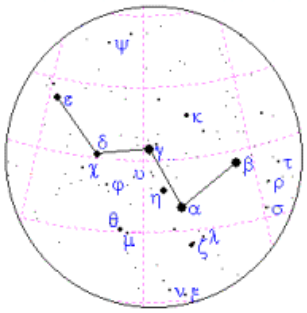


Wadhurst Astronomical Society Newsletter September 2016

There was no meeting in August and this year's barbecue was cancelled because very few members were able to attend. Since there was no meeting to report on it might be a good idea to mention a couple of services available within the Society.

The Society Library

We carry a number of books for paid-up members to borrow covering a large range of subjects from the history of astronomy through to new techniques such as astro-imaging. There are books that deal with the practical side of setting up equipment, books with sections on the use of ancillary attachments and others dealing with some aspects of modern astronomy. These books have been donated over the years by members of the Society.

We don't claim to have a comprehensive list but it is well worth having a look to see if there is something that might be of interest to you.

The library is present at each meeting and the librarian, Eric Gibson has a register for members to sign when books are borrowed.

Society Equipment

The society possess a limited number of telescopes that members can borrow such as a 4-inch refractor with eyepieces and a tripod but without drives and an 8-inch Dobsonian with 6.3 mm, 97 mm and 25 mm eyepieces, a 2 x Barlow and a Telerad Star finder.

We will issue a fuller list soon.

MEETINGS

Our next meeting is on 21st of September when we welcome back Melanie Davies for another of her informative talks. This time Melanie talks about "The Pleiades".

Meetings take place in classrooms IL5 and 6 which are in the blue walled classroom block at the far end of the drive from the main gate of Uplands College and up by the tennis courts. Signs will direct you. There is car parking near the block. The postcode is TN5 6AZ.

FUTURE MEETINGS

19th October 2016 – Dr David Whitehouse returns to tell us about what we might encounter on a "Journey to the Centre of the Earth".

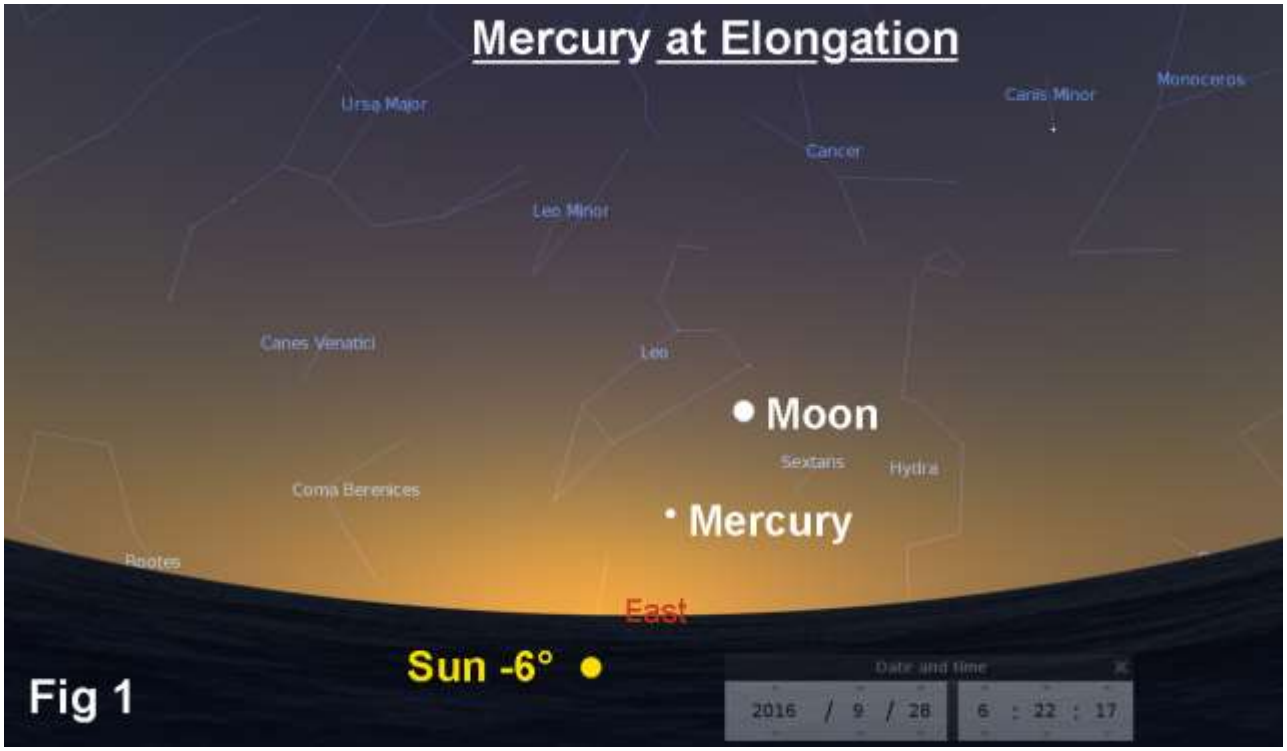
16th November 2016 – Jan Drozd tells about "A History of Man's Understanding of Our Universe".

14th December 2016 (NB the second Wednesday of this month) – Brian Mills FRAS talks about "Local Astronomers".

SKY NOTES FOR SEPTEMBER 2016

Planets

Mercury reaches inferior conjunction on the September 13th, when it will lie between the Earth and Sun. Due to this it will be unobservable until later in the month when it becomes visible as a morning object low down in the east. It reaches greatest western elongation, of 18°, on the 28th when it will be 10° high with the Sun 6° below the horizon. At this time Mercury, with a magnitude of -0.5, will lie almost equidistant from a very thin crescent Moon and the horizon. Following elongation the smallest planet continues to brighten and will be -1.0 by the start of October, although it will be lower in the sky. This apparition is the best opportunity for observers in the UK to see Mercury in the morning skies this year. Fig 1 shows its position at opposition.



Venus is now an evening object and should become more obvious towards the end of the month, although it currently lies below the celestial equator and will remain there until the end of January 2017. However, that doesn't mean that we won't have a good view of the planet, because its declination begins to improve towards the end of November after which it moves swiftly northwards. Also its brightness will aid in identification.

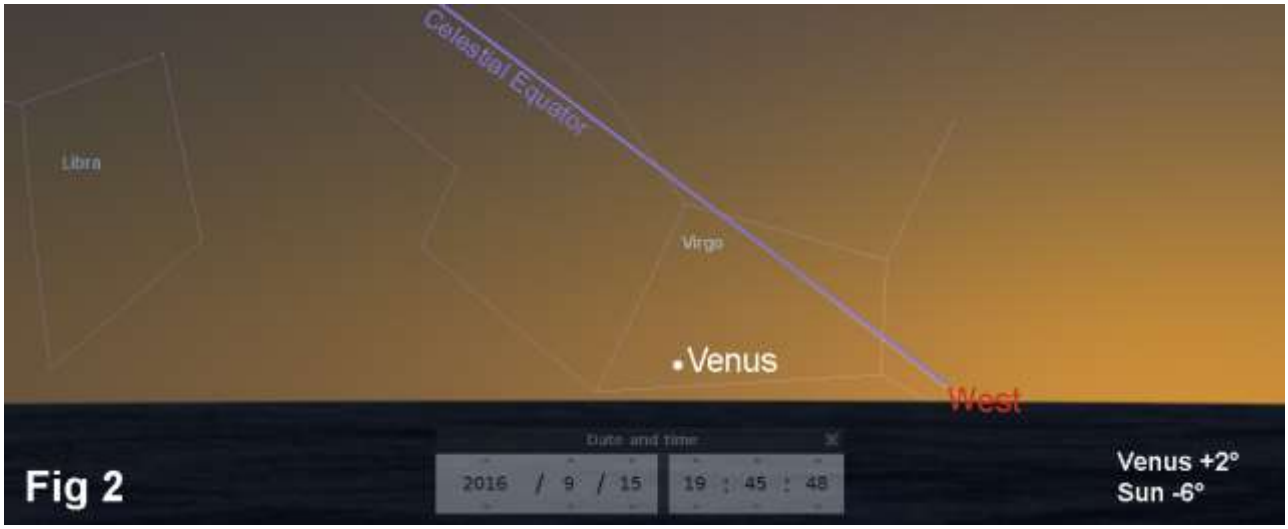


Fig 2 shows the position of the planet in the middle of the month at the end of civil twilight (Sun 6° below the horizon). During September the planet's brightness remains constant at -3.9 whilst its apparent size increases slightly from 11 to 12 arc seconds as it gradually draws closer to the Earth. Whilst this is happening, its gibbous phase decreases from 92% to 86%. Venus was at superior conjunction (on the far side of the Sun) in early June when its phase, if we were able to see it, would have been 100%. Now that it has emerged from behind the Sun its phase will gradually decrease until it reaches inferior conjunction (between the Earth and Sun) when of course it will be "new" and invisible to us on Earth.

Mars is still an evening object, rising and culminating in daylight and setting around 22.20 BST at the start of the month. Due to Mars' swift eastwards motion, by the end of September this has only slipped to 22.05. The red planet starts the month in Scorpio but within

two days has moved into the southern part of Ophiuchus. By the 22nd it has reached the border with Sagittarius and moves rapidly towards the "Teapot" asterism, passing just south of the Lagoon nebula on the 28th.

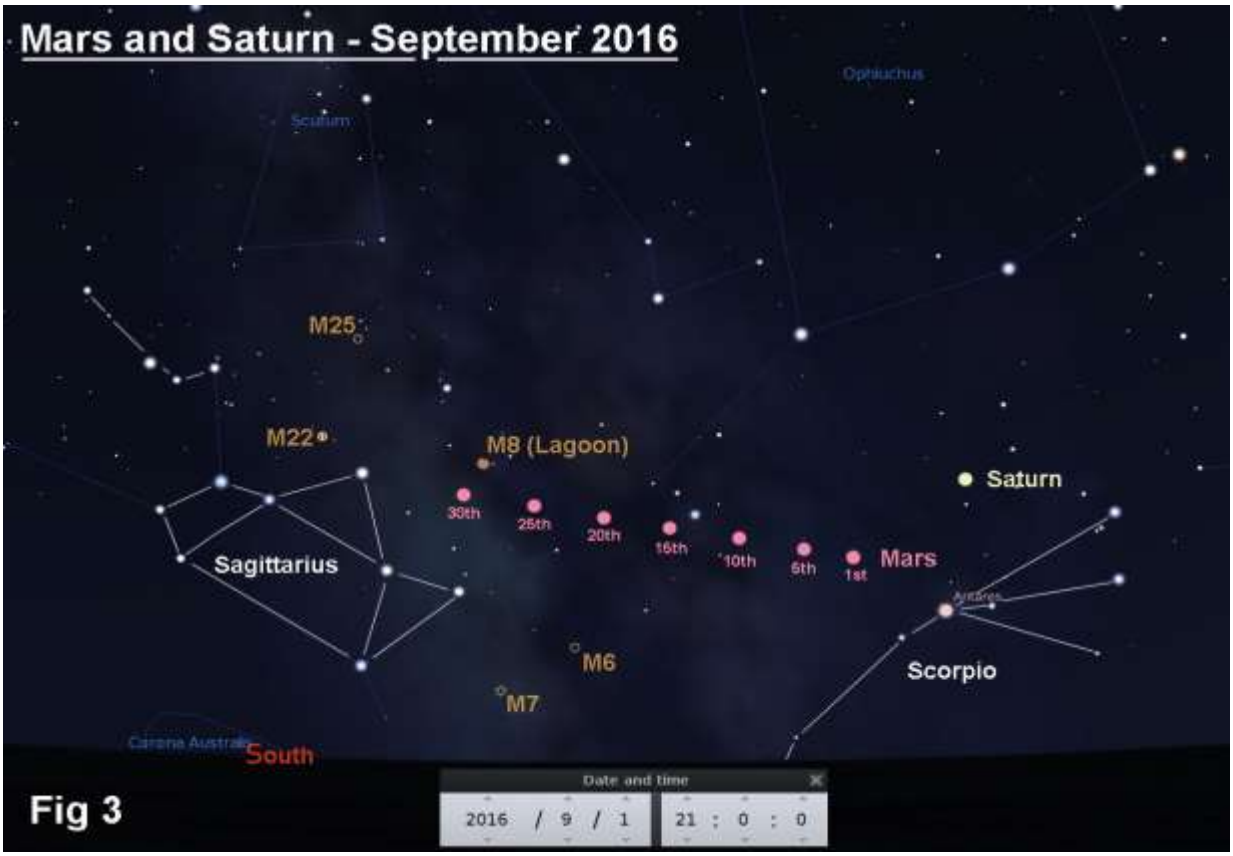


Fig 3 gives the position of Mars throughout the month as well as a few Messier objects in the area. The map is drawn for the first day of the month, so you need to remember that whilst the changing position of Mars with respect to the constellations is correct, the relationship of all the objects will alter with respect to the horizon. The planet's apparent size and brightness fall slightly as the Earth continues to pull away from its neighbour following the May opposition. Incidentally, the small group of stars north east of the "Teapot" of Sagittarius is known as the "Teaspoon".

Jupiter is in conjunction with the Sun on September 26th and is therefore unobservable this month. It should become visible in the morning skies in mid October, low down in the east before dawn.

Saturn is an evening object, spending the whole month in the constellation of Ophiuchus, although its period of visibility is now shortening. At the beginning of September it sets just over three hours after the Sun but by month's end this has fallen to two and a half as it heads towards a December conjunction with the Sun. The ringed planet's brightness remains steady at +0.5 whilst its apparent diameter shrinks very slightly. The north pole of Saturn remains tilted towards Earth at just over 26°, something that increases gradually for the remainder of the year. Its position is shown in fig 3 although its motion is so slow, when compared to Mars, it will have moved imperceptibly over the course of the month so is only shown once.

Lunar Occultations

In the table below I've listed events for stars down to magnitude 7.0 that mostly occur before midnight although there are many others that are either of fainter stars or occur at more unsociable hours. DD = **d**isappearance at the **d**ark limb whilst RD = **r**eappearance at the **d**ark limb. The column headed "mm" (millimetres) shows the minimum aperture telescope required for each event. **Times are in BST.**

Sept.	Time	Star	Mag	Ph	Alt °	% illum.	mm
Sept 11	20.48	ZC 2787	6.3	DD	20	72	70
Sept 11	21.21	ZC 2794	6.6	DD	19	73	70
Sept 11	21.58	SAO 162239	7.0	DD	18	73	100
Sept 18	23.00	ZC 249	4.4	RD	25	93	40
Sept 21	23.18	ZC 695	6.6	RD	10	66	80
Sept 21	23.55	ZC 699	5.8	RD	16	66	50
Sept 22	00.04	ZC702	5.1	RD	17	66	40
Sept 22	00.18	ZC 704	4.7	RD	19	66	40

Phases of the Moon for September

New	First ¼	Full	Last ¼
1st	9th	16th	23rd

ISS

There are only two evening passes of the International Space Station (ISS) in September with all the others occurring in the early hours of the morning. The details of all passes, including those visible after midnight, can be found at www.heavens-above.com. Please remember that the times and directions shown below are for when the ISS is at it's ***maximum*** elevation, so you should go out and look at least five minutes beforehand. **Times are in BST.**

Sept	Time	Mag.	Alt°	Az.		Sept	Time	Mag.	Alt°	Az.
29th	20.02	-1.2	14	SSE		30th	20.44	-1.6	24	SSW

Iridium Flares

The flares that I've listed are magnitude -2.5 or brighter although there are a lot more that are fainter or occur after midnight. If you wish to see a complete list, or obtain timings for somewhere other than Wadhurst, go to www.heavens-above.com . When one of these events is due, it is sometimes possible to see the satellite before and after the "flare" although, of course, it will be much fainter then. **Times are in BST.** Note: The events of the 6th and 18th are especially bright.

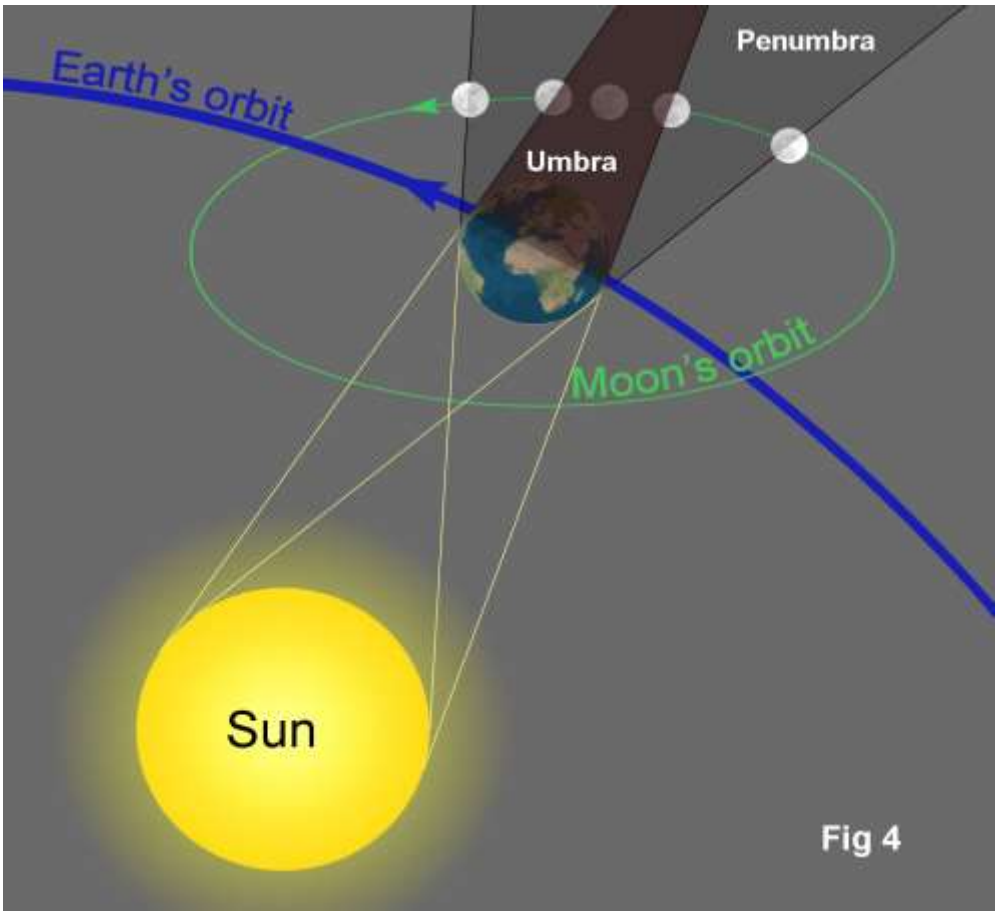
Sept	Time	Mag.	Alt°	Az.°		Sept	Time	Mag.	Alt°	Az.°
2nd	22.22	-2.5	31	54 (NE)		13th	21.35	-5.1	42	76 (ENE)
3rd	22.17	-7.4	31	56 (ENE)		17th	21.20	-2.8	47	85 (E)
6th	20.33	-8.4	64	106 (ESE)		18th	21.14	-8.1	47	87 (E)
7th	22.02	-5.2	36	64 (ENE)		19th	21.08	-4.4	47	89 (E)
8th	20.22	-2.7	64	113 (ESE)		20th	19.27	-4.0	63	157 (SSE)
8th	21.56	-7.7	38	66 (ENE)		24th	20.47	-4.8	51	101 (E)
9th	21.55	-5.2	39	69 (ENE)		26th	18.59	-5.1	59	178 (S)
13th	20.00	-7.5	66	132 (SE)		30th	20.20	-5.7	55	118 (ESE)

Annular eclipse of the Sun – September 1st.

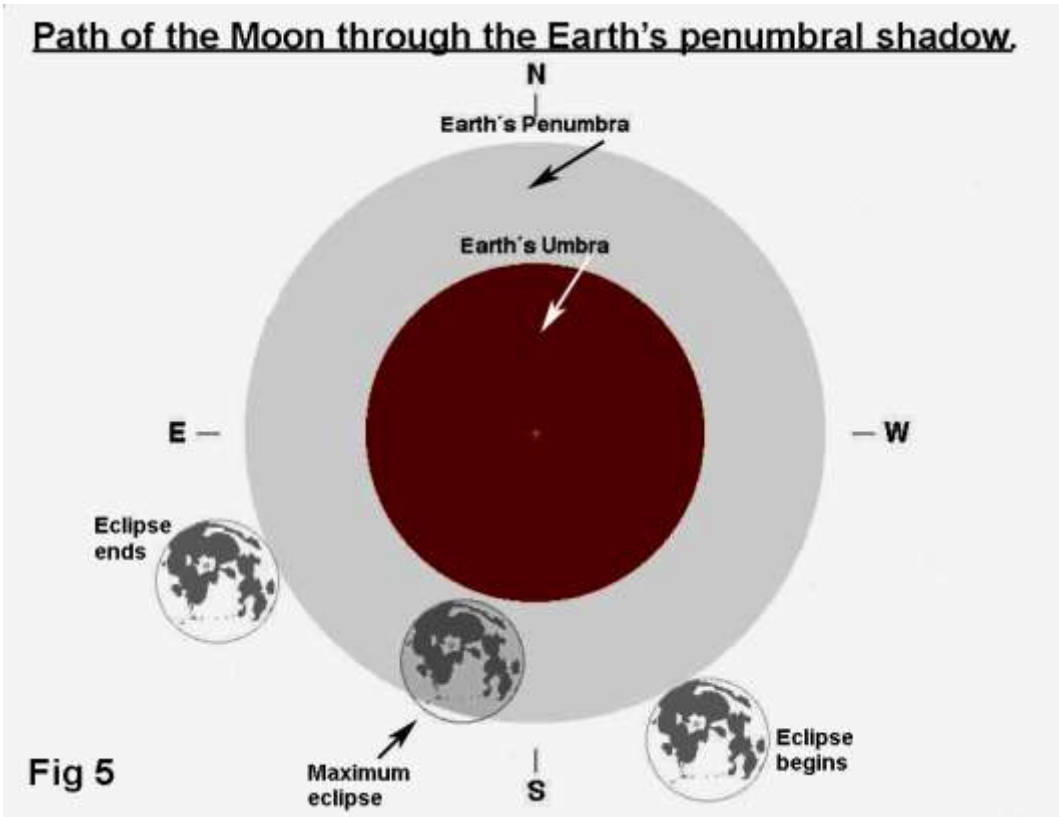
This is not visible from the UK but there should be a number of live feeds available over the internet. The track crosses Africa and Madagascar with the event beginning at 07.13 BST and concluding at 13.00 BST.

Penumbral eclipse of the Moon – September 16th.

The eclipse is already in progress when the Moon rises at 19.15 BST. The effects of a penumbral eclipse are very subtle and it is possible that you may not be able to tell that a penumbral eclipse is actually in progress.

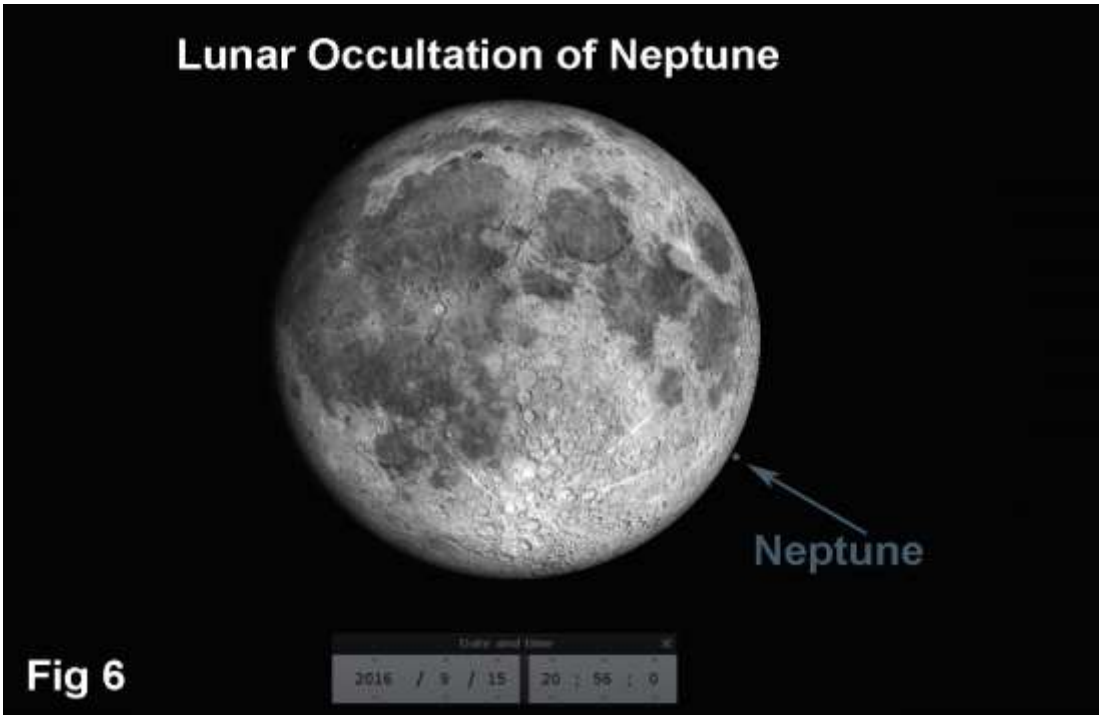


This type of eclipse is caused by the Moon moving into the outer (penumbral) shadow that the Earth casts out into space. On most occasions the Moon passes above or below the shadow due to the slight difference in the planes of rotation of the Earth and Moon. If we are lucky, as we were in September last year, the Moon passes through the central shadow cone (umbra) and we see a total eclipse as shown in fig 4. Maximum eclipse occurs at 19.54 BST, although the Moon will not be fully immersed in the penumbra at this, or any, time. Fig 5 shows it passage with respect to the shadows. The eclipse concludes at 21.54 when the Moon finally leaves the shadow. The fact that the Moon will be low in the sky may make it easier to detect the eclipse as it will not be seen at full brightness as the thick layer of the atmosphere that it is shining through will reduce the glare. Also, the sky will not be fully dark as the Sun will only be 8° below the western horizon. As you know, the Moon always looks larger when seen against trees and buildings on the horizon so it will be interesting to see how the penumbral eclipse looks.



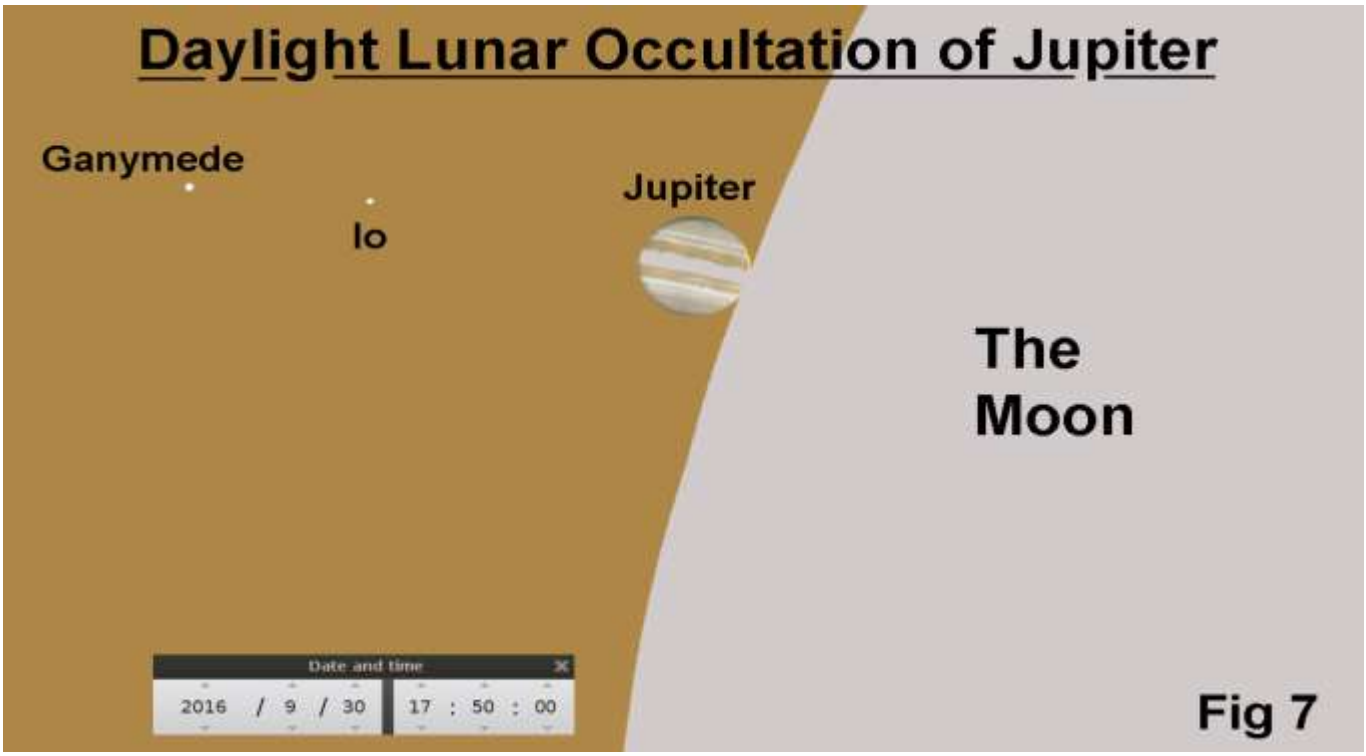
Lunar Occultation of Neptune – 15th September

There will be a lunar occultation of Neptune seen against a dark sky (Sun -16°) although the Moon will be 98% illuminated at the time. Neptune, at magnitude +7.8, reappears on the bright limb at around 20.55 BST on the evening on September 15th. The diagram in fig 6 shows the position of the planet as it emerges from behind the Moon although the size of Neptune has been exaggerated for clarity. At the time of the event the Moon is 18° above the south western horizon.



Lunar Occultation of Jupiter – 30th September

This will be a difficult event to see for a number of reasons. Firstly, it occurs in daylight, secondly the Moon is just under 4° from the Sun and thirdly the Moon is almost new and will almost certainly be invisible. Add to this the fact that the Moon is just 7° above the western horizon and you can see how marginal an observation it is. **Due to the extremely close proximity of the Sun, this is an event that should only be attempted by experienced observers.** Fig 7 shows the position of the planet with reference to the limb of the Moon, at first contact, when the Sun is less than 4° to the east (left). The time of disappearance is approximately 17.50 BST although times vary a little depending on location. The Moon and Jupiter will have set by the time the gas giant reappears on the opposite limb of the Moon.



The Night Sky in September (Written for 22.00hrs BST mid month)
In the north Ursa Major is moving ever closer to the horizon once again as Capella in Auriga is climbing away from it. Now is a good time to identify the twists and turns of Draco as it winds between the bears. One of its stars, Thuban, used to be the pole star 5,000 years ago thanks to the action of the precession of the Earth's axis. Ursa Minor lies to the west of the north celestial pole whilst Cepheus and Cassiopeia lie to the east.

Looking towards the west Arcturus is now only 10° high and will set at midnight BST. Above it are Corona Borealis and Hercules who are all outshone by the brilliant Vega (in Lyra) that forms one third of the Summer Triangle. Hercules is of course home to the brightest globular cluster in the northern hemisphere, M13, and is just visible to the naked eye as well as M92 which is a little fainter being only magnitude 6.5.

Turning to the south we find Deneb, the brightest star in Cygnus, lies on the meridian just 6° from the zenith, meaning that the rest of the Summer Triangle is still well presented. Below Cygnus is the small but obvious shape of Delphinus, and below that is Capricornus. An indication of air quality is given by looking for the faint group of stars that form the constellation of Microscopium that lies between Capricornus and the horizon. The brightest star in Pisces Austrinis, Fomalhaut, lies just to the east of the meridian and can be found by extending a line through the two most westerly stars (rightmost) of the Square of Pegasus and continuing it southwards.

In the east the autumn constellations are already well displayed. Pegasus and Andromeda are some 40° above the horizon whilst below them both of the "fishes" that form Pisces have risen. Also below Andromeda, in the space bounded by Perseus and Pisces, we find the small constellations of Triangulum and Aries. Of note in this general area are the Andromeda Galaxy (M31) and the double cluster in the sword handle of Perseus (NGC 869 & 884), the last of which is a lovely binocular object. See fig 8 for a map of the area.

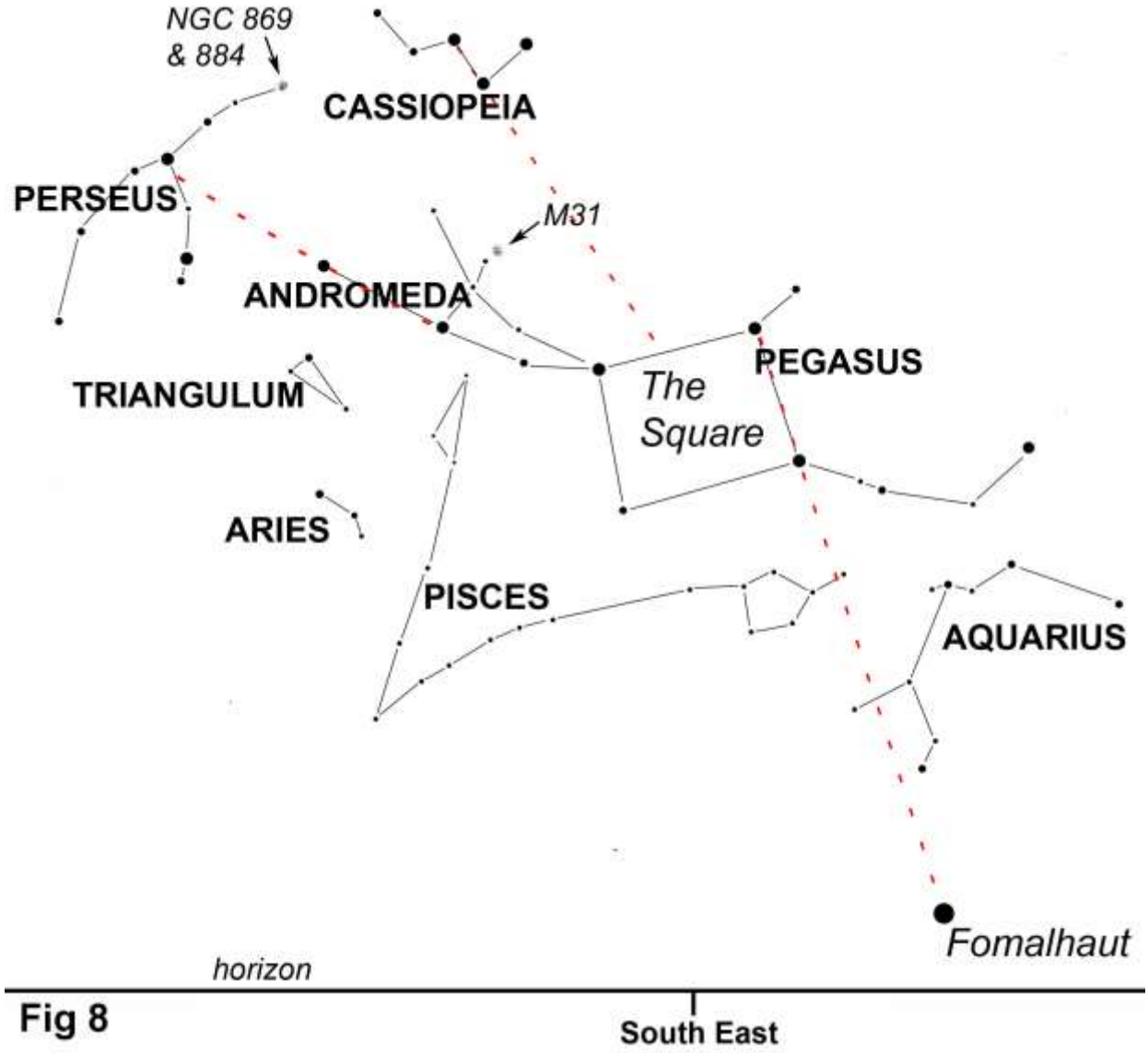


Fig 8

Brian Mills

SPACEPLACE - NASA

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Is there a super-Earth in the Solar System out beyond Neptune?
By Ethan Siegel

When the advent of large telescopes brought us the discoveries of Uranus and then Neptune, they also brought the great hope of a Solar System even richer in terms of large, massive worlds. While the asteroid belt and the Kuiper belt were each found to possess a large number of substantial icy-and-rocky worlds, none of them approached even Earth in size or mass, much less the true giant worlds. Meanwhile, all-sky infrared surveys, sensitive to red dwarfs, brown dwarfs and Jupiter-mass gas giants, were unable to detect anything new that was closer than Proxima Centauri. At the same time, Kepler taught us that super-Earths, planets between Earth and Neptune in size, were the galaxy's most common, despite our Solar System having none.

The discovery of Sedna in 2003 turned out to be even more groundbreaking than astronomers realized. Although many Trans-Neptunian Objects (TNOs) were discovered beginning in the 1990s, Sedna had properties all the others didn't. With an extremely eccentric orbit and an aphelion taking it farther from the Sun than any other world known at the time, it represented our first glimpse of the hypothetical Oort cloud: a spherical distribution of bodies ranging from hundreds to tens of thousands of A.U. from the Sun.

Since the discovery of Sedna, five other long-period, very eccentric TNOs were found prior to 2016 as well. While you'd expect their orbital parameters to be randomly distributed if they occurred by chance, their orbital orientations with respect to the Sun are clustered extremely narrowly: with less than a 1-in-10,000 chance of such an effect appearing randomly. (There is more about TNOs in this month's SpacePlace article from NASA)

Whenever we see a new phenomenon with a surprisingly non-random appearance, our scientific intuition calls out for a physical explanation. Astronomers Konstantin Batygin and Mike Brown provided a compelling possibility earlier this year: perhaps a massive perturbing body very distant from the Sun provided the gravitational "kick" to hurl these objects towards the Sun. A single addition to the Solar System would explain the orbits of all of these long-period TNOs, a planet about 10 times the mass of Earth approximately 200 A.U. from the Sun, referred to as Planet Nine. More Sedna-like TNOs with similarly aligned orbits are predicted, and since January of 2016, another was found, with its orbit aligning perfectly with these predictions.

Ten meter class telescopes like Keck and Subaru, plus NASA's NEOWISE mission, are currently searching for this hypothetical, massive world. If it exists, it invites the question of its origin: did it form along with our Solar System, or was it captured from another star's vicinity much more recently? Regardless, if Batygin and Brown are right and this object is real, our Solar System may contain a super-Earth after all.

A possible super-Earth/mini-Neptune world hundreds of times more distant than Earth is from the Sun. Image credit: R. Hurt / Caltech (IPAC)

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Any material for inclusion in the October 2016 Newsletter should be with the Editor by September 28th 2016