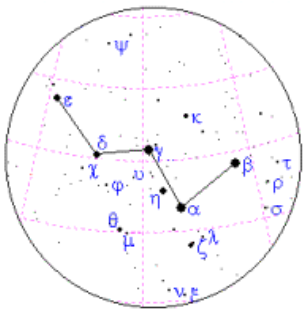


Wadhurst Astronomical Society Newsletter DECEMBER 2015

MEETINGS

COMMITTEE MEETING

Members of the Committee are respectfully reminded that there is a meeting of the Committee on Tuesday the 5th of January 2016 at Phil's house staring at 1930

NOVEMBER MEETING

Owing to the Drama Studio being used for an examination, our November meeting was held in two combined classrooms in the block next to the tennis courts. This seemed to be a popular change judging by the number of members' comments and the Committee have since asked if this venue might be available in the future. Our December meeting will be held back in the Drama Studio and will continue to be held there until perhaps the other classrooms become available later in the New Year.

Phil Berry welcomed 39 members and guests to the November meeting and then went through the evening's programme before introducing our speaker, our own Jan Drozd who over the years has given a number of enjoyable and informative talks on many different subjects.

Astronomy in Western Art
Jan Drozd

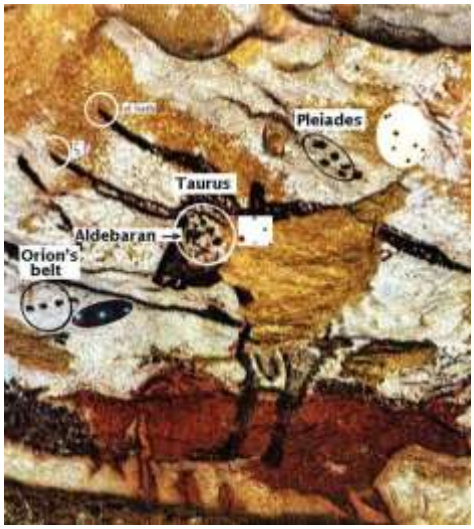
We were taken on a journey through the way astronomy has been recorded through visual art from very early cave paintings to modern art in the Western World.

To begin his talk, Jan referred to the definition of "Art" as being 'the expression or application of human creative skill usually in a visual form such as painting, producing works to be appreciated for their beauty or emotional power'.

From ancient times people wondered at the sky; were what they saw signs from the Gods, - how far away were they and what did they represent.

We were told that a British astronomer, Sir Norman Lockyer (1836 – 1920) broke ancient astronomy into three phases; The Worship Stage where astronomical events were viewed as moods and warnings of the Gods; using astronomy for practical purposes such as agriculture and navigation, and purely to gain knowledge.

Perhaps the oldest star maps were discovered in the Lascaux Cave in France by schoolboys during the last war and dating from 16,000 to 13,000 BC. They are thought by some to identify amongst other objects, the Pleiades, Aldebaran and Orion's Belt.



Cave paintings in the Lascaux Cave

The Bronze Age Nebra Disk

Jan then referred to the Nebra Sky Disc, which he has spoken of in a previous talk. This is a Bronze Age (1600 BC) disk discovered in East Germany about 20 years ago and it clearly shows the Sun, the Pleiades, the Moon and some of the major planets. This challenges the idea that astronomy arose around the Mediterranean.

We were told that in the past, astronomy and astrology were considered to be interlinked and were shown the Dendra Zodiac (50 BC) displaying very accurate representations of the stars and the Zodiac.

In 1620 Philosopher and scientist, Francis Bacon published a book outlining the new system of thought called the Scientific Method where a scientific question led to research. The results of careful tests and experiments would be analysed and from their conclusions, lead to a hypothesis. If true, this would lead to a reported result or if the hypothesis was untrue, tests and measurements would be done again. The book was Bacon's hope to encourage empirical investigation and smash through old scientific ideas and lead to a greater understanding of the world and of the heavens.

Astronomy was beginning to appear in Western Art and the Bayeux Tapestry included Halley's comet. It is said that William the Conqueror felt this foretold success just before he invaded England in 1066. Others saw comets as signs of a great disaster or change.

The Church regarded astronomical events to be very important such as timing used to calculate the liturgical calendar for the year. The calendars were illustrated, often including an astrolabe used by mathematicians.

Giotto Di Bondone's 1305 painting of the Adoration of the Magi includes the Star of Bethlehem, which does look like a comet in the painting, and as Jan said Halley's comet had been seen just four years before Giotto made the painting.

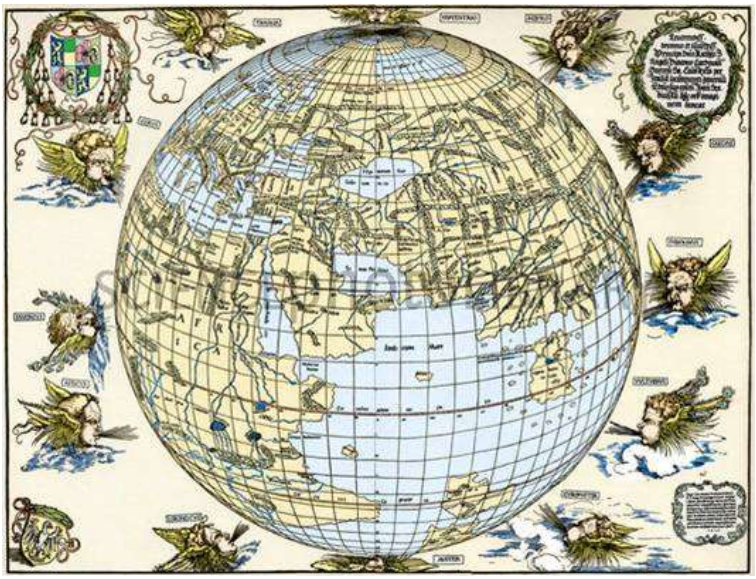
Comets appeared in many paintings with several appearing in the Book of Miracles created in Augsburg, Germany around 1550 and has only recently resurfaced a few years ago. It shows spectacular discoveries in the field of Renaissance art. There are many illustrations of other events such as conflagrations and floods and even the future end of the world.

Adoration of the Magi - Bondone

Pages from the Book of Miracles

Jan showed a number of paintings that showed many well know ancient scientists and notable public figures often with their hands on astronomical instruments such as an astrolabe. One painting by Albrecht Altdorfer in 1529 was as if painted at a great height and actually showed the curvature of the Earth.

Albrecht Altdorfer's painting showing the curvature of the Earth



Albrecht Dürer's Perspective drawing of the Earth

An astonishing drawing by Albrecht Dürer made in 1515 was the first known published perspective drawing of the Earth. We were told that the general belief that the Earth was flat was not true and that many people in the Middle Ages thought of it as a sphere and this was illustrated in a number of paintings from the 12th century onwards.

A very well known painting by Hans Holbein the Younger from 1533 and hung in the National Gallery shows the interest in astronomical scientific instruments, which were carefully laid out in the picture.

Aristotle had said that all heavenly bodies are pure spheres but once Galileo looked at the Moon through his telescope and published his drawings it was realised that the surface was marked with craters, which are then shown in a 1612 fresco in the Pauline Chapel, Santa Maria Maggiore painted by Ludovico Cigoli.

There was a certain amount of conflict between what is art and what is scientific thought and Jan showed William Blake's painting of 1795 from the Romantic Era showing Newton 'misguidedly' peering down at sterile geometric drawings.

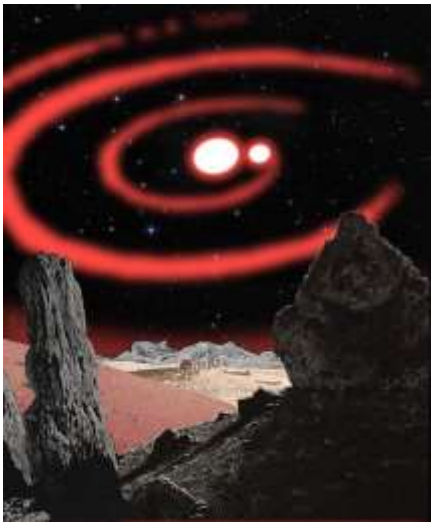
A dramatic painting by Vincent van Gogh, "Starry Night" from his asylum window in the south of France just before his death showed a wild scene of the night sky with the planet Venus. Astronomers have subsequently calculated that the painting showed Venus, as it would have been at 7 pm on the 16th of June 1889.

Starry Night – Vincent van Gogh

Persistence of Memory - Dali

Then we were brought up to 1931 with Dali's "Persistence of Memory" showing the warping of reality and time itself. Was this inspired the theory of Relativity?

The American painter and illustrator, Chesley Bonestell in the early to mid 20th century, caused a major influence on science fiction. He was regarded as an early pioneer of astronomical art along with French astronomer-artist, Lucien Rudaux. Other modern astro-artists are people like Lynette Cook whose paintings include the European Extra Large Telescope, beautifully painted to include the Milky Way and rather large planets, and David Hardy whose paintings are often of imagined scenes from the surface of other planets.



Chesley Bonestell's – Bet Lyrae from an airless planet

Pillars of Creation – NASA Hubble Space Telescope

Then, right up to date, Jan discussed whether photographs such as the Hubble "Pillars of Creation" are an accurate picture or technical art since the images have been so enhanced electronically.

Finally he posed the question for discussion as to whether infrared images are a form of art since the human eye would, in some areas of the night sky see nothing where in fact there are sources of infrared?

Has any other branch of science had such an impact on art as astronomy?

Once again Jan left us with a fresh and intriguing view of his subject; this time Art in Astronomy.

Snippets from the World of Science
John Wayte

Telescopes on the Moon

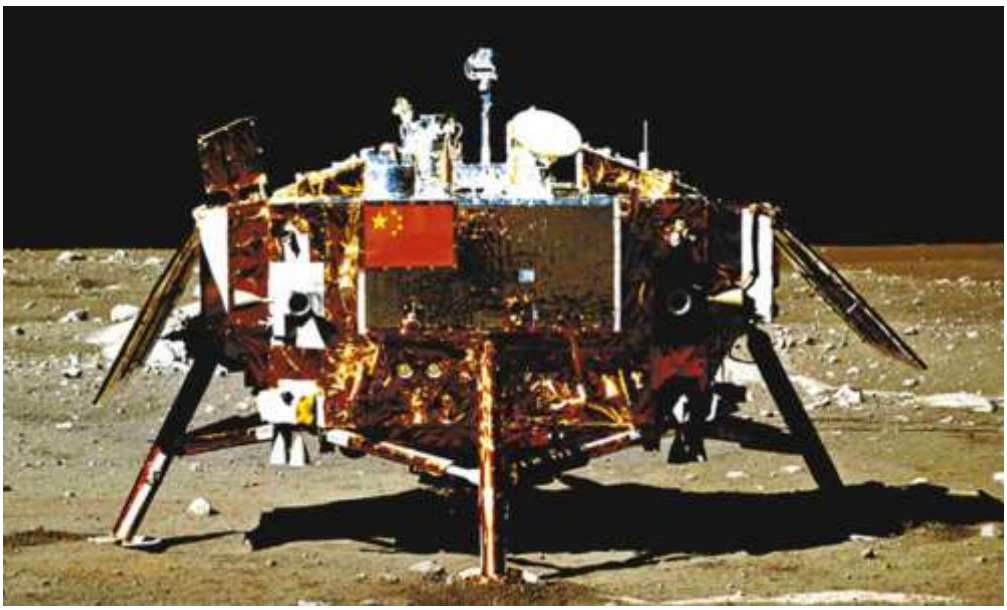
In the run-up to Christmas, John Lewis has been showing an advert with a lonely old man sitting on the Moon and a little girl on the Earth. One day the girl spies the old man through her telescope. She feels sorry for him and fires an arrow with an order for a telescope to be delivered to the Moon. A parcel subsequently arrives on the moon and the old man looks through his new telescope and sees the little girl and they both wave to each other.

This got me to thinking – are there any telescopes on the Moon?

Apparently there have been two. The first one was taken there on Apollo 16 and was a small manually operated UV telescope.

Who do you think put the second one on the Moon?

The Chinese, on Chang'e 3 Lander in December 2013. This mission was supposed to last 1 year but it has been operating so successfully that it has been extended to at least the end of this year. The Yutu rover also on the lander hasn't had such success and has failed.



China's Chang'e 3 on the surface of the Moon taken from the Yutu lander

The 15 cm telescope is particularly useful for viewing from there because as there is no atmosphere it can view in Ultraviolet light making useful observations that can't be seen from Earth. Also, since the Moon rotates much more slowly than Earth, it can make long exposures without interruptions. So far they have had 2,000 hours of use and observed 40 stars.

For the future there are several plans for more sophisticated scopes including one on the "Dark Side of the Moon" – but I thought that someone in Pink had already been there before…

A distant cloud of haze

In a galaxy far, far away there is a cloud of Christmas Cheer. It is a rather large cloud of alcohol, in fact so much that it could make 400 trillion pints of beer. Not quite sure where they get the hops from, but where there's a will there's a way! If you want to go and get a pint, just hop (ha ha) on your local spacecraft and go to the constellation of Aquila and travel (wait for it) 10,000 light years. This cloud is so large that our Milky Way could fit in it 10,000 times over.

Is someone out there having a hell of a party?

DECEMBER MEETING

Wednesday 16th December - Brian Mills FRAS takes as his theme "What Did Women Ever Do For Astronomy?"

This meeting will take place in the Drama Studio at Uplands Community College. The address is: The Drama Studio, Uplands Community College, Lower High Street, Wadhurst TN5 6AZ and is through the gates and on the left.

Meetings begin at 1930 although members are invited to arrive anytime after 1900 as this is a good time to exchange ideas and discuss problems and also relax before the meeting starts.

Anyone is welcome but non-members are asked if they wouldn't mind contributing £3 towards costs.

Since this is the meeting just before Christmas, there will be mince pies.

FUTURE MEETINGS

Wednesday 20th January 2016 – A brief AGM of the Society to be followed by a talk given by Ian King who talks about his life in telescopes.

Wednesday 17th February 2016 – Melanie Davies tells us about "Cassini-Huygens: A Journey to Saturn"

Wednesday 16th March 2016 – The entertaining Dr. David Mannion updates us on "The Search for Dark Matter and Dark Energy"

SKY NOTES FOR DECEMBER 2015

Planets

Mercury passed through superior conjunction in the middle of November and then became an evening object. It will reach greatest eastern elongation (20°) on the 29th December. On that date, with the Sun 6° below the south western horizon, Mercury will be 6° above it and will be a difficult target at magnitude -0.5.

Venus is still a magnificent object in the morning skies shining at magnitude -4.2. At the start of the month it rises more than 4 hours ahead of the Sun, although its period of visibility is decreasing. By the end of December this has dwindled to 3 hours and will continue to do so as the planet approaches superior conjunction in June 2016. Its phase is steadily increasing and it has now become gibbous whilst its apparent size decreases as it becomes more distant. Venus passes within 5° of the bright star Spica (in Virgo) on the 1st of the month. See fig 1.

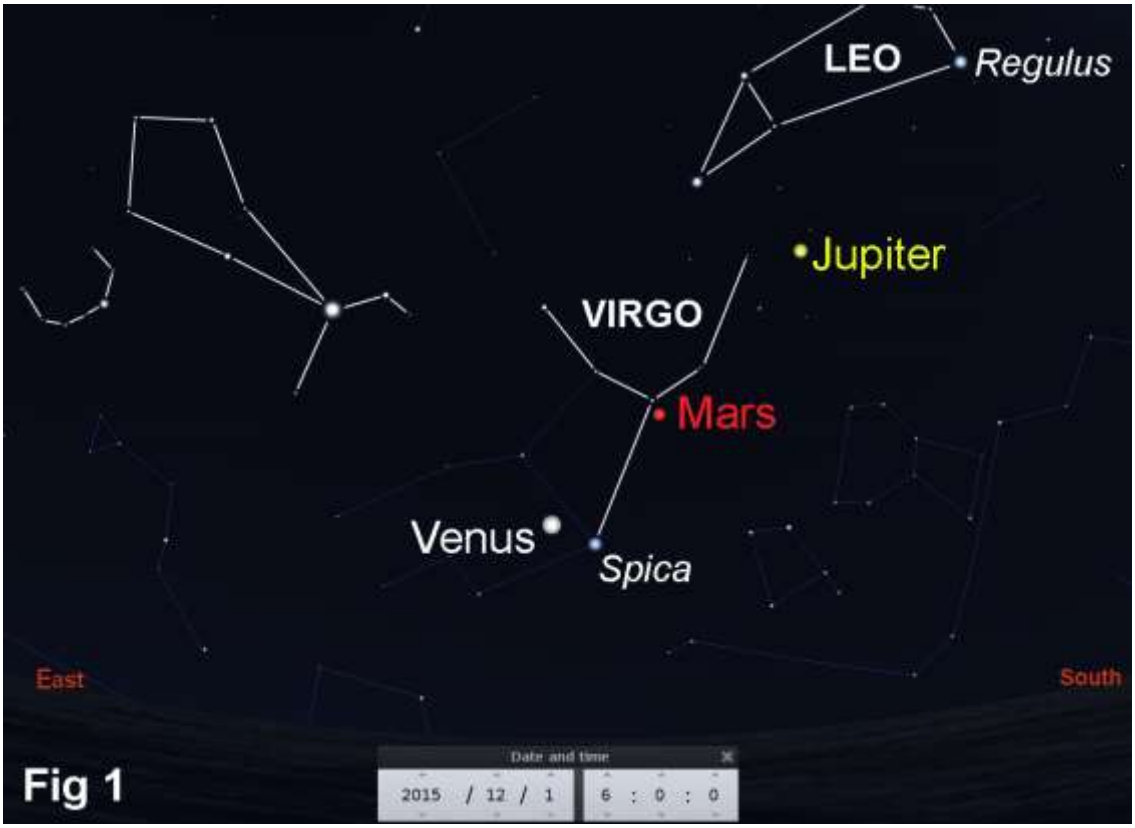


Fig 1

Mars is also a morning object within the confines of Virgo as shown in fig 1. Unlike Venus, Mars is growing gradually in apparent size and brightness as it approaches opposition next May. It rises just after 02.00 throughout the month despite its fairly brisk easterly (direct) motion although it will be mid April next year before it rises early enough to be classed as an evening object. Sadly for us it is not only moving east but also south so that it is dropping further below the celestial equator making it a more difficult object to observe due to it restricted altitude. Currently its declination is -6° but by the time of opposition this will have tumbled to -22° which translates to an altitude at culmination of just 17°.

One problem of low altitude is that objects closer to the horizon suffer from "extinction" which is a gradual dimming of their light due to it having to pass through a thicker layer of the Earth's atmosphere as shown in fig 2. Here you can see that an observer on at the Earth's surface who is looking up towards the zenith at point "A" is looking through a lot less air than if he were looking towards "B" on the horizon. That atmosphere, of course, has a large number of pollutants within it which exacerbates the issue.

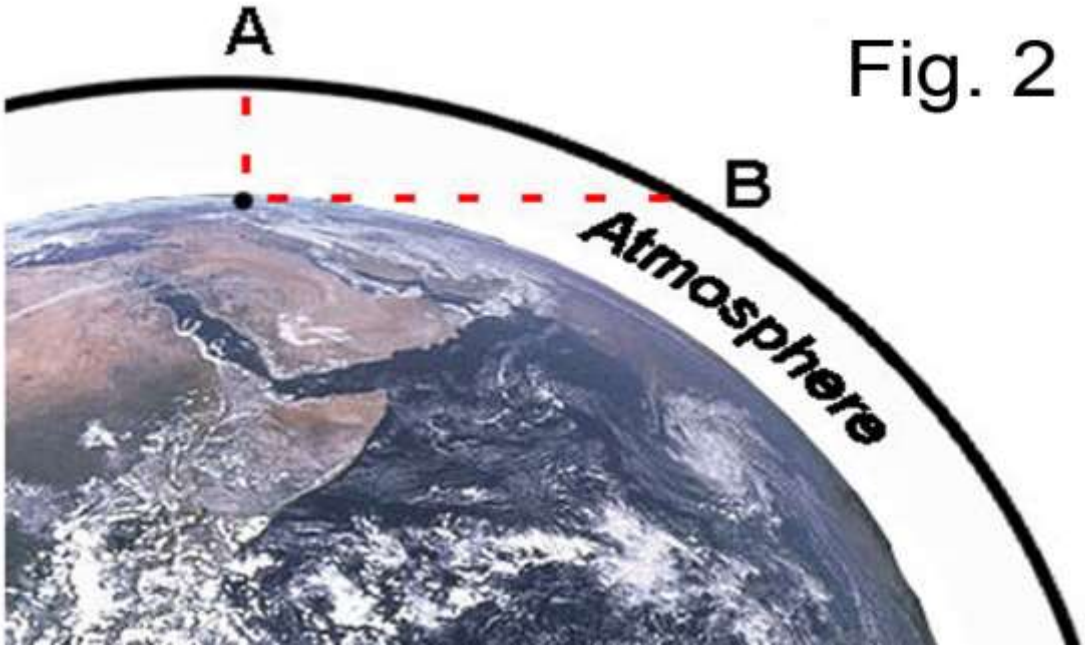


Fig. 2

Jupiter is the last of the early morning trio, though it lies the furthest west of the three and rises before midnight by the middle of the month. It will reach opposition on the 8th March 2016 and so, in readiness, is growing both in brightness and apparent size. This month its brightness is -1.9 and will rise steadily to a maximum of -2.5. Data tables giving Jupiter's size in arc seconds always give two figures, one around the equator and one around the poles. This is because centrifugal force has caused the planet to become considerably larger at the equator. This month, for example, the gas giant is 39.3" from west to east and 36.7" north to south. These measurements correspond to an equatorial diameter of 142,984 km but a polar diameter of "only" 133,708 km. Jupiter's position at the beginning of December is shown in fig 1.

Saturn was in conjunction with the Sun on the 30th November and may now be glimpsed low down in the dawn skies close to Venus. Fig 3 shows the view looking generally south at 07.00 at the end of December. Locating the ringed planet, at magnitude +0.5, will be made easier by using Venus and the bright star Antares, because the three bodies form a right angled triangle.

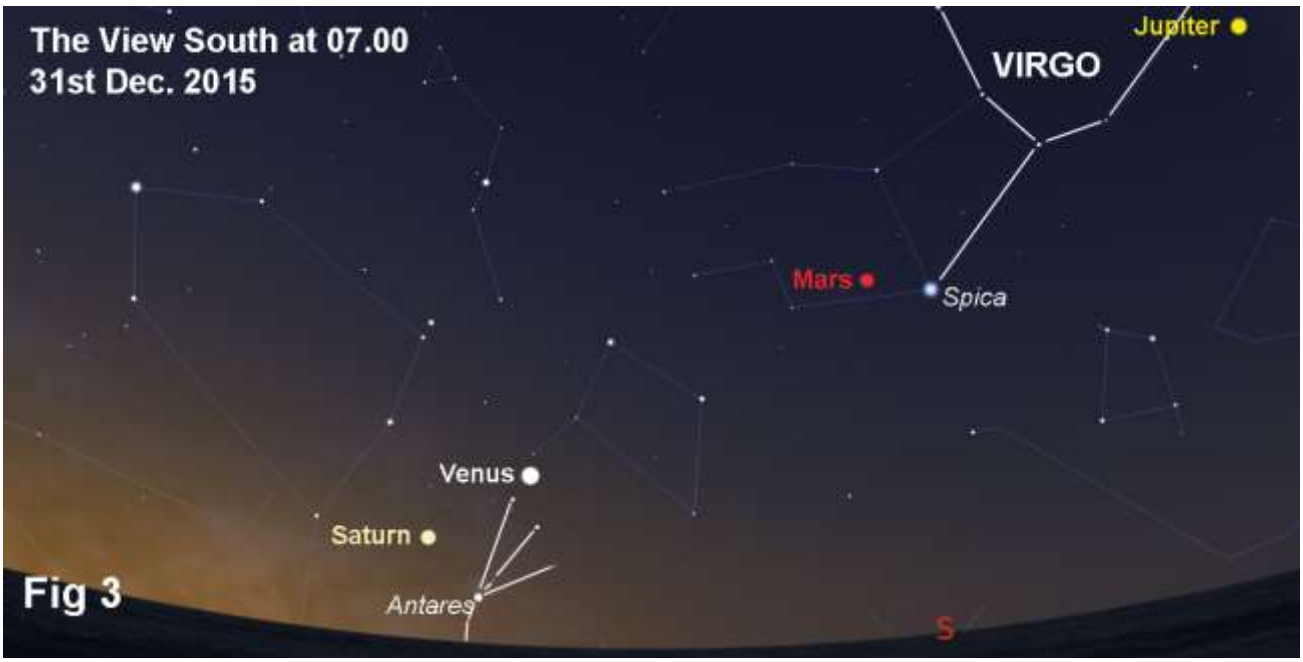
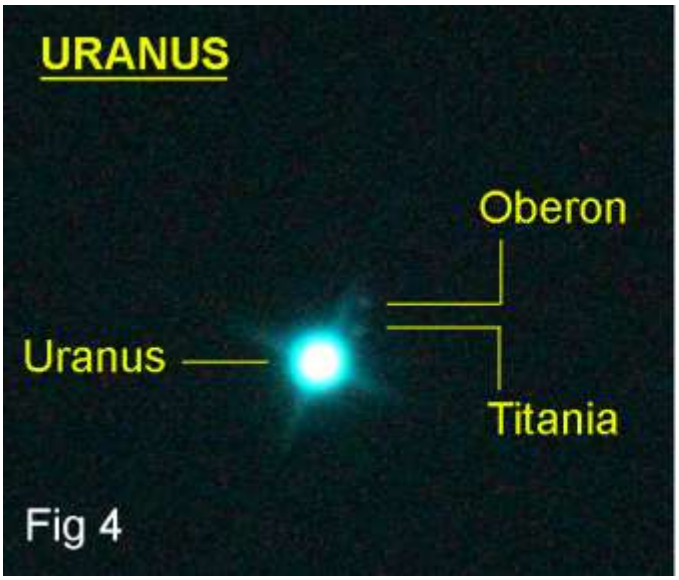
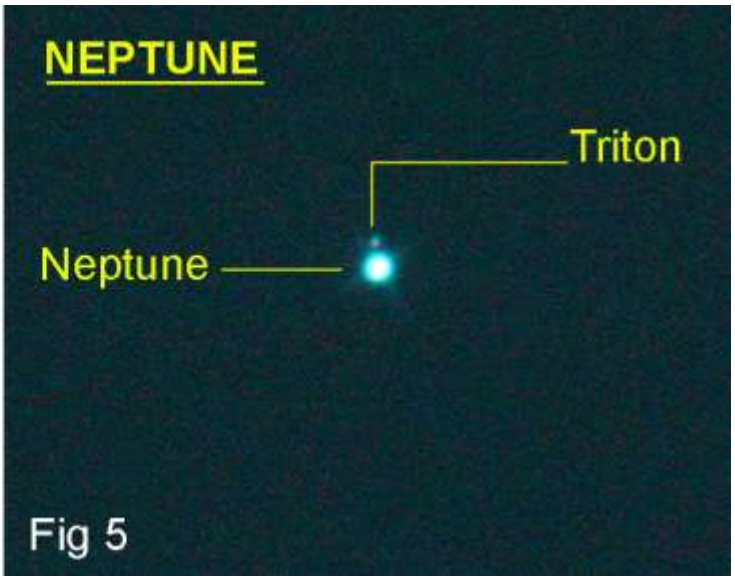


Fig 3

Uranus and Neptune are both moderately well positioned evening objects with the former being in Pisces and the latter in Aquarius. Uranus at magnitude +5.7 culminates at an altitude of 45° whilst Neptune is fainter at magnitude +7.8 and crosses the meridian 30° above the horizon.

The images in figs 4 and 5 are ones I took on Friday 13th November 2015 of the two "Ice Giants". Fig 4 is a 30 second exposure that shows Uranus and its two largest moons Oberon and Titania, both of which are 14th magnitude. Fig 5 is a 60 second exposure of Neptune showing its largest moon Triton which is also 14th magnitude. The images were taken at prime focus using a Canon EOS 700D that was coupled to a 12" Ritchey Chrétien telescope.





Lunar Occultations

In the table below I've listed events for stars down to magnitude 7.0 that 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 GMT.**

Dec	Time	Star	Mag	Ph	Alt °	% illum.	mm
1st	23.58	SAO 98747	6.9	RD	17	62	80
12th	20.35	ZC 109	6.4	DD	38	63	60
20th	21.35	ZC 269	7.0	DD	42	74	80
22nd	16.23	ZC 516	6.9	DD	19	90	110
23rd	17.06	ZC 685	6.6	DD	19	96	100
25th	23.37	ZC 1029	5.2	RD	55	99	50

Occultation of Aldebaran

There is another event in the sequence of occultations of the first magnitude star Aldebaran this month. The times are more sociable than previously but the disadvantage is that the Moon, on this occasion, is 96% illuminated.

Fig 6 shows the position of Aldebaran (arrowed) first for the disappearance at the dark limb, and then the more difficult reappearance at the bright limb. Binoculars will show the disappearance with ease and tripod mounting them will assist greatly. **Times are in GMT.**

Dec.	Time	Star	Mag	Ph	Alt °	% illum.	mm
23rd	18.09	Aldebaran	0.9	DD	29	96	40
23rd	19.11	Aldebaran	0.9	RB	38	96	40

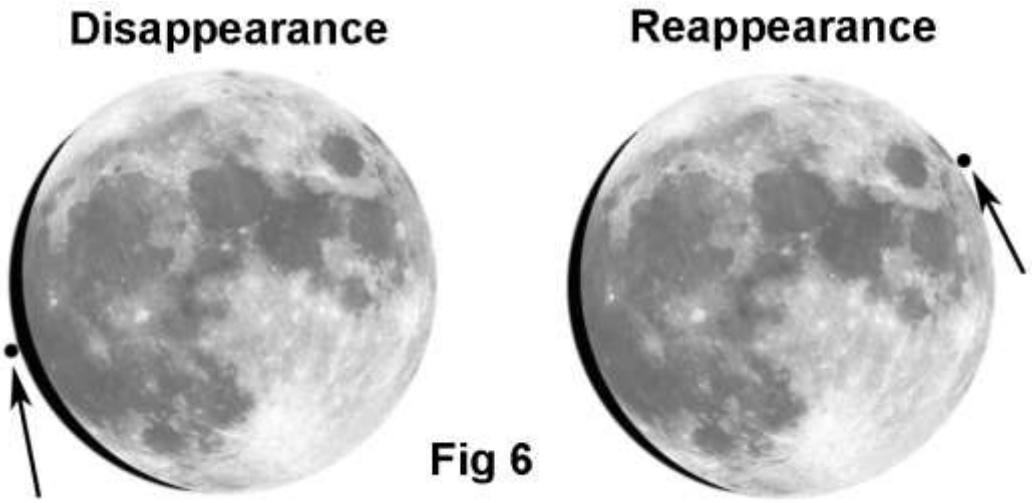


Fig 6

Phases of the Moon for December

Last ¼	New	First ¼	Full
3rd	11th	18th	25th

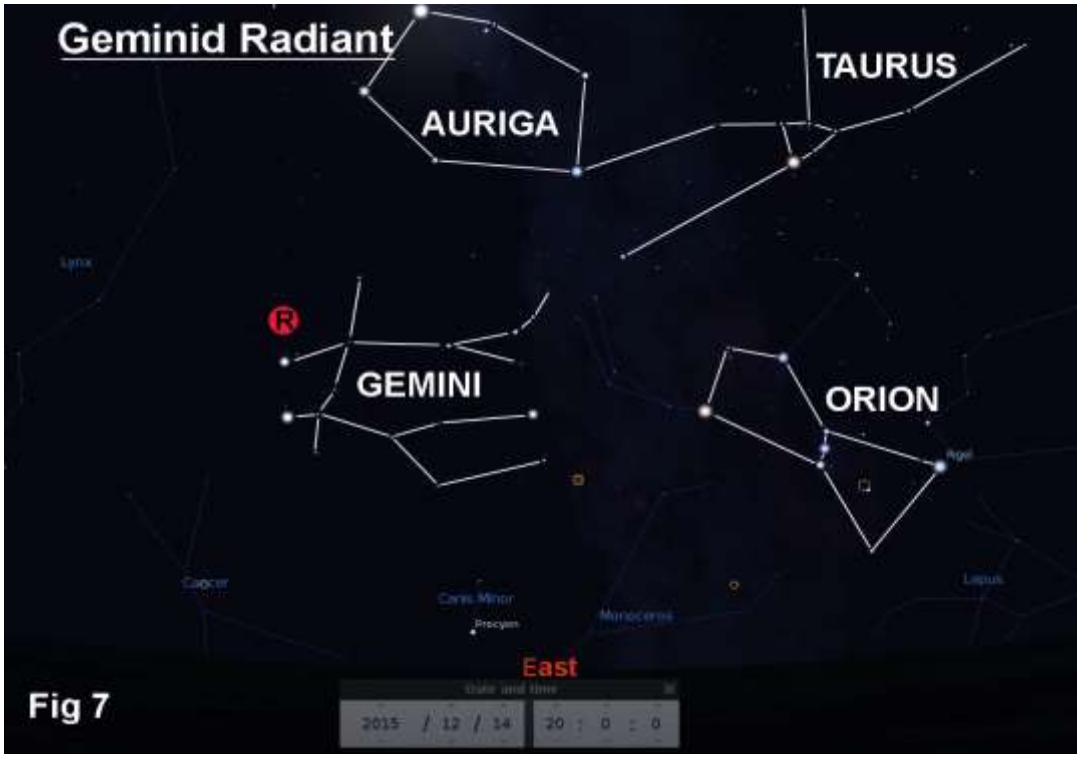
The Night Sky in December (Written for 22.00hrs GMT mid month)
In the north the bright star Vega is about to be lost below the horizon, leaving just one member of the Summer Triangle on view. The Great Bear stands on its tail to the east of the pole, whilst diametrically opposite it lies the constellation of Cepheus. Within its borders is IC1396, The Elephant's trunk Nebula at magnitude 3.5, which should be visible under ideal conditions although, by its nature, it is a diffuse object. There is also a smattering of open clusters, the brightest of which is NGC 7160 at magnitude 6.1.
Ursa Minor appears to "hang" from the Pole Star at this time of year, whilst Draco curls beneath it with the dragon's head pointing towards the now recently set Hercules. North of the little bear and straddling the meridian lies the faint collection of stars that makes up the indistinct constellation of Camelopardalis. Save for a few faint galaxies and the open cluster, NGC 1502 at magnitude 5.7, there is little in the area to linger over. As the plough climbs higher in the sky, those stellar neighbours, M81 and M82 at a current altitude of 45°, become more and more accessible and enticing particularly for the imagers amongst us.

Turning towards the east we see that Leo has almost cleared the horizon, whilst above the lion is the faint outline of the celestial crab. Cancer contains the open cluster M44, which has a nebulous appearance to the naked eye, although binoculars will easily resolve individual stars. The fact that Messier included such objects in his catalogue has always been a matter for conjecture. He began recording anything nebulous simply because, as a comet hunter, he wanted to avoid any comet-like object that could lead to confusion. As well as M44 he also included the Pleiades (M45) because, it is argued, he wanted to outdo his French rival, La Caille, who had catalogued 42 nebulous objects from the Cape of Good Hope.
Below Cancer is Hydra, the water snake, the largest of the 88 modern constellations covering just over 1,300 square degrees. The head of the snake is obvious, just south of the crab, whilst its tail borders Centaurus and is best seen during late spring and early summer evenings.

Looking south, Capella is 15° from the zenith although still a little east of the meridian. Below it Aldebaran is also approaching that particular threshold and ahead of it lies the selection of faint constellations, Eridanus, Cetus and Pisces when compared to the dazzling groups that follow in its wake. Just to the east of the meridian we have Orion and his retinue that together typify the cold, crisp and frosty nights of winter when the hunter and his dogs command the southern aspect. The Orion nebula is always a favourite of imagers, because even those with a DSLR and a telephoto lens can record something of the beauty of that area.

Towards the west the Square of Pegasus will soon be lost from view. Andromeda, which reaches from the top left corner of the square, points towards the zenith with M31 still at a very respectable altitude of over 55°. The line of Andromeda, if followed north, leads towards Perseus with the well known double cluster in the sword handle. Also within the borders of Perseus we find M34, an open cluster that should be just visible to the naked eye along with the near neighbours NGC 1545 and NGC 1528. These are both open clusters of magnitudes 6.2 and 6.4 respectively that at this time can be found just over 5° from the zenith.

Meteors – The Geminids
The Geminids are active from December 8th to the 17th with maximum occurring at 13.00 on the 14th. This is the strongest shower of the year with estimates of 100 to 120 meteors per hour. However, that statement needs some qualification as this refers to the zenithal hourly rate (ZHR) which is a notional figure that predicts what the rate would be if the radiant were at the zenith. Of course this rarely happens, leading to disappointment for those who don't understand the terminology. Despite that note of caution I think we could realistically expect to see one meteor per minute particularly as the Moon is a thin waxing crescent on the night of maximum and has set before 19.30 anyway. In fig 7 the radiant is shown by an "R" within a red circle.



Meteors – The Ursids

The period of activity lasts from December 17th to the 25th with maximum taking place on the night of the 22nd/23rd. The ZHR is predicted to be around 10, although there have been occasional outbursts. Moonlight will interfere to some degree this year with a waxing gibbous Moon towards the south.

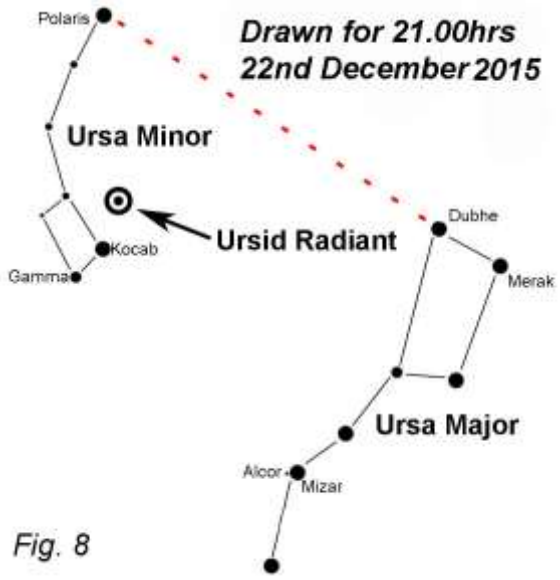


Fig. 8

ISS

Below are details for passes of the International Space Station (ISS) that occur before midnight and are magnitude -2.0 or brighter. 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 GMT.**

Dec.	Time	Mag.	Alt°	Az.		Dec.	Time	Mag.	Alt°	Az.
8th	18.20	-2.1	37	SSW		15th	18.29	-2.0	40	W
9th	17.28	-2.2	32	SSE		16th	17.36	-3.4	81	N
10th	18.10	-3.2	69	SSW		17th	16.34	-3.3	78	N
11th	17.16	-2.9	52	SSE		17th	18.19	-2.8	58	WSW
12th	17.59	-3.5	87	NNW		18th	17.25	-3.4	84	S
13th	17.05	-3.3	77	SSE		19th	16.31	-3.4	82	N
14th	17.48	-3.4	78	N		19th	18.07	-2.3	42	SSW
15th	16.54	-3.4	85	NNW		20th	17.14	-2.9	61	SSW

Iridium Flares

The flares that I've listed are magnitude **-**2.0 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 . Remember that 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 at those times. **Times are in GMT.**

Dec.	Time	Mag.	Alt°	Az.°		Dec.	Time	Mag.	Alt°	Az.°
1st	17.18	-2.3	16	290 (WNW)		18th	16.57	-2.5	17	208 (SSW)
1st	17.27	-5.7	14	292 (WNW)		19th	18.08	-7.3	32	165 (SSE)
2nd	16.40	-3.6	12	220 (SW)		20th	16.55	-5.4	14	213 (SSW)
2nd	17.03	-2.3	19	287 (WNW)		21st	17.47	-5.1	12	297 (WNW)
3rd	16.57	-4.3	20	287 (WNW)		22nd	17.23	-3.1	17	291 (WNW)
3rd	17.41	-2.1	32	177 (S)		22nd	17.32	-5.8	15	293 (WNW)
7th	17.27	-2.3	29	186 (S)		23rd	17.17	-4.2	18	290 (WNW)
9th	15.45	-6.7	33	277 (W)		23rd	17.53	-6.3	31	174 (S)
10th	15.48	-5.1	35	276 (W)		26th	16.41	-2.2	25	284 (WNW)
11th	17.12	-2.8	26	192 (SSW)		27th	17.38	-6.9	29	183 (S)
15th	18.23	-5.9	33	157 (SSE)		28th	16.20	-5.8	30	280 (W)
16th	17.00	-4.1	20	204 (SSW)		30th	17.29	-3.1	27	190 (S)

Advance Warning for 2016

9th January – Conjunction of Saturn and Venus
20th January – Occultation of Aldebaran
8th March – Jupiter at opposition
9th May – Transit of Mercury
22nd May – Mars at opposition
3rd June – Saturn at opposition
16th September – Penumbral eclipse of the Moon
13th December – Occultation of Aldebaran

Brian Mills

SPACEPLACE - NASA

This article is provided by NASA Space Place.
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Our Solar System Is Almost Normal, But Not Quite
by Ethan Siegel

It was just over 20 years ago that the very first exoplanet was found and confirmed to be orbiting a star not so different from our own sun. Fast forward to the present day, and the stellar wobble method, wherein the gravitational tug of a planet perturbs a star's motion, has been surpassed in success by the transit method, wherein a planet transits across the disk of its parent star, blocking a portion of its light in a periodic fashion. Thanks to these methods and NASA's Kepler spacecraft, we've identified many thousands of candidate planets, with nearly 2,000 of them having been confirmed, and their masses and densities measured.

The gas giants found in our solar system actually turn out to be remarkably typical: Jupiter-mass planets are very common, with less-massive and more-massive giants both extremely common. Saturn—the least dense world in our solar system—is actually of a fairly typical density for a gas giant world. It turns out that there are many planets out there with Saturn's density or less. The rocky worlds are a little harder to quantify, because our methods and missions are much better at finding higher-mass planets than low-mass ones. Nevertheless, the lowest mass planets found are comparable to Earth and Venus, and range from just as dense to slightly less dense. We also find that we fall right into the middle of the "bell curve" for how old planetary systems are: we're definitely typical in that regard.

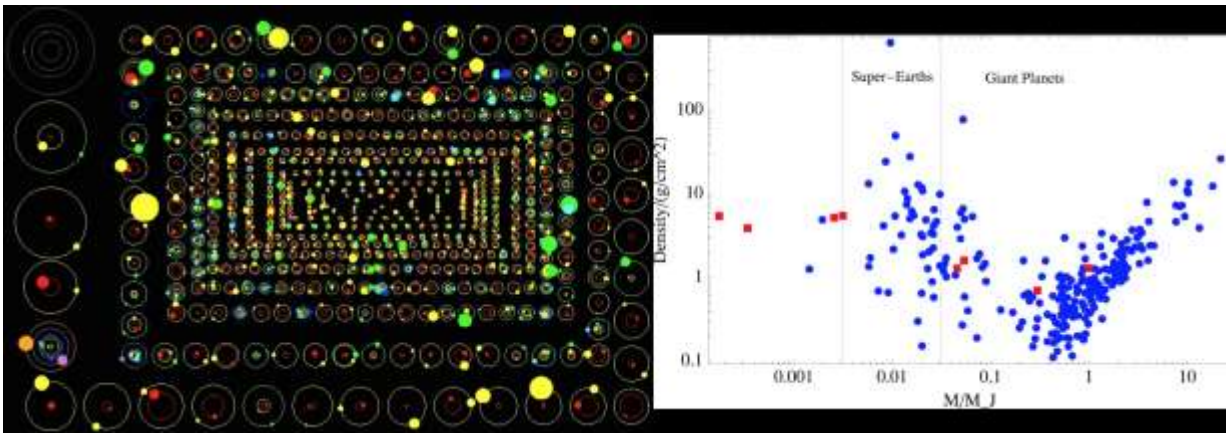
But there are a few big surprises, which is to say there are three major ways our solar system is an outlier among the planets we've observed:

All our solar system's planets are significantly farther out than the average distance for exoplanets around their stars. More than half of the planets we've discovered are closer to their star than Mercury is to ours, which might be a selection effect (closer planets are easier to find), but it might indicate a way our star is unusual: being devoid of very close-in planets.

All eight of our solar system's planets' orbits are highly circular, with even the eccentric Mars and Mercury only having a few percent deviation from a perfect circle. But most exoplanets have significant eccentricities, which could indicate something unusual about us.

And finally, one of the most common classes of exoplanet—a super-Earth or mini-Neptune, with 1.5-to-10 times the mass of Earth—is completely missing from our solar system.

Until we develop the technology to probe for lower-mass planets at even greater distances around other star systems, we won't truly know for certain how unusual we really are!



Images credit: NASA / Kepler Dan Fabricky (L), of a selection of the known Kepler exoplanets; Rebecca G. Martin and Mario Livio (2015) ApJ 810, 105 (R), of 287 confirmed exoplanets relative to our eight solar system planets.

CONTACTS

General email address to contact the Committee
wadhurstastro@gmail.com

Chairman John Vale-Taylor

Secretary & Events Phil Berry 01892 783544

Treasurer John Lutkin

Membership Secretary John Wayte

Editor Geoff Rathbone 01959 524727

Director of Observations Brian Mills 01732 832691 email: brianm@wkrcc.co.uk

Committee Members Jim Cooper
Eric Gibson

Wadhurst Astronomical Society website:
www.wadhurstastro.co.uk

SAGAS web-site:
www.sagasonline.org.uk

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