JANUS
THE NEWSLETTER OF EWELL ASTRONOMICAL SOCIETY

January 2024 EDITION
Editor: ewellastro.editor@gmail.com
Email: ewellastro@gmail.com
Website: https://www.ewellastronomy.org

Editorial

Happy New Year to all our readers, and welcome to the first edition of Janus for 2024. Let's hope for a goodly number of clear nights during the coming year – Almost anything would be an improvement on the last few weeks!

The first lecture of the new year will be given by EAS member Martin Howe who will talk about defending the earth from asteroids.

For the benefit of those who were unable to attend the AGM on 8 December but would, nonetheless, like the opportunity to enjoy the challenge of the quiz which, incidentally was won by David Fishwick - I have attached a copy of the quiz to this edition of Janus. I'm not sure how many of the answers Google can help with, but you're welcome to try it for those questions you don't know the answer to. Otherwise, you'll have to wait until next month for the answers!

Do you know how to tell the difference between a star and a planet? I'm sure you do, but if you want further guidance you might like to look at this: *https://starwalk.space/en/infographics/star-vs-planet.*

The same source gives information on the full moons throughout 2024: h*ttps://starwalk.space/en/infographics/full-moons-2024* - also (their selection) of the 12 best astronomy events world-wide, only some of which should be (weather permitting) observable from UK: *https://starwalk.space/en/infographics/best-astronomy-events-2024.*

Finally, my usual "observation" that any contributions will always be gratefully received. John

The Solar System January

MERCURY: begins the month emerging into the morning sky as it approaches greatest elongation W. It will be difficult to see as it reaches its highest point in the sky during daytime and gets no higher than 5° above the horizon at dawn. Visibility may improve slightly as the month progresses, although by the end of the month it will soon pass behind the Sun and will remain difficult to see, reaching its highest point in the sky during daytime and being no higher than 0° above the horizon at dawn.

VENUS: is visible as a morning object, having recently passed greatest elongation W. It begins the month visible in the dawn sky, rising at 04:57 - 3 hours and 6 minutes before the Sun - and reaching an altitude of 16° above the SE horizon before fading from view as dawn breaks at around 07:38. By the end of the month, still just about visible as a morning object, it is now well past greatest elongation W and returning closer to the Sun. Observation will be challenging as it will reach its highest point in the sky during daytime and be no higher than 7° above the horizon at dawn.

MARS: recently passed behind the Sun at solar conjunction. Throughout the month, it is not readily observable. At the beginning of the month, it is very close to the Sun, at a separation of only 12° from it. By the end of the month, it will reach its highest point in the sky during daytime and be 1° below the horizon at dawn.

JUPITER: is currently an early evening object. It begins the month visible in the evening sky, becoming accessible around 16:26, 36° above the SE horizon, as dusk fades to darkness. Reaching its highest point in the sky at 19:30, 50° above the S horizon, it will continue to be observable until around 01:39, when it sinks below 7° above the W horizon. By the end of the month, now receding into evening twilight, it is visible in

the evening sky, becoming accessible around 17:09, 51° above the S horizon, as dusk fades to darkness. It will then reach its highest point in the sky at 17:38, 51° above the S horizon, and will continue to be observable until around 23:51, when it sinks below 7° above the W horizon.

SATURN: is currently an early evening object, now soon to pass behind the Sun at solar conjunction. At the beginning of the month, it will become visible at around 16:52, 24° above the S horizon, as dusk fades to darkness. It will then sink towards the horizon, setting at 20:41. By the end of the month, it is slightly difficult to see, reaching its highest point in the sky during daytime and being no higher than 11° above the horizon at dusk.

URANUS: is currently an early evening object. It begins the month visible in the evening sky, becoming accessible around 17:31, 41° above the SE horizon, as dusk fades to darkness. Reaching its highest point in the sky at 20:23, 55° above the S horizon, it will continue to be observable until around 01:31, when it sinks below 21° above the W horizon. By the end of the month, still visible in the evening sky, it becomes accessible around 18:10, 55° above the S horizon, as dusk fades to darkness. It will then reach its highest point in the sky at 18:24, 55° above the S horizon and will continue to be observable until around 23:31, when it sinks below 21° above the W horizon.

NEPTUNE: begins the month as an early evening object, now receding into evening twilight, and will become visible at around 17:31, 35° above the S horizon, as dusk fades to darkness. It will then sink towards the horizon, setting at 22:47. By the end of the month, it will soon pass behind the Sun at solar conjunction, and will become visible at around 18:10, 22° above the SW horizon, as dusk fades to darkness. It will then sink towards the horizon, setting at 20:53.

MOON PHASES:

Full Moon	27 December
Last Quarter	4 January
New Moon	11 January
First Quarter	18 January
Full Moon	25 January

Notable Events:

Observation of some of these events may require a telescope, although some will be visible with the naked eye. More information with times at *https://in-the-sky.org*

January

2 The cluster Messier 41 is well placed
3 The Earth at perihelion
4 Quadrantid meteor shower 2024
6 Mercury at highest altitude in morning sky
7 Mercury at dichotomy
8 Lunar occultation of Antares
Conjunction of Moon and Venus
9 Conjunction of Moon and Mercury
10 Conjunction of Moon and Mars
12 Mercury at greatest elongation west
14 Close approach of Moon and Saturn
15 Lunar occultation of Neptune
Cluster Messier 47 is well placed
NGC 2403 is well placed
17 Conjunction of Venus and Ceres
Cluster NGC 2451 is well placed
18 Close approach of the Moon and Jupiter
19 γ-Ursae Minorid meteor shower 2024
20 Asteroid 354 Eleonora at opposition
Close approach of the Moon and M45
134340 Pluto at solar conjunction
Cluster NGC 2516 is well placed
22 Lunar occultation of Beta Tauri
24 The cluster NGC 2547 is well placed
27 Uranus ends retrograde motion
Conjunction of Mercury and Mars
31 Beehive cluster is well placed
Omicron Velorum cluster is well placed

February

1 Cluster IC 2395 is well placed
5 Lunar occultation of Antares
Conjunction of Mercury and Pluto
7 Conjunction of the Moon and Venus
8 Conjunction of Moon and Mars
α-Centaurid meteor shower 2024
Conjunction of Moon and Mercury
NGC 2808 is well placed
11 Conjunction of the Moon and Saturn
12 Lunar occultation of Neptune
14 Comet C/2021 S3 (PANSTARRS) passes perihelion

15 Conjunction of Mars and Pluto
Conjunction of the Moon and Jupiter

16 Close approach of the Moon and M45

18 Conjunction of Venus and Pluto
Lunar occultation of Beta Tauri

19 Messier 81 is well placed

21 The cluster NGC 3114 is well placed

22 Conjunction of Venus and Mars

27 The cluster IC 2581 is well placed

28 Mercury at superior solar conjunction
Saturn at solar conjunction

Collected Observations (and thoughts) – Gary Walker

Halley's Comet – Posted 11 Dec

It is a long time now since Halley's Comet last passed Earth in 1985-1986 - about 38 years ago!

It was recently announced that, on 9 December, the comet reached its furthest point in its orbit from the Sun – something which Ron Canham mentioned in his Sky at Night presentation on 8 December. All this time, it has been moving further and further away from us, but now it is starting its return journey towards Earth!

At apogee, it is about 35 au from the Sun, which is roughly the same distance that Pluto is! Of course, when in its outer reaches of its orbit, its velocity slows down, and only speeds up when it reaches the inner Solar System (one "au" means "astronomical distance" between the Earth and the Sun, i.e. 93 million miles). Thus, it is now 35 X 93 million (about 3.25 billion) miles distant.

It won't, however, get here anytime soon, as it next passes us in 2061 - another 38 years away! If I happen to be still alive then, I would be about 100 years old!

In the UK, the comet was best seen between November 1985 and January 1986, and again from late April to mid-May 1986. Typically, its best views were reserved for the Southern Hemisphere, although, in any case, this was not a good apparition, as it never passed particularly close to the Earth and, when at its brightest, the comet and the Earth were on opposite sides of the Sun. In fact, this proved to be the worst apparition in 2000 years!

Although I observed it on a number of occasions, I needed my 10 X 50 binoculars to see it, as it was never visible to the naked eye in our skies. In binoculars, and my 60mm refractor telescope, it appeared as a brightish, fuzzy ball with a brighter centre, surrounded by an outer fuzzy area. The tail was not seen by me until January 1986 and, even then, it was faint. I estimated the magnitude of it to be a little fainter than M31.

In short, it resembled many comets that I have seen over the years since then. Whilst it was exciting to see it, it was rather disappointing when you consider how spectacular it was during earlier passes!

I first saw it, when it was close to the Pleiades (M45), on about 17 November 1985. It was still being observed by big telescopes when, as late as 1991, it suffered an outburst. This was some 5 years after it had left us, by which time it was at 14.4 au distance from us!

It was last observed in 2003, by the Very Large Telescope - 17 years after it passed us! I don't know if they will try and do the same now, as it is at its turning point but, in any case, it will only at best, as a faint blob. Its present brightness is only magnitude 28! Be that as it may, it is significant that present day telescopes can follow it around much easier than was the case last time; it was only first picked up by the Mount Palomar 200" telescope on 16 October 1982, only 3 years before it reached the inner Solar System!

The last time that it reached apogee was in 1948, following the 1910 encounter, and it took another 37 years to come back to the Earth. Hence, we are now in the same position, as we were in 75 years ago in 1948!

During the build-up to Halley's Comet, there were a number of books in the shops detailing how to observe it; they came out in October 1985, and I, of course, bought all of them! The same thing happened in the build-up to the Total Eclipse of the Sun in 1999. Sutton Library produced some literature on it, and I attended a lecture there given by Nigel Hemburst, and found myself sitting next to Heather Couper!

When I was a child, and first became interested in Astronomy c.1970, events like the next Halley's Comet visit, or the Total Solar Eclipse of 1999 were so incredibly far in the future that it seemed that they would never come. Now, ironically, both events are way back in the past, and Halley's Comet has reached the halfway point of its orbit around the Sun! Although the comet is usually seen as coming round "once in a lifetime", those who first see it as a child may be lucky enough to see it twice, and some in our Society may be still alive, when it gets here again!

New Space Port now licensed in Scotland – Posted 17 Dec

It was announced on the News today that a Space Port has now been licensed by the Civil Aviation Authority on the Shetland island of Unst. This will be the first such space port in Western Europe where vertical space launches will take place. It will be known as SaxaVord Space Port.

The first launch is expected to be as early as next year, and aim is to conduct about 30 launches per year.

Up to now, the only space port in the UK was the one at Newquay, in Cornwall, where a space rocket was launched from a 747 Jumbo jet last January, but failed to reach orbit.

Incidentally, the island of Unst, witnessed a Total Solar Eclipse on 30 June 1954, which is now over 69 years ago! The next one visible there is not until 2133, about 110 years from now! However, over the 3000 year period from AD1 to AD3000, due to the randomness of the various Solar eclipse cycles, Scotland and the Shetland Islands get more than their fair share of total eclipses, as does Cornwall!

50 Years ago in Astronomy – Posted 22 dec

It is now 50 years since Pioneer 10 passed close to Jupiter on 3 December 1973, the first ever probe to do so, following a journey of nearly 2 years from Earth!

In comparison to later probes, the images it obtained were crude, but they were certainly exciting, as they were the first ones ever taken of an outermost planet, as previous missions had only reached the Moon, Venus, and Mars.

Since then, of course, all the planets of the solar system have now been reached by space probes, including Pluto. Several probes have reached and even orbited Jupiter and Saturn!

The solar system in 1973, was much simpler than it is now, and Pioneer 10 paved the way for this. Jupiter was known to have 12 moons and Saturn, 10. Now, the "body count" of moons around both planets has vastly expanded, with Saturn now known to have at least 145 moons (so far)!

Also, at this same time, the much over-hyped Comet Kohoutek was about to pass the Earth. Some predictions claimed that it would shine as bright as the full moon; sadly, it, like many comets, failed to live up to expectations!

I remember trying to find it in January 1974, but I never saw it! At one of our current affairs lessons in our last year of the Junior school, we had one about this, and were given a diagram showing its close path around the Sun!

It was thought that it would be very bright, as it was showing a lot of activity even way out in the solar system, when it was discovered in March 1973, but by the time it came close in, it had effectively run out of steam! Comets' behaviour and magnitudes were, and still are, almost impossible to predict in advance. Some, like Comet Kohoutek, fizzle out along the way, whereas others can be much more spectacular than expected!

The amateur astronomer, David Levy, has correctly stated that "Comets are like cats: they do exactly as they please, and they both have tails".

I had to wait another 10 years to see any comets, such as Comet IRIS-Araki-Alcock of May 1983 and, of course, the previously mentioned Halley's Comet of 1985-1986. To see any bright and spectacular comets, I had to wait another 10 years, for Comet Hyakutake of 1996, to be closely followed by Comet Hale-Bopp in 1997!

The longstanding mystery of Mars's moons – and the mission that could solve it

Acknowledgement: This article was written by Ben Rider-Stokes, Post Doctoral Researcher in Achondrite Meteorites, The Open University and was published in THE CONVERSATION on 7th December 2023. It is republished in full under a Creative Commons Licence. The original article, with additional links and images can be found here *https://theconversation.com/the-longstanding-mystery-of-mars-moons-and-the-mission-that-could-solve-it-219161*

The two small moons of Mars, Phobos (about 22km in diameter) and Deimos (about 13km in diameter), have been puzzling scientists for decades, with their origin remaining a matter of debate. Some have proposed that they may be made up of residual debris produced from a planet or large asteroid smashing into the surface of Mars (#TeamImpact).

An opposing hypothesis (#TeamCapture), however, suggests the moons are asteroids that were captured by Mars's gravitational pull and were trapped in orbit.

To solve the mystery, we'll need material from the moons' surfaces for analytical analyses on Earth. Luckily, the Japan Aerospace Exploration Agency (Jaxa) will launch a mission, named "Martian Moon eXploration" (MMX), to Phobos and Deimos in September 2024. The mission will be carried by a newly designed rocket, the H-3, which is still under development.

The spacecraft is expected to reach Martian orbit in 2025, after which it will orbit Phobos and finally collect material from its surface before returning to Earth by 2029.

This will make it the next in a series of recent missions bringing material from space back to Earth, following on from Jaxa's successful mission to asteroid Ryugu(Hayabusa2), as well as Nasa's Osiris-Rex mission to asteroid Bennu and the Chinese Space Agency's Chang'e 5 mission to the Moon.

Giveaways

If an impact origin did indeed occur, we would expect to find similar material on Phobos to that which is found on Mars. While we do not have any material returned directly from Mars (yet), we are lucky enough to have rock that has been ejected off its surface which eventually found its way to Earth.

These meteorites may therefore be similar to the material returned from Phobos, providing a fantastic comparison.

In the case of a captured asteroid origin, however, we are more likely to find material on Phobos that is found on other asteroids in our Solar System. The prevailing hypothesis in the #TeamCapture group is that the moons are made up of the same rock as meteorites, called carbonaceous chondrite. Thankfully, we have plenty of such meteorites and samples that we could compare with the Phobos material.

Comparing meteorites and material brought back from Phobos will be a fantastic tool for helping us understand the origin of the two moons. Once we have material in the laboratory, rigorous analytical techniques can be applied to the samples.

One such technique is oxygen isotope analysis. Isotopes are versions of elements whose nuclei have more, or fewer, particles called neutrons. Oxygen, for example, has three stable isotopes, with atomic masses of 16, 17 and 18.

The sum of the isotopic ratios of oxygen-17/oxygen-16 and oxygen-18/oxygen-16 is denoted as $\Delta^{17}O$, and is characteristic of specific parent objects. Depending on where in the Solar System a rocky body is formed, a distinct oxygen composition is acquired and retained in the rocks. For example, rocks from Earth have $\Delta^{17}O$ of around 0, while meteorites from Mars have $\Delta^{17}O$ of around ~0.3. Therefore, rocks from Earth and Martian meteorites can be readily separated from one another.

If Phobos formed in the same or at least similar location in the Solar System to Mars, we would expect the composition of the material brought back by MMX also to have $\Delta^{17}O$ of around 0.3. As mentioned previously, #TeamCapture suggest a carbonaceous chondrite-like origin for Phobos. All known carbonaceous chondrites studied by scientists have revealed negative isotopic $\Delta^{17}O$, ranging from -0.5 all the way down to -4. Oxygen can therefore be an extremely powerful tool in deciphering the origin of the moons of Mars, and should be a high priority for the mission once material is returned to Earth.

If Phobos does indeed represent an ancient fragment of Mars, it could comprise the most primitive of Martian material. Mars has experienced a wide range of processes that have altered the rocks on its surface, including wind erosion and water alteration. Based on features such as dry river-beds observed from orbiters such as Viking, it is clear that water on Mars once existed.

This water likely originated from a mix of asteroids and comets, and volcanic activity. Mars also retained a thick atmosphere, which allowed water to be present as a liquid on the planet's surface.

Phobos, on the other hand, has remained an airless body where processes such as contamination from water have not occurred (though minor impact events may have taken place). This means that samples returned from Phobos could provide extremely important insights into the original water content of Mars, and a window to processes that occurred in the early Solar System.

MMX is one of the most exciting planned missions in space exploration. With less than a year to go, our fingers are already firmly crossed for a successful launch, sample acquisition, and sample return. Many scientists, including myself, would absolutely love the possibility of one day studying those samples.

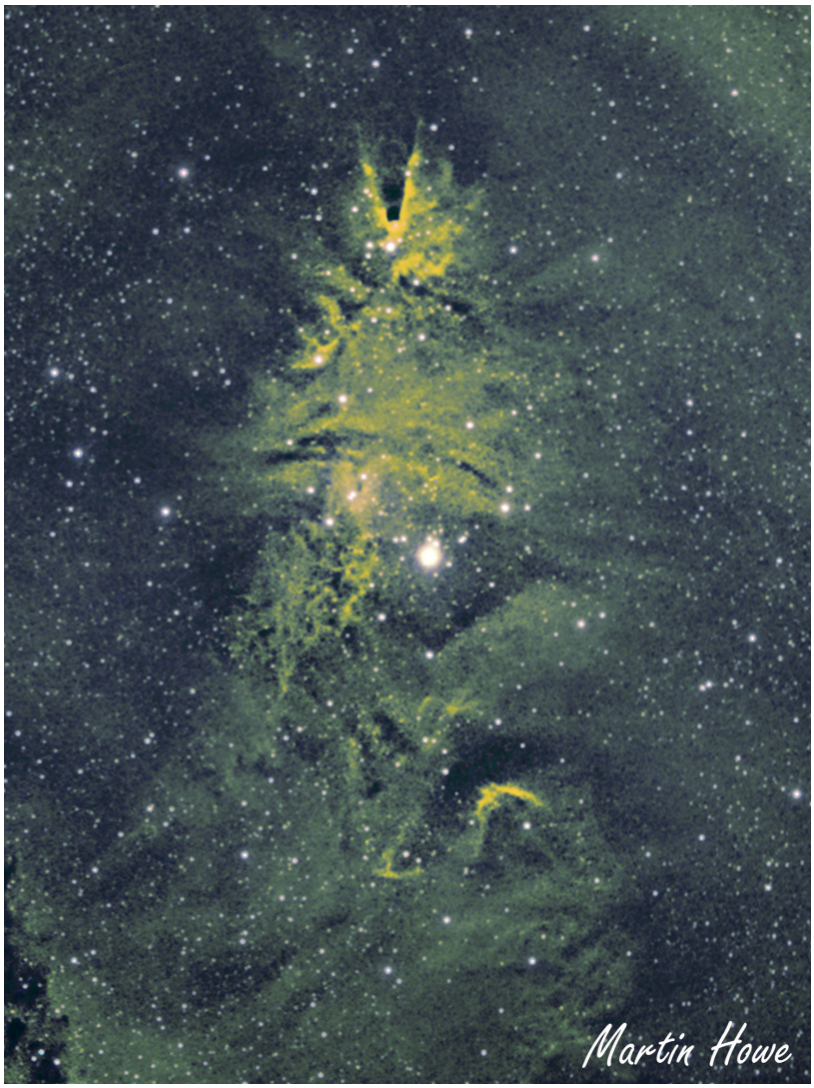
Object(s) of the month - The Christmas Tree Cluster (and Cone Nebula) - Martin Howe

This month's object is a seasonal choice – the Christmas Tree Cluster (NGC 2264). This is so named because of the triangular shape of this group of stars, although in my opinion, even more suited because of the shape of the associated nebulosity in the region which looks somewhat like a Christmas tree. There are actually a number of separately named objects in this region. There is the Cone nebula, which is a dark pillar of gas and dust (i.e. a dark nebula) silhouetted against the bright emission nebula, and sits at the top of the "Christmas tree" (see the image below). In the middle is the Christmas Tree Cluster itself. Within this cluster there is a subgroup of stars which is also known as the Snowflake Cluster, as the geometric shape of the group is said to resemble a snowflake. Finally, a small part of the wider nebula incorporates a patch of nebulosity that goes by the name of the Fox Fur nebula.

Although distance estimates vary, these objects lie about 2,500 light years away in the constellation of Monoceros – a medium-sized constellation (representing the unicorn) to the east of Orion. This constellation has no stars brighter than magnitude 3, but is easy to locate by virtue of it being in the middle of the triangle of bright stars Betelgeuse, Procyon and Sirius. The cluster is over 25 degrees in altitude in the ESE by 8pm and continues to rise until it culminates at about 50 degrees around midnight in early January.

The cluster contains about 600 stars, but all are quite faint – the brightest being S Monocerotis, which is actually a variable star ranging in magnitudes between 4.3 and 4.7. However, collectively, the cluster has a listed magnitude of 3.9, so in theory visible to the naked eye, but with a listed size per Stellarium of just 10 arcminutes, this would be very hard to see visually in anything less than a small telescope. This object (and especially the nebulosity) is better suited as an astrophotography target. The cluster lies just above the half-way point of a line drawn between Betelgeuse and Procyon, in the very northern reaches of the constellation, near the boundary with Gemini.

The image below was taken with a 200mm f/2.8 Canon lens attached to an ATIK314L CCD camera, using a combination of Ha, OIII and SII filters. Some artistic licence was used to create a seasonal interpretation of this object, colouring the hydrogen alpha channel in green to mimic the foliage of a Christmas tree. The stars also double as snowflakes to give an even more seasonal touch!



Important Note:

To allow sufficient time to compile Janus and place it on the EAS Website by the 1st of the month any submissions for publication are required at least 3 days before the end of the month. Any items received after this date will be held over until the following month.

Up Next:

NEXT MEETING: 8pm Friday 12 January – Nonsuch High School

Our own EAS member Martin Howe will talk about Defending the Earth from Asteroids.

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

NEXT USER GROUP:

Suspended until further notice.

NEXT DENBIES OBSERVING SESSION:

The next session, allowing for moon rise & set times and cloud conditions, should be sometime around the new moon which is on 21 January.

The precise date and timings of any session will be advised by email and WhatsApp a few days in advance but should be within the period 13-26 January.

AD HOC OBSERVING AT WARREN FARM:

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

EWELL ASTRONOMICAL SOCIETY – QUIZ – CHRISTMAS 2023

1. What is the largest optical telescope in the world, including those currently under construction?

a) The TMT, Mauna Kea, Hawaii
b) The GMT, Atacama Desert, Chile
c) The ELT Atacama Desert, Chile

2. Which optical system is the fastest?

a) f10 b) f20 c) f30

3. Which layer of the Sun is observed in white light?

a) Chromosphere b) Corona c) Photosphere

4. Which of these solar system bodies is the largest?

a) The Moon b) Io c) Pluto

5. Who was the first Astronomer Royal?

a) Christopher Wren b) John Flamsteed c) Edmond Halley

6. In which year did the Lovell telescope become operational?

a) 1955 b) 1957 c) 1961

7. Which of these stars is the hottest?

a) Type 0 b) Type F c) Type K

8. In which year was the Society (EAS) formed?

a) 1964 b) 1966 c) 1968

9. The distance to the edge of the hypothesised Oort cloud surrounding our solar system is thought to be as much as 100,000 AU (AU = orbital distance of the Earth from the Sun). If this distance was shrunk such that it was the same as from central London to Gatwick airport, approximately how far away would the nearest star, Proxima Centauri, be on this scale?

a) Dover b) Rome c) Cape Town

10. Each of the following had a significant contribution to 20th century astronomical research, but can you put them in chronological order of their birth?

a) Edwin Hubble; Fred Hoyle; Albert Einstein
b) Albert Einstein; Edwin Hubble; Fred Hoyle
c) Edwin Hubble; Albert Einstein; Fred Hoyle

11. How many official constellations are there, north and south combined?

a) 66 b) 77 c) 88

12. What is the temperature of the surface of the Sun in Kelvin?

a) 5778 b) 5887 c) 5998

13. How many moons does Mars have?

a) 2 b) 4 c) 6

14. As of 9 November 2023, how many confirmed Exoplanets have been discovered?

a) 4850 b) 5023 c) 5539

15. Which Lagrange point provides an uninterrupted view of the Sun?

a) L1 b) L3 c) L4

16. Which planet has the most moons?

a) Saturn b) Jupiter c) Uranus

17. What is the name of the fifth asteroid to be discovered?

a) Flora b) Hebe c) Astraea

18. What is the penultimate letter of the Greek alphabet?

a) Phi b) Psi c) Chi

19. What is the constellation Aquila represent?

a) Eel b) Eagle c) Water waves

20. How far away is Voyager 1?

a) 5 billion km b) 100 billion km c) 23.381 billion km

21. Which of these planets has the fewest moons?

a) Uranus b) Jupiter c) Neptune

22. Charles Messier came up with his famous catalogue. Why?

a) He just loved numbering things.
b) He wanted to observe 150 things before he died.
c) It was a list of damn nuisances that looked like comets.

23. If the moon was 100 meters away how far away is Neptune?

a) 12,200,000 km b) 40,000,000 km c) 5,000,000 km

24. How long does a day last on Saturn?

a) 9hr 56m b) 10hr 34m c) 16hr 6m

25. What is Space Adaptation Syndrome?

a) 2-3 Days of Horrible Sickness
b) Filters, Fans and Engines Constantly Whirr
c) Astronauts that fail to use the Restroom Correctly

26. During which years did the Apollo Missions take Place?

a) 1963-1972 b) 1960-1969 c) 1960-1973

27. What is the name of Pluto's closest moon?

a) Nix b) Kerberos c) Charon

28. How much of the Milky Way is visible?

a) 20% b) 0.000003% c) 0.02%

29. How long is the Venusian day?

a) 5,823 hrs b) 1,408 hrs c) 24hrs 37 mins.

30. What is the total number of Astronauts to have set foot on the Moon?

a) 12 b) 16 c) 8