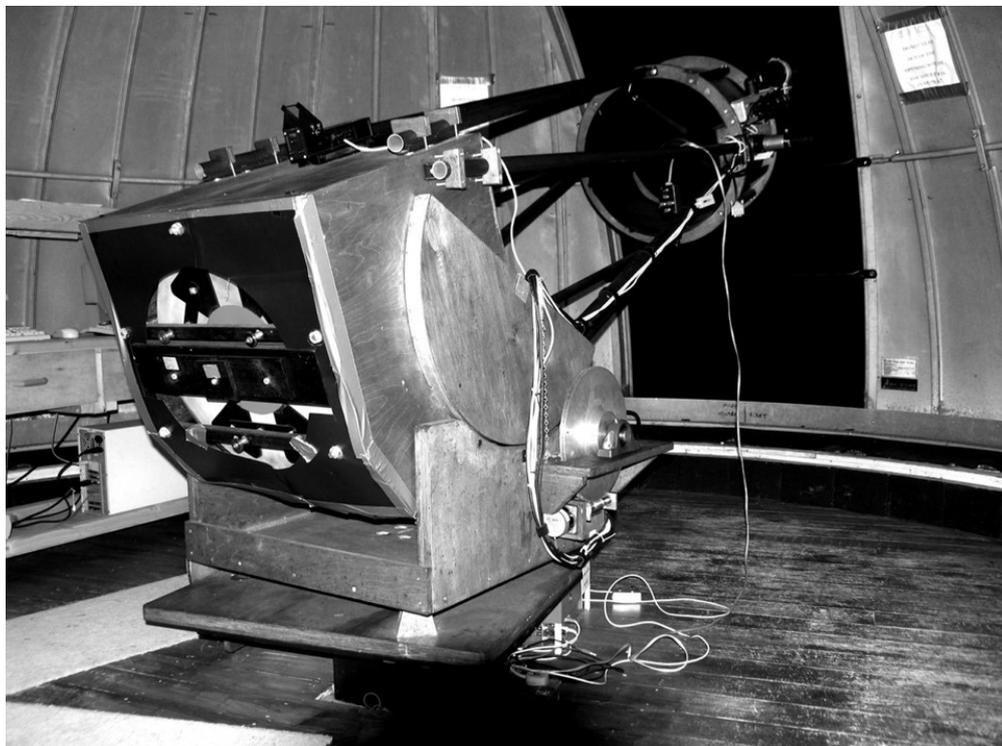


Breckland Astronomical Society

Affiliated to the British Astronomical Association and the Federation of
Astronomical Societies

EXTRA ***TERRESTRIAL***

Newsletter December 2020



Registered Charity no, 1044478

| Contents | | Page |
|--|-----------------------|-------------|
| Chairman's Notes | <i>Dan Self</i> | 3 |
| Astro Dairy December 2020 | | 5 |
| Johns News Bits | <i>John Gionis</i> | 7 |
| Dan's Quiz Questions. | <i>Dan Self</i> | 9 |
| What was the Christmas Star? | <i>Chris Bailey</i> | 11 |
| Myths and legends of the cosmos, Taurus, the Hyades, Pleiades and Orion | <i>Alison Chapman</i> | 19 |
| Falcon 9 | <i>Liz Gilmour</i> | 22 |
| Observing other objects | <i>Dan Self</i> | 23 |
| VNS Equatorial Platform | <i>John Wilkins</i> | 28 |
| Astounding Facts | <i>Dan Self</i> | 35 |
| Member's Astrophotography | <i>Various</i> | 36 |
| Leonids Long Echoes | <i>Chris Bailey</i> | 46 |
| For Sale and Wanted | | 48 |
| Contacts | | 49 |
| Programme 2020/21 | <i>Dan Self</i> | 50 |
| Quiz Answers | <i>Dan Self</i> | 52 |

Copy is always needed for this newsletter. Articles with an astronomical theme are welcome but anything of likely interest to the membership will be considered. Text or Word documents preferred but handwritten submissions also welcome.

Chris Bailey is the newsletter editor. newsletter@brecklandastro.org.uk

Mick Ladner is visitor organiser. visitors@brecklandastro.org.uk

Chairman's Notes December 2020

Some of us observatory gatherers have been meeting via Zoom on Tuesdays during this lockdown, which has been arranged on the facebook group. I hope we can return to normal soon, but obviously not at the expense of any risk so we have virtual talks lined up until April.

Some of you have good skies around the county. I've been trapped in a city and am not allowed to escape to the country at night despite being completely isolated, so I decided to invest in a new nebula filter. I am lucky to have an old telescope as a tracking mount, although it is bulky. Having this motor, otherwise known as an RA drive, is the next step to astro-photography. Sights such as the Pleiades and Andromeda galaxy can be taken using them, provided you have the appropriate telephoto lens and camera. A D-SLR can be used on a tripod with a wide field lens to a certain extent, but upgrading to a star-tracker opens up a new world of image targets.

Like a Renaissance Clockwork Sky Theory, there are many things about to arrive in the sky. The Jupiter Saturn conjunction on 20-21-22 December is approaching. Neptune, is further around the ecliptic, then Uranus and Mars. A distanced observatory trip for that may be possible for a few of us. The conjunction can be captured low in the South West from anywhere with a good enough view, but you will need a good telescope and to be available from 4pm to set up, weather permitting of course.

Asteroid Vesta is beginning to approach Earth again, and during Christmas, it passes NGC 3692 and 3705 in Leo. It is below iota Leonis and 7.5 magnitude.

Comets joining us are C/2020 M3 Atlas (all night, Auriga) and 156P Russell Linear (evening) and 141P Machholz (very early evening, Capricorn, near Jupiter/Saturn).

The Geminid meteor shower looks good this year on Saturday the 12th – you can look from 8 or 9 pm onwards with rates increasing slightly until a broad peak at 1am.

Prior to lockdown John brought a nice little unit for the loo at the obs. These sort of things are of real help as it is the little things that improve the experience of everyone. Housekeeping is essential and it is useful if all the regulars can chip in with help here and there when possible.

We are thinking about loaning kit out to members as a benefit. There will be a few conditions of course. This provides practical help starting enjoying this hobby and comes with our advice and expertise. Your support helps us fund speakers, observatory fixed costs, and inspire visitors and especially the next generation. It also helps us keep our equipment up to date and fixed. The information we provide is currently conveyed in a large part by this Newsletter, edited by Chris Bailey, who has expertise in many areas of astronomy, available in the files section of the facebook page.

Observatory rules post-lockdown December 2020 (as of November 22):

- Follow Government advice re Tiered system.
- Stay outdoors when possible despite the cold (after all we are astronomers)
- Sign in/out required – we'll delete your data after the 21 day period is up.
- Shared use of Observatory Eyepieces not permitted.
- Maximum 2 persons with social distancing still in place in main room, dome, 1 household in kitchen/toilet area.
- Masks should be worn, exceptions granted.
- Hand sanitiser should be used and hand washing at sinks.
- Disposable or own brought mugs for coffee and disposable cutlery/towels.

We are still at high risk given likely rates of Covid-19, so please reconsider visiting if you are at a higher risk of transmission. It goes totally against what we encourage but

Talks

The quiz was fun to do but a bit of a different feeling online. We got an audience of 13 so it felt like we had little party in the lab – see separate article.

The google meet link to this month's talk will go out by email and be up on the facebook group near the time.

The year will end with a look again at North Norfolk's Dark Sky Festivals. Kate Dougan, the Norfolk Coast AONB officer has inspired us to educate and enthuse others – as this is a major way we can change people's attitudes to preventing light pollution. This is an important message for us astronomers while still being a subject full of natural wonder. To complement this, I will kick off the evening with a short selection of the clubs amazing astro-photographs from 2020.

Paul Money is coming (virtually) with a bit of fascinating Mars history in January. And Paul Fellows of Cambridge Astronomy Association is following up his popular Stephen Hawking talk in Feb. There is a Star Party planned for March at Haw Wood Farm (now looked after by DASH), as usual straight after our talk on the Friday night.

Dan Self

Astro Dairy

December 2020

**Comet 141P Machholz passing through constellation Aquarius after
11th December**

| | |
|---|--|
| 5th December Moon. | Topocentric conjunction : Beehive (M44) and Moon. |
| 6th December | Peak of Meteor shower, Dec Phoenicids Topocentric conjunction : Regulus and Moon |
| 7th December | Peak of meteor shower. Puppis Valids. |
| 9th December | Neptune , Eastern Quadrature |
| 10th December | Topocentric conjunction Spica & Moon |
| 13th December | Moon occults Graffias |
| 14th December | Peak of Meteor Shower: Geminids Moon Occults Mercury. Visible but during daylight (0930z onwards) |
| pass at | Solar Eclipse(Not visible from East Anglia) Close 1730z |
| 15th December the south | Mars @ 2200z albedo feature Syrtis Major and polar cap |
| 19th December | Peak of Meteor Shower: Coma Berenicids |

JOHN'S NEWS BITS

December 2020

Asteroid 2020 VT4 some 5-10 metres across skimmed the Earth less than 250 miles over the Pacific. It was spotted by the Asteroid Terrestrial Impact Alert System (ATLAS) at the Mauna Loa observatory in Hawaii. Hope we get more notice next time.

November 17, NASA's SpaceX Dragon successfully docked with the ISS. Looks like a low cost private taxi service to the ISS that will save NASA billions.

The parachute system that will deliver ESA's Rosalind Franklin Exo-Mars rover to Mars has successfully completed a high altitude drop test; some refining still needed as there is no room for error. The launch is due for September 2022.

In 100 days, the Mars Perseverance Rover mission will land on Mars to collect samples from the Jerez crater for returning to Earth. This was a collaborative NASA/ESA mission which is going to plan according to the latest review board meeting.

The issue of the phosphine biosignature in the clouds of Venus is still under investigation after two months of scientific scrutiny. There is a possibility that this was a calibration error with the ALMA telescope software that interpreted the original observation. The International Union's Commission for Astrobiology is concerned that the data was prematurely released to the public before being fully investigated.

A study published by the Astrophysical Journal into the thermal history of the universe over the last 10 billion years found that the mean temperature of the gas across the Universe increase tenfold reaching about 10 million deg.K. This allows scientists to time the progress of cosmic structure formation by checking the temperature of the universe. Researchers used data from the Planck and Sloan Digital Sky Survey. The universe is warming because of the natural process of galaxy and structure formation

In a report from 'Inside Science' a one-way quantum network has been established between two labs. A milestone in creating a quantum internet

worldwide, between the Brookhaven lab. and the Stony Brook University in N.Y.

Quantum computers cannot use the current internet that works off 1's and 0's as quantum computers run on the superposition of 1' and 0's and so can't use the internet for communication.

The asteroid 16 Psyche could be worth 10,000 quadrillion dollars according to a report by CNN. It is a rare metallic asteroid located in the asteroid belt between Mars and Jupiter. It is likely that it is the metallic core of iron and nickel was left over from an early planet that lost its mantle and crust. NASA is to send an unmanned mission for a close study of its composition. Now how to mine it!

ESA and member states Atmospheric Remote-sensing Infrared Large-survey telescope (ARIEL) exoplanet mission is now cleared for launch in 2029. This billion euro space telescope will study the atmospheric gases of exoplanets to understand how they evolved and also their suitability to support life. The mission will be led from the University College London. The instrumentation and mirror will be assembled at RAL Space on the Harwell campus.

Up to 1,000 exoplanets will have their atmospheres examined by spectroscopic instruments as the planet moves in front of the parent star.

The last Solar cycle minimum ended on December 2019 and the next solar max has already started reaching the maximum solar spot activity in summer of 2025. This follows the 11 year cycle. At the last solar max some 114 sunspots were detected with a similar number expected in 2025.

LATEST NEWS

China has just launched a mission to bring back rock samples from the Moon. The mission, Chang'e-5 (named after the Chinese goddess of the Moon) took off on the 24th Nov. This will be the first attempt to bring material from the Moon since the 1970's. Once in the Moon's orbit the probe will deploy a pair of vehicles to the surface to drill into the ground and collect rock samples. The plan is to collect around 2 kilograms of samples from a lava plain called Oceanus Procellarum and return the samples to the orbiting vehicle 200km above the Moon's surface for return to Earth.

John Gionis

Dan's Quiz – from Nov 13

We had 8 rounds of 8 questions from the lab on Friday the 13th = $(2^3)^2 = 2^6$. As usual they were challenging, but I had some lovely letters of thanks. Here are the 52 non-picture Questions in case you wanted a go (answers at the end of the newsletter).

1 Music – Guess the song, which has been altered by word association.

1. Get yer mits off 1990 hip-hop rap
2. Bathbashing 2002 indie pop
3. e.g. Rectangle of 21st letter 2017 pop
4. Steps to Nirvana 1971 blues rock
5. Arsonist 1996 dance rave electronic
6. Objects will just improve 1993 dance electronic pop
7. Underground Missing Colours – 1965 folk
8. A Place above the spectrum 1939 film score

2 Biology and Nature

1. What is an Imago?
2. How big is a Bacterium? A. 0.1mm B. 1 micrometre C. 10 nanometres D. 0.1 nanometres
3. What is Post Prandial Somnolescence?
4. How many eyes does a (honey) bee have?
5. Adults hear up to about 16 kHz as the highest frequency. How many times bigger than that is the call of a common pipistrelle?
6. Bob Greef mentioned this class of organisms in his lectures on astrobiology. They can survive very high or low temperatures, very dry conditions, or very high pressures.
7. Are marsupials mammals?
8. The last word in the OED is now zyzyva (a genus of South African weevil). What is nearly the last word and means a cell formed by the coming together of a male and female haploid cell?

3. Number Fun

1. What mathematical sequence is seen in nature in the form of shells, flowers and reproduction?
2. If a door number fitter at Ellingham Expansion Estates had to fit numbers 1 to 100, how many 9s would they need?
3. Maths was invented by the Ancient Greeks True or False?
4. If 99% of dog walkers clear up after their dogs who do a 1 dodo per day in a village of 1000 dog owners. How many doggy dodos are done in a year? (not a leap year)
5. How many things was Rick Astley never gonna do?
6. How many times did a 33 $\frac{1}{3}$ record spin round while a 3:00 minute long track played? e.g. Bad Bad Leroy Brown by Jim Croce.
7. The main character in 'Hidden Figures' was a computer. What was the name of the main character?
8. What did Einstein struggle with most in coming up with his theory of General Relativity?

4. Literature

1. Who is the following quote by "one swallow does not a summer make" A. Aristotle B. Arthur Ransome C. Dylan Thomas D. William Shakespeare

2. Who was the author of *River of Consciousness* and *The Man Who Mistook His Wife for a Hat*?
3. "Variety is the spice of life" comes from whom? A. Oscar Wilde B. William Cowper C. William Shakespeare D. Geri Halliwell
4. What is this: "the of and to a in is I that it for you was with on as have but be they"
5. Which novel by Sally Rooney novel was made into one of BBC Three's most watched adaptations? A. The Royals B. Common People C. Normal People D A life less ordinary
6. Who writes under the pseudonym Robert Galbraith?
7. Are there more English words where c is followed by ei, or by ie, i.e. "cei" or "cie"
8. Whose autobiography published 15 Oct 2020 is called Limitless?

5. Sport (questions by Leo)

1. What numbers are to the Left & Right of 1 on dartboard?
2. Steve Redgrave got how many Olympic gold medals in his career?
3. Who said "When seagulls follow the trawler it is because they think sardines will be thrown into the sea"?
4. Who was the Last F1 winner not to be British or German?
5. Who is the Dark Destroyer (not a black hole!)?
6. Which of these has NOT been an Olympic event: A. Tug of War B. Hot air ballooning C. Rope Climbing D. Town Planning E. Chess F. Tandem bicycle sprint
7. When was The Hand of God?
8. In which sport to commentators refer to Catching a Crab?

6. Astronomy – Fly Me to the Moon

1. Who wrote Fly me to the Moon? A. Bart Howard B. Frank Sinatra C. Neil Armstrong D. Henry Mancini
2. What are we, a term that defines the members of this society that is an anagram of MOON STARERS?
3. What's the official IAU Name for these: Ceres, Pluto, Haumea, Makemake, Eris.
4. What substance causes stars to twinkle?
5. What instrument was Patrick Moore famous for playing?
6. What was the name of the brightest comet of 2020?
7. Black Holes were found to theoretically faintly shine. What late scientist is this named after?
8. This year, after Betelgeuse caused excitement by dimming, it was found to be closer than previously thought. How many light years away is Betelgeuse?

7. Geography

1. What is UK's castle with the largest area?
2. What's the length of the Welsh Coastal path (Chester-Chepstow) A. 189 miles B. 352 miles C. 493 miles D. 870 miles
3. Which is more WEST, Aberdeen or Newcastle?
4. What is the English name of Ynys Môn?

The rest are picture questions and so this abridged version is out of 52.

Dan Self

What was the Christmas Star?

The Star of Bethlehem – nowadays often just called the Christmas Star – is a major seasonal symbol throughout the world.

What was the Star of Bethlehem? Over the years many astronomical explanations have been suggested for this key aspect of the Christmas story.

Imagine, if you will, the silhouettes of three regally attired men on camels. They are gazing across gently rolling hills or dunes of white, to a tiny solitary building in the distance. The night is dark, and one exceedingly bright star appears to hover over the small building, sending a bright shaft of light earthward to illuminate its outline. Another light glows gently inside.



This is the picture most of us have of the Christmas Star, but it's an image derived more from imagination and greeting cards rather than from the Bible. In fact, the Gospel of Matthew in the New Testament is the only place this "star" is mentioned, (Matt 2:2, 7-10, King James Version). Even there, information on the star is sparse. The most telling reference is Matt. 2:9:

“When they had heard the king, they departed; and, lo, the star, which they saw in the east, went before them, till it came and stood over where the young child was.”

If this verse is literally true, then the Star of Bethlehem could not have been any known natural phenomenon, simply because none would move that way.

However, if we grant the author of Matthew – who was not an eyewitness at the Nativity – a little artistic license, the “star” might not have appeared literally in the way described. In that case we can consider some natural, astronomical possibilities. In fact, there is some uncertainty about the use of the word for star in the Greek manuscript. Some contend that the word could have meant or implied an object other than a physical star.

There is no mention of there being three kings, only 'Magi' (wise men, magicians or possibly astrologers) who left three gifts, "gold, frankincense, and myrrh." The Greek word, generally translated as 'star' (αστερα - astera/astra from which we get 'astronomy') can also mean planet, or could refer to other objects such as a comet. Because they were possibly astrologers (not astronomers) they were used to looking for differences in the sky and would have plotted the results on a chart. This may explain the direction “east” otherwise they would have needed to be coming from the west of Bethlehem, not from the Middle East as they were. Although Magi (Greek μαγοι) is usually translated as "wise men", in this context it probably means 'astronomer/astrologer'. The involvement of astrologers in the story of the birth of Jesus was problematic for the early Church, because they condemned astrology as demonic.

There is no mention that the star is particularly bright, and it doesn't appear to have had significance for anyone other than the Magi.

The first consideration is the actual date of Christmas. Here there are problems. Firstly we don't know for sure when Jesus was born. Due to an error by a Church cleric hundreds of years later, the birth of Jesus was thought to be at least four years earlier than it appears. So today we know that the birth was no later than 4 B.C., and it could have been a little earlier. And it certainly was not on December 25. The Bible does not say, leaving us few clues. One clue we do have, however, is the reference that shepherds were out in the field “keeping watch over their

flock by night". This is something that at that time was likely only done in the spring when lambs were born.

If the story of the Star of Bethlehem described an actual event, it might identify the year Jesus was born. The Gospel of Matthew describes the birth of Jesus as taking place when Herod was king. According to Josephus, Herod died after a lunar eclipse and before a Passover Feast. The eclipse is usually identified as the eclipse of March 13, 4 BC. (Josephus ben Matthias, the best known ancient Jewish historian, was born in 37 AD, only a few years after Jesus' execution. Josephus was well educated in biblical law and history. On his mother's side he was a descendent of the Hasmonean Kings.)

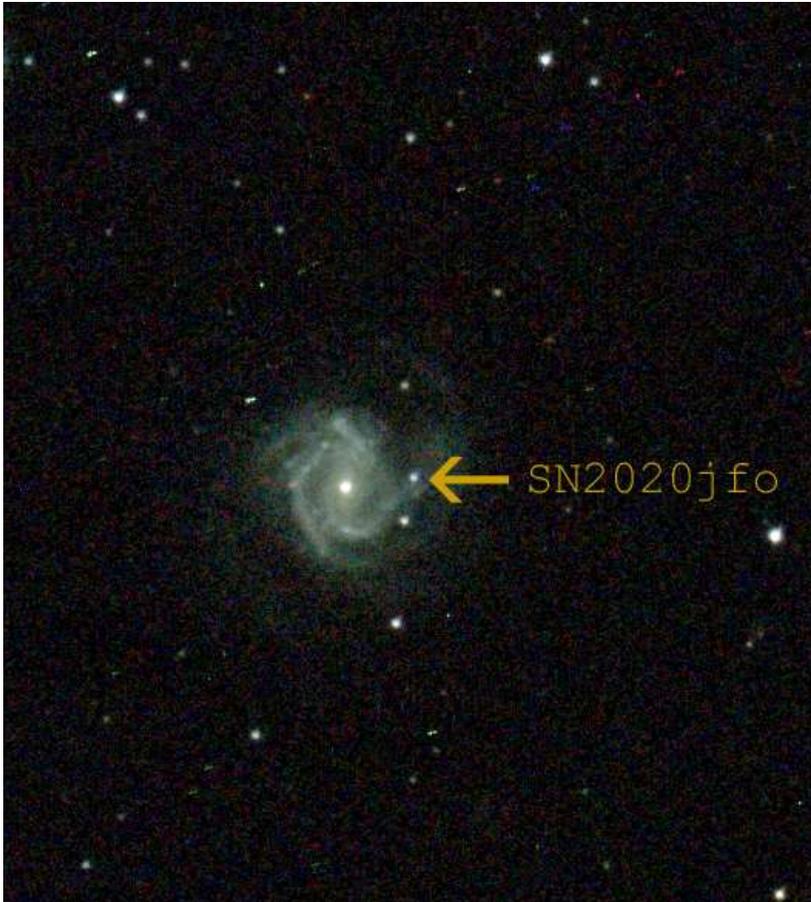
Thus the birth was likely in the spring, probably between 7 and 4 B.C.

Explanation 1: The Christmas Star was a nova or supernova explosion

One possibility is that the Christmas Star was a nova or supernova, a previously unseen star that suddenly brightens in a big way. Indeed, one such star was recorded by the Chinese in the spring of 5 B.C, and was seen for more than two months. However, its position in the constellation Capricornus meant that it is unlikely to have led the wise men in the manner implied in the Bible.

A recent (2005) hypothesis advanced by Frank Tipler is that the Star of Bethlehem was a supernova or hypernova occurring in the nearby Andromeda Galaxy. Although it is difficult to detect a supernova remnant in another galaxy, or obtain an accurate date of when it occurred, supernova remnants have been detected in Andromeda.

Another, more likely, theory is the supernova of February 23 4 BC, which is now known as PSR 1913+16 or the Hulse-Taylor Pulsar. It is said to have appeared in the constellation of Aquila, near the intersection of the winter colour and the equator of date. The nova was recorded in China, Korea, and Palestine.



Explanation 2: The Christmas Star was a comet

Few astronomical records were kept at the time, except by the Chinese and Koreans. They did record what might have been a comet in 5 BC. This object was observed for over seventy days, possibly with no movement recorded. Ancient writers described comets as "hanging over" specific cities, just as the Star of Bethlehem was said to have "stood over" the "place" where Jesus was (the town of Bethlehem).

However, this same argument could be applied to an object moving with the stars if the journey of the Magi took some months. Most classical depictions of the nativity show the 'star' as a comet.

Halley's Comet was visible in 12 BC and another object, possibly a comet or nova, was seen by Chinese and Korean stargazers in about 4 BC.

The main problem here is that comets were generally regarded as omens of evil and bad fortune by the Chinese and likely also by the Magi-astrologers. Rather than follow such a cometary "star," they are more likely to have gone the other way.



Explanation 3: The Christmas Star was a conjunction of Jupiter and Saturn

In 1614, German astronomer Johannes Kepler determined that a series of three conjunctions of the planets Jupiter and Saturn occurred in the year 7 BC. He argued (incorrectly) that a planetary conjunction could create a nova, which he linked to the Star of Bethlehem.

Modern calculations show that there was a gap of nearly a degree (approximately twice a diameter of the moon) between the planets, so these conjunctions were not visually impressive.

An ancient almanac has been found in Babylon which covers the events of this period, but does not indicate that the conjunctions were of any special interest. In the 20th century, Professor Karlis Kaufmanis, an astronomer, argued that this was an astronomical event where Jupiter and Saturn were in a triple conjunction in the constellation Pisces. Archaeologist and assyriologist Simo Parpola has also suggested this explanation. Such an event could have been of religious or astrological significance.



Jupiter, captured with the Society's 9.25" Celestron. Dan Self, Darren Carter and Rod Stevenson, 27 Jun 2018.

In 6 BC, there were conjunctions/occultations (eclipses) of Jupiter by the Moon in Aries. "Jupiter was the regal 'star' that conferred kingships - a power that was amplified when Jupiter was in close conjunctions with the Moon. The second occultation on April 17 coincided precisely when

Jupiter was 'in the east', a condition mentioned twice in the biblical account about the Star of Bethlehem."

In 3–2 BC, there was a series of seven conjunctions, including three between Jupiter and Regulus and a strikingly close conjunction between Jupiter and Venus near Regulus on June 17 2 BC. The fusion of two planets would have been a rare and awe-inspiring event

Another Venus–Jupiter conjunction occurred earlier in August, 3 BC. These events however occurred after the generally accepted date of 4 BC for the death of Herod. Since the conjunction would have been seen in the west at sunset it could not have led the Magi south from Jerusalem to Bethlehem.

Explanation 4: The Christmas Star was a stationary point of Jupiter

Jupiter, in its apparent path across the sky, is generally seen to move from east to west across the starry background.

Due to the relative movements of the Earth and the planets, this motion appears to slow and then stop as the planet reaches what is called a 'stationary point'.

The planet then appears to move from east to west for some days before again stopping and resuming its west to east movement. At the possible time of the birth of Christ in the Bible, one of the stationary points could have occurred when Jupiter was directly overhead at Bethlehem at the same time of night for several nights.

The disadvantage of this explanation lies in the lack of any rarity in the phenomenon, as it would happen every year.

Explanation 5: The Christmas Star as a conjunction of Jupiter, Regulus and Venus

One other possibility includes a set of conjunctions of the planets Jupiter and Venus, and the bright star Regulus. In this case, the mythologies associated with the objects become important.

Jupiter in Hebrew is known as 'Sedeq', which is often translated as meaning righteousness. Jupiter is also often viewed as being the 'king' of the planets.

Regulus itself is Latin for 'prince' or 'little king', and Venus is often viewed as a symbol of love, fertility and birth.

As such, the combination of these objects close in the sky could have led to the interpretation of the birth of the 'King of Kings'. Particularly to astrologers who may have been able to predict this combination.

Explanation 5: The Christmas Star as a meteor event

Some artistic depictions show what appear to be a bright meteor or "falling star". Although exploding meteors, sometimes called bolides or fireballs, can be startling and truly impressive, they last only seconds. They can occur at any time. People far more aware of the night sky than the modern city dweller would not have placed much significance in them. Such transient phenomena could not possibly have "led" the wise men to Bethlehem.

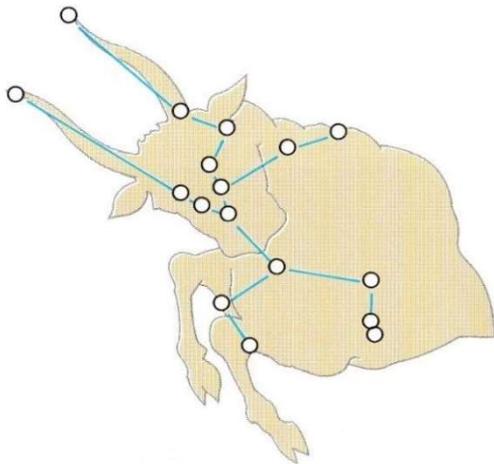
Unless some major and indisputable archaeological discovery is found to settle the question once and for all, the mystery of what the Christmas Star was will remain in the realm of faith. Science cannot explain it as any known physical object; history offers no clear record; and religion offers only an untestable miraculous apparition. But although there may be no agreement on the nature of the star or even its actual sighting two millenia ago, all sides can agree on the message the Christmas Star heralded: "... on earth peace, good will toward men." (Luke 2:14).

Season's Greetings to All our Readers

Taurus, the Hyades, Pleiades and Orion

Alison Chapman

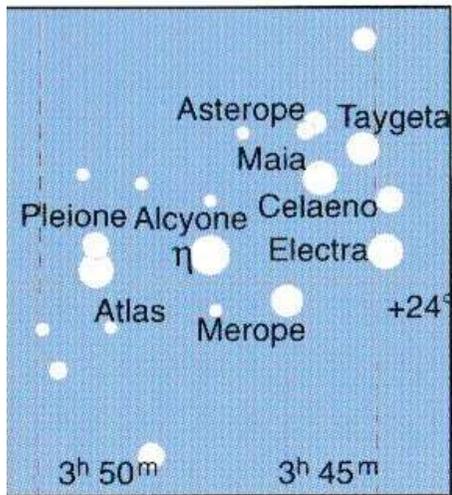
Taurus the bull was the disguise Zeus adopted in order to abduct Europa, daughter of Agenor, king of Phoenicia (modern Lebanon). Europa was one day picking flowers with her friends on the shore near the city of Tyre. A tame bull wandered about near them and let itself be stroked and festooned with flowers. Eventually, Europa felt so safe that she climbed on the bull's back. At



"How do I *know* you're Zeus?"

once it galloped into the sea and carried her south to the island of Crete. There

Zeus changed back from his disguise and slept with the princess. Europa bore him three sons, Minos, Rhadamanthys and Sarpedon. Minos was famous for imprisoning the monster that was the Minotaur in a labyrinth. Zeus commemorated the bull, whose form he took, in the stars as this constellation.



△ THE PLEIADES

The V-shaped cluster of stars that makes up the bull's face is known as the **Hyades**. They were the five daughters of Atlas and Aethra. Their brother Hyas while out hunting was killed by a wild boar and the sisters were so upset that the gods took pity and set them in the sky as stars. Their name in Greek means 'Rainy Ones' and this may refer to the tears they are shedding or to the fact that Taurus becomes prominent in the autumn as

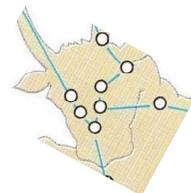
the weather changes. The gods may also have wanted to reward them for their role in nursing the god Dionysus on Mount Nysa when he was a baby.

On the bull's shoulder is another cluster of stars known as the **Pleiades** or **Seven Sisters**. They were the daughters of Pleione and Atlas (thus half-sisters of the Hyades). All seven are named: Maia, Electra, Taygeta, Alcyone, Celaeno, Asterope and Merope. Six of them bore children to gods. Perhaps the most famous offspring is Hermes, the messenger god, son of Zeus and Maia.

One of the seven stars shines more faintly than the others. This is said to be either Merope, ashamed because she married a mere mortal, or Electra, the mother of Dardanus, a founder of Troy. She is in mourning for the death of her son and the fall of a great city.

Zeus took pity on the Pleiades and put them in his own constellation Taurus because they were in terrified flight from Orion. He had been out hunting with the goddess Artemis, caught sight of the girls and set off in pursuit. In their distress the sisters prayed to Zeus and he turned them into doves so that they could fly away.

Later he set their image in the constellation. In the sky Orion is never far



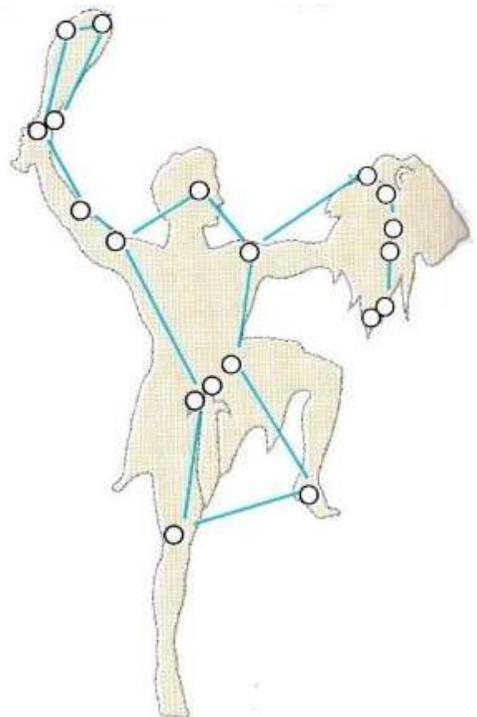
away, still in pursuit, but will never catch them. The name Pleiades comes from the Greek word for 'sailing' and they were always regarded as stars favourable to navigation, perhaps because they are easy to pick out in the night sky.

Orion the hunter was a handsome giant and a son of Poseidon god of the sea. His father granted him the ability to cross the sea with ease: either he could walk on water, or he was so tall that he could wade through the deepest ocean with his head and shoulders clear of the waves. The goddess of the dawn, Eos (or Aurora as the Romans called her), fell in love with Orion and carried him off to the island of Delos. She still blushes every morning when she remembers their nights together.

Orion spent a great deal of time hunting on Crete with the goddess Artemis. Her brother Apollo was afraid that she might become as susceptible to his charms as Eos was and sent a huge scorpion to sting him. Orion plunged into the sea to escape it and Apollo tricked Artemis into killing her friend with an arrow. She realised that she had shot Orion only when his dead body drifted into the shallows. In her grief she set his image in the sky.

Orion has his two hunting dogs, Canis Major and Canis Minor, at his side and his hunter's eye on Lepus the Hare. A bear (Ursa Major) keeps wary watch from a distance and Scorpio is always chasing him. The scorpion was made a constellation too because of its service to beasts of the earth in helping to rid the world of such a successful hunter as Orion.

(N.B. As before, I have used Greek names of the gods: Zeus = Jupiter, Artemis = Diana, Dionysus = Bacchus, Hermes = Mercury.)



Falcon 9

Liz Gilmour

Late last Sunday (15h November 2020) night I stumbled across a live link on Facebook covering the launch of Space X Falcon 9, taking 4 astronauts to join the International Space Station. I started watching just before countdown and found it absolutely fascinating. The excitement of hearing the countdown and the roar of the mind bogglingly large engines. It felt like actually being there and one could almost imagine sitting with them in the rocket. I was lucky enough in October 1989 to be in Florida and went to Kennedy Space Centre to see a launch but, due to weather conditions, it didn't happen on the day. A few days later I saw it in the sky from afar, which was a good, if not surreal experience. I hasten to add the live stream was far more exciting and then at 0038 hours on Monday morning, just 13 minutes after launch in the USA, due to a very clear sky, I saw Falcon 9 go over Attleborough, from right to left, a very fast moving 'dot' in the sky. This may not seem much, but to see it with the naked eye, I felt was something rather special.

On a light different note, but within the 'Star' theme - following the comments on the live event - someone did try and befriend me on FB, which I ignored but did sneak a look at his profile and found him to be a Steve Martin lookalike !! Nearly a star - just amused me.

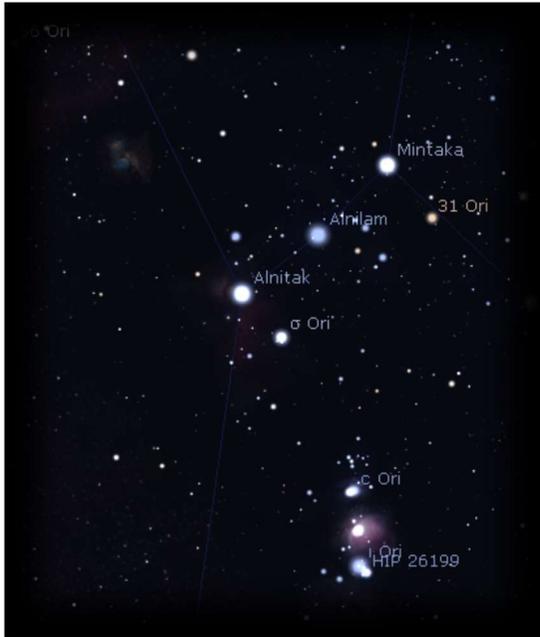


Photo from NASA

Observing Other Objects – OOO!

Here are some different and less observed Deep Sky Objects to find with your Telescopes this winter.

M78 – Reflection Nebula in Orion. This looks like headlights in fog to some. The fog is rather faint if there is any actual fog, or light pollution, but it really stands out in a dark sky. A normal, 25mm eyepiece should show it in a 4 – 10 inch scope. It can be found the other side of Alnitak in Orion's belt from the Great Orion Nebula, but not quite as far away. The star just below the belt, sigma, can be used as a pointer. If a line is drawn through sigma and Alnitak (the left most star of the belt), this line can be extended three times to reach the location of M78. There is a dust lane separating the two patches of fuzz, which is difficult to see. Usually only one fuzzy patch is



noticed. Not so many people observe this object, which contains a variable nebula.

Very close to Alnitak is the Flame Nebula, NGC 2024, which is surprisingly bright. The famous Horsehead hangs down to the south of the star, but to the East (left) is a larger 'burning bush' shape. This has been surprisingly visible, as a large faint fuzz, when Alnitak's glare is pushed out of the edge of the view. Use a wider field eyepiece for this one, under 100x.

If you do dare (!) look for the Horsehead, if you have exceptional skies you will notice NGC 2023 first, the small reflection nebula, that is close by to the dark notch out of IC 434 that comprises the Horse's head.

Heading North, into Orion's East (on the left) Arm, is NGC 2169, the '37' cluster,



which is an interesting looking asterism. It makes a right angle with the fainter arm stars xi and nu Orionis.

If you keep going North, into Taurus, you will be getting near M1, which is worth a look. The Crab Nebula Supernova Remnant. It is fairly faint and looks like a bluish piece of cotton wool. No structure is really discernible in moderate sized telescopes, despite it being rated 8th magnitude.



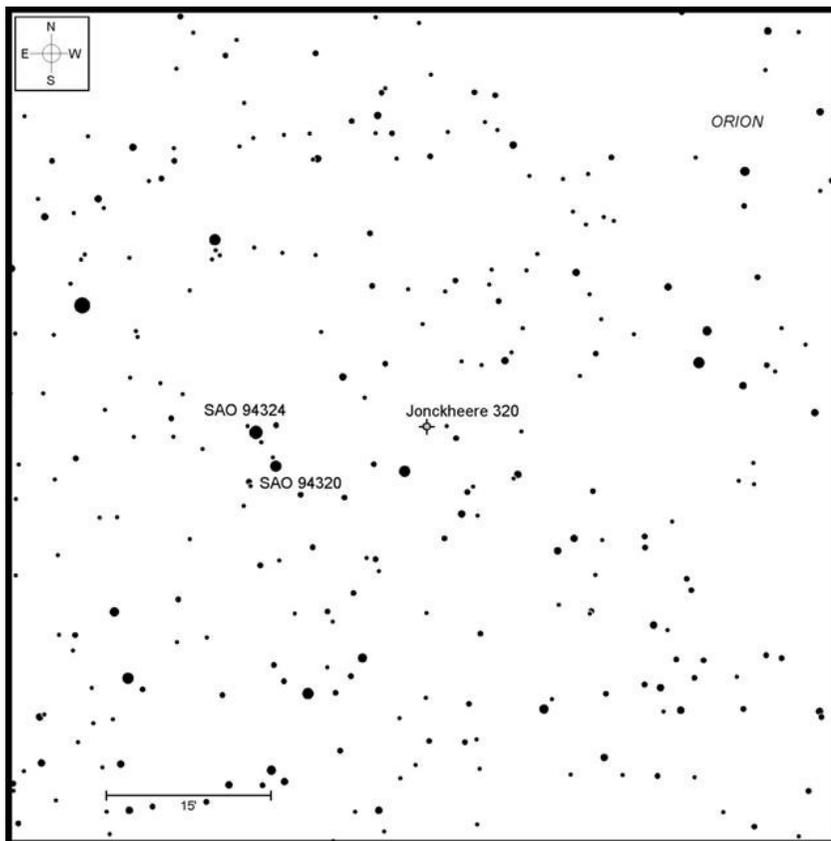
It is about a degree above zeta Tauri, the bull's lower horn. An easy star hop but can take several minutes.

Near Orion's head, the small asterism around phi1 phi2 and lambda Orionis (called Meissa), is a good stepping stone to a tiny, seldom-observed planetary nebula NGC 2022. Like most planetaries, they survive a fair bit of light pollution, although this one is fainter. Its compact size and pure wavelengths of light, are as if it were optimised for the human eye to spot, despite its faintness. It needs a moderate telescope, as it is classified as being 12th mag or dimmer

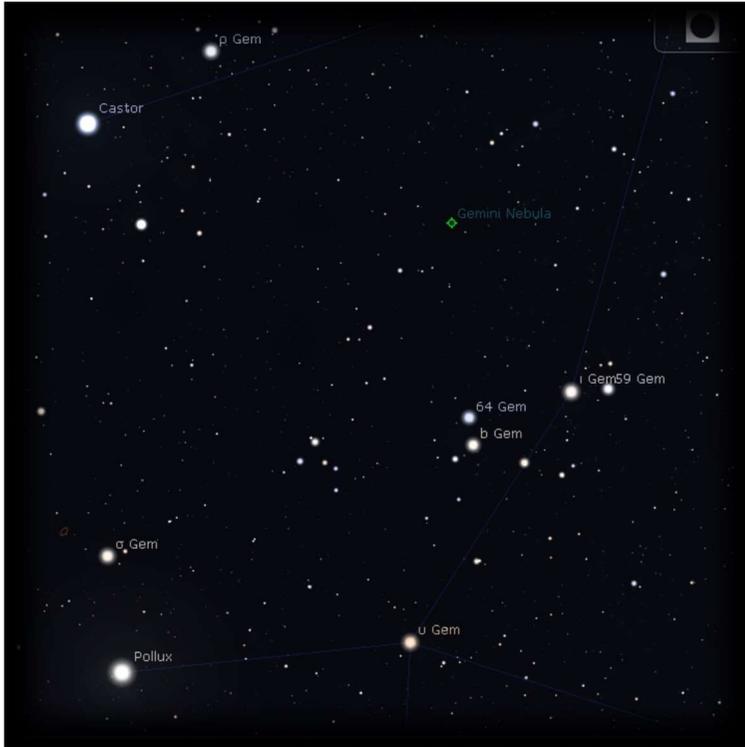


according to different sources. It is known to deep sky astronomers as it is in a convenient position in the sky for UK in Winter.

A polypolar protoplanetary nebula – are you up for the challenge? Back in Orion, but West of lambda (his head), towards the shield, is a tiny polypolar planetary nebula, called Jonckheere 320, or PN G 190.3-17.7 – this is quite a challenge to find, but is in the range of a modest telescope under modest skies. Phil Harrington has done a nice chart for this below the general area chart – see his webpage.



Between Perseus and Andromeda lies the lovely showpiece galaxy NGC 891, but everyone's looking at that, right? Why not turn your telescope a few degrees to the East and look at NGC 1023. Not many people around the world are sharing your experience. It may just be your soul alone, receiving the light from this galaxy when you peer at it. It is a fairly compact Lenticular (or Elliptical) Galaxy located 34 million light years away, and it is surprisingly bright ellipse 5 by 2 arc minutes in size. If you star hop here, you can start at Algol, and hop round the loop of rho Per, 16 Per, then 12 Per. At this point you can travel 2 ½ degrees North to the bright large Open Cluster



M34, or go a degree South and a touch west to this galaxy. Check it out, not many do. This can be done without a chart.

The Double Bubble Nebula NGC 2371-2 in Gemini is quite a challenge to find. I remember getting my 8 inch on it and being really pleased I could see something and with a shape, that was rated at 13th magnitude. It certainly is easily seen in dark skies. It is a much fainter

cousin of the Eskimo Nebula, NGC2392, near Wasat and 63 Gem. You may need to make your own chart from *Stellarium* or look it up on an online sky map. It makes a sort of Equilateral triangle with Castor and Pollux going SW, but not exactly, and this large a shape isn't of much use, you will have to hunt a bit as it doesn't instantly jump out at you. You will have to, in most telescopes/skies, star-hop, as it can be sitting there in the field of view and you just don't notice it. It is 1 ½ degrees North of iota Geminorum, the naked-eye star that forms the triangle with Castor and Pollux.

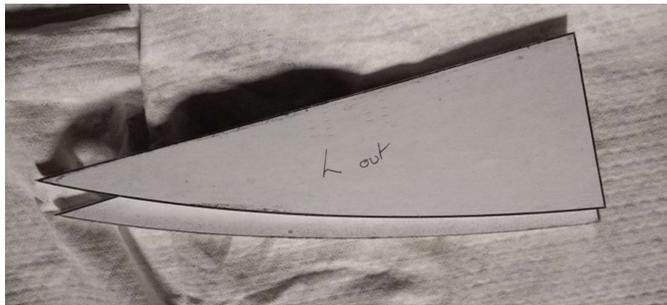
If you've seen lots of pictures of diffuse nebulae people with cameras have collected over hours, you may imagine they are not visible to the eye. However, try looking at the Rosette Nebula, centred on cluster NGC 2244. The cluster is easy to find East of Betelgeuse, and is just W of epsilon Monocerotis, S of 13 Mon. I have found panning around here reveals hints of the large nebulosity, especially to the North of the cluster of 6 bright stars. You are directly looking at the fluorescence of the gas excited by these stars – it's amazing to see it with your own eyes.

If you are positioned this way, try Hubble's Variable Nebula. NGC 2261, it usually looks like a little comet or smear of light leaking out of a dusty hole. Stars Epsilon and 13 lead to 15 Mon in an evenly spaced line. HVN is just to the left of this line, about 40% of the way down from 15 to 13 Mon. If you do a bit of panning around you may notice it. The Christmas Tree Cluster NGC 2264 is much more obvious, beautiful in fact, and is linked to the Cone Nebula, seen on photographs but this is very faint by eye. This can be used to hop down to Hubble's Variable Nebula.



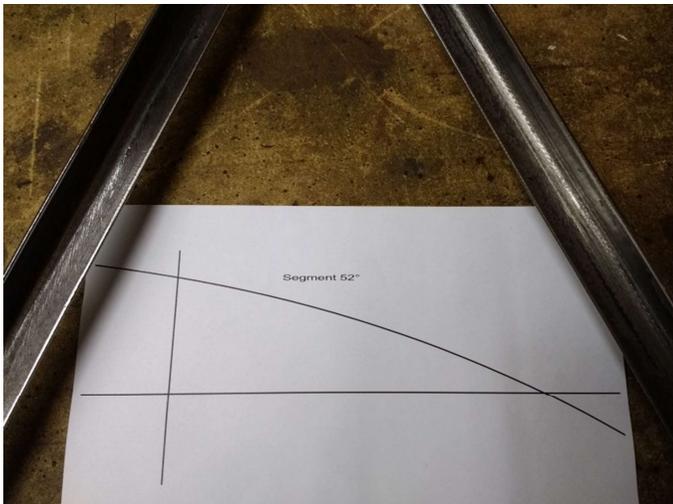
So next time it's clear and moonless, try out some more interesting objects rather than M42 and M31! Charts courtesy of *Stellarium* (available free at Stellarium.org) and Phil Harrington's CloudyNights.com Challenge.

Dan Self



The segments cut out of 6mm aluminium.

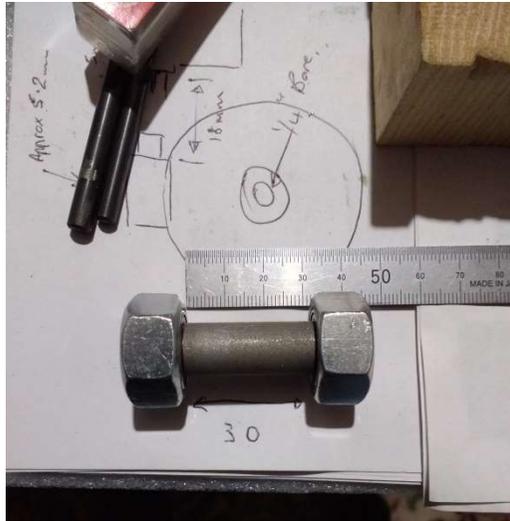
A wood mock-up was made to check the main dimensions, the alignment of the rollers and clearances as the platform swings.





Frame was constructed with 1" angle.





The rollers run in ball races housed in bored out 16mm nuts. The South bearing at the pointed end of the frames nut running stand-off.



The South bearing at the pointed end of the frames nut running stand-off consists of a domed in PTFE cup set in a steel





Now I need to mount the drive motor and some adjustable feet.

VNS equatorial platform with a dobsonian telescope, dummy trial set up.



ASTRONISHING FACTS

These mind blowing statements were presented between the rounds of the quiz in November. They are truly worth sharing and is why I love astrophysics.

Sunsets on Mars are blue.

Venusian days exceed Venusian years.

Moon dust smells of gunpowder.

Uranus does actually look greenish.

Neptune is a tiny bit smaller than Uranus

but it is a tiny bit heavier than Uranus.

Earth is the densest body in the Solar System.

Something weird is making Methane on Mars.

There was an excess of Matter over Antimatter produced in the Big Bang of the order of 1 part in a billion. Without that tiny imbalance, there would be no universe.

Hold up your hand. About 65 billion neutrinos are passing through it each second.

If a black hole spin exceeds 84% of the speed of light, the event horizon disappears, revealing a naked ring singularity.

Gravity is not a force. It is an acceleration upwards from the ground beneath us.

If you could ride a beam of light at light speed, no time would pass, and so it would appear not to exist.

Jupiter has 2.5 times Earth's surface gravity.

Except there's no surface.

You plunge into ever thickening, darkening, toxic atmosphere until you burn up.

If you are lucky you may see some beautiful sights on the way down.

Dan Self

Members Astrophotography

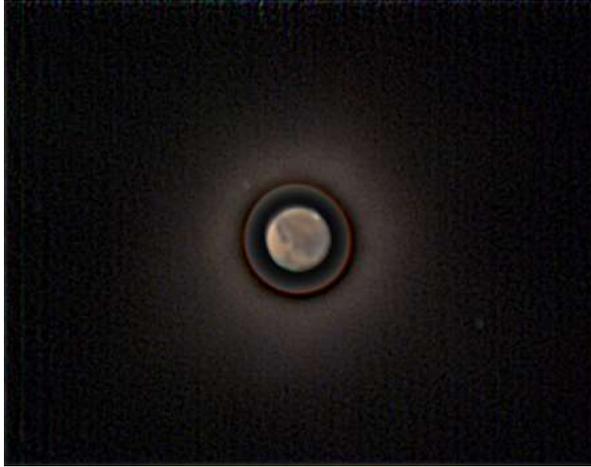
Dan Self



. 2000 of 3000 frames on ZWO ASI 130MC-S camera with 2 x barlow lens, and ADC (atmospheric dispersion corrector) in place on my 8" SCT.



Mars V Uranus F=4M



Phobos and Deimos overlay



Uranus Moons



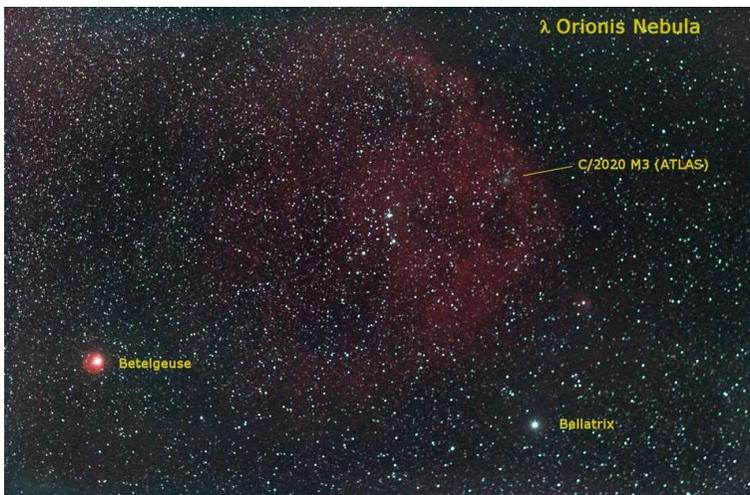
Heart & Soul and h&X per 16X1 minute from city Optolong L-Enh



Lamda Orionis plus c2020M3 ATLAS 27X1m Flats Opt L-Enh2



Orion Low from City 10X90sec Quick process Opt L-Enh



27 minutes from Norwich, pointed at Orion's head. I managed to pick up a comet!
Canon 1000D with Optolong L-Enhance filter

John Gionis



M45-the Pleiades open cluster.

Imaged with a Canon 500D on a 10" Meade Schmitt Newtonian

20x 90sec. frames at ISO1600 processed with DeepSkyStacker.

The Pleiades are a mere 415 light years away and were formed some 100 million years ago.



The crescent Moon at dusk on Nov. 19

Imaged with a Canon 500D on a 10" SNT.

1/125 sec. ISO 200.

Malcolm James Dent



A star cluster known to every civilisation and buried within the folklore across every culture on the planet, The Pleiades or the seven sisters is probably the most recognisable of all the 88 constellations. I think also the best example of a reflection nebula. Containing over a thousand members mostly of hot young stars. Slowly moving through space and an unrelated dust cloud the dust is illuminated by light and the energy of the stars.

Darrell Brown



Triband from Altair mixed with the Quadband 1.5hrs

Andrew Luck



A first attempt at combining the Ha and OIII data for Sh2-216 using a synthetic green ($\text{Ha} * \text{OIII} * 1.5$).

Richard Harmon

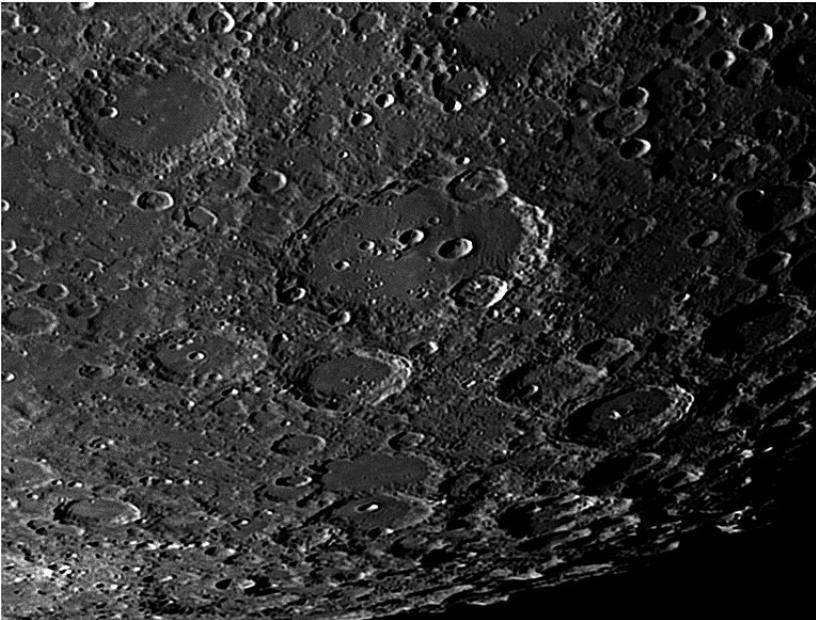


M31 pictures I took from the observatory with Darrell just before lockdown_v2.0. 20 x 1 minute subs taken using the RedCat and Canon 6D

Mick Ladner



Chris Bailey



Area around crater Clavius.



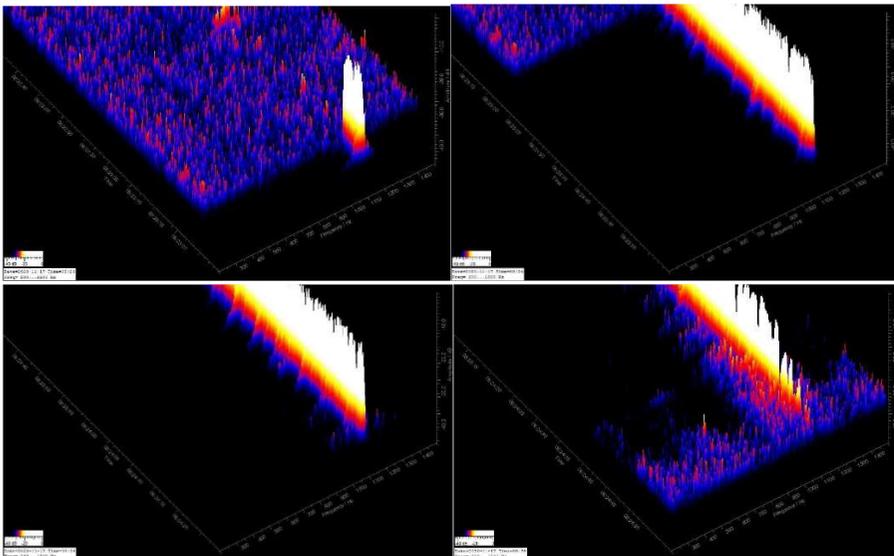
Leonids

Long Duration Echoes

The Leonids meteor shower occurs in mid-November and can give rise to some interesting events. This year's shower was not spectacular for its numbers but did give rise to some larger events. This shower is the result of the orbit of the Comet now known as Swift-Tuttle. It has in the past been known to give spectacular fireball events.

Due to the orbital factors the speed of arrival of the meteors is one of the fastest at over 70Kms/sec

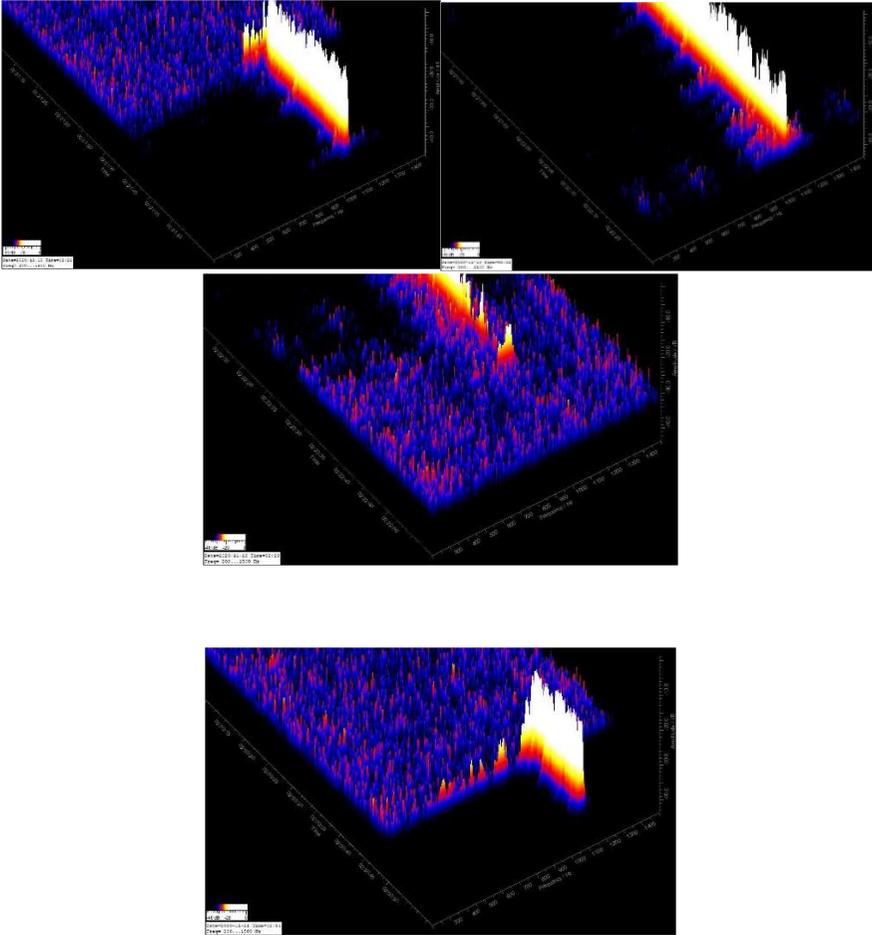
Using the GRAVES Radar transmitter and a receiver in Suffolk the following long echoes were obtained. The length of the echo is dependant on the speed of arrival and the size of the meteor prior to arrival (These 2 factors account for the level of energy that is dissipated as the meteor is vapourised). The Radar returns are not reflected from the actual meteor but from the ionised path that is created as the meteor dissipates its energy. The greater the energy the greater the ionisation and therefore the longer it takes to dissipate and with it the reflective zone for the Radar signal.



The above is the longest recorded with a total time of 93 Secs, Obviously the meteor was not travelling for this length of time but the ionisation path took that long to dissipate.

There were several others with times from 40 Secs to over a minute.

Some show the distinctive start with doppler shift as the meteor slows down.



There have been several reported bright meteors associated with this shower this year including Cabo Rojo Puerto Rico, The Iberian Peninsula and the Research Vessel Investigator.



Courtesy of Meteornews

For Sale or Wanted

This section is for the sale of Astronomical items and any wants from members. Details of items for sale (With photographs where applicable) should be forwarded to the newsletter editor at newsletter@brecklandastro.org.uk

It is suggested that a donation of 5% of the final sale price be given to the Society to assist with funds. If sellers do not wish to make their contact details public then please make this known to me and I will field any enquiries on a box number system. Please send any sales details to me before the 26th of the month for inclusion in the next issue.

Please ensure that if any item is sold by another means prior to publication that I am advised so it can be removed to avoid confusion.

CONTACTS

Chair Dan Self
Contact chairman@brecklandastro.org.uk

Observatory/Visits Mick Ladner
Contact visitors@brecklandastro.org.uk

Webmaster Andrew Luck (temporary)
Contact webmaster@brecklandastro.org.uk

Newsletter Chris Bailey
Contact newsletter@brecklandastro.org.uk

Membership/Treasurer Andy Jones
Contact treasurer@brecklandastro.org.uk

Secretary Rebecca Greef
Contact secretary@brecklandastro.org.uk

Please check with any of the contacts in bold before visiting the observatory. Please ensure you are wearing appropriate footwear and clothing and bring a torch (preferably one showing a RED light)

Breckland Astronomical Society Events – 2021

7:30pm Great Ellingham Recreation Centre, Watton Road, Great Ellingham, Attleborough, Norfolk

Google Meet – details to follow - £free

We may return someday! Hall entry £2.50 £1 U18s

| | | |
|--|--|---|
| Friday, December 11 th 2020 | North Norfolk AONB and the Dark Skies Project Update + Review of 2020 in pictures | Kate Dougan, Norfolk Coastal Partnership Members |
| Monday, December 21 st 2020 | Jupiter Saturn conjunction viewing 5pm | Observatory – restricted numbers |
| Friday, January 8 th | The Vikings at Barsoom part 1 – orbital operations | Paul Money (the one and only) |
| Friday, January 29 th | Public open night (subject to public mobility) | Observatory |
| Friday, February 12 th (palindrome date!) | Cosmic Dawn and Destiny (follow up to Hawking/Edge of Physics) | Paul Fellows, Cambridge AS |
| Friday, February 26 th | Public open night (subject to public mobility) | Observatory |
| Friday, March 12 th | Building an Observatory + The Crisis in Cosmology | Malcolm Dent and Dan Self (BAS) |
| Week March 10 – 17 th Main: Sat, March 13 th | Spring Star Party 2021* (<i>star walk/talk Sat eve</i>) | Haw Wood Farm (see below) |
| Friday, March 26 th | Public open night (subject to public mobility) | Observatory |
| Friday, April 9 th | The Vikings at Barsoom part 2 – the search for life | Paul Money |
| Friday, April 30 th | Public open night (subject to public mobility) | Observatory |
| Friday, May 14 th | Our Moon – a closer look + AGM | Jerry Workman (in person) |
| Friday, June 11 th | Comets past and future | Nick James, BAA |
| * Haw Wood Farm Caravan Park, Hinton, Saxmundham, IP17 3QT. www.hawwoodfarm.co.uk to book: info@hawwoodfarm.co.uk 01502 359550. £12 per pitch per night subject to updates | | |

| | | |
|--|---|--|
| <p>DASH has kindly invited us to the following great talks in early 2021 To ask to join please email Jim in advance on dashastro.info@gmail.com</p> | | |
| Sunday, January 24 th | Quasars and Their Influence on Galaxy Evolution. | Amy Rankine, IoA Cambridge |
| Thursday, January 28 th | Surveying the Sky for Radio Galaxies | Prof Martin Hardcastle Uni of Herts. |
| Sunday, March 28 th | The Čerenkov Telescope Array | Prof Michael Burton, Director Armagh Obs |
| Friday 23 rd April | Effects of Impacts on Planet Atmospheres | Catriona Sinclair. |

Answers to Quiz:

1 Music

1. Get yer mits off – U can't touch this MC Hammer
2. Bathbashing – Tubthumping Chumbawumba
3. Eg Rectangle of 21st letter – Shape of U (Ed Sheeran)
4. Steps to Nirvana – Stairway to Heaven (The Zep)
5. Arsonist – Firestarter (Prodigy)
6. Objects will just improve – Things Can Only Get Better D*Ream
7. Underground Missing Colours – Subterranean Homesick Blues (Dylan)
8. A Place above the spectrum – somewhere over the rainbow Harold Arlen Yip Harburg

2 Biology and Nature

1. Imago is an insect adult winged stage – butterfly, dragonfly, mayfly etc...
2. Bacterium is about B. 1 micrometre (C is the size of a virus, D is the size of an atom)
3. Post prandial somnolence – is feeling sleepy after eating a large meal
4. Honey Bees have 5 eyes. 3 little ones on the top of the head.
5. Adults hear up to about 16kHz. Pipistrelle is around 3 times that, 45 or so kHz. (nearly 48)
6. The organisms are called extremophiles.
7. Marsupials are Mammals. Yes.
8. The cell, near the end of the dictionary is a Zygote. It's how we all started.

3. NUMBERS

1. Fibonacci sequence $1+1=2$ $1+2=3$ $2+3=5$ $3+5=8$...
2. Ellingham Expansion Estates number of 9s is 20. (counting that sounds like angry German)
3. False – it was around before (eg. Sumerians = manipulated numbers and abstracted, etc.)
4. 1000 do-dos per day, 10 don't get cleared up $\times 365 = 3,650$ per year.
5. 8 things. Give you up, let you down, turn around, desert you, make you cry, say goodbye, tell a lie, hurt you (repeated – same things)
6. $3 \text{ min} \times 33\frac{1}{3} = 100$ complete turns.
7. Katherine Johnson (died feb 20 this year aged 101) (nee Coleman), not the IBM mainframe!
8. The Maths!

4 LITERATURE

1. Aristotle (350BC)
2. Wife/hat book by Oliver Sacks.
3. Variety is the spice of life – William Cowper
4. "the of and to a in is I that it for you was with on as have but be they" are the most common 20 words used in English speech.
5. Sally Rooney novel was "Normal People" 2020 young romance BBC 2018 book (Irish)

6. Robert Galbraith is J K (Joanne) Rowling (OBE)
7. It's cie, contrary to the saying. Frequencies, species, fancier, etc (less common words)
8. Limitless was by Astronaut Tim Peake OBE

5. SPORT

1. L & R of 1 on dartboard are 20 and 18.
2. Steve Redgrave got 5 olympic gold medals in his career
3. Seagulls follow the trawler speech by Eric Cantona
4. Last F1 winner not to be UK or German was Kimi Raikonen in 2007. Lewis, Jenson, Vettel, Lewis, Rosberg and Lewis.
5. Dark Destroyer is Nigel Benn CHECK
6. It was E Chess ADD STATS
7. Hand of God was 1986
8. Catching a Crab is in rowing

6. ASTRONOMY

1. Fly me to the Moon – A Bart Howard
2. ASTRONOMERS
3. They are Dwarf Planets
4. Air just air causes stars to twinkle
5. Xylophone – also piano and maybe you could say playing with his telescope!?
6. NEOWISE
7. Hawking
8. Betelgeuse is 490-870 ly away

7. Geography

1. Windsor Castle (actual castle area wise)
2. Welsh coast path is so crinkly (not a fractal though!!! As it is on land) D = 870 miles!
3. Aberdeen is more West as the UK tilts west as you go North
4. Anglesey is Ynys Mon