martian days (or Sols). As a result, longer days and longer nights can be expected by future colonists.

Jupiter (spins at 45,260 km/h): Given the fact that it is the largest planet in the Solar System, one would expect that a day on Jupiter would last a long time. But as it turns out, a Jovian day is officially only 9 hours, 55 minutes and 30 seconds long, which means a single day is just over a third the length of an Earth day. This is due to the gas giant having a very rapid rotational speed, which is 12.6 km/s at the equator. This rapid rotational speed is also one of the reasons the planet has such violent storms.

Note the use of the word *officially*. Since Jupiter is not a solid body, its upper atmosphere undergoes a different rate of rotation compared to its equator. Basically, the rotation of Jupiter's polar atmosphere is about 5 minutes longer than that of the equatorial atmosphere. Because of this, astronomers use three systems as frames of reference.

System I applies from the latitudes 10° N to 10° S, where its rotational period is the planet's shortest, at 9 hours, 50 minutes, and 30 seconds. System II applies at all latitudes north and south of these; its period is 9 hours, 55 minutes, and 40.6 seconds. System III corresponds to the rotation of the planet's magnetosphere, and it's period is used by the IAU and IAG to define Jupiter's official rotation (i.e. 9 hours 44 minutes and 30 seconds).

So if you could, theoretically, stand on the cloud tops of Jupiter, you would witness the sun rising an setting in the space of less than 10 hours from any latitude. And in the space of a single Jovian year, the sun would rise and set a total of about 10,476 times.

Saturn (spins at 37,005 km/h): Saturn's situation is very similar to that of Jupiter's. Despite its massive size, the planet has an estimated rotational velocity of 9.87 km/s. As such Saturn takes about 10 hours and 33 minutes to complete a single sidereal rotation, making a single day on Saturn less than half of what it is on Earth. Here too, this rapid movement of the atmosphere leads to some super storms.

And, also like Jupiter, Saturn takes its time orbiting the Sun. With an orbital period that is the equivalent of 10,759.22 Earth days (or 29.4571 Earth years), a single Saturnian (or Cronian) year lasts roughly 24,491 Saturnian days. However, like Jupiter, Saturn's atmosphere rotates at different speed depending on latitude, which requires that astronomers use three systems with different frames of reference.

Using radio emissions, and oscillations in the planet's rings caused by its gravitational field, has yielded a recent measurement for Saturn's internal rotation rate of 10 hr 38 min 38 sec.

Uranus (spins at 8972 km/h): When we come to Uranus, the question of how long a day is becomes a bit complicated. On the one hand, the planet has a sidereal rotation period of 17 hours 14 minutes and 24 seconds, which is the equivalent of 0.71833 Earth days. So you could say a day on Uranus lasts almost as long as a day on Earth. It would be true, were it not for the extreme axial tilt this gas/ice giant has.

With an axial tilt of 97.77°, Uranus essentially orbits the Sun on its side. This means its north or south pole is pointed almost directly at the Sun at different times. When one pole is going through "summer" on Uranus, it will experience 42 years of continuous sunlight. When that same pole is pointed away from the Sun (i.e. a Uranian "winter"), it will experience 42 years of continuous darkness. Hence, you might say that a single day – from one sunrise to the next – lasts a full 84 years on Uranus!

Neptune (spins at 9667 km/h): Last, but not least, we have Neptune. Here too, measuring a single day is somewhat complicated. For instance, Neptune's sidereal rotation period is roughly 16 hours, 6 minutes and 36 seconds (the equivalent of 0.6713 Earth days). But due to it being a gas/ice giant, the poles of the planet rotate faster than the equator.

Whereas the planet's magnetic field has a rotational speed of 16.1 hours, the wide equatorial zone rotates with a period of about 18 hour. Meanwhile, the polar regions rotate the fastest, at a period of 12 hours. This differential rotation is the most pronounced of any planet in the Solar System, and it results in strong latitudinal wind shear.

In addition, the planet's axial tilt of 28.32° results in seasonal variations that are similar to those on Earth and Mars. The long orbital period of Neptune means that the seasons last for forty Earth years. But because its axial tilt is comparable to Earth's, the variation in the length of its day over the course of its long year is not any more extreme.

As you can see from this little rundown of the different planets in our Solar System, what constitutes a day depends entirely on your frame of reference. In addition to it varying depending on the planet in question, you also have to take into account seasonal cycles and where on the planet the measurements are being taken from.

Hunting the first magnitude stars

by John Flannery

Our thoughts post-Christmas almost invariably turn to how we will see out the Old and ring in the New a few days later.

My own plans for last New Year were a little different than most as I decided to view - in a single night - all the first magnitude stars visible from Ireland.

The idea was inspired by a Scott Levine article in the December 2018 issue of Sky & Telescope about such a project that he occasionally completes on New Year's Eve, which was my goal too; Arcturus rises moments after midnight from here and would appropriately herald the turning of the year.

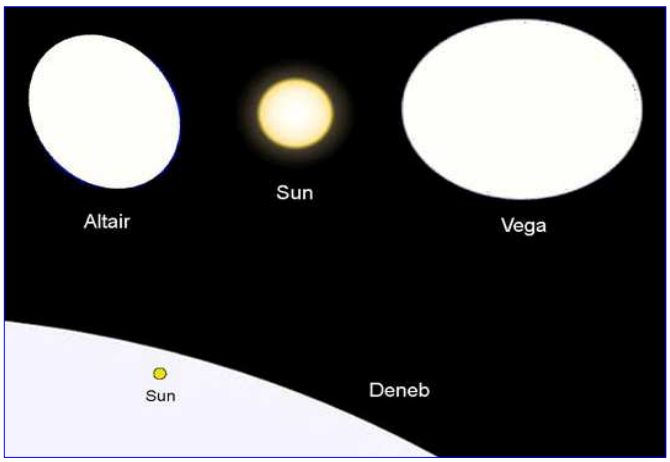
Clouds intervened however, so my attempt was postponed to the next night instead. That evening also had the added bonus of an occultation of Uranus, along with all the major planets visible after sunset and a binocular comet for the morning hours.

The brightest stars

Astronomers classify 21 stars as first magnitude or brighter, with only six of them being too far south to rise from Ireland's latitude. Technically, magnitude 1.5 Adhara (ε Canis Majoris) could be added as number 22 as it sits right at our cut-off limit, but most stick with the traditional 21.

Sirius blazes at magnitude -1.46 and is the brightest star visible in our night sky. It is also the closest in our table at only 8.6 light years. Deneb (magnitude 1.25) on the other hand is the second faintest but that belies the fact it is a powerhouse.

The celestial swan's *lucida* is the most remote of the first magnitude stars with values ranging from 1,460 to 2,600 light years - its exact distance is difficult to determine, as the star saturates the sensitive detectors on the *Gaia* and *Hipparcos* astrometry satellites.



Rank	Star	Visual Mag	Constellation	Light Years
1	Sirius	-1.46	Canis Major	8.6
4	Arcturus	-0.05(v)	Bootes	37
5	Vega	0.03	Lyra	25
6	Capella	0.08	Auriga	43
7	Rigel	0.13	Orion	860
8	Procyon	0.34	Canis Minor	11
9	Betelgeuse	0.50(v)	Orion	550
12	Altair	0.76	Aquila	17
14	Aldebaran	0.86(v)	Taurus	65
15	Antares	0.96(v)	Scorpius	550
16	Spica	0.97	Virgo	250
17	Pollux	1.14	Gemini	34
18	Fomalhaut	1.16	Piscis Austrinus	25
19	Deneb	1.25	Cygnus	2,600
21	Regulus	1.39	Leo	79

We do know however that our Sun would be dwarfed if placed beside Deneb, and that the star is around 70,000 times more luminous than our own (it may be far more than that due to uncertainty about Deneb's exact properties).

This contrast in brightness being not only due to distance, but also because of the characteristics of a star, has meant astronomers grade them by *absolute* magnitude besides the familiar *apparent* magnitude.

Absolute magnitude is the apparent magnitude an object would have if it was located at a distance of 10 parsecs (32.6 light years). The absolute magnitude of Sirius, for example, is 1.43, while our Sun is a more feeble 4.83. Deneb's absolute magnitude on the other hand is a whopping -8.3 - it would cast shadows here on Earth from a dark site!

Preparations

Seeing all the first magnitude stars visible from Ireland in a single night sounds like an easy task but some planning is required.

For starters, the opportunity to do so is only possible between the period from late-December to roughly late-January due to the distribution of these stars on the celestial sphere.

Autumn is too early to catch Spica, while Fomalhaut disappears into the evening twilight towards the end of January and is lost until late-June. By then, Taurus, Gemini, and Orion are just some of the winter groups hidden in the solar glare.

Antares, our final target, rises as the sky starts to lighten on January mornings, making it the most difficult to bag during our observation window.

The low altitudes of both Fomalhaut and Antares means you need a good southwest and southeast aspect - especially so in the latter case as you have to compete with the onrushing daybreak in your attempt to spy Antares when it is barely over the horizon.

New Year's Night

Patches of fog continued to linger in the Nenagh area during New Year's Day so prospects for successfully sighting all the stars on my list later were not looking good. Things began to improve though by late afternoon. The chase was on.

My first goal was to try to catch Mercury as twilight faded. The planet glimmered at only magnitude 1.6 that day and was rather low - too low in fact, as a stubborn patch of cloud over the Silvermines Mountains hid the elusive innermost world.

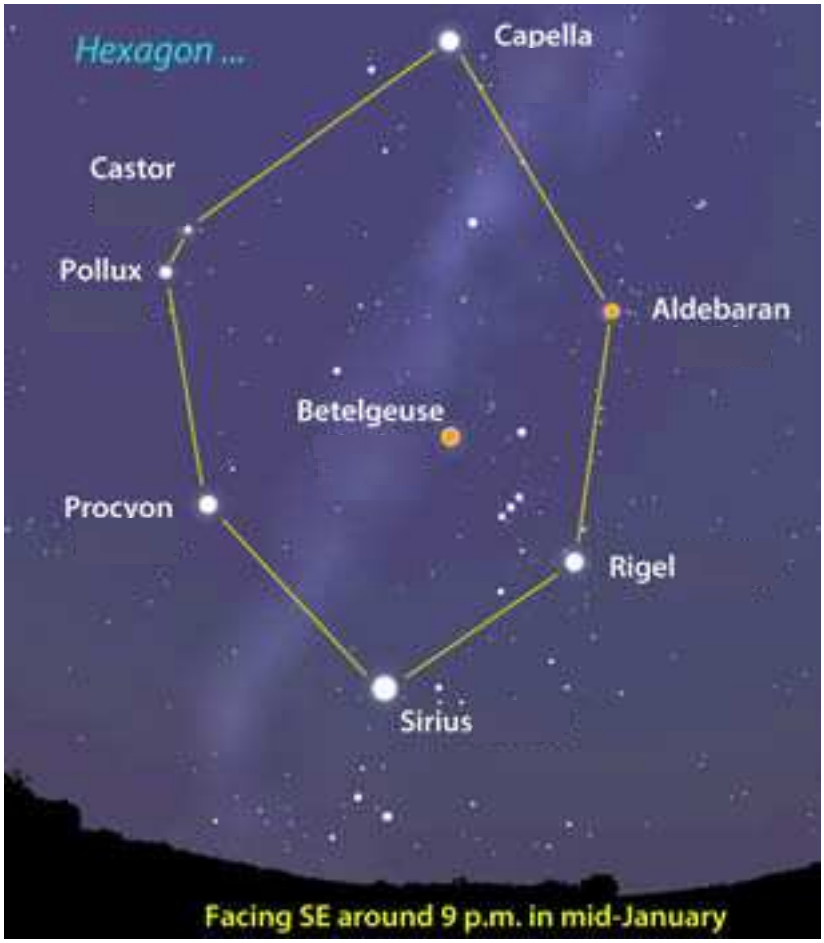
I was doubtful of seeing Mercury anyway due to its faintness vying with the dusk, but a beautiful sunset compensated. The scene was enhanced by a lingering orange glow with peach crepuscular rays, while a delicate veil of fog was draped over the fields below.

Venus was a brilliant glint in the fading light and soon lonely Fomalhaut appeared above a distant rooftop.

Fomalhaut resides in a bright-star poor area of sky colloquially known as the Celestial Sea. The term is not only because this region of the heavens has a number of watery constellations, but also because they were on the meridian during the rainy season for the parts of the ancient world where the constellations were initially devised. The moniker is apt in another way as our gaze in this direction is out of the plane of our galaxy and into the Universe's depths.

I was surprised how long twilight lingers at this time of year, as Vega, Altair, and Deneb were slower than expected to pop into view. It nicely showed how planetarium apps rarely match the real sky in terms of the visibility of objects around dusk and dawn.

Vega in Lyra, Altair in Aquila, and Deneb in Cygnus make up the Summer Triangle. Interestingly, Vega is at not too a dissimilar a declination as Capella, and both are on the opposite side of the celestial pole and are circumpolar. That distinction means Vega can be found low on the northern horizon during the winter months while Capella holds the high ground, with the two trading prominence six months later.



The Winter Hexagon

By this stage I decided to dispense with seeing the occultation of Uranus later on due to an early rise the next morning, but tried for the ice giant anyway in 15x70mm binoculars close to the just past first quarter moon. The glare overwhelmed the planet though, which was to be expected. However, I did sweep up Neptune in Pisces, along with the naked eye planets Saturn, Jupiter, and Mars.

Taking a break for a while to catch up with my brother's family, I planned to return to the sweep a couple of hours later with the Winter Hexagon, comprising Aldebaran, Capella, Castor and Pollux, Procyon, Sirius, and Rigel. Betelgeuse is sometimes included in the asterism to form the Heavenly G, and all would quickly boost my running count of first magnitude stars seen.

Back home for 9pm, I popped out to the garden to see Orion in the southeast along with his faithful dogs. The thought "This is like shooting fish in a barrel." crossed my mind, but I knew Antares would be the biggest challenge pre-sunrise, and that I still needed the sky to stay clear for that crucial time.

While the Plough is a distinctive and familiar pattern, the collective brilliance of Orion and his retinue are far more striking. About 36% of the sky's fifty brightest stars are concentrated in the area bound by the Hexagon, and those that are on our list are close to the Sun, bar the behemoths of Orion.

Many of Orion's prominent stars are part of an apparent spur of the Milky Way tilted 18° that was first noticed by William Herschel. It became known as the Gould Belt after further studies by the American astronomer Benjamin Gould in the 19th century traced a ring of stellar nurseries right around the sky.

Recently, the feature has instead been found to be a 9,000 light-year long series of inter-connected molecular clouds and star-forming regions undulating about 500 light years above and below the galactic plane. Now called the Radcliffe Wave, it may be the backbone of the Orion Arm to which our Sun belongs.

Morning hours

As my alarm chimed 6am, the tally was now eleven of the fifteen first magnitude stars seen. Fog patches remained around Nenagh but thinned out as I headed for Moneygall where my map indicated a flat horizon towards where I expected Antares to rise.

Few were on the road at that hour and the clarity of the sky was good. I first set up to view C/2022 E3 (ZTF) that had exited the circlet of Corona Borealis a few days earlier. The 15x70mm binoculars easily showed the comet's soft magnitude 7 diffuse glow.

Leo, with Regulus, was now sinking in the south-west, while Spica lay on the meridian, and orange Arcturus herded the celestial bears.

All three stars are quite interesting to study. Spica is a spectroscopic binary with the two close components whirling around each other in only four days. Both are egg-shaped due to their mutual gravitational interaction.

Our own Sun takes a rather lazy 27½ days on average to spin once on its axis, but Regulus A (the primary in a quadruple system) does so in just under sixteen hours. That dizzying speed means Regulus would look like a rugby ball if seen up close. Any faster and Regulus should break up, but that rarely happens because speed is limited by the initial angular momentum imparted to a star as it formed with the collapse of a rotating gas cloud. If the proto-star is spinning too fast then it sheds any material it tries to accrete. Rapidly rotating stars can lose their outer layers to a circumstellar disk though.

Arcturus is my favourite star for many reasons and it has a particular warmth that kindles a still chilly early spring evening.

There is a rich lore associated with Arcturus, even in the modern era, as astronomers focused its light onto a photoelectric cell in May 1933 to turn on the illuminations at the opening of Chicago's World Fair that year. The previous such event in the city was forty years earlier and since Arcturus was believed then to be forty light years away, it was a memorable way to open proceedings. We now know the star's correct distance to be three light years closer.

Arcturus, along with some fifty other members of the Arcturus Stream, is in a highly inclined orbit about the Milky Way. It was thought the Stream's stars once belonged to a shredded open cluster but current thinking is split between two camps: the stars may originate from a dwarf galaxy torn apart by the Milky Way's gravitational field, or they might have been dragged into our galaxy's thick disk by a close encounter with a Milky Way satellite. The latter idea has merit as Gaia data suggests the Arcturus Stream, along with others, are a thread of suns unravelled from one of our galaxy's spiral arms. Arcturus will fade from our view in about 500,000 years as we part ways. We will never meet it again.

Rush hour

Only a sighting of Antares was left now to finish the list, as I contemplated the pre-dawn quiet.

There, is that it? The time was 7:20am and Antares should be about two degrees up. I was having doubts though as the star I spotted seemed too faint to be the red giant. I took a photo with my phone camera and confirmed the speck to be delta Scorpii.

Time was slipping by and the sky was brightening. The Scorpion's heart was giving *me* palpitations as I thought I would founder at the last. There was a small hill in the distance which looked to be enough to conceal Antares until almost sunrise, now a little over an hour away.

I brought the binoculars up to my eyes and checked the area where Antares should be. Finally, there it was at 7:38am, now clear of that bump. The horizon glow was growing stronger but I was determined to see Antares with the naked eye. Offsetting from a distant landmark, I caught glimpses of the star at certain moments, and another photo confirmed its position and my sighting to be real.

Tired but elated, it was only natural to wait for sunrise on another new day to salute a successful bright star marathon.

Final thoughts

It was thrilling to have completed the challenge, and to have seen the stars of each season over a single night. Looking back, I would definitely scout a better location to see Antares sooner than I had. My sighting of the star was touch-and-go for a time, so future attempts will hopefully not be as fraught.

However, you do not have to wait until a crisp January night to track down the first magnitude stars as all can be seen over the course of a year, if you have not made a point of appreciating them before.

The important thing to take from the list though is that it encourages us to see the first magnitude stars as individuals with fascinating astrophysical characteristics who also still retain an important place in the sky lore of many cultures. That personal satisfaction of seeing them afresh adds a new dimension to our hobby.

Skynotes

by Michael McCreary

April to June 2023

Universal Time is used throughout - add 1 hour for Irish Summer Time

The Sun

- On April the 1st, just twelve days after the spring equinox, sunrise at Dublin is 05:58 UT. It transits the meridian at 12:28 UT at 41º altitude. Sunset that day is at 18:59 UT.
- The earliest sunrise of the year occurs on June 18th at 03:55 UT. This date does not coincide with the summer solstice due to the equation of time (when the Sun passes the meridian changes during the year).
- The summer solstice occurs on June 21st at 14:58. On this day, the Sun reaches its highest northerly declination and it is the longest day of the year(17h 00m).
- The latest sunset of the year occurs on June 25th at 20:58 UT.
- There is no true dark between May 14th & July 30th (Sun never more than 18° below the Dublin horizon).
- Sunspot activity for Solar Cycle 25 has begun to pick up recently. As always, use caution when observing the Sun: solar projection is the safest method, or a suitable (certified) solar filter for your instrument.
- *Editor's note*: I caught the displays of the northern lights on February 27th and March 23rd - the latter was not forecast but subsequent analysis by space weather forecasters showed that an earlier weak Coronal Mass Ejection (CME) was overlaid on a strong solar wind stream from an earth-facing coronal hole. That was enough to spark the display we saw. Aurorawatch UK (also an app) is an excellent resource for alerts.

The Planets

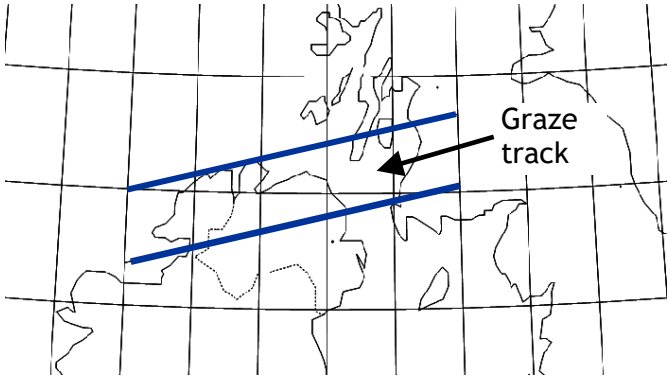
Mercury can be seen in the evening sky for the majority of April. The planet is at its greatest eastern elongation on the 11th that month and is highest for observation after the end of civil twilight. The magnitude 0.1 planet will be visible in the WNW to the unaided eye. Mercury then becomes a morning object from the end of May and June but it will be difficult to observe, reaching only a peak altitude of 5° above your local horizon at sunrise. The planet is at greatest elongation west (25°) on May 29th.

Venus is a spectacular evening sky object presently and does not set until midnight at the end of April. It lies only 2½° from the Pleiades on April 11th. The magnitude -4.3 planet is not setting until after 1am (with IST in effect) during May and lies near the crescent moon on the 23rd. Venus reaches greatest elongation east in the evening sky on June 4th when 45° from the Sun and is at half phase.

Mars is in the constellation of Gemini at the beginning of April and is 2.8° from Tejat Posterior (the star in the right foot of Castor twin) on the 5th. Mars and the Moon are then 2.9° apart on the 25th.

May sees the Red Planet cross into the constellation of Cancer mid-month, shrinking to less than 5 arc-seconds in apparent diameter. It then passes north of the Beehive cluster M44 on June 1st. Mars is 5º to the lower right of the Moon with the planet Venus nearby on June 22nd.

Jupiter is too close to the Sun to observe in a darker sky until towards the end of May. On the 17th of May there is a daylight occultation of Jupiter that is visible from the extreme northern tip of Ireland, and it is a brief graze event from other areas shown in the map below. The Moon is a waning crescent that day just two days before New. June sees the planet return to morning visibility, rising at 02:45h on the 1st of the month then at 01h by the 30th.



Saturn should be picked up in the constellation of Aquarius towards the end of April in the morning sky. It is bright (mag. =1.0, brightening a little to 0.9 by the end of May) and visible to the unaided eye. Saturn is stationary on June 18th and then begins to retrograde.

Eclipses in 2023

There are two eclipses of the Sun and two of the Moon during 2023.

A hybrid solar eclipse on April 20th is visible from the southern hemisphere. These less common eclipses occur because the Earth's surface is curved, so sometimes an eclipse can shift between annular and total as the Moon's shadow moves across the globe. Western Australia will see just one minute of totality.

The second solar eclipse is an annular on October 14th and will cross North, Central and South America. It is unfortunate that neither will be seen from Ireland.

There are two lunar eclipses - that on 5/6th of May is a penumbral but is not visible from Ireland. However, on Saturday, October 28th, a shallow partial lunar eclipse is visible from here.

Meteors

The **Lyrids** meteor shower peaks on April 23rd but the radiant near the star Vega is not at a decent altitude to observe until the early hours. The Zenithal Hourly Rate (ZHR) is 18 and conditions are favourable as maximum is two days after new moon.

Special attention has been drawn to the **Camelopardalids** this year by the International Meteor Organisation (www.imo.net) who suggest a possible increase in activity on May 24th when Earth encounters some debris trails laid down by comet 209P/LINEAR on previous visits to the inner solar system. Any spike in the rates are expected to occur during daylight hours for us unfortunately. The radiant is not far from delta UMa.

The **eta Aquarids** are another early morning shower and reach maximum on May 5th with a ZHR of 50. The conditions to observe them are not as favourable this year as full moon is the same day.

Variable Stars

Algol (β Persei, varies from 2.1m to 3.4m**):** Minima are predicted for Apr 01d 0.3h, Apr 03d 21.1h, Apr 23d 22.9h, May 16d 21.4h Jun 5d 23.1h, Jun 23d 4.0h, and Jun 26d 0.8h

The following Mira-type stars are approaching maximum: V Cam (May, mag. 9.9); U Ori (May, mag. 6.3); X Cam (Apr, mag. 8.1); T Cas (April/May, mag. 7.9) R Ser (April/May, mag. 6.3) o Cet (Jun, mag. 3.4); x Cyg (Jun, mag. 5.2). All dates and magnitudes for Mira stars are approximate.

Noctilucent Clouds

Cirrus-like wisps of silvery noctilucent clouds (NLCs) can appear any time from here between late May and mid-July. They occur just above 80km altitude in the cold air of the mesosphere and form when ice crystals condense on meteor dust.

NLCs can appear above the northern horizon 90 minutes after sunset or before sunrise at our latitude. See Martin McKenna's website www.nightskyhunter.com (NLCs page link) for more details. Poor weather over last summer meant the first sightings of NLCs from Ireland by most people were not until toward the second week of August - many commented that this was the latest in the NLC season that they saw the clouds.

Bright star lunar occultations (at Dublin) - *produced with IOTA's Occult 4 software*

Date	Star (Mag.)	Event (and Cusp Angle °)	Moon Ill.
Apr 10	Sigma Sco (2.9)	disappears 02h 33.2m (-38S°) / reappears 03h 25.5m (+52S°)	-83%
Apr 11	43 Oph (5.3)	reappears 04h 22.3m (+73S°)	-74%
May 17	Jupiter	Track of the graze event for N. Ireland is in the main notes	-5%
May 30	Eta Vir (3.9)	disappears 01h 08.5m (+29S°)	+72%
Jun 7	59 Sgr (4.5)	reappears 02h 59.6m (+20S°)	-88%

Cusp Angle (CA) is the angle of the event around the limb of the Moon measured from the nearest cusp. Negative values (-) indicate a bright limb event. The cusps are usually N (north) or S (south) but can be E (east) or W (west) near Full Moon.

Lunar phases and Lunation

Each cycle of the Moon (new moon to new moon) is called a lunation and each lunation is given a specific sequential number.

There are various numbering systems, each differing only by when the first new moon in the sequence is. A popular system is the **Brown Lunation Number** which refers to Lunation 1 as the new moon of January 17 1923.

You will note in our lunar phase table for January to March 2023 that the Lunation Duration varies from month to month. In fact the difference between the shortest possible lunation and the longest is approximately eight hours, which is significant.

The reason of the variation is because the Earth-Moon system does not move at constant speeds in perfect circles. Throughout the year the alignment of the elliptical path of the Moon relative to the Earth's orbital path around the Sun changes as does the movement of both bodies. This means that the period of time between each new moon will vary from month to month. It also gives rise to the phenomenon known as **libration**.

Major Librations Apr - Jun 2023: Maximum librations are given below for the period - note that libration is still favourable two to three days before and after a given date.

Date	Size (°)	P.A. (°)
Apr 13	7.2	14
Apr 26	7.0	210
May 11	6.8	355
May 26	6.9	206
Jun 7	6.7	339
Jun 19	6.8	208
Jun 30	7.4	75

Moon's Phases

Lunation	New Moon	First Quarter	Full Moon	Third Quarter	Lun/Duration
1240			Apr 06d 04h 34m	Apr 13d 09h 11m	29d 10h 49m
1241	Apr 20d 04h 12m	Apr 27d 21h 19m	May 05d 17h 34m	May 12d 14h 28m	29d 11h 41m
1242	May 19d 15h 53m	May 27d 15h 22m	Jun 04d 03h 41m	Jun 10d 19h 31m	29d 12h 44m
1243	Jun 18d 04h 37m	Jun 26d 07h 49m			29d 13h 55m

Perigee and Apogee

The Moon's orbit path around Earth is elliptical in shape. This means the distance between Earth and the lunar orbit varies from day to day. The point of the path that is closest to Earth is called **perigee** and the point furthest from Earth is called **apogee**. When the full moon occurs at perigee, the Moon appears at its largest from Earth and is popularly known as a Super-Moon. When it occurs at the apogee it is at its smallest and is occasionally referred to as a Micro-Moon. The first of four supermoons this year occurs on July 3rd.

Perigee		Apogee	
Date & Time	Distance	Date & Time	Distance
Apr 16d 02h 23m	367,968 km	Apr 28d 06h 43m	404,299 km
May 11d 05h 05m	369,343 km	May 26d 01h 39m	404,509 km
Jun 07d 00h 06m	364,861 km	Jun 22d 18h 30m	405,385 km

We are now just two years away from a major lunar standstill, when the Moon's declination reaches a maximum monthly limit at 28.725° north or south. The June full moon this summer is just 8° up when on the meridian (due south) on the 4th, whereas the same month's full moon in 2015 stood 19° high when that year was the mid-point between the standstills of 2006 and that of 2025 (the period between each standstill is 18.6 years).

90 with the C-90

by Kevin Berwick

This time I look at a few prominent bright stars in Orion and Taurus. In addition, I look at a prominent variable star in Perseus.

Aldebaran

Aldebaran is an intense bright orange star in a relatively poor star field. Certainly in the 32mm, a relatively low power eyepiece, very few other stars were visible. Of course, the Hyades are nearby but Aldebaran does not sit within the Hyades, it is merely beside them. I counted perhaps only 10 faint stars in the whole field on the night I viewed Aldebaran.

This bright, prominent, richly coloured star has understandably attracted considerable attention outside the field of Astronomy. An interesting character in the sky lore of Aldebaran is Axel Stoll, a far-right esoteric German geophysicist and conspiracy theorist. He thought that Germany colonized the moon after the defeat of the Wehrmacht in World War II. This idea was popularised in the movie 'Iron Sky'. Lucky readers may have missed this film! Alex also thought that the 'Aryan race' are aliens from the star Aldebaran and that the Earth is a jail planet for those who did wrong. In his opinion, all races are fighting for superiority. Looking around at how the world is in 2023, who could argue with him?

The planetary exploration probe Pioneer 10 is no longer powered or in contact with Earth, but its trajectory is taking it in the general direction of Aldebaran. It is expected to make its closest approach in about two million years….I expect an update on its progress will appear in Orbit at that time!

Finally, the Austrian chemist Carl Auer von Welsbach proposed the name Aldebaranium (chemical symbol Ad) for a rare earth element that he (among others) had found. Today, it is called ytterbium (symbol Yb).

δ Orionis (Mintaka)

Mintaka is 1,200 light-years from the Sun and together with Alnitak (Zeta Orionis) and Alnilam (Epsilon Orionis), the three stars form Orion's Belt. This object consists of a double in Orion's belt. There's a white primary and a faint purplish blue secondary nearby visible in the 32 mm eyepiece.

ι Orionis

This triple star lies in a lovely field of stars framed beautifully in the 32mm eyepiece. The Orion nebula spills onto the edge of the frame adding enormously to the visual pleasure. A little asterism of stars around iota looks like a squashed Auriga with Iota Orionis as a 'B list' Capella. Many observers see the three stars as red, white and blue. I have to confess I didn't notice any obvious colour myself.

When I observed it on a crisp, freezing night, predicted to reach -4° C, the experience reminded me of observing with my 60 mm refractor as a boy. The C90 is often touted as a small sharp telescope (refractor like) adding to the illusion.

Rigel

A prominent star in Orion, Rigel is a pure white star through the C90. Again, there is a considerable amount of sky lore associated with this object. The Rigel Skerries, not to be confused with the agreeable North Dublin seaside town, are a chain of small islands in Antarctica, renamed after originally being called Utskjera. They were given their current name as Rigel was used as an astro-fix.

In the Simpsons, Rigel 7 is a planet home to the Rigellians, including Kang and Kodos, one of whom is illustrated here. They speak Rigellian, which by lucky coincidence, sounds exactly the same as English.

Kang from The Simpsons

Algol (β Persei)

In the C90, Algol appears to be a bright yellowish white star in a star field containing many much fainter double stars. The star really stands out, especially in the wide field 32mm Plossl, as no nearby stars even come close to its brightness.

Algol is considered an unlucky star. It is often referred to as the Demon star and constitutes the most feared star in the pseudo-science of astrology. The star represents the head of the Gorgon Medusa who was slain by Perseus. Medusa, who was the only mortal one of the three Gorgon sisters, was originally a beautiful maiden, but her hair was changed into hissing serpents by Minerva, mother of Chrysaor and Pegasus. The father was Neptune and conception occurred in one of Minerva's temples.

Algol is one of the first non-nova variable stars to be discovered. Its magnitude is usually near-constant at 2.1, but regularly dips to 3.4 every 2.86 days during the roughly 10-hour-long partial eclipses. You can easily follow the variability with binoculars. A secondary eclipse occurs when the brighter primary star occults the fainter secondary. This dip in intensity cannot be detected visually.

Thanks for reading. More next time.

Observer's Corner

compiled by Aubrey Glazier

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We have an interesting set of observations in this Observer's Corner. James O'Connor has been studying a large sunspot and looking into a mix-up about a deep sky object in Virgo. Kevin has been observing some winter wonders and is entertaining us at the same time. John O'Neill observed 2 comets, some asteroids, 3 planets and even some deep sky objects. And I have been finding some nice double star systems and other features in Cepheus. We also have images from Michael Murphy, Barry Pickup and Ken Finlay. Deirdre and Darren have provided us with 2 contrasting sketches of the recent comet C/2022 E3 ZTF. It was also a pleasure to see this comet myself.

I wish you all clear skies over the Easter season!

from John O'Neill

Sunspot counts: Dec 2022 – Feb 2023: Counts were conducted on 22 days during this period. The maximum count I observed was on 12th December when the Wolf Number was W=115, while the minimum count I observed was on 2nd February when the Wolf Number was W=39. All observations were reported to the AAVSO Solar Section. 70 mm refractor equipped with a Thousand Oaks Type 2+ solar filter.

Comet C/2020 V2 ZTF: 9-10 January 2023: Seen immediately at 80x, but better at 117x. DC=2. Dia 1.2'. It appeared considerably fainter than a 9.8 mag field star. Lies 2.2° NW of 50 Cas. 23.45 UT. Clear sky with good transparency. 18-19 February 2023: Appears slightly brighter in the centre with DC= 1. Clear sky. Transparency goodish. 28 cm SCT at 117x.

Comet C/2022 E3 ZTF: 16-17 January 2023: Easy object. DC=4. Dia 19'. No tail visible. It lies 8.5° ENE of Beta Boo. 09.55 UT. Clear sky with good transparency. 29-30 January 2023: A striking coma with a strong central condensation, DC= 6. Lies 10° from Polaris. 02.00 UT. Clear areas with an 8-day moon. 28 cm SCT at 80x.

8-9 February 2023: The coma appears fainter, DC= 4. Dia 4', but there is a faint glow throughout the 48' FOV. 00.45 UT. Clear areas with good transparency. 28 cm SCT at 80x. I estimated the magnitude of the coma as 6.0 (in 12x36 IS binoculars).

11-12 February 2023: The comet appears as a faintish patch. DC= 1. Dia 15'. Magnitude estimate 6.3. 12X36 binoculars. 01.10 UT. Clear sky with goodish transparency.

18-19 February 2023: The centre of the coma was condensed, DC=4. Dia 3'. 28 cm SCT at 80x. 00.25 UT. Clear sky with goodish transparency. In 12x36 binoculars the comet was lost in the sky glow of the city to the south.

349 Dembowska: 8-9 December 2022: Easy, yellowish object in Taurus. I estimated the magnitude of the asteroid to be 10.3. 28 cm SCT at 80x. 23:07 UT. Clear sky with good transparency. Temperature -4° C.

Mars: 29-30 December 2022: The Syrtis Major was prominent near the west limb. Also dark were the Mare Serpentis and the Sinus Sabaeus (a bright area was noted north of this feature). 00.00 UT. 28 cm SCT at 255x and 318x. Light red filter (#23A) used. The planet was then 14.9" in diameter. Seeing: moderate to goodish.

121 Hermione: 9-10 January 2023: Appears rather faint. Lies 2.5° SE of Beta Tauri. 28 cm SCT at 117x. 00:15 UT. Clear sky with good transparency.

NGC 1514 (in Taurus): 8-9 February 2023: This planetary nebula showed a faint haze (2' in diameter) surrounding a central star. A brighter field star of mag 8.2 showed fainter scattered light. 28 cm SCT at 80x. Clear sky with goodish transparency. Seeing: ok.

Delta Geminorum: 11-12 February 2023: Double Star. The companion was seen in approx PA 225°. Primary: whitish. Secondary: a brown speck. 28 cm SCT at 200x. 00.20 UT. Seeing: moderate. The catalogued separation was 5.4".

505 Cava: 11-12 February 2023: Asteroid Cava was near perihelic opposition in Gemini. I estimated the magnitude as about 11.7 at 00:50 UT. Observed with a 28 cm SCT at 80x. Clear sky with goodish transparency.

53 Kalypso: 14-15 February 2023: Kalypso lay in Cancer. This asteroid appears off-white in colour and nearly as bright as a 10.9 field star. 00:25 UT. 28 cm SCT at 80x. Clear sky with ok transparency.

Venus and Jupiter: 2-3 March 2023: To the naked eye at 22.50 UT Jupiter was steadily held near Venus. The twilight was still very bright at that stage. In 12x36 binoculars both were a striking sight separated by 53'. Altitude of Venus 25°. Clear area, but rapidly clouded over soon after.

from James O'Connor

Naked-eye sunspot: Sunspots generally continued at a moderate level. However, the outstanding feature for me was the large sunspot that dominated its group from the time I first saw it close to the eastern limb

on January 13 to my last view of it close to the western limb on January 24. (My observations were by projection through a 15 cm. reflector.) On three days (January 16, 19 and 20) it was visible to the naked eye and would, no doubt be similarly visible on some other days but for cloud cover. On January 20, the projected image bore a striking resemblance to the outline of the map of Cyprus, with the large eastward-pointing prominence of Apostolos Andreas (literally) very prominent.

The galaxy in Virgo that was catalogued as a planetary nebula: The April 2023 number of *Sky & Telescope* gives an interesting account of mix-ups made 44 years apart by father and son William and John Herschel that caused an edge-on galaxy, NGC 4517, to be mistaken for a planetary nebula by William (probably because of the presence of a foreground star) and subsequently catalogued again (as NGC 4437 in a position where there isn't any galaxy) by reason of a 5' (arc minute) error in right ascension by John. The galaxy is magnitude 10 but its sparse light is spread over an area of 10.5' x 1.5'. I decided to have a look to see what I made of it on the one occasion that I observed it (1992 April 24, using a 25-cm reflector). This is what I found:

"Finally, I had a look at the largish but faint edgewise galaxy NGC 4517 in Virgo. I am not sure whether I saw something or not. I saw a starlike object, which may have been the core, almost directly south – just a little west of a 10th magnitude star. The object – whether foreground star or not – was about mag. 12."

So, now, 30 years later, I have learned that I did, indeed, observe the core of NGC 4517 that night!

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from Aubrey Glazier

I own a William Optics 158 mm f/7 apo refractor supported by a Berlebach Planet alt-az mount and a William Optics 70 mm f/6 small apo refractor with mirror diagonals fitted at all times on both scopes.

Dec 8: Lambda Ursae Minoris is a magnitude 6.5 red giant star very near Polaris. Its spectral class is M1. I observed at 11x, 40x and 112x. I found it to be a good orange star.

Before the snow arrived, I spent some time observing the largest planet in the solar system: Jupiter. At 167x the North and South Equatorial Belts, the Great Red Spot, the narrow South Temperate Belt and the North and South Polar Regions were visible. All four Galilean moons were observed with the addition of a mag. 9 star called HD 224510 1.5' south of Callisto.

Dec 15: Jupiter's largest moon Ganymede started transiting Jupiter at 19.04UT. But it took a whole 8 minutes for its disc to be pass in front of the planet. Indeed even at 19.15UT Ganymede was still visible right in front of the South Temperate Belt. Nice!

Dec 20: Here are some nice celestial objects in Cepheus. Beta Cephei (Alfirk) is a double star. Magnitudes: A = 3.2. B = 8.6. Sep = 13.5". PA = 251˚. Tight split at 40x – much better at 112x. The primary has a slight blue-white tint. The secondary is more of a definite blue.

Kappa Cephei is a true binary. Magnitudes: A = 4.4. B = 8.3. Sep = 7.3". PA = 120˚. Lovely split at 112x and 167x. Both stars are white.

Delta Cephei is a very easy double star to separate. Magnitudes: A = 4.2. C = 6.1. B is too faint for my scope. Sep = 41". PA = 191˚. With my small apo it's a delight to split at 11x. With my large scope at 40x I can see that the primary is yellow-white and the secondary is blue.

We all love to see a moon of Jupiter reappearing from behind Jupiter's shadow. At first the innermost moon Io was extremely faint at 18.54UT. After 2 minutes it was at its normal bright magnitude.

Dec 21: I observed the variable star RW Cephei on a number of occasions recently. It can be a yellow or red hypergiant. Lately one experienced spectroscopist on www.cloudynights.com has given this star a spectral class of K4. It's beautifully orange in both my telescopes from 11x up to 225x. I observed RW Cep on these dates: Dec 21, Jan 2 and Jan 25. I must confess that its magnitude hadn't varied by much: 7.3 or 7.4. It has faded since, but my skies are constantly cloudy. But I will try again in 2023.

Jan 1: Our friend Darren phoned on New Year's Day to ask me if I had plans to observe the lunar occultation of Uranus, highlighted by both Donnacha O'Driscoll and Mick McCreary in the last *Orbit*.

Amazingly, the skies cleared after sunset, and so Darren and I successfully observed a very rare occultation of the seventh planet occurring at 22.23UT.

Neither of us had observed a lunar occultation of Uranus before. The planet's magnitude was +5.7. Its angular diameter was 3.7", whereas the 9.5 day old Moon's magnitude was a very brilliant -11.2, and its illumination was 78%. Uranus' globe had a slight blue tint and it took 12 seconds to disappear while our Moon passed in front of it.

I observed the event with my 6.7mm 167x eyepiece. At this power I also saw a rille on the lunar terminator. It was one of the Rimae Ramsden. The occultation could well be my number one event of 2023 – even though the year has only commenced.

Jan 2: I made out that Jupiter's Great Red Spot had a salmon colour to it at 167x. At 17:08UT the

moon Ganymede disappeared behind the planet. You could say that all in all it was a pleasant experience.

Many of us know that Mu Cephei is called the "Garnet Star". But I found another garnet candidate star 5˚ north of Mu Cep called VV Cephei. Its spectral class is M2 and I observed at powers up to 225x. It's a bit fainter but well worth checking out.

Xi Cephei (Alkurhah) is a true binary. Mag.: A = 4.5. B = 6.4. Sep = 8.1". PA = 274˚. What a wonderful sight it is. Even at 40x the blue secondary is hanging separately from the brighter white primary. At 167x it truly is a spectacular sight – a real teardrop effect!

About 2˚ from Xi Cep is an open cluster called NGC 7160. I counted 11 stars in it. Most were white, but one or two had an orange tint. The two brightest stars in this cluster are an actual double star. S 800 has magnitudes: A = 7.1. B = 7.9. Sep = 62.7". PA = 145˚. Both stars are white and I could effortlessly see them separated at 40x. I pushed my magnification up to 167x again to fully appreciate the whole open cluster. NGC 7160 became a wondrous sight. It was first observed by John Herschel in 1829.

HJ 1713 is a true binary close by and it has interesting colours. Magnitudes: A = 8.7. B = 10.7. Sep = 18.7". PA = 125˚. At 167x I could make out that the primary is yellow-white and the secondary is orange. HJ stands for John Herschel (1792-1871). His father was William Herschel who discovered Uranus in 1781.

Jan 17: I noticed something unusual in the clouds of Jupiter's North Equatorial Belt at 225x. There seemed to be a double curve on view. An imager on www.cloudynights.com got the same formation. Thankfully I was vindicated. Sometimes we see something very strange for the first time.

STF 2843 is a triple star in Cepheus. Magnitudes: A = 7. B = 7.3. C = 11. Sep's = 1.4" & 54.7". PA's = 150˚ and 277˚. I had no problem seeing C at 112x. But what an interesting sight I had at 140x with the primary and the secondary. The two stars were touching and not fully split even at 167x. However what a magnificent view I had at 225x. Using my Nagler 5mm eyepiece I had that tiny black gap we all seek after between these two bright stars.

ARY 43 is a wide and bright double star. Magnitudes: A = 6.4. B = 6.8. Sep = 100.4". PA = 128˚. Easy split at 11x with my small apo. But can anyone think of a double star when the primary is blue and the secondary is orange? Isn't it normally the other way around? That's what I saw at 112x. How amusing!

Jan 17: STF 2823 is a double star: Magnitudes: A = 9.2. B = 10.1. Sep = 1.5". PA = 254˚. I knew these two faint and tight white stars were going to be tough to split. I needed my Nagler 3.5mm eyepiece, that gives me 320x, to see that narrow black gap.

STF 2835 is another tough double (mag 9, 9.9). Sep = 1.9". PA = 272˚. Again, I needed my 3.5mm to see a narrow split. The primary is yellow-white. B is white.

The SW sky was clear for Barry Pickup to take some pictures with his Canon 500D and 50mm f2 lens of the February 22nd last Jupiter-Venus-Moon conjunction. Taken approximately 15 mins after sunset, 1/100s f2

Jan 31: As many of you know, we have had a fairly bright comet recently. Its designation is C/2022 E3 ZTF. On the last night of January I finally observed it in the constellation of Camelopardalis next to a 4.5 magnitude star called SAO 6022 (spectral class K5).

The comet's distance then from Earth was just under 43 million kilometres. It was even visible at 11x in my small apo. Valerie joined me in our back garden and I increased the magnifications up to 280x. The comet appeared easy to see - round, grey and shaped like a fuzz ball galaxy. I soon discovered its speed: over 200,000 km/h. I wonder how many penalty points it would receive if it was caught!

ZTF stands for Zwicky Transient Facility. This facility is part of the Palomar Observatory in southern California. The comet was first observed by Bryce Bolan and Frank Masci while studying images with a camera that was attached to the Samuel Oschin telescope and was first observed on the March 2nd 2022.

The nucleus is very small – about 1 km wide. At no time could I see the nucleus. But the comet had a tiny bright centre and a superbly large coma. Over the space of two hours, Valerie and I both noted the speed of the comet as it moved away from some faint stars and approached others. I don't believe I have ever seen such a movement before with any comet.

I observed Comet ZTF on two other occasions: 5th and 13th February. It had faded somewhat when it was about 1˚ from NGC 1647 in Taurus on this latter date. It is my 14th observed comet and it was a real honour to have seen it.

Right: **Ken Finlay** took this photo of the 15-day old waning gibbous moon setting at 8am in the western sky in Gemini on Dec 9th last. It was 402,220 km away at the time. Nikon D5600 at f/5.6. ISO 200 & 300 mm lens.

Below left: **Darren Devereux** sketched C/2022 E3 ZTF at 32x through his 25 cm Dobsonian. Nice small coma and a tiny nucleus. The star below the comet is mag. 5.7 HD 33167, a G class yellow star in Auriga.

Below right: **Deirdre Kelleghan** also sketched C/2022 E3 ZTF from Killadoon, Co Mayo when the Moon was absent (Pastel and Gel pen on black paper). Feb 7th with 32 mm eyepiece (70° FoV) and 20 cm Dobsonian. South is up. The comet was magnitude 6 at the time.

Bottom: **Michael Murphy** captured the Cocoon Nebula in the Hubble Palette from South Dublin. Images: 19 Ha; 49 O3 and 27 S2 subs each 300s long. Taken with his Atik 414EX camera on a Skywatcher ED80 refractor.