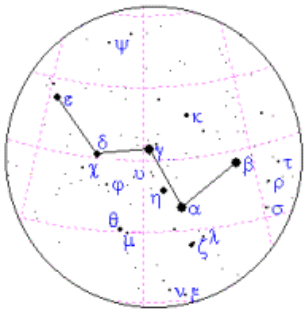


Wadhurst Astronomical Society Newsletter March 2017

2017 SUBSCRIPTIONS

Subscriptions to the Wadhurst Astronomical Society are due for 2017. The subscriptions are £18 per adult and £25 for two members at the same address. Members under 17 years of age and students remain free.

Subscriptions can be paid either by cheque made payable to Wadhurst Astronomical Society or as cash at the meetings or by post to:
John Wayte
Members Secretary
Wadhurst Astronomical Society
27 Pellings Farm Close
Crowborough
East Sussex
TN6 2BF

Subscriptions can also be paid via electronic banking to:
Wadhurst Astronomical Society
Account Number **35104139**
Sort Code **60-22-15**
Putting your name as the **Reference** so we know who is paying.

MEETINGS

FEBRUARY MEETING

The February meeting was led by Phil Berry who, after outlining the evening's programme, said that our Chairman, Brian Mills had been in touch with the Royal Astronomical Society with the idea of arranging a visit to their fascinating library which holds a number of important and historical items. At this stage, Brian is trying to get an idea of the number of members who would be interested in going along. The visit would probably be mid-week during one of the summer months this year. A show of hands at the meeting indicated that there is sufficient interest to make it worth making further enquiries. Other members will be able to show their interest at the next meeting.

Phil went on to say that he has just completed a new 2017 Dark Skies Survey for Wadhurst. He hopes this will go towards the Council's application for a loan from the Sussex Community Fund of about £10,000 to improve the lighting.

Phil added that he is moving house and warned that he will not have a broadband connection for the next few weeks and so there may be a delay in replying to any emails.

Then he introduced tonight's talk from a speaker we are very pleased to welcome back. David Mannion is now in semi-retirement and is still giving many talks including presentations on cruise ships.

ET – Are You Out There?
Dr David Mannion

To begin his talk, David asked how many of us think there is intelligent life of any form in our Galaxy; to which just about everyone said they thought there might be. Everyone believed that we are not unique in the universe although there was one comment about it not being intelligent.

We were told that there is something like 10^{22} stars in the Universe or to put it visually, there are more stars in the Universe than there are grains of sand on all the beaches of the Earth.

Even within our own Galaxy, communicating by radio is going to take a very long time. As David pointed out, we have been broadcasting for just over 90 years and the earliest of those broadcasts would only have travelled 90 light years – any intelligent life

53 light years away might just be tuning in to the first episode of “Coronation Street”! Our Galaxy alone is 100,000 light years across.

We looked at the local group of galaxies, which includes the Magellanic Clouds and Andromeda Galaxy which alone is one-and-a-half times larger than our Milky Way and then we considered the number of stars and possible planets there could be.

Next, David talked about how we can begin to estimate the number of possible intelligent life forms there might be by looking at how many stars there are and roughly what the conditions are for life to occur on any planets. He added that we have been ‘listening out for ET’ broadcasts for the past 58 years.

But we need some idea of the chance of there being life and we were introduced to the Drake Equation which looks just at our Galaxy;

$$N = N^*. fp . ne . fl . fi . fc . L$$

N is the number of intelligent civilisation who can and would want to communicate with us.
N* is the number of stars in our Galaxy which is between 100 and 200 billion.
fp is the fraction of stars that have planets
ne is the number of planets that could sustain life around each star
fl is the fraction of planets that will develop life.
fi is the fraction of life-bearing planets that develop intelligent life.
fc is the fraction of intelligent life that can and will communicate.
L is the fraction of the lifetime of our galaxy in which an intelligent civilisation survives.

David inserted data as accurately as possible into the equation. For example, there are now known to be over 3,500 exoplanets with about a dozen less than the size of the Earth in the habitable zone. More are continually being discovered by the Kepler Mission and other sources. As many as three are being discovered every day. It is possible that there are 17 billion Earth-like planets in our Galaxy although not all would be at the right distance from their parent sun to produce life. His answer was however very approximate but indicated it might be positive.

We were shown the different methods of detecting exoplanets such as photometry where an exoplanet passes in front of a star causing an incredibly small dip in light level. Another method is by using Doppler effect to see the minute changes in red-shift. The wobble of the parent sun can sometimes be detected, indicating the presence of an object in orbit around it. Yet another method is by lensing, where gravity can distort the light from the star. More and more sensitive measuring techniques are continually being developed.

Kepler Spacecraft - NASA

One interesting fact David told us about is that if the parent star is very massive, it will burn its fuel much faster and won’t survive long enough for intelligent life to form.

Sadly, one mission called TPF (Terrestrial Planet Finder) could have been capable of analysing the atmosphere of some exoplanets but was axed in 2008.

Part of the Atacama Large Millimetre Array - ALMA

Next, David talked about ALMA, the Atacama Large Millimetre Array in Chile, which consists of 64 radio telescopes operating in the millimetre part of the electromagnetic spectrum. The whole array is like having a telescope 14 kilometres in diameter and at those wavelengths it becomes possible to see further than optical telescopes when looking towards the middle of our Galaxy because microscopic particles of dust that exist don't present a problem. ALMA actually has a better resolving power than the Hubble Space Telescope.

Another use of the millimetre band is that it is possible to listen on 60,000,000 channels. So, what is the chance of intelligent life being found on a planet at this present time? David said the chance of there being life is about 30,000 to 1, a 0.003% probability on just one channel. With 10,000,000 stars and 60,000,000 channels we were told that it would give 1,800,000,000,000,000,000 to 1. It is possible to reduce this chance by looking at thousands of planets and millions of channels over decades, over and over again which reduces the chance to 1 in a 100 billion.

We ourselves have sent messages in a programme called SETI, Search For Intelligent Life, from the Great Radio Telescope at Arecibo in Puerto Rico and the Yevpatoria radio telescope in Crimea but as David says, we are going to have to wait a very long time for a reply, if ever.

Giant Arecibo Dish – Puerto Rica

Yevpatoria Telescope - Crimea

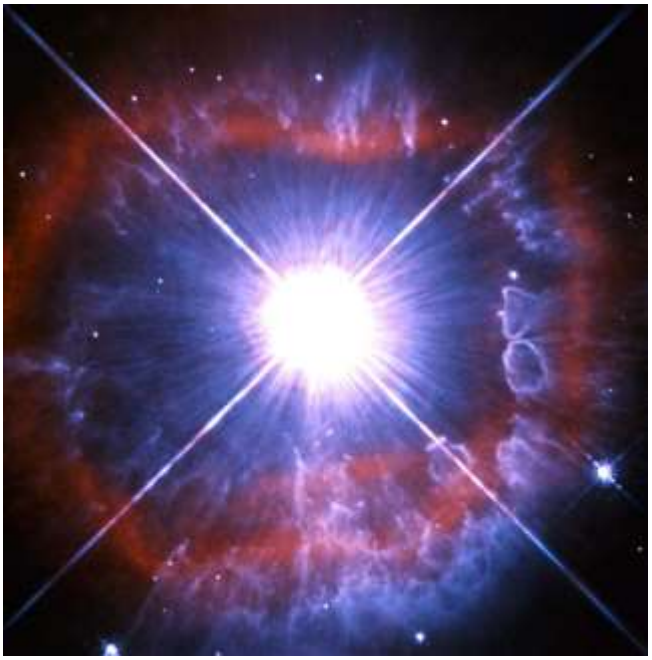
Finally, David asked "Has ET already landed?" The energy required for a spacecraft to reach the speeds required would be the equivalent of 100 x one-GW power stations for 390 years.

Should we talk to Aliens? Professor Steven Hawkins says "No"!

What do you think?

Snippets from the world of Science
John Wayte

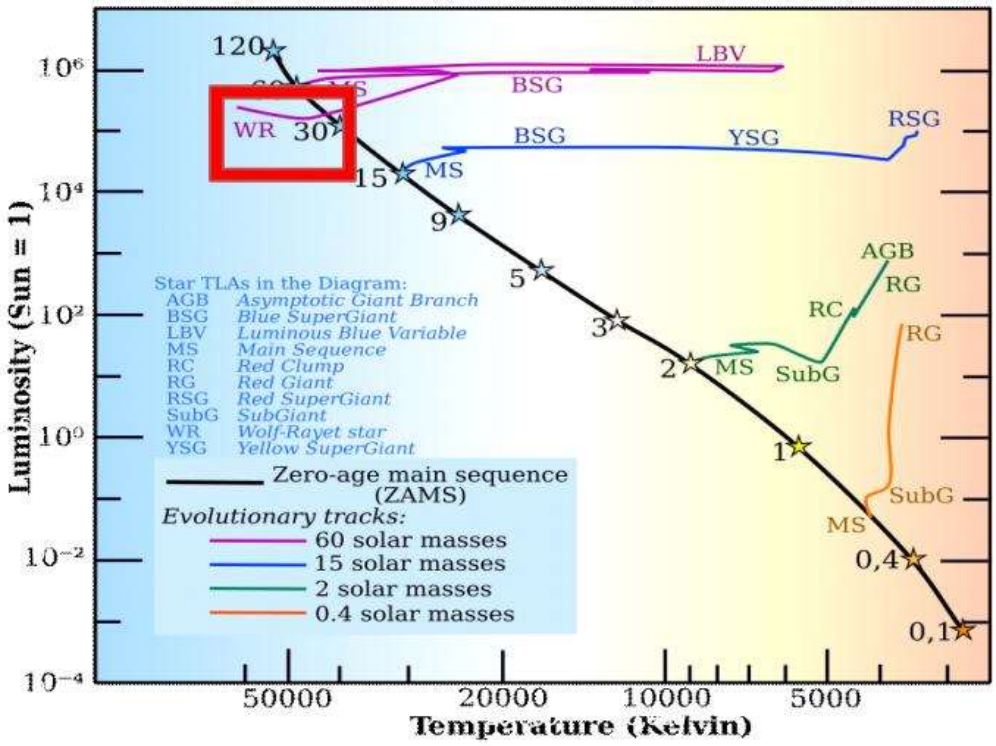
This image taken by Hubble is of a strikingly luminous star AG Carniae or more specifically HD94910. The star lies 20,000 light years away in the southern constellation of Carina.



AG Carinae

It is a rare star and is classified as a luminous blue variable and will transform into a Wolf-Rayet star. This type of star has completely lost its outer layer of hydrogen and is fusing helium or heavier elements in the core. They are massive stars some 20 to 25 times bigger than our Sun and have an extremely high surface temperature of 24,000 Kelvin compared to our sun of about 5,000 Kelvin. However, its luminosity is several million times greater than our Sun.

I have shown the Hertzsprung-Russell diagram and marked the star with a red box.



This type of star is shedding its mass at a phenomenal rate and exerts enormous pressure of several million kilometres per hour on the already expelled material from the star. These winds have already cleared a region immediately surrounding the star and created these rather beautiful sculptured images.

The glare at the centre of the picture is not the actual star, which is tiny and hidden in the saturated region. The white cross is simply an effect of the telescope.

Noordwijk

This is the door to the ESA's cavernous Hertz chamber.

The Meteosat Third Generation

Meteosat third Generation (MTG) imagining and sounding satellites.

The space segment procurement will include four MTG-I imaging and two MTG-S sounding satellites.

Inside the HERTZ Chamber

A prototype antenna placed within a mock-up MTG-I underwent testing inside ESA's Hybrid European RF and Antenna Test Zone (HERTZ) chamber in ESA's ESTEC technical centre in Noordwijk in the Netherlands.

About Noordwijk Space Centre

ESA has sites in several European countries, but the European Space Research and Technology Centre (ESTEC) in Noordwijk is the largest. ESTEC is the technical heart – the incubator of the European space effort – where most ESA projects are born and where they are guided through the various phases of development. The main purposes are:

- Developing and managing all types of ESA missions: science, exploration, telecommunications, human spaceflight, satellite navigation and Earth observation.
- Providing all the managerial and technical competences and facilities needed to initiate and manage the development of space systems and technologies.
- Operating and environmental test centre for spacecraft, with supporting engineering laboratories specialising in systems engineering, components and materials, and working within a network of other facilities and laboratories.
- Supporting European space industry and working closely with other organisations, such as universities, research institutes and national agencies from ESA member states, and cooperating with space agencies all over the world.

Space Expo Noordwijk

Space Expo is Europe's first permanent space exhibition. Space Expo is also the visitor's centre for ESA in the Netherlands, the European Space Agency's largest technical establishment.

- First men on the Moon
- Experience a rocket launch
- Discover satellites
- How astronauts live in space

Etc.

Following John's talk, Brian Mills, our Chairman and Director of Observations gave the Sky Notes which follow later in the newsletter.

MARCH MEETING

15th March – Professor Louise Harra brings us the latest news of "Solar Activity".

Meetings will 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.

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

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

FUTURE MEETINGS

19th April – William Joyce tells us about "Interacting and Active Galaxies"

17th May – **This meeting will take place in the Drama Studio** – The Science and Astronomy writer Colin Stuart sets out "13 Journeys Through Space and Time: Christmas Lectures From the Royal Institution"

21st June - TBC

SKY NOTES FOR MARCH 2017

Planets

Mercury will reach superior conjunction on March 7th when it will be on the opposite side of the Sun to the Earth and therefore invisible to us. However, as the month progresses the planet becomes visible low down in the west after sunset. Fig 1 shows its position just after 20.00 hrs on the last day of March, at the end of civil twilight which is when the Sun is 6° below the horizon. This is the day before it reaches greatest elongation of 19° and will provide Mercury's best evening showing of 2017.

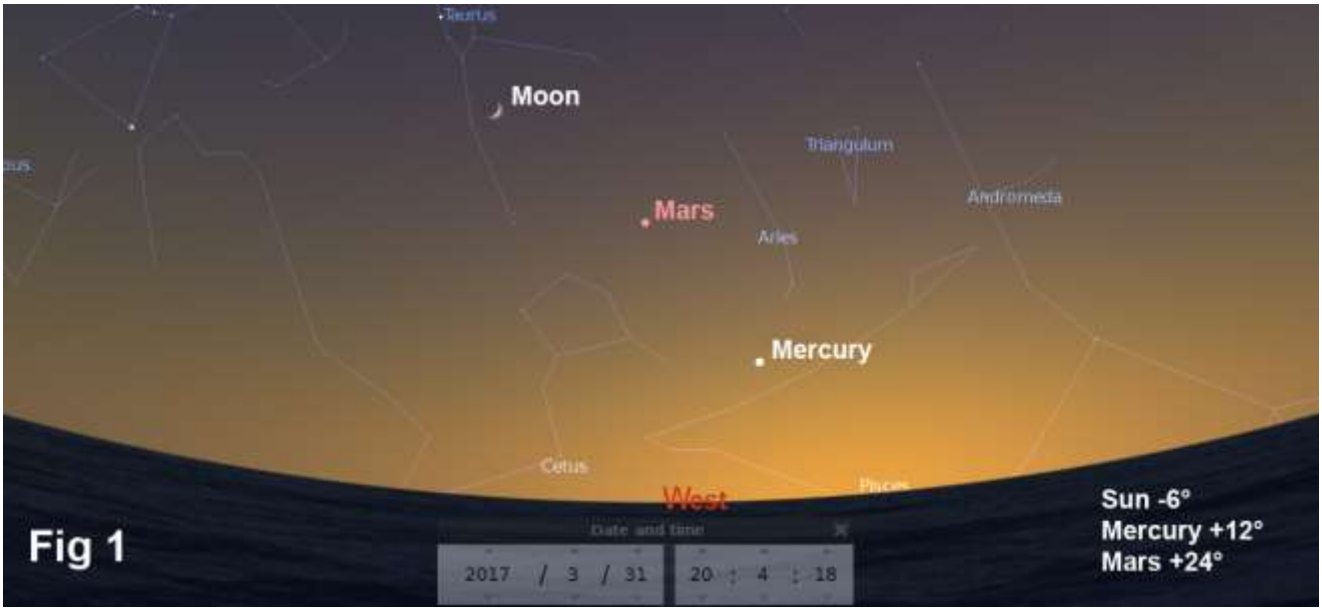


Fig 1

Venus is still a brilliant evening object setting more than three hours after the Sun at the start of the month. However, make the most of it now as it will be very quickly overtaken by the Sun, reaching inferior conjunction on March 25th.

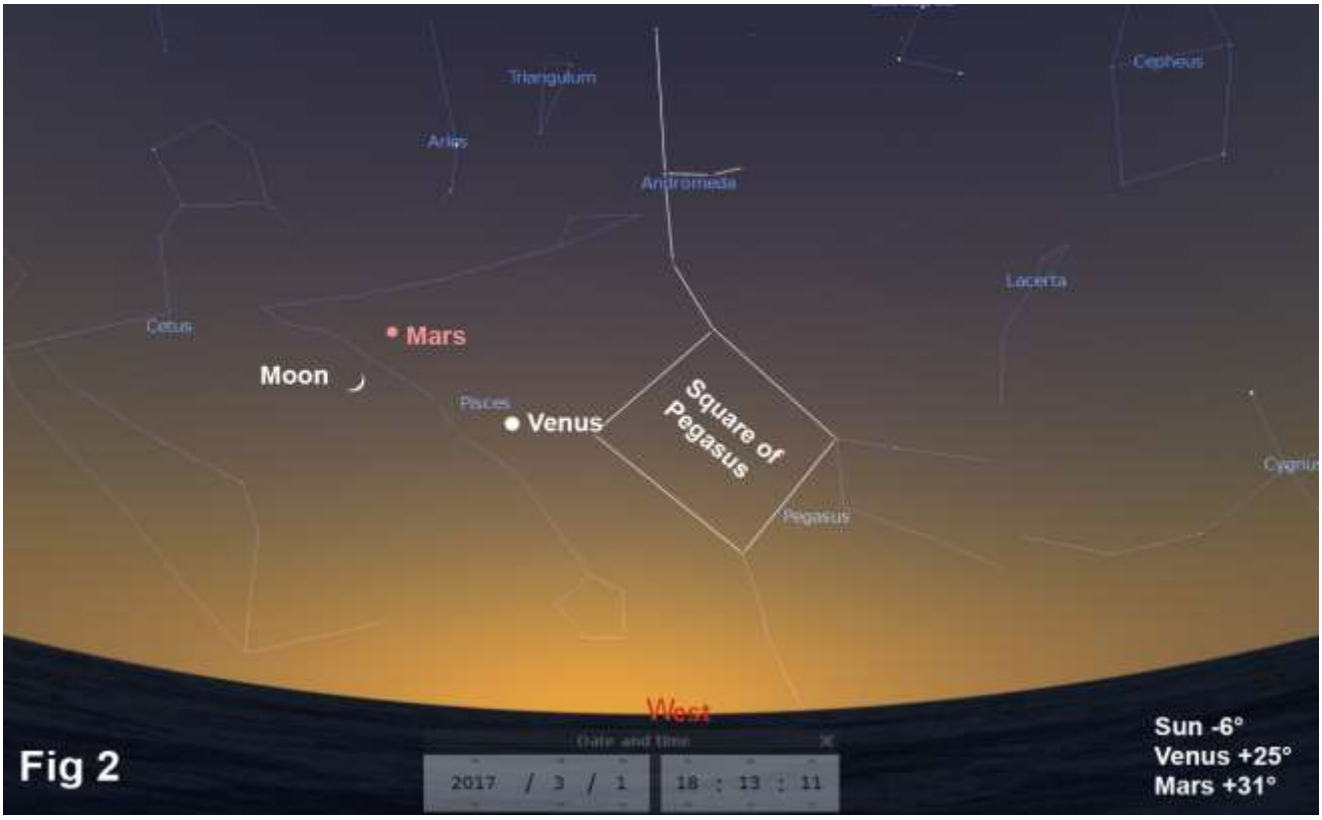
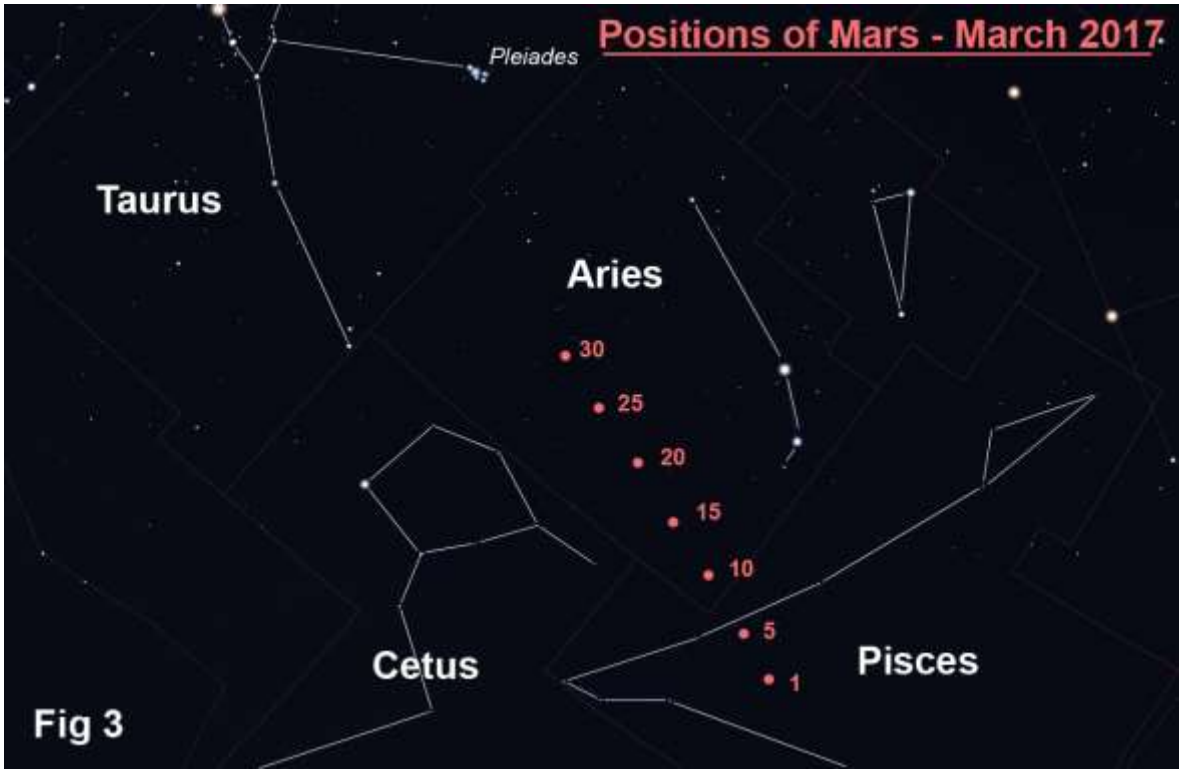


Fig 2

At that time Venus will lie between the Earth and Sun and will of course be invisible. The alignment of the three bodies is not perfect due to the planes of rotation of the planets varying by a few degrees. This is enough for Venus (or Mercury) to seem to pass either above or below the Sun. If the alignment were precise then we would see regular transits of both the inner planets. If you want to observe the phase of Venus it is often best to do so during twilight when the sky is lighter and the contrast difference is less. The position of Venus on the first of March is shown in fig 2. Following conjunction Venus moves west of the Sun to become a morning object visible from the second week of April.

Mars is also an evening object and located close to Venus in the early part of the month making identification much easier. This is shown in fig 2. Although the red planet begins March in Pisces its eastward motion carries it across the border into neighbouring Aries on the 8th. Mars continues on this trajectory until on April 21st/22nd it passes less than three degrees from the Pleiades cluster. Its changing position is shown at five day intervals in Fig 3. The planet continues its gradual fall in both brightness (mag. +1.4) and apparent size (4.4 arc seconds).



Jupiter is now an evening object, in the east, rising at 21.15 (GMT) as the month begins, although by the end this will have moved to 20.00 (BST). The planet lies close to the bright star Spica in Virgo, with them both being joined by a waning gibbous Moon on the 15th. The gas giant is moving retrograde (east to west) whilst all the time its brightness increases (from -2.1 to -2.4) as it approaches opposition on April 7th. Its apparent size is now over forty arc seconds, making it an attractive target for visual observers as well as imagers. Fig 4 shows the location of Jupiter with respect to the constellations of Leo and Virgo.

As well as taking stunning photos of Jupiter, some of the more accomplished planetary imagers are even able to tease out markings on Jupiter's satellites. If however you just want to see the giant planet's brightest moons, all you need are a pair of decent binoculars. Hand holding them is unlikely to be successful though, so being able to mount them on a vibration free tripod will make viewing considerably easier. It is both enjoyable and fascinating to watch the positions of the moons change over consecutive nights. If you have a telescope you can sometimes see them pass behind the body of Jupiter or cast their shadows onto the tops of the gas giant's clouds as they pass in transit across the face of their parent planet.

Saturn has only recently crossed the border into Sagittarius where it remains for the rest of the month. It rises at 03.00 (GMT) at the start of the month and 02.00 (BST) by the end, although it will not become an evening object until the end of May. Its magnitude remains constant at +0.5 whilst its apparent size increases marginally to 16.2 arc seconds.

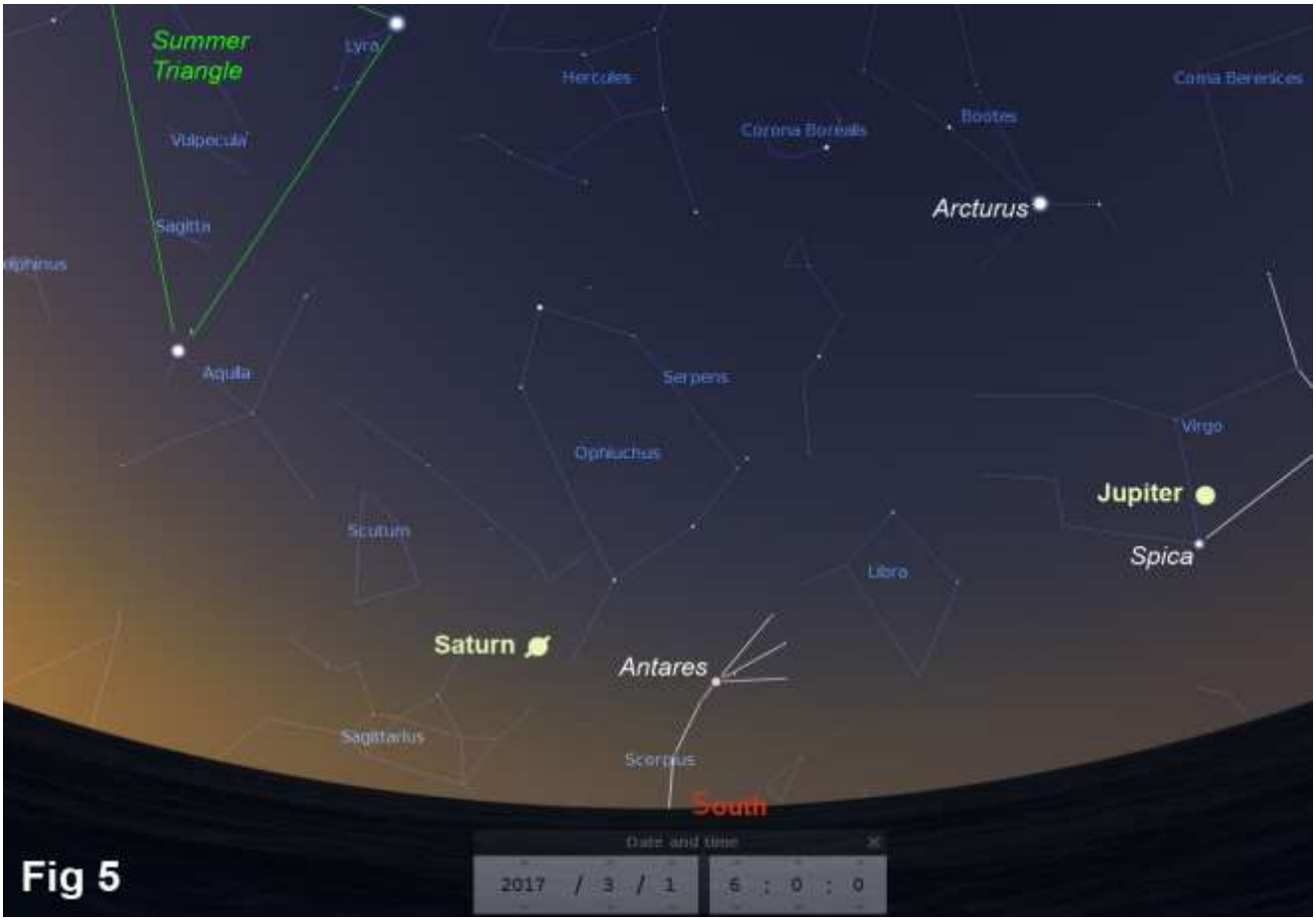


Fig 5 shows the planet's position on the first of the month at 06.00 GMT. It lies 17° to the east of the obviously ruddy hued star Antares in Scorpio.

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. RD = **r**eappearance at the **d**ark limb. The column headed "mm" (millimetres) shows the minimum aperture telescope required for each event. The Moon passes through the Hyades cluster on the night of March 4th/5th causing multiple events, many of which do not meet the above criteria. **Times are in GMT.**

March	Time	Star	Mag	Ph	Alt °	% illum.	mm
3rd	21.46	ZC 491	6.0	DD	18	32	40
4th	18.37	ZC 626	6.3	DD	51	42	40
4th	20.48	ZC 635	3.7	DD	37	43	40
4th	23.43	ZC 661	4.5	DD	11	44	40
4th	23.44	ZC 659	6.6	DD	11	44	70
5th	23.29	ZC 806	5.0	DD	23	55	40
6th	19.11	ZC 951	6.6	DD	57	65	60
8th	19.04	ZC 1238	6.0	DD	48	84	60
8th	22.45	ZC 1247	7.0	DD	50	85	90
14th	21.06	ZC 1921	5.9	RD	8	94	100
14th	22.03	ZC 1924	5.8	RD	15	94	70

Phases of the Moon for March

First ¼	Full	Last ¼	New
5th	12th	20th	28th

ISS

Below are details for passes of the International Space Station (ISS). The details of all passes, including those visible between midnight and dawn, 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.**

Mar	Time	Mag.	Alt°	Az.		Mar	Time	Mag.	Alt°	Az.
27th	20:40:07	-1.1	12°	SSE		30th	21:14:46	-3.3	57°	SSE
28th	21:23:00	-1.8	25°	SSW		30th	22:47:55	-0.1	10°	W
29th	20:31:32	-2.1	23°	SE		31st	20:21:54	-2.8	39°	SSE
29th	22:05:35	-1.1	21°	WSW		31st	21:57:26	-2.5	49°	W

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 . 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 GMT unless otherwise indicated.**

Mar	Time	Mag	Alt°	Az.°		Mar	Time	Mag.	Alt°	Az.°
6th	18.26	-8.2	56°	169° (S)		24th	21.31	-2.8	15°	42° (NE)
10th	19.47	-8.0	52°	114° (ESE)		24th	21.31	-2.3	15°	42° (NE)
11th	18.05	-5.8	55°	185° (S)		25th	18.43	-3.4	65°	154° (SSE)
14th	19.31	-7.6	57°	122° (ESE)		26th	22.28	-6.6	18°	47° (NE)
15th	19.25	-3.1	57°	124° (SE)		27th	21.16	-2.9	53°	91° (E) **BST**
16th	19.21	-4.2	58°	127° (SE)		28th	21.10	-4.8	54°	93° (E) **BST**
20th	19.04	-5.8	62°	138° (SE)		28th	22.26	-4.0	21°	50° (NE) **BST**
23rd	21.27	-6.2	12°	39° (NE)		30th	22.23	-7.0	25°	54° (NE) **BST**
24th	20.25	-3.1	46°	86° (E)						

The Night Sky in March (Written for 22.00hrs GMT mid month)

In the north Ursa Major is heading towards the meridian with the "paws" of the bear almost at the zenith, whilst on the other side of the overhead point lies the faint constellation of Lynx. It has only one star with a Bayer classification, alpha at magnitude 3.1, which explains why it is so inconspicuous. It reaches from Camelopardalis, around the feet of Ursa Major, and could easily have been joined to Leo Minor which lies at its other extremity. One point of interest is that, rather surprisingly, one of its stars is designated 10 UMa (10 Ursae Majoris). This is due to it originally lying in an area of sky that was allocated to Ursa Major before the IAU's boundary reorganisation in 1930. With Lynx close to the zenith, now is a good time to try and identify its elusive shape. Camelopardalis, despite being the 18th largest by area, can only muster a star of magnitude +4.03 as its brightest. Two of the stars of the Summer Triangle, Deneb and Vega are skirting the northern horizon with the former a little east of due north.

As we look east Arcturus and Corona Borealis are climbing away from the horizon and the bright star Spica has risen. Close to Spica, the planet Jupiter (as previously mentioned) is now an evening object and by the end of March will be nearly 30° in altitude by midnight UT. Between Virgo and Ursa Major lie the two small constellations of Coma Berenices and Canes Venatici. The latter is home to the globular cluster M3, an excellent example of the genre at magnitude 6.3. For most, this is just below naked eye visibility but binoculars or a moderately sized telescope will resolve it. Also in the same area of sky is the Whirlpool Galaxy (M51) which, at magnitude 8.4, is best seen with apertures above 200mm.

To the south we find Cancer on the meridian with the open cluster variously known as M44, The Beehive, Praesepe or NGC2632 culminating at an altitude of almost 60°. As with many clusters of this type it covers a comparatively large are of the sky, and in this case it spans some 95' which is 1½°. Below Cancer and also on the meridian lies the head of Hydra (the Water Snake) whose body winds south eastwards until it passes below the horizon. If your view to the south is unobstructed see if you can find any of the stars of Pyxis (brightest is alpha at magnitude 3.7) which is also on the meridian.

Turning to the west those doyens of autumn, Pegasus and Andromeda, are disappearing as are the large and faint constellations of Cetus and Eridanus. Taurus, with Aldebaren, and Auriga, which contains Capella, are all still visible but past their best although Capella is still nearly 60° above the horizon. The trio of open clusters, M36, M37 and M38 are well placed as is their fainter neighbour NGC 1857.

BST Begins at 01.00 UT on Sunday March 26th when clocks should go forward one hour.

Brian Mills

SPACEPLACE - NASA

This article is provided by NASA Space Place.
With articles, activities, crafts, games, and lesson plans, NASA Space Place encourages everyone to get excited about science and technology.
Visit **spaceplace.nasa.gov** to explore space and Earth science!

Solar Eclipse Provides Coronal Glimpse
By Marcus Woo

On August 21, 2017, North Americans will enjoy a rare treat: The first total solar eclipse visible from the continent since 1979. The sky will darken and the temperature will drop, in one of the most dramatic cosmic events on Earth. It could be a once-in-a-lifetime show indeed. But it will also be an opportunity to do some science.

Only during an eclipse, when the moon blocks the light from the sun's surface, does the sun's corona fully reveal itself. The corona is the hot and wispy atmosphere of the sun, extending far beyond the solar disk. But it's relatively dim, merely as bright as the full moon at night. The glaring sun, about a million times brighter, renders the corona invisible.

"The beauty of eclipse observations is that they are, at present, the only opportunity where one can observe the corona [in visible light] starting from the solar surface out to several solar radii," says Shadia Habbal, an astronomer at the University of Hawaii. To study the corona, she's traveled the world having experienced 14 total eclipses (she missed only five due to weather). This summer, she and her team will set up identical imaging systems and spectrometers at five locations along the path of totality, collecting data that's normally impossible to get.

Ground-based coronagraphs, instruments designed to study the corona by blocking the sun, can't view the full extent of the corona. Solar space-based telescopes don't have the spectrographs needed to measure how the temperatures vary throughout the corona. These temperature variations show how the sun's chemical composition is distributed—crucial information for solving one of long-standing mysteries about the corona: how it gets so hot.

While the sun's surface is ~9980 Farenheit (~5800 Kelvin), the corona can reach several millions of degrees Farenheit. Researchers have proposed many explanations involving magneto-acoustic waves and the dissipation of magnetic fields, but none can account for the wide-ranging temperature distribution in the corona, Habbal says.

You too can contribute to science through one of several citizen science projects. For example, you can also help study the corona through the Citizen CATE experiment; help produce a high definition, time-expanded video of the eclipse; use your ham radio to probe how an eclipse affects the propagation of radio waves in the ionosphere; or even observe how wildlife responds to such a unique event.

Otherwise, Habbal still encourages everyone to experience the eclipse. Never look directly at the sun, of course (find more safety guidelines here: https://eclipse2017.nasa.gov/safety). But during the approximately 2.5 minutes of totality, you may remove your safety glasses and watch the eclipse directly—only then can you see the glorious corona. So enjoy the show. The next one visible from North America won't be until 2024.

For more information about the upcoming eclipse, please see:

NASA Eclipse citizen science page
https://eclipse2017.nasa.gov/citizen-science

NASA Eclipse safety guidelines
https://eclipse2017.nasa.gov/safety

Want to teach kids about eclipses? Go to the NASA Space Place and see our article on solar and lunar eclipses! http://spaceplace.nasa.gov/eclipses/

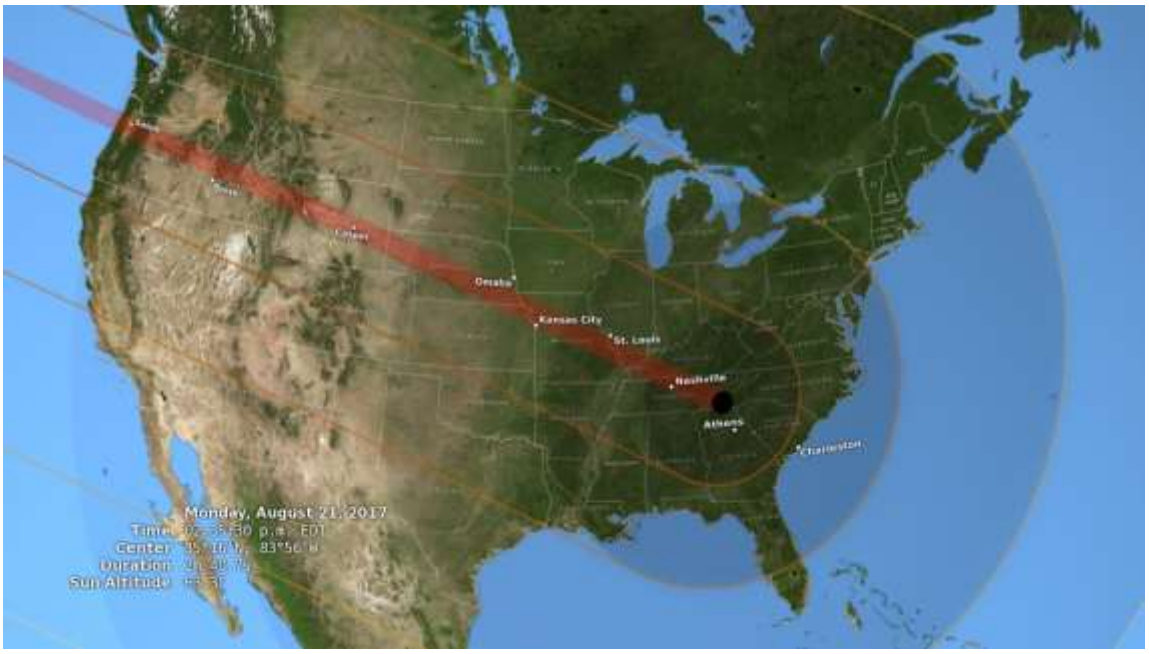


Illustration showing the United States during the total solar eclipse of August 21, 2017, with the umbra (black oval), penumbra (concentric shaded ovals), and path of totality (red) through or very near several major cities. Credit: Goddard Science Visualization Studio, NASA

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

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

Any material for inclusion in the April 2017 Newsletter should be with the Editor by March 28th 2017