JANUS
THE NEWSLETTER OF EWELL ASTRONOMICAL SOCIETY

April 2020 EDITION
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Editorial:

Welcome to the April edition of Janus. I have to start on a sombre note; for those who haven't heard through other media, Geoff Walker, a long-standing EAS member, sadly passed away a couple of weeks ago. His widow hopes to arrange a memorial later in the year.

I think we'd all agree that a single thing has dominated all our thoughts and actions since last month – the Covid19 pandemic. Although totally unrelated to astronomy, it has led to the cancellation of all our EAS events for April and May. Given the way the pandemic is progressing, and the Government restrictions on gatherings, it seems to me unlikely that any similar events will take place before June or even July. In the meantime, perhaps we might consider "virtual meetings"? I've heard of 2 other societies that have gone down this route so, if readers would like to email their views on this to me, we could perhaps gauge the potential level of support and investigate possible options.

If there's any upside to the restrictions it is that, even in self-isolation, there ought to be more time for us to indulge in solitary observing sessions in our own gardens - assuming we have one, of course!

If it's cloudy, or you're looking for something to occupy daylight hours, John Murrell has pointed out that in response to the Covid19 emergency the BAA have made their archive of past meeting videos available to anyone. The link is: https://britastro.org/node/21026 Hopefully this might keep some members amused for a few hours of confinement.

As noted on the EAS website, you might want to look out for Comet C/2019 Y4 (ATLAS). This is becoming brighter than expected (currently Mag 8 and might reach Mag +5 around 1 May), and is visible with a medium telescope in the North East above the Great Bear, URSA Major. It will come closest to Earth on May 23, 2020. Its perihelion will occur on 31 May 2020.

John

SkyUpdate
What's up this month?

The Solar System April

MERCURY: starts the month as a morning object, having recently passed greatest elongation west. It is, however, not observable as it reaches its highest point in the sky during daytime and is 1° below the horizon at dawn. At month's end, it will soon pass behind the Sun and is not readily observable since it is very close to the Sun, at a separation of only 5° from it.

VENUS: is visible throughout the month as an evening object, having recently passed greatest elongation East. It begins the month visible around 19:51 (BST) as the dusk sky fades, 37° above the W horizon, before sinking towards the horizon, setting at 00:11. At month's end, it will become visible around 20:41 (BST) as the dusk sky fades, 29° above the W horizon. It will then sink towards the horizon, setting at 00:26.

MARS: emerges from behind the Sun and becomes a morning object but, throughout the month, it is not observable. Reaching its highest point in the sky during daytime, it will be no more than 10° above the horizon at dawn.

JUPITER: is emerging from behind the Sun and is visible in the dawn sky. It starts the month rising at 03:58 (BST) – 2 hours and 38 minutes before the Sun – and reaching an altitude of 13° above the SE horizon before fading from view as dawn breaks around 06:14. By the end of the month, it is visible in the dawn sky, rising at 02:12 (BST) – 3 hours

and 23 minutes before the Sun – and reaching an altitude of 16° above the southern horizon before fading from view as dawn breaks around 05:10.

SATURN: is currently emerging from behind the Sun. It begins the month not observable – it will reach its highest point in the sky during daytime and is no higher than 10° above the horizon at dawn. It ends the month visible in the dawn sky, rising at 02:26 (BST) – 3 hours and 9 minutes before the Sun – and reaching an altitude of 14° above the south-eastern horizon before fading from view as dawn breaks around 04:50.

URANUS: begins the month approaching solar conjunction and not observable – it will reach its highest point in the sky during daytime and is no higher than 6° above the horizon at dusk. By the end of the month, having recently passed behind the Sun at solar conjunction, it is not readily observable since it is very close to the Sun, at a separation of only 3° from it.

NEPTUNE: recently passed behind the Sun at solar conjunction. Throughout the month, it is not observable – it will reach its highest point in the sky during daytime and will be below the horizon at dawn.

C/2019 Y4 (ATLAS): may possibility become a naked eye comet over the next few weeks. There is a summary on the BAA site at https://britastro.org/node/20911. You'll really need a telescope or large binoculars to see it properly, but at least there won't be any aircraft to interfere with the view!

Planetary viewing highlights this month

3 April – 19:45 UT: Venus within Pleides

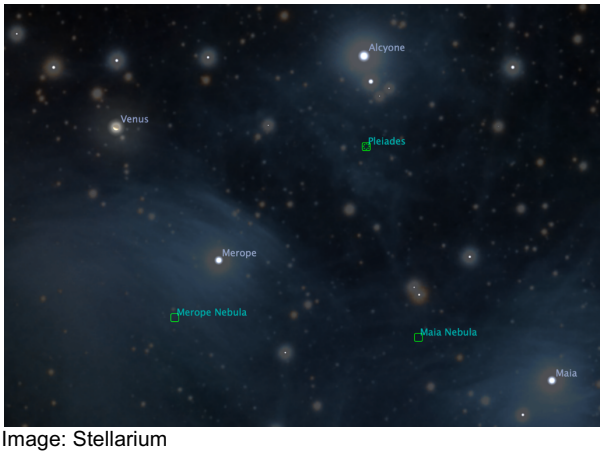


Image: Stellarium

After sunset on 3 April, if clear, Venus will be seen to lie above and to the left of Merope within the Pleiades Cluster. A possible photo opportunity!

15 April – 03:15 UT: Moon and 3 Planets

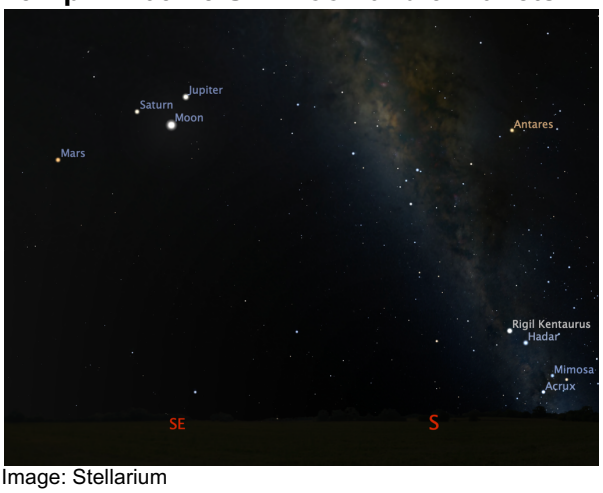


Image: Stellarium

Before dawn on 15 April, the Moon, just after third quarter, lies below a line-up of Mars, Saturn and Jupiter.

15 April – 18:15 UT: Thin crescent moon and Venus

Image: Stellarium

If clear after sunset on 25 April, a very thin crescent moon and Venus will be seen.

MOON PHASES:

First Quarter	1 April
Full Moon	8 April
Last Quarter	14 April
New Moon	23. April
First Quarter	30 April

NASA Supports Project to image Starlink Satellites – John Davey

John Murrell was going to write about a project, supported by NASA, to image Starlink Satellites and see how they change the night sky. On closer inspection, his view was that it appears to be a project without any real scientific objectives or methodology - so he decided not to bother. After a somewhat cursory examination, I'm inclined to agree with John although, as a non-scientific, general interest project, it has some merit. If you want to see for yourself, the link is at:
https://astronomy.com/news/2020/03/nasa-needs-you-to-photograph-starlink-satellites-with-your-smartphone.
You need to follow the links from that page to fully understand the objectives of the project and how it is intended to work.

Astronomy and the Corona Virus – Gary Walker

With the sudden escalation of the Corona Virus in the UK, everything seems to be closing down. The April Meeting of EAS has been cancelled, and who knows whether things like next year's London Astrofest will occur, as we seem to be on a long, uncertain, haul. I don't know if the Astronomical magazines will keep printing – hopefully they will - the whole thing is just like a sci-fi/horror movie going on!

One thing, it won't stop (unless we became really ill with the virus), is astronomical observing! Even in self-isolation, one can go out into one's garden, and observe! As a matter of fact, in any case, that's what I always do - observe on my own, at home!

Venus is starting to get interesting – Gary Walker

In the late afternoon of 6 March, I observed Venus with my 8" SCT, at c. 16.20 UT. It appeared as a waning half-phase (although the astronomy magazines state that it is still about 63% phase – i.e. still technically gibbous).

I could see some vague grey shading spreading out from the terminator - cloud formations, and the terminator was noticeably dimmer than the limb of Venus.

I could just pick out Venus with the naked eye, when I had pin-pointed with binoculars exactly where it was in the sky, as a delicate spot of light. Seeing it was easier, as it was very close to a cloud edge. It is said that if you look at a cloud, and know where Venus is, you can then pick out Venus with the naked eye, even in daylight This is because, when you look at something like a cloud, or the Moon, in the daylight sky, your eyes set on "infinity" and focus better, so it is then possible to pick out Venus.

Historically, the crowds around Napoleon and US President Lincoln, became astonished, when they realised that many in the crowd were not looking at them, but up at the sky, where they were all picking out Venus in broad daylight.

In my 11 x 80 binoculars, Venus appeared very bright and luminescent, even in the late afternoon sky.

Now is the start of a period when Venus becomes interesting. As it passes towards Inferior Conjunction on 3 June, things speed up, and Venus gets rapidly larger and becomes a thinner and thinner crescent. This makes a change from the endless, boring, gibbous phase, which seem to last for ever!

One cannot miss Venus, at present, as it is blazing brightly in the evening sky. Ironically, that is the worst time to observe Venus via a telescope, as it is so bright, that the phase can be difficult to see, as well as the fact that the image of Venus will become wobbly, when it is low in the sky. That is why I prefer to observe it (and Mercury) in full daylight, when they are high up in the sky, and the glare is cut-off

As an aside to my observations of Venus, I note that Betelgeuse is now a bit brighter than Bellatrix, but not as bright as Aldeberan, so it seems to be returning to normal.

Mercury – Gary Walker

After seeing David Fishwick's excellent presentation on Mercury, I thought I would like to add some comments.

Of course, Mercury always presents a small angular size, so it is usually c. 6'-7' arcseconds in size (only about 3-4X the size

of Neptune). Thus, it is not surprising that it was difficult to find out its nature, even when using the best telescopes at high magnifications.

The best, that could be seen was vague shadings on it - despite the fact that it has no atmosphere to speak of so, in theory, should be as clear as our Moon.

This is partly because it is never that close to Earth - no closer than c. 50 million miles- and often a lot further away It is also not very big - only about 3000 miles in diameter.

It is usually only visible, well, for a few days, when it is further from the Sun, and it moves around quickly, as it has the fastest orbit (only 88 days), of all the planets. Thus, good observations of it, are limited!

Mercury often has to be observed when it is low down in the sky, at dawn or dusk, as it can never get very far away from the Sun. This means that it will be at low altitude, resulting in poor seeing conditions, such that it will just appear as a fuzzy blob! For serious observation, it is best to observe it in daylight, when it is highest in the sky, so as to reduce poor seeing.
I have observed Mercury with my 8" SCT, both at dusk, and in the daytime. At dusk, it appears pinkish in colour, but in the daytime, it appears a whitish-greyish colour. The reason why it appears pinkish at low altitude, is the same reason that the Sun does, in these same conditions.

Mercury always appears small, in my scope, even at high magnifications, so I am lucky if I can pick out its phase. It is clearly much dimmer than Venus, so it is harder to see it well.

In May 2010, I could see a bright patch upon Mercury, on a number of days, but I have no idea whether this was real, or just a contrast effect. I have also, sometimes, seen a bright patch on Venus, which could be the same!

Of course, one cannot beat a Space Probe, for showing the true nature of planets - especially in the case of Venus, Mercury, Mars, and Pluto, as even the best telescopes are limited. However, the venerable amateur planetary observer, Damien Peach, managed to image Mercury, with his 14" SCT, which could be matched up by the Messenger Probe, which took the same image of Mercury, at the same time. Of course, the Messenger image was superior, but Damien Peach's one showed a blurrier, but recognisable, view of the same features that were seen by the probe! Thus, it can be seen that amateur images nowadays, are superior to the old 1950-1960's telescope images of planets, e.g. with the 200" Palamar telescope.

An explanation of a 1400-year-old event? – John Davey

Japanese scientists may have solved a 1400-year-old mystery. In 620 AD, red light streaked the night sky over Japan. Witnesses compared it to the tail of a pheasant - it appeared as a fan of beautiful red feathers stretched across the sky. Since the event, scientists have studied the witness accounts written at the time and speculated about what the cosmic phenomenon could have actually been. Now researchers from The Graduate University for Advanced Studies believe they may have found the answer, and they published their results earlier this week.

The event is the oldest Japanese astronomical record of a “red sign” and, according to one of the researchers, could be a red aurora produced during magnetic storms. Although the description has been very famous among Japanese people for a long time, convincing scientific explanations for it have previously not been provided.

The problem with the aurora hypothesis is that auroras do not look like pheasant tails. Instead, they are ribbon-like, waving across the sky. Some researchers have speculated that it could have been a comet, but comets do not often appear red.

To better understand the phenomenon, the team adjusted their view - literally. The magnetic latitude of Japan was 33 degrees in 620 AD, compared to 25 degrees today. The pheasant tail appeared to be about 10 degrees long, placing it well within the area that would be affected by a strong magnetic storm. The researchers claim that recent findings have shown that auroras can be “pheasant tail” shaped, specifically during great magnetic storms. This has led them to conclude that the 620 AD phenomenon was likely to have been an aurora.

This is an interesting (and successful) example of where modern science can benefit from an ancient emotion evoked by the surprise appearance of a phenomenon in the sky which can be related to something familiar (in this case a bird). Pheasants are culturally significant in Japan and have been for generations. They were considered messengers of the heaven in traditional Japanese folklore. According to the researchers, it is likely meaningful that the historical records used the shape of a pheasant's tail to describe the "heavenly" phenomenon of the fan-shaped auroras.

The researchers plan to continue examining other literary references to unexplained phenomena for modern scientific relevance.

(Herschel) - Gould Belt an update – John Murrell

Some of you may remember that in March 2014 I spoke to EAS on “OB Stars - The Brightest Stars in our Galaxy”. Following an introduction to massive hot blue OB stars, the core of the talk was about how the O & B stars form a ring on the sky which is tilted relative to the plane of the galaxy. The Earth is offset from the centre of the ring. The southern part of the ring was discovered by John Hershel from South Africa in 1834-8, but he did not publish his discovery. The Northern part of the ring was discovered by the American Astronomer Benjamin Gould, and he joined these with Herschel’s discovery to form a ring. He published this discovery in his 1874 paper “On the number and distribution of the bright fixed stars”.

The formation of the OB stars requires a shock in the interstellar medium to start the collapse of the gas into stars. There were several theories as to what caused a circular shock wave including a ring of supernovae, a dwarf galaxy or gas cloud passing through the plane of the Milky Way at an angle, or a blob of dark matter passing. None of these were totally satisfactory for various reasons. Jump forward to 2020 and the release of data from the ESA Gaia astrometry has allowed accurate positions and velocities of stars in Gould’s belt and beyond to be measured. This data has been supplemented by data on interstellar gas from ground based surveys. As the Gaia data contains both 3D positions and 3D velocity data, this allows the part of the Milky Way nearest the Sun to be mapped in 3D.

This is what a group of astronomers led by João Alves in their paper “A Galactic-scale gas wave in the Solar Neighbourhood” available at https://arxiv.org/abs/2001.08748 (free to view), its good to see John Herschel’s observations from 1834-8 acknowledged in the paper.

The researchers have found a long linear feature in the stars & interstellar medium with a wave, now named the Radcliffe wave, in the vertical plane. The Herschel - Gould belt forms part of this wave structure, but the authors argue that the belt does not in fact exist but is a projection effect of the wave structure they have identified.

The image below shows the structure in 3D. The left shows the view that would be seen from above the Milky Way - the faint grey lines show the dust along each measurement line, the blue areas are the star forming molecular clouds.

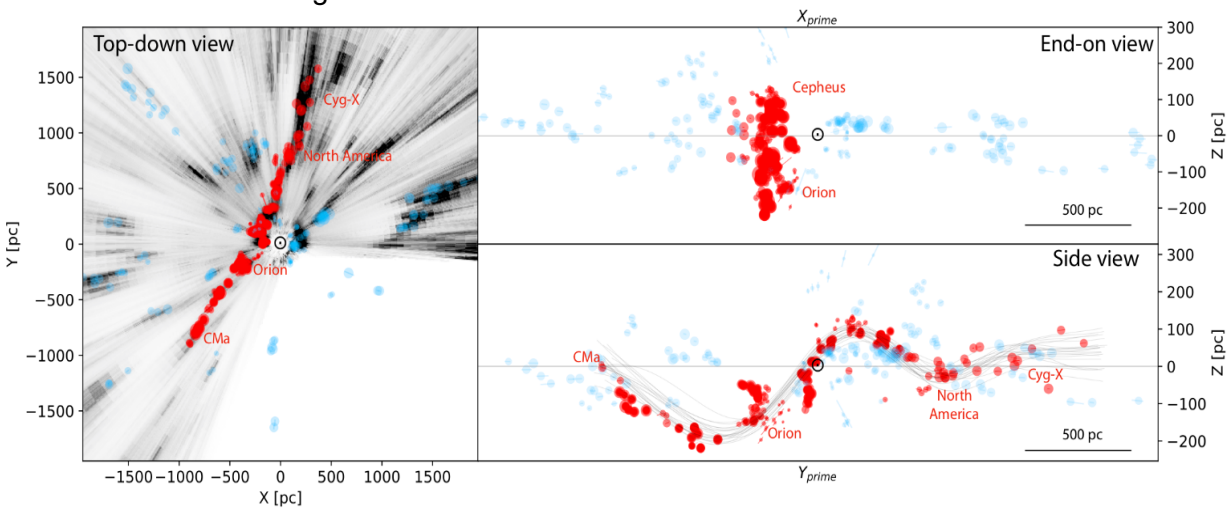


Diagram © João Alves et al 2020

A 3D interactive model of the diagram above as well as links to videos & links allowing visualisation in the 'World Wide Telescope' (WWT) can be found at: https://sites.google.com/cfa.harvard.edu/radcliffewave/home. The 3D presentation on the WWT is interesting as it shows the features on a cartoon artists impression of the Milky Way and the software allows you to tilt the entire galaxy as well as zoom around at speeds well in excess of the speed of light!

Note the WWT site works best with the Google Chrome browser if you have that on your computer. The authors of the paper note that there is more work to be done to identify the rest of the feature, as well as identifying the cause for the wave. One major area of work you will notice from the diagram above - and it shows even better on the WWT - is that they have only looked in the direction of the Milky away from the galactic centre. I presume the dust and stars in the direction of the galactic centre are too dense and confused to separate out the features. However there is little evidence of a structure in the direction of the galactic centre.

I have had problems comparing the results with the diagrams shown in my presentation due to the differences in measuring units and features compared to those in this paper. Have a look at the diagrams in the presentation linked below and decide for yourselves how they compare.

If anyone wants a copy of my 2014 presentation to EAS it is on my website at: http://www.johnmurrell.org.uk/OBStars-V3a.pdf (Note the capitalisation has to be correct to work !) The core about the Herschel – Gould belt stars at slide 33

J002E3 – "an Apollo[1] Asteroid"

The editorial in the March edition of Janus about the Earth's minimoon 2020 CD3 reminded me of an interesting discovery of a previous minimoon in September 2002.

The object was initially discovered on 3rd September 2002 by the amateur astronomer Bill Yeung. The initial analysis showed that this was an asteroid in an unusual orbit, due to interactions with the Moon it spends some time in orbit in the Earth Moon System and at other times it is in a Solar orbit far from Earth. Running the orbit element integration backwards showed the object was newly arrived in Earth orbit from a Solar orbit and running the orbit further backwards showed it was last near the Earth in 1971, rather surprisingly the orbital prediction before this was unstable indicating that the orbit had been perturbed at this time though what caused it was not clear.

The mystery deepened when a spectra was taken of the asteroid, this showed a spectra of titanium together with a number of other elements that have not been previously identified in asteroids. The identification was further complicated when it was identified from changes in the orbit due to radiation pressure from the Sun that the asteroid had a low density.

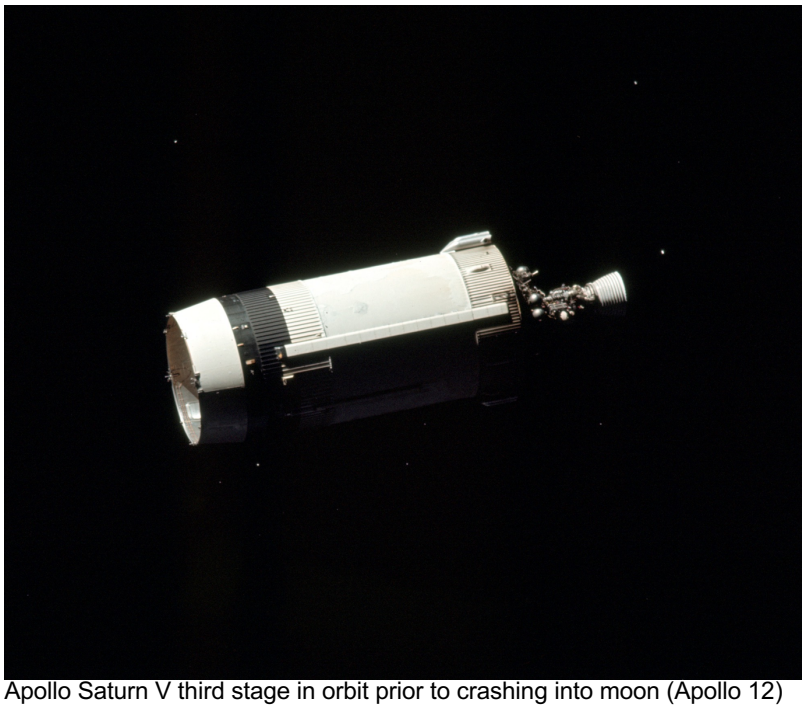
The orbital predictions also showed that the asteroid would leave Earth orbit in June 2003 and not return until the 2040's.

The combination of low density and unusual elemental composition lead to the conclusion that the 'asteroid' was in fact man made! While it was not possible to prove conclusively it appears likely that J002E3 is the lost third stage of the Apollo 12 moon landing rocket. The location of all the other 3rd stages of the Saturn V rocket are known. They were either crashed into the moon to provide a impact for the seismometers left on the moon by Apollo 11 or were injected into heliocentric orbits which would not approach the Earth. However, the Apollo 12 third stage suffered a malfunction and did not achieve the desired objective of hitting the Moon. The belief is that the change in orbit caused by the malfunction resulted in the rocket stage orbiting in a chaotic manner around the Earth Moon system from 1969 until it was ejected in 1971 into its present orbit.

[1] This Apollo 'asteroid' should not be confused with Near Earth Orbit asteroids of the Apollo family named after the asteroid 1862 Apollo. These are natural asteroids that are mostly in Earth crossing orbits so are potentially hazardous.

More details can be found in the JPL press release reproduced at:
http://www.spaceref.com/news/viewpr.html?pid=9497 ,
and animations of the 2003 orbit are at https://cneos.jpl.nasa.gov/doc/j002e3/ .

It should be noted that exact predictions of the return date are not possible due to the effect of Radiation Pressure on the object. It is not possible to calculate the effect of this without knowing the spin parameters of the rocket stage that are unknown.


Apollo Saturn V third stage in orbit prior to crashing into moon (Apollo 12)

There has been a recent update on 2020CD3, the subject of the March editorial. There is now a suggestion that this may also be a lost rocket stage, although a smaller one than the Saturn V third stage – see:

https://cneos.jpl.nasa.gov/news/news205.html for an update as well as an interesting orbital diagram.

You need to take care looking at these orbital diagrams as they are drawn in as Earth centric which results in the very tight loop at around 11 O'clock from the Earth. As shown in my previous article on "Is the Moon a Planet?" the orbit as seen from a heliocentric point of view is very different.

A heliocentric animation of 2020CD3 is available at:
http://orbitsimulator.com/gravitySimulatorCloud/simulations/1582674492776_2020cd3_mpec.html .
This can be run forwards or backwards in time to show its entry to and exit from Earth orbit.

Up Next:

NEXT MEETING: Friday 12 June 2020, Nonsuch High School for Girls Library 8pm.

Maurice Gavin Memorial Lecture - Neil Phillipson will talk on a subject to be agreed.

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

NEXT USER GROUP: Nonsuch High School for Girls 8pm.

Date to be advised – check EAS web site.

This is an informal session for members to meet and discuss anything related to their telescopes and sky events and, if weather permits, to go up on the roof for observing. Enter via the Main Entrance opposite the Car Park

NEXT DENBIES OBSERVING SESSION:

Date to be advised – please check EAS web site.

AD HOC OBSERVING AT WARREN FARM:

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