JANUS

THE NEWSLETTER OF EWELL ASTRONOMICAL SOCIETY

November 2023 EDITION

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

Editorial

Welcome to the November edition of Janus. This month's lecture will be given by Brad Gibson from Hull University and is (fascinatedly) entitled "How Astronomers Control Your Life…."! What does the title mean to you? My own view is that astronomy certainly controls some elements of astronomers' own lives (e.g. staying up all night out in the cold whilst others are sleeping!), but I would question whether astronomers control anyone else's lives. I await the lecture with interest.

There will be no December lecture; instead we will have our AGM. Please attend if you can and see if you can win the quiz!

As I reported last month, India's Chandrayaan-3 mission was a success. However, the beginning of the second lunar night on 30 September, eliminated all hopes of reviving the spacecraft and extending the mission. Sad, but predictable, and not unexpected.

October saw the launch of yet another Asteroid related mission – Psyche. Gary Walker watched the launch on his mobile phone, and I have included an item from THE CONVERSATION which gives more details of the mission and the asteroid "16 Psyche" itself. I have also included a piece from the same publication about an odd, cigar-shaped object known as "1I/'Oumuamua". In it, the author, Prof Monica Grady, debates whether, based on current classification criteria, the object is a Comet or an Asteroid.

Finally, a request! I have been editing Janus for nearly 5 years now and would like to try and vary the content/format as I feel it's become a bit stale. To do this, I need feedback – good or bad. Please send your thoughts to me so that I can consider how to revamp Janus in the New Year.

John

The Solar System November

MERCURY: recently passed behind the Sun at superior solar conjunction. It begins the month not readily observable since it is very close to the Sun, at a separation of only 7° from it. By the end of the month, it remains difficult to see, reaching its highest point in the sky during daytime and being no higher than 1° above the horizon at dusk.

VENUS: is visible as a morning object, having recently passed greatest elongation west. It begins the month rising at 02:27 and reaching an altitude of 34° above the SE horizon before fading from view as dawn breaks at around 06:28. Visible throughout the month, it ends the month rising at 03:30 and reaching an altitude of 27° above the SE horizon before fading from view as dawn breaks at around 07:14.

MARS: begins the month soon passing behind the Sun at solar conjunction, and not readily observable since it is very close to the Sun, at a separation of only 5° from it. By the end of the month, despite having passed behind the Sun, it remains extremely difficult to see being still very close to the Sun, at a separation of only 3° from it.

JUPITER: begins the month approaching opposition and is visible for over 12 hours. It will become accessible at around 17:33, when it rises to an altitude of 7° above the E horizon. Reaching its highest point in the sky at 23:50, 52° above the S horizon, it will become inaccessible at around 06:07 when it sinks below 7° above the W horizon. By the end of the month, having passed opposition, it is visible in the evening sky, becoming accessible around 16:20, 15° above the E horizon, as dusk fades to darkness. It will then reach its highest point in the sky at 21:42, 51° above the S horizon, and will continue to be observable until around 03:54, when it sinks below 7° above the W horizon.

SATURN: is currently an early evening object, and begins the month visible in the evening sky, becoming accessible around

17:16, 19° above the SE horizon, as dusk fades to darkness. Reaching its highest point in the sky at 19:29, 25° above the S horizon, it will continue to be observable until around 23:00, when it sinks below 10° above the SW horizon. By the end of the month, now receding into evening twilight, it is visible in the evening sky from around 16:44, 24° above the S horizon, as dusk fades to darkness. Reaching its highest point in the sky at 17:37, 25° above the S horizon, it will continue to be observable until around 21:08, when it sinks below 11° above the SW horizon.

URANUS: begins the month approaching opposition and is visible in the morning sky from around 19:24, when it reaches an altitude of 21° above the E horizon. It will then reach its highest point in the sky at 00:36, 56° above the S horizon, and will be lost to dawn twilight around 05:29, 24° above the W horizon. By the end of the month, now past opposition, it will become accessible at around 17:23, when it rises to an altitude of 21° above the E horizon. Reaching its highest point in the sky at 22:33, 56° above the S horizon, it will become inaccessible at around 03:43 when it sinks below 21° above the W horizon.

NEPTUNE: begins the month as an early evening object, visible in the evening sky, and becoming accessible around 17:55, 22° above the SE horizon, as dusk fades to darkness. It will then reach its highest point in the sky at 21:00, 35° above the S horizon, and will continue to be observable until around 00:12, when it sinks below 21° above the SW horizon. By the end of the month, still an early evening object, but now receding into evening twilight, it becomes accessible around 17:24, 31° above the SE horizon, as dusk fades to darkness. Reaching its highest point in the sky at 19:05, 35° above the S horizon, it will continue to be observable until around 22:16, when it sinks below 21° above the SW horizon.

MOON PHASES:

Full Moon	28 October
Last Quarter	5 November
New Moon	13 November
First Quarter	20 November
Full Moon	27 November

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*

November

1	Lunar occultation of Beta Tauri Jupiter at perigee
3	Jupiter at opposition
4	Saturn ends retrograde motion
5	Asteroid 18 Melpomene at opposition
9	Close approach of the Moon and Venus Lunar occultation of Venus
10	Comet C/2023 H2 (Lemmon) passes perigee Comet C/2023 H2 (Lemmon) reaches peak brightness
12	Northern Taurid meteor shower 2023
13	Uranus at opposition
14	Conjunction of Moon and Mercury
18	Mars at solar conjunction Leonid meteor shower 2023 Pleiades cluster is well placed
20	Close approach of the Moon and Saturn
21	1 Ceres at solar conjunction
22	α-Monocerotid meteor shower 2023
25	Close approach of Moon and Jupiter
27	Close approach of Moon and M45
28	Lunar occultation of Beta Tauri November Orionid meteor shower 2023 Hyades cluster is well placed

December

2	Pheonicid meteor shower 2023
4	Mercury at greatest elongation east
6	Neptune ends retrograde motion December φ-Cassiopeid meteor shower 2023
7	Puppid-Velid meteor shower 2023
8	Mercury at dichotomy

9	Close approach of the Moon and Venus Monocerotid meteor shower 2023
10	Mercury at highest altitude in evening sky
12	σ-Hydrid meteor shower 2023 Large Magellanic Cloud is well placed
14	Conjunction of the Moon and Mercury Geminid meteor shower 2023
15	Running Man cluster well placed Orion Nebula well placed
16	Comae Berenicid meteor shower 2023
17	Close approach of the Moon and Saturn
19	Lunar occultation of Neptune
20	December Leonis Minorid meteor shower 2023
21	Asteroid 4 Vesta at opposition
22	December solstice Close approach of the Moon and Jupiter Mercury at inferior solar conjunction Asteroid 9 Metis at opposition

Collected Observations (and thoughts) – Gary Walker

Latest Observations – Posted 10 Oct

One cannot fail to have noticed Jupiter in the night sky, as it now rises in the late evenings and gets very high up in the sky later on! It is a blazing beacon of light, far brighter than any other celestial body, apart from the Moon, whilst Venus is hours behind it!

On the evening of 5-6 October, I saw the shadow of Ganymede transiting near the South Pole of Jupiter. Unfortunately, as it was very low down on Jupiter, it was less easy to see than a similar transit much higher up on the planet, preferably moving across the central part of Jupiter!

On the morning of 10 October, at about 10:30am, Venus was only about 7.4 degrees South of an 18% waning crescent Moon. Luckily, the Moon was visible to the naked eye. In binoculars, Venus was clearly visible.

In my telescope, Venus was now, clearly, a very fat crescent, just short of half-phase, so it is gradually becoming less interesting, as it leaves it's beautiful crescent phase behind. It is now at approximately, 40% phase.

Saturn is well ahead of Jupiter, and visible in the South in the end evenings.

More news on Osiris Rex probe – Posted 12 Oct

On 11 October, there was more on the BBC News about the Osiris Rex probe, showing scientists in the process of opening the probe to study the sample from Asteroid Bennu.

Some of the report showed a scientist at the Natural History Museum in London, which will receive part of the sample, as will other institutions around the world.

The sample visible looked like charcoal, which is not far from the truth! The probe seems to have done a good job, picking up more from the asteroid than was expected!

This report was in the usual designated place for science articles - at the end of the main news, unlike on 24 September, when the landing amazingly made Top Item on the BBC News!

Psyche Launch – Posted 13 Oct

I watched the launch of the Psyche probe on my phone today - it launched at about 3.21pm, UK time.

I saw the view of the Earth receding away, and the return of the two booster rockets, which landed perfectly, a few seconds apart, more or less next to each other!

This probe is going to an asteroid called Psyche which is thought to contain a lot of metals, rather than the usual rocky type. It probably shows what the Earth's Core is like.

This was shown on the 6pm BBC News (albeit as the final item), but it was still quite a decent report.

Editor's Note: See later piece about this mission

EASTENDERS meeting on October 13 – Posted 13 Oct

We had an unusual Society meeting tonight; the expected Speaker was unable to turn up for this meeting, so Anita announced that we would have a “Members Evening"!

First up, Ron Johnson showed a cinema film of the construction of the Ewell Observatory at Nescot in the early 1970's. Then, two members, Pete Scott and Martin Howe, demonstrated how to set up, respectively, an altazimuth mount, and an equatorial mount, and they had their mounts and telescopes with them!

After that, Anita announced that we would have a quiz with a difference! She set us up in two teams, depending on which side of the aisle we were sitting. We moved our chairs around to form two circles. My side was the A team, and there were only 8 of us in it. The B team had about 16 in it, as more people were sitting their side of the aisle!

Anita asked us about 10 astronomical questions, and she had a 30 second stop clock running during which time each team would have to answer the question.

Sadly, my team, the A team, lost with only 4.5 points, whilst the B team got 8 points. After that, Anita handed out prizes of doughnuts and biscuits to the two teams, which was very nice!

The attendance tonight was not that large, with only about 24 attending, plus an unusually high number than normal on Zoom!

That may be down to the bad weather tonight, with some rain passing through just when we were travelling there in the early evening. Typically, by the end of the meeting, the sky was totally clear!

Annular Eclipse – “One Ring to Rule them all”! – Posted 15 Oct

I watched live footage of the 14 October Annular Eclipse on my phone!

The first area was from Albuquerque, in New Mexico, and then another place in Texas, 500 miles away. The ring looked beautiful, and before it became complete, I could actually see the thin edge of the Sun, breaking up, within a number of seconds! This occurred about 5.36 pm, UK time. I saw the ring form and disappear twice, as the live stream showed it from these two places!

When the Moon was centrally placed on the Sun, the ring appeared perfectly symmetrical, but in the earlier and later stages of annularity, the ring appeared lopsided - thinner in one direction, as you would expect!

At Albuquerque, you could hear children cheering all the time, and doing a countdown to annularity. The annular phase lasted about 4 minutes.

The BBC News at Ten mentioned the eclipse, and that is little in the way of exaggeration, as it just showed a few photos, with no on-sight report!

Once again, it was the "and finally" item, after the sports, and the news announcer did actually use these words, on this occasion. Blink, and you'd miss it!

Annular eclipses occur when the Moon is just too far from the earth to create a total eclipse, so one gets a ring of sun around the moon, often referred to as a "Ring of Fire" (as was the case here!)

They are as rare as total eclipses, with the last ones visible from the UK in 1921 and 2003, (both only from Scotland). The next one is not until 2093!

The USA is very fortunate in this period with two total eclipses, as well, in 2017 and 2024! One town called Carbondale, in Illinois, actually sees BOTH of these total eclipses, so anyone living there can see Two Totalities from their homes! Normally, people can be incredibly lucky to even see ONE such eclipse from their home, even if they live to be around 100 years old!

The London area had a similar situation, when there were two total eclipses in 1715 and 1724. However, since then, there have been none, and the next ones are not until 2151 and 2600! (Make a note in your diaries!)

The Sun – Posted 26-28 Oct

Lately, towards the end of October, the Sun has had very few sunspots visible, down to only one or two, and even they were of small - medium size. On 27 October, the Sun was virtually blank; the following day, there was only one tiny spot - probably a new one! The Sun has not been this devoid of spots for a long time.

Observing the Partial Lunar Eclipse – Posted 28 Oct

I saw this eclipse despite the appalling weather!

During the week leading up to it, the sky had been clear or partially clear during most of the evening. Typically, of course, the weather forecast for 28 October was very bad, with heavy rain rolling in!

However, I kept an eye on the sky and, before the eclipse started, I noticed a change in the bland overcast sky, and began seeing a few small breaks.

I first saw the Moon, although it was fuzzy at first, as it seemed to be shining through a higher layer of cirrus. Later, from about 8.50pm, some small, but clear, breaks appeared, as did the Moon - in eclipse! The Moon was fairly high up in the East by now, and the clouds were moving from South to North.

It was only a very small partial, with just the bottom of the Moon in the Umbra. Only about 12% of the Moon was in the Umbral shadow. To the naked eye, the Moon appeared strange, with a virtually straight "cut off" of the bottom of the Moon!

In binoculars, I clearly saw the Umbra and the Eclipsed Southern limb of the Moon shining dimly. To the North of this, I could see the Penumbra, showing fairly distinctly, appearing a brownish, even reddish, colour, extending about halfway up the Moon!

By about 9.28pm, the Umbra could clearly be seen to have moved towards the right-hand side of the Moon.

It can be said that I had to observe this eclipse under what can be called, "challenging" conditions! The Moon was visible only intermittently between about 8.50pm, and 9.46pm, but enough to get a reasonably good view of it. Near the end of the eclipse, the weather clouded up more, and I last saw the eclipse at 9.46pm, only about 9 minutes before the end of the Umbral phase.

There were still some sudden and heavy rain showers around which were short-lived, but still heavy, and I had to keep on putting my telescope back in the shed, and then getting it out again! As a result, I ended up watching some of the eclipse from my back door with binoculars. Fortunately, the temperature was very warm!

I found it weird having a lot of clouds, with heavy showers, and yet still being able to see the Moon!

The timetable of this eclipse was as follows:

- Penumbral eclipse start at 7. 02 pm.
- Umbral shadow start at 8.35pm.
- Mid-eclipse (and Greatest extent of eclipse) at 9.15pm.
- End of Umbral eclipse at 9.53pm.
- End of Penumbral eclipse at 11.26pm.

As this was only a small partial eclipse, it was shortish in duration, with the Umbral phase, lasting about 1 hour and 18 minutes. All things considered, this eclipse was a success, as I managed to observe it. In many other eclipses I have seen nothing at all and, early on, I really did not have much hope of seeing this one either!

The last lunar eclipse was on 16 May 2022.

Reflections on Lunar Eclipse – Posted 29 Oct

The weather was so deceptive last night. The forecast seemed to indicate that it would be totally overcast throughout, with heavy rain - enough for the Weather Office to give one of its frequent weather warnings!

Although there were some heavy showers earlier on this evening, it did break in time for the eclipse. Many people, however, would have assumed that it would be a dead loss, especially as there were continuing heavy showers, including during the actual eclipse, itself. Even when the eclipse was happening, the sky still looked predominantly overcast,

and it required patience to see what was actually happening in the sky and decide whether the eclipse could be visible. Of course, this would never apply to any member of this Society, who would have all been agog to see this eclipse!

The change from completely overcast sky to one with breaks could not have been predicted as, usually, it just stays cloudy. Indeed, at the end of the eclipse, the clouds closed in again, with more rain, with the Moon only appearing about Midnight!

This is the 29th lunar Eclipse that I have seen, as against only 13 solar eclipses in about the same period, of around 50 years. Oddly enough, partial Lunar Eclipses are rarer than total lunar eclipses, (the opposite is the case with solar eclipses!). So most lunar eclipses are total. I have seen similar eclipses to this one, in September 2006, and April 2013.

Shadow Transit of Io across Jupiter – 30 Oct

On 30 October, I observed a shadow transit of the moon, Io, across Jupiter. When I saw it, at about 9.25pm, it was almost half-way across Jupiter, and it was moving "along" the Southern Equatorial Belt.

Shadow transits always appear jet black, and one can see a three-dimensional effect of them being above Jupiter (which of course they are!).

Extending below the Southern Equatorial Belt, through the South Tropical Zone to the South Temperate Belt, was a dark band of material, which I have never seen before!

Nasa's Psyche mission is set for launch – here's how it could unveil the interior secrets of planets

Acknowledgement: This article was written by Gareth Dorrian, Post-Doctoral Research Fellow in Space Science, University of Birmingham and Ian Whittaker, Senior Lecturer in Physics, Nottingham Trent University and was published in THE CONVERSATION on 12th October 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/nasas-psyche-mission-is-set-for-launch-heres-how-it-could-unveil-the-interior-secrets-of-planets-215547*

It's unlikely to be a bad omen, but Nasa's mission Psyche is currently due to launch on Friday 13 October. Lifting off at 10.19 EDT on a SpaceX Falcon Heavy rocket, it faces a perilous journey and isn't scheduled for arrival at its namesake asteroid, 16 Pscyhe, until 2029.

Asteroid 16 Psyche (meaning "soul" in Greek) was discovered in 1852 and is named after an ancient Greek princess who married Eros (the namesake of another asteroid). It orbits the Sun in the main asteroid belt between Mars and Jupiter, at approximately three times the distance from the Sun as Earth. It is a massive M-type asteroid (M stands for "metal-rich"), over 230km across.

Astronomers have to be careful with the term metal though, as in stellar physics "metallicity" means anything heavier than helium. In this case though, we are talking about metals such as iron and cobalt.

To give an idea of scale, if the Sun was shrunk down to the size of an official NBA basketball, then the asteroid's diameter would be about the same size as the thickness of three pieces of paper (0.3mm), and located at a distance of 161 metres away.

As you can see, a mission to an object so small is not straightforward, although smaller objects have been visited – for example the recent sample return of OSIRIS-REX from asteroid Bennu or the Hayabusa 2 mission to 162173 Ryugu.

To accomplish this remarkable voyage, the Psyche spacecraft, once launched, will use solar-electric propulsion. This works by using an electrically charged gas that's accelerated out of the rocket nozzle by a powerful electric field. This form of propulsion, unlike a chemical rocket, produces very modest thrust. But it can operate continuously over many months or even years, while using comparatively little fuel.

The technology is very useful for long-distance interplanetary missions, but it does require a decent amount of sunlight for the spacecraft's solar panels to generate the necessary electrical power. Lucy, another recently launched Nasa mission to asteroids in the outer Solar System, uses the same propulsion.

Mission goals

So, what makes this particular asteroid interesting? Planets are born in "protoplanetary disks" through a process called accretion. This involves small bits of material gradually acquiring more mass from gravitational attraction and collision with other nearby material.

Technically, this is an ongoing process as the Earth sweeps up some 100 tons of natural debris every day as it orbits the Sun. However, the bulk of a planet's mass is acquired within the first few million years of its existence.

This is typically an extremely violent epoch in which catastrophic collisions between young worlds are common. Needless to say, not every planet to be survives to full planethood. And 16 Psyche may be an example of such as "stunted" planet.

If there's enough internal radioactive decay and heat released by countless impacts during planetary formation, a young world will melt and undergo a process called "differentiation", in which heavier material sinks to the core and lighter material floats to the surface.

There are several models of formation for 16 Psyche, but the simplest one consistent with present evidence is that 16 Psyche appears to have undergone differentiation, but subsequently suffered a catastrophic impact with another young world – obliterating the outer layers, leaving a remnant dense metal-rich core exposed to space.

A key science objective of the Psyche mission will be to distinguish which of these models is most likely correct.

There are two main reasons for visiting Psyche. One is the scientific interest in visiting an object that could be similar to the iron core of a planet – including the Earth. The second is to find out whether it is possible to mine the metals – with Forbes calling it a "quadrillion-dollar asteroid".

Venturing into the centre of a planet to directly study its core is impossible with our current technology. However, visiting an exposed planetary core provides an excellent opportunity to test our current models of planetary formation.

The Psyche spacecraft carries a number of scientific instruments such as an imager for mapping the surface of the asteroid, a gravity experiment to help to determine the world's interior structure, and a spectrometer for investigating the mineral content of the asteroid's surface.

One of the instruments is a magnetometer which is designed to try and detect whether 16 Psyche has a magnetic field. This is useful because any remnant magnetic field could demonstrate that Psyche's interior was once indeed molten and underwent differentiation.

As long as the spacecraft reaches the asteroid safely, there are great discoveries to look forward to. It will certainly provide a wealth of data for scientists to analyse back on Earth for years to come.

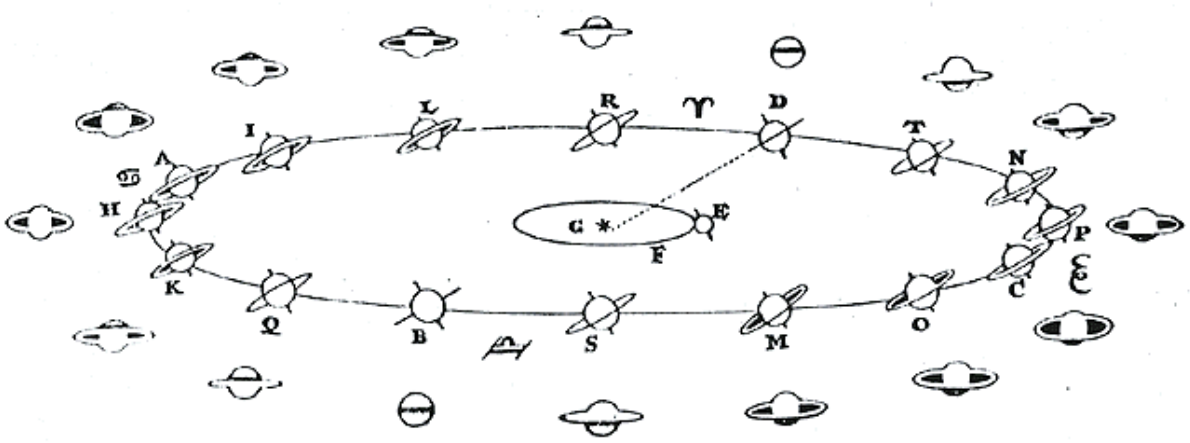
Object of the month – Saturn – Martin Howe

As with last month's object, this month's object also needs no introduction – it is arguably the most beautiful planet in the solar system - not counting the Earth of course!

Saturn's rings are so prominent that Galileo was the first to see them when he pointed his first, rather inferior, 50mm telescope to Saturn in 1610, and reported that "the star of Saturn is not a single star, but is a composite of three, which almost touch each other, never change or move relative to each other, and are arranged in a row along the zodiac, the middle one being three times larger than the lateral ones, and they are situated in this form: oOo."

However, what puzzled Galileo and his contemporaries who were soon also using telescopes was that it gradually changed shape over several years to the point that it lost its two smaller companions, and was a single body again, only to revert back several years later.

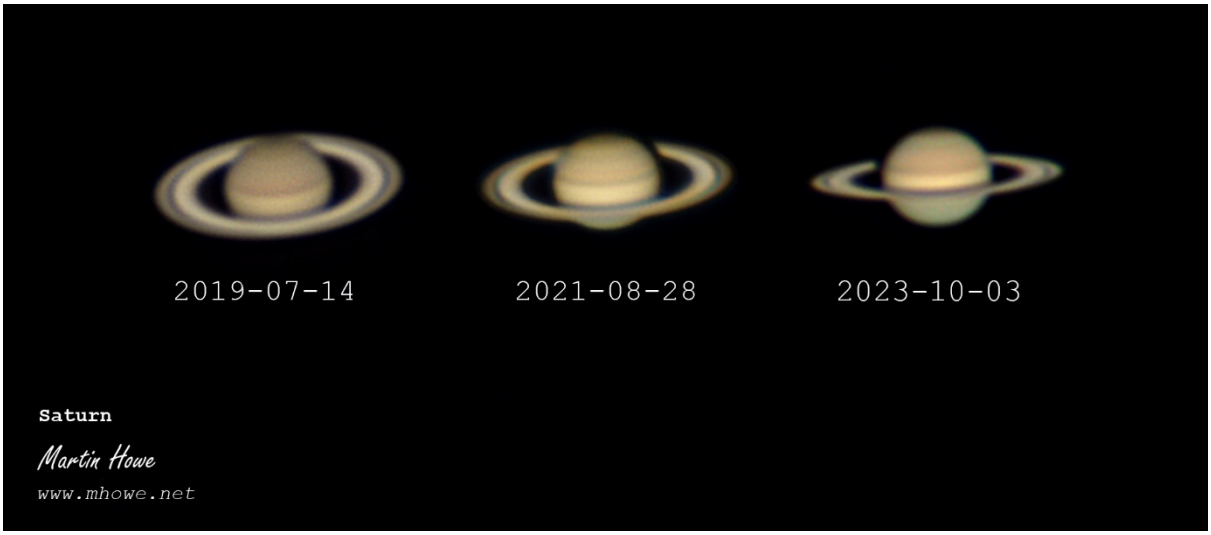
It wasn't for another 50 years when Christiaan Huygens published his theory in 1659, proposing that the planet was surrounded by a thin flat ring physically separate from the planet itself, and that this, combined with the axial inclination of Saturn, gave rise to its changing appearance, per his illustration below:



Consequently, we see the rings wide open (or edge-on) about twice every Saturnian year, or about once every 14 years. The edge-on view, seen twice over the course of a single orbit, can be seen in the above illustration where the shape is represented by ϴ on opposite sides of the orbit. The rings are currently closing, and will be edge-on in 2025.

Although Saturn reached opposition in late August 2023, it is still well placed in the sky, crossing the southern meridian about 7:30pm on the 1st of November at an altitude of 25°. (Sunset is about 4:30pm, so the sky is well and truly dark by this time.) The rings are a truly magnificent sight, even in a small telescope such as a 60mm refractor.

The composite image below is made up of three separate observations, taken two years apart using a 127mm refractor, and clearly show how the rings are moving towards the edge-on view.



Comet or asteroid? Mysterious ‘Oumuamua shows why we may need a new classification system

Acknowledgement: This article was written by Monica Grady, Professor of Planetary and Space Sciences, The Open University and was published in THE CONVERSATION on 28th June 2018. 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/comet-or-asteroid-mysterious-oumuamua-shows-why-we-may-need-a-new-classification-system-99083*

Ever since space scientists first spotted the odd, cigar-shaped object known as 1I/‘Oumuamua in the sky, they have been debating what it is exactly. Suggestions have included an asteroid, a comet and even alien spaceship. Now a study, published in Nature, suggests it may actually be a comet – but an unusual one.

The fascinating findings add to recent discoveries which suggest it may be time to think beyond the division of asteroid versus comet.

The force of gravity is what keeps our feet on the ground, the moon orbiting the Earth and the planets orbiting the sun. It is also the main agent that governs the trajectory of comets as they swing through the solar system. It was his laws of gravity that allowed Newton’s colleague Edmond Halley to predict the return of the comet that is now known as Halley’s comet. The same laws enabled the Rosetta spacecraft to catch up with and fly alongside comet 67P/Churyumov-Gerasimenko.

There are non-gravitational effects that can influence the orbit of a comet, but they are so weak compared to gravity that they are usually negligible. But in the case of object 1I/‘Oumuamua, its orbit is so unusual that non-gravitational effects might play a role in its geometry.

1I/’Oumuamua was first sighted in October 2017. Calculations based on the laws of gravity showed that its trajectory was neither the ellipse of a comet nor the circle of an asteroid. Instead, ‘Oumuamua appeared to have a hyperbolic orbit, meaning it was not gravitationally bound to the sun. This means it is almost certainly an interloper from beyond the solar system. Hence the “1I” part of its name: the first interstellar body.

‘Oumuamua passed within 0.25 astronomical units (AU) of the sun (1 AU is the distance between the sun and the Earth). As a well-behaved comet, it should have developed a coma and tail as ice

and dust vaporised from the surface by a process called sublimation. But, despite an organised and concerted observing campaign by the international astronomical community, no trace of a coma or tail was seen.

Indeed, measurements of its composition showed it had more in common with asteroids than with comets: the low reflectiveness of its surface indicated that there was little, if any, ice. It also seemed to have organic material that had been altered by exposure to cosmic radiation – like many asteroids.

Alongside such observations was ‘Oumuamua’s very unusual shape: although the object couldn’t be seen directly, modelling of its light curve (how the amount of reflected light varies as an object rotates) suggested that it was long and thin – cigar-shaped rather than the more usual semi-rounded appearance of asteroids and comets. This led the more fanciful to posit that ‘Oumuamua might be a fabricated, rather than a natural, visitor to the inner solar system, perhaps an alien spacecraft.

Latest evidence

So: comet, asteroid or spaceship? We can probably discount the interstellar spaceship – surely it would have at least paused to investigate the mixture of signals emanating from our planet. So comet or asteroid are the options left. The same group that published the discovery report of ‘Oumuamua continued observing the object, acquiring data from instrumentation on practically all the world’s major ground-based telescopes, as well as from the Hubble Space Telescope.

What they discovered was that there was a deviation from the path that ‘Oumuamua should be following if it were influenced by gravitational effects alone. It seemed as if ‘Oumuamua was being slightly pushed away from the sun. The team investigated every non-gravitational effect that they could: was ‘Oumuamua swayed from its path by the pressure of solar radiation? Was the effect of thermal emission as the object rotated significant? Had it had a collision that changed the trajectory?

Other options included it having an unusual distribution of mass or perhaps a centre of gravity displaced from the centre of its body. It could also be highly magnetised, so that it interacted more strongly with the solar wind. Based on their extremely precise and comprehensive series of observations, the team surmised that none of these effects was sufficient to explain ‘Oumuamua’s orbit. Instead, they concluded that significant release of gas by sublimation was the main feasible mechanism – and that would suggest it is a comet.

Profound implications

This is a significant conclusion to reach, not just for ‘Oumuamua, but for cometary and asteroidal science more generally. There has only been a handful of previous observations of non-gravitational effects on cometary orbits, mainly because the measurements required to make the calculations have to be undertaken over a very wide distance. Assuming ‘Oumuamua was outgassing in a similar way to other comets, then the body was losing water and dust at a rate of about 2.4kg per second.

This compares with 20kg per second for 67P/Churyumov-Gerasimenko. It would appear that although ‘Oumuamua seems to have a similar density to solar system comets, it must be much stronger, given the paucity of dust released. Or perhaps the dust was more firmly bound to the surface by the organic compounds present.

So can we really say 1I/'Oumuamua is a comet, albeit with asteroidal properties? Or could it be an asteroid with cometary properties? Does it matter? I'm not sure that it does. The division between asteroids and comets in the solar system used to be obvious: asteroids had circular orbits, were made of rock and metal and lived in the asteroid belt between Mars and Jupiter. Comets had inclined elliptical orbits, were made of rock and ice and came from further away.

But over the past few years we have discovered families of asteroids scattered all over the solar system, as well as Kuiper Belt Objects. We have also found comets with both short and long orbits. And we have seen unusual features on objects that we thought we knew quite well. The asteroid Ceres, for example, has salts left behind as ice vaporised from the surface by sublimation – a process often seen in comets, but not in asteroids.

Since 'Oumuamua, along with small bodies in the solar system and interstellar guests, seem to exhibit a spectrum of compositional and dynamic properties, it may be time to think beyond the asteroid versus comet division, and look for a new way to classify these objects. Perhaps we need many more categories. Or maybe just one – the class of Small Body. Clearly 'Oumuamua is showing us that we have not yet uncovered the variety of objects to be found in our own neighbourhood.

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 10 November – Nonsuch High School

Brad Gibson from Hull University will give a talk entitled "How Astronomers Control Your Life…."

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 13 November.

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 6-18 November.

AD HOC OBSERVING AT WARREN FARM:

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