NEWSLETTER

June - August 2016 Issue 175

Our new Chairman, Phill Wallace, feeling the "Buzz" during the Mercury Transit event

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Editorial John Richards

This edition of the newsletter brings us to the end of the Society's 40th year. Looking back it's been an exciting year of outreach events, including Britons in space, Mercury transits and deep sky observing events at Dyffryn. Would you like to join us for the next event? It takes place at the Mountain Visitor Centre, Libanus, in the Brecon Beacons National Park on Saturday July 30th. It starts at 10am and finishes around 4pm. It's easy to get to, just off the A470 before Brecon. It's a solar viewing event, and at that time of year, we usually have lovely views of Pen Y Fan, and the surrounding countryside. We set up in the field for a relaxing sunny day, meet people from all around the World, enjoy our picnics and yes, do some astronomy as well. Why not come along?

This edition of the newsletter has articles from the newer members of your committee. Our new secretary, Robert Jones, and new Chairman, Phill Wallace, have both produced short Bios. In a "Phill packed" edition, he has also produced a summary of the AGM, and an article on the feasibility of a "space elevator". We also have a film review of "*The Last Man on the Moon*" by Theresa Cooper.

The programme of talks for 2016-17 has been finalised, and is available for viewing on the Society web site. It certainly offers a variety of presentations: from an '*Introduction to Practical Astronomy*', to '*Black Hole Jets'* and the '*Apollo Space Program'*. We hope we've included something for everyone.

The daylight hours are getting longer, which for an astronomer can mean bad news, but one of the highlights of Summer is undoubtedly the Perseid meteor shower, that peaks during mid August. The Almanac (page 21) has more information about that. Enjoy the Summer and this edition of the newsletter.

Contact Details

Have you changed your email address or other contact details recently? If so, you could be missing out on receiving important Society information. Please keep us up to date with any changes. Send your revised details to either our Membership Secretary (membership.secretary@cardiff-astronomical-society.co.uk) or Secretary (secretary@cardiff-astronomical-society.co.uk).

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BEHIND THE SCENES Phill Wallace

Annual General Meeting and new Chairman Bio

Hello everyone!

For those of you who weren't at the AGM, or who missed the last few meetings, there have been quite a few changes to the Committee since the last newsletter. First and foremost, we once again have a Secretary; Robert Jones, a recently-joined member, offered to take on this weighty role, and so far has been doing an excellent job. Secondly, our Treasurer, Christine Saunders, has decided to step down. Peter Crabb, our Librarian, has agreed to carry out this job as well, and will be gradually taking over the role in the next few months. Christine will stay on as Assistant Treasurer for now and continue to support the Committee's efforts. Finally, and most importantly for my ego, the committee Chairman Martin Chick has decided to stand down as well, returning to his former role as Vice-Chairman. As such, I have become Chairman. During the AGM, Martin was presented with a special award in gratitude for his 40 years of service to the Society. The presentation was a display cabinet with fragments of meteorites which fell to Earth in Nantan China during 1516, Sikhote-Alin near Vladivostok Russia in 1947 and Canyon Diablo, 30,000 years ago in Arizona. Also, during the AGM, this years recipient of the Bill Sutherland Award was announced. Cedric Longville receives the award in recognition for his outstanding contribution, enabling the Society to be registered for Charitable Status. Many thanks Cedric.

Martin receiving his special award

So, since I am now at least notionally in charge, it's probably a good idea if you all knew a little more about me than "that guy who

occasionally chair's meetings." I'm originally from Buckinghamshire; I came to South Wales for my degree at the University of Glamorgan (as it then was), studying Observational Astronomy. Those were the best years of my life and I decided to stay in Treforest for the near future as I rather liked living here, and it was prefereable to moving back in with my parents!

Cedric Longville receiving the Bill Sutherland Award

I eventually found a job at my old University working in student recruitment. I found myself working more-or-less alongside Emma Wride, a coursemate of mine, CAS member and astronomy outreach extraordinaire. Last February, she mentioned that she was coming to CAS to show her films and I offered to come along for moral support. I decided I liked CAS, and I was looking for more social things to do beyond going to the pub, so it seemed ideal. I quickly joined, and a few months later I was at the AGM where Martin mentioned there were some Committee roles vacant. Wanting to help (and not understanding the effort and work involved) I signed on as Vice-Chairman.

The rest is history. Beyond CAS I spend my time frantically trying to find a 'proper' job, shooting airguns for fun, endless hours reading or watching the classic Doctor Who series or getting into long drawn-out discussions on physics and philosophy with my housemate.

So that's me in a few paragraphs, though honestly there isn't much else to say. I'm looking forward to a long and enjoyable future with CAS. I joined in the 40th Anniversary year, and hopefully I'll be around to celebrate the 80th Anniversary in 2055. I hope by then we'll have some way of ensuring clear skies! *(editor: those eagle eyed amongst you may notice a picture of our new chairman on the front cover)*

New Secretary Bio

Hi. My name is **Robert Jones** and I am the new Secretary for Cardiff Astronomical Society. I am an avid astronomer and have been since the age of 8 years old, when I had my first telescope as a Christmas present. It was a basic refractor, but ever since I saw Jupiter and Saturn through it, I have been hooked.

Astronomy has been a hobby which I have picked up and put down whilst at university, but after joining CAS (only recently in August 2015), I am back doing what I love.

I am currently studying a Certification in Astronomy and Planetary Science with the OU, which was to be the foundation on gaining a degree in astrophysics, but have recently had a change of heart and will be going on to gain a degree in Computing and Mathematics. (the idea of building simulated planetary models really fascinates me)

You will find me at the talks and at both the star parties and Observing sessions, so please feel free to say hello. If there are any members who cannot get to observing sessions or star parties but would like to, please feel free to contact me on the secretary's email, and I will do my utmost to help you out. I live in Newport. I am also available for meeting up with members who do not have scopes but would like to do some viewing work with a scope.

Transit of Mercury Event, Dyffryn Gardens/National Museum Cardiff - 9th May 2016

CAS responded well to this celestial event – two teams covering all possibilities and crowd management! Priority was to observe the transit at our own observatory at Dyffryn Gardens. So helpful and fruitful discussions with our contact in the National Trust (Kate Simons, Visitor Experience Manager) resulted in daytime access to the site for our members, as well of course those of the National Trust.

The team were on site by 10 am getting ready for the start of the transit at just after midday. The observatory was looking at its best, tidy, polished, with the big scope and solar scopes at the ready.

What wasn't ready was the sky – clouded over with poor conditions forecast. But pressing on regardless ….. the Cory Centre was setup with a live link from an ESA (European Space Agency) site in Tenerife with clear skies!

Meanwhile, the other CAS team at the Museum were also busy setting up. The solar viewing there was hopefully being carried out by staff of the University and the Institute of Physics. However, all the experts still have to hope for clear skies (not on this occasion sadly) but their Plan B was a VLS – no, not a Very Large Scope but a very very large screen also linked to ESA so that all of us, and the public, could watch the event from the comfort of the café or our stand.

Our merchandise stand did good business, new members signed up and CAS member Mike Foley starred, alongside Chris North of Sky at Night fame, on the "*Made in Cardiff"* news bulletin that evening. The clip is now available on YouTube! Thanks must go to Mike for the excellent information brochures he compiled to give away to all those interested in the celestial phenomenon, and astronomy in general. He is now being asked to autograph his excellent photographs which he also gave away. A star in his own right. So good publicity for CAS, good public engagement,11 out of 10 for effort and very importantly we all had fun! Would you like to join us for the next event? If so, then why not contact myself, or any member of the committee. We'd love to see you. **Theresa Cooper**

The Night Sky - June to August 2016

Hugh Lang

The planets

The progression of the season into summer brings with it short nights that are never truly astronomically dark as the Sun never gets more than about 18 degrees below the horizon in the mid month of June. This in turn means late nights and early mornings for the keener observers. The warmer weather although generally welcome, also causes problems, as the astronomical seeing is generally less than optimal due to turbulent pockets of warm air disturbing the atmosphere.

Mercury is now past it's best for evening appearance this year. The planet reaches greatest western elongation on June 5th, making it a morning object, at around apparent visual mag 0.0, and rising just before the Sun. Unfortunately this time the planet is unfavourably located for Northern observers. There is another, though brief, possibility of locating this inferior planet just after sunset in mid July, as it moves into the evening sky after its conjunction with the Sun, which occurs on July 7th Locating the planet will also be assisted by the bright planet Venus (Mag -3.9) which will be positioned, just over a Moon's diameter away to the South of Mercury (Apparent visual mag -1.7) on July 16th. Note that the planet will be observable for only around half an hour after sunset. Mercury makes another orbit of the Sun to make a brief, not very favourable appearance in our evening sky around August 16th. This appearance favours observers in the southern hemisphere. The second best opportunity of this year for observers in the Northern hemisphere occurs in the latter half of September, though this is a morning appearance, suiting early risers, and takes place from the middle to the end of the month with the planet reaching it's stationary point on the 21st and reaching greatest Western elongation (W18 deg at apparent visual mag -0.8) on the 28th.

For the period covered by this article **Venus** is not favourably positioned. Over the past few months the planet, has been residing in the morning skies, moving ever closer to the Sun to reach

superior conjunction by June 6th. From that point onwards Venus moves into evening skies, but remains too close to the Sun to be safely seen until mid July at the earliest, when it may be found shining brightly at around apparent visual mag -3.9, and setting around some thirty minutes or so after Sunset by June 16th. Venus now continues to move away from the Sun, becoming only slightly easier to spot in the North Western sky, and will be briefly joined to form a close triple conjunction with Jupiter (4 minutes of arc separation) and Mercury on August 27th. By September the planet, though still moving away from the Sun, still isn't very well placed for observing, but is still very bright at apparent visual mag -3.9. On September 3rd Venus can be found around six moon diameters away (3 degrees) from a 5% waxing Moon.

At the start of June **Mars** can be found residing in the constellation of Libra; and having just passed opposition is still very bright at apparent visual magnitude -2. While it has a respectable apparent angular size of 18.6 seconds of arc at the start of the month, its low elevation doesn't help observationally, and matters only get worse. As the Earth races away from opposition, Mars will rapidly shrink in size and apparent visual brightness, though any serious Mars observer will still be able to make useful observations with a medium sized telescope over the coming months. By mid July, Mars will have lost around a magnitude in apparent visual brightness and around three arc seconds in diameter, while still losing altitude and sinking into the atmospheric murk as the month's progress. During August Mars will have moved into the constellation of Scorpius now at apparent visual magnitude -0.8 with a apparent visual angular size of 13 seconds of arc. Mars then makes a brief move into Ophiuchus (around the 21st - 27th August) before re-entering the constellation of Scorpio.

Jupiter having been a beacon of the night sky over the past months is now past its best for this year. At the start of June Jupiter will be easily located amongst the stars of Leo at apparent visual magnitude -2.1 with a apparent visual angular size of 37 seconds of arc, setting in the West around midnight. As the coming month progresses the planet will slowly dim in brightness and shrink in

apparent size. By August Jupiter will be low in the evening Western twilight sky at apparent visual magnitude -1.7, its apparent visual angular size having shrunk to 32 seconds of arc. Jupiter then moves into the constellation of Virgo on the 8th of that month.

On June 3rd **Saturn** reaches opposition. Located in the constellation of Ophiuchus the planet will be observable throughout the night, at apparent visual magnitude 0.3 and apparent visual angular size 18.4 seconds of arc. At this point in time Saturn will be 9.01 AU from Earth, 75 light minutes away. The North side of the ring system will be tilted toward Earth at an angle of 26.1 degrees with the ring system sporting an angular diameter of some 42 seconds of arc while the planets globe diameter will be some 18.2 seconds of arc, so it's well worth the effort of observing. Unfortunately for the next few years Saturn only remains low close to the ecliptic, and so being close to the ecliptic the murky atmosphere will degrade the quality of seeing. That though, should not detract anyone from taking the time to look at this ringed wonder, even a pair of binoculars will show the planet has a distinctive shape i.e. not round, a small telescope will readily show the planets rings, the Cassini division separating ring A from ring B. A medium sized telescope should detect the subtle north belt and possibly Saturn's polar hood, the fainter C ring and quite a few of the planets 62 orbiting satellites. Also look out for the 'Seeliger' effect; a brightness enhancement first studied by German astronomer Hugo von Seeliger (1849-1924), who proposed the disappearance of shadows as the cause for the rapid brightening of the rings. Seeliger saw it as confirmation that the rings were made of individual pieces rather than a series of solid disks. This apparent brightening of the rings occurs around opposition. Over the next few months Saturn dims by about half a magnitude and reduces in apparent visual angular size to around 16.2 seconds of arc.

Uranus is situated in the constellation of Pisces for the period covered by this article, and can be located, with difficulty, in the morning sky. At the start of June Uranus has an apparent visual brightness of magnitude +5.9. The planet begins retrograding in Pisces on the 30th of July and will continue to do so until opposition in mid October.

Neptune rises retrograding through the constellation of Aquarius. It rises slightly earlier than Uranus so consequently even though it's dimmer at apparent visual magnitude+7.9, visual apparent diameter 2.3 seconds of arc, it's going to be easier to find than Uranus (when using binoculars), as it's not so swamped by brightening morning twilight sky. Neptune reaches opposition on September 2nd so the planet is visible all night at apparent visual magnitude of +7.8, having an apparent visual diameter of 2.3 seconds of arc. Light reflected from its upper atmosphere taking some 4 hours to reach Earth (Distance 28.9 au.)

As we move from spring into the summer season, the dark night skies change from inky black to a twilight blue hue making the contrast between the faint fuzzy galaxies and nebulae difficult to view against the light background of the night sky. Some think that taking the telescope into the back yard during this time isn't worth the bother, but there is still a myriad of objects tucked away in the summer constellations whose photons will stimulate, and create beautiful vistas on the visual receptors of the observer's eye. So even though the darkest periods of the night are only a few short hours around midnight around the summer solstice, it's still worth getting out there and looking up.

At the start of June, at around 10-11pm, as astronomical twilight falls, we find the bright star Spica located in the constellation of **Virgo**, placed slightly Westwards of the meridian line (due South) . It will be breaking through the darkening twilight sky. Looking upwards, more or less overhead, another bright star **Arcturus** in the constellation of Bootes should also have made an appearance. Now if you look along the ecliptic to the West, the star **Regulus** in the constellation of **Leo** will be peeking through the light veil of darkening sky. As the darkness falls, sandwiched between these constellations, a cluster of faint stars comprising the constellation of **Coma Berenices** will slowly break into view. Around this area the 'realm of the galaxies' is located. The area is home to the Coma and Virgo super clusters, of which our small group of galaxies, 'the local group' is associated. There are literally hundreds of faint galaxies that can be hunted out by the keen deep sky observer. There are too many to mention individually in this article, but as a taster there

are 16 Messier galaxies, that are easily located in a small telescope. If you have any interest in hunting a few of these galaxies out then don't wait much longer as the nights now quickly shorten and the galaxies will become washed out and difficult to see against the brighter night sky. Looking up, during mid June around 10-11 pm, Spica in Virgo has moved West. Leo is now disappearing into the haze of the Western horizon and the summer time constellations are making their move onto the celestial stage. Due South, and fairly low on the horizon, the bright red star of Antares, located in 'the tail of the Scorpius' will be shining. If you follow the sting northwards (Up) then you arrive at one of the largest of the 88 constellations,**Ophiuchus**. To be honest,this is a fairly barren constellation, though there are a few gems in the way of open clusters, **M10**, **M12**, **M14** and **M107** hidden amongst the constellations sparse boundaries to be hunted down. To the East side of Ophiuchus we find **Serpens Caudia,** home to **M16**, the Eagle Nebula . This is the location of the famous Pillars of Creation; though you would need a medium sized telescope in order to glimpse it. Above Ophiuchus, more or less overhead is the Keystone of **Hercules**, containing two nice globular clusters, the well known **M13** and the lesser but by no means less viewable **M92**, while below, Eastwards, and close to the ecliptic resides **Sagittarius** the archer, another area full of telescopic delights. Just West of South, riding along the ecliptic is the faint constellation of **Libra** the scales. At the darkest time of the night you may also see a faint misty patch of light stretching upwards from South to North; we are looking at the billions of stars comprising 'The Milky Way', the galaxy we reside in. High up, slightly to the Westward side of this hazy streak of light, the bright white star of Vega situated in the constellation of the **Lyre** stands high. Buried within the Milky Way, Eastwards of Vega are the two bird constellations of **Aquila** the eagle, with the bright star Altair, and above Aquila, **Cygnus** the swan with the bright star Deneb. These three bright stars make up the asterism known as the summer triangle. Look out for **M57** the Ring Nebula. It's situated between the two lowest stars of the Lyre. Scattered between Cygnus and Aquila are the two small constellations of **Equuleus**, and slightly higher and to the West, **Delphinus**, again moving slightly higher and to the West,

sandwiched between Aquila and Cygnus. Look for **M29** and **M39**, both open clusters in Cygnus. Buried deep in the Milky Way is **Vulpecula** the Little Fox, containing **M27**, 'The Dumbbell Nebula'. This is a really spectacular sight in a small to medium sized telescope and now is the best time to observe this.

Moving to mid July Sagittarius and Scorpius share the meridian. These two constellations contain a good number of astronomical delights to feast upon, including **M8** 'The Lagoon Nebula', **M17**, the Omega Nebula, Open clusters **M18**, **M21**, **M23**, **M24**, and **M25** and finally some Globular clusters, **M22**, **M28**, **M55**, **M69**, **M70**, and **M75**. These 13 objects are all located in Sagittarius! Incidentally its also home to the centre point of the Milky Way. The constellation of Scorpius contains **M80**, (a globular cluster) and **M20**, 'The Trifid Nebula'. In the East the head of Pisces is peaking above the horizon. The water constellations of **Aquarius** and **Capricornus** have appeared above the horizon. Look out for the globular cluster **M30** in Capricornus. Virgo meanwhile is now sinking into the haze of the Western horizon. In the North East the great square of Pegasus and Andromeda with its well known galaxies **M110**, **M31**, **M32** and **M33** are dominating that part of the night sky.

By August the night skies are again becoming better suited to mid-late evening observing, the Milky Way is more or less overhead, as are the constellations of Lyre, Cygnus and Aquila. Libra is now disappearing in the West to be replaced in the East by **Pisces**, situated on the ecliptic. Skimming low on the south east horizon is the constellation of **Cetus** the whale. In the North east **Aries** the Ram has risen and the **Pleiades** cluster is just starting to reappear. **M74** is a nice spiral galaxy in the constellation of Pisces to hunt down. Finally, during the month of August we have the spectacular Perseid meteor shower which this year reaches its peak on August 12th. This shower is popular as the meteors are fairly slow moving which makes for nice trails coupled with the generous numbers of meteors, generally around 100-120 per hour but this year there is a good possibility of an enhanced shower, reaching more than 150 meteors an hour. Hopefully the Society will have arranged an observing session for this event.

<u>The Last Man on the Moon</u> - a review by Theresa Cooper

My review could be very short and summarised in one word - **excellent**. For those who weren't around at the time, or for those who were and, unlike me, didn't take much notice, this is a look back at the Apollo 10 mission and the last Moon landing mission of Apollo 17. The last man on the Moon (hopefully, just up until now), Eugene Cernan, was one of the astronauts on both occasions. This film is not just for the space buffs like me but will capture those that are interested in ordinary humans trained to do extraordinary jobs and how they and those around them cope. After all, they still remain humans.

It gives new insight into the life of the astronauts, the demands of the job, their driven personalities and some of the difficulties faced by them when the work was over and also by their families before, during and after the Apollo project. They all lived in a media bubble which NASA learnt how to manage as time went on, but they were also in a strange 'false' environment (literally after their relevant launch) where the daily little things of life, getting up in the morning, running and maintaining a home, doing the chores, cutting the grass, became remote and not part of their highly structured and incredibly focused world. Those necessary tasks which ground us all, were left entirely to the wives who also had the double jeopardy of worrying about husbands on dangerous work, highlighted to them by the fatalities of Apollo 1. To paraphrase Eugene Cernan's wife – '*If you think it's hard work going to the Moon then you should see what it's like staying at home*'.

The film, surprisingly to me (as the manned Moon missions are now part of revered American history) - was made by a team from the

UK (including the son of Sir Jackie Stewart) and one step removed from all the patriotic fervour. Perhaps as such, it is a more perceptive documentary of the time. Actual footage is cleverly and seamlessly entwined with simulations and special effects but not excessively so. This film is about the man. Gene is given centre stage and his presence on the screen is not rationed in the name of entertainment. His former fighter pilot colleague and now ‘best friend’ Fred “Baldy” Baldwin makes a valuable contribution to our understanding of Cernan’s personality and he is a best friend in that Cernan’s job as a ‘celebrity’ is immaterial to him. Cernan is ‘allowed’ to talk and not just be interviewed about his life then, and now. His thoughts and dialogue are what is important and nothing in this documentary gets in the way of that.

This film is one to watch on the big screen, especially for the footage shot on the Moon. I was glued to our small TV at home for every space mission. But in the Odeon, I was there! I was with him as he found orange soil, drove the lunar rover and in tears when the upper stage of the LEM took off for one last time. Cernan takes time to look back over his life, how he had a chance to go to the Moon, and what it was all about. The last question he hasn’t yet fully answered and perhaps never will. He does not hold back from relating his mistakes and although he did an unusual job, he remained very human. He is still just as driven but now it is to give out the message that if he did all that, then what’s stopping us from reaching our own targets? We can all achieve things we never knew we had the capability for until we try. The film was followed by a live Q&A session with the producers, Baldy and Cernan himself. Cinemas all around the UK were synchronised to transmit this and, again, the man held centre stage. Further Apollo missions were cancelled and he stated that he (and many others) have strong concerns about the lack of vision by governments and private organisations, as no plans are being formulated to return humans to the Moon and travel beyond it.

The production team certainly had to be tenacious to get him to agree to participate in the film and, hopefully, he is pleased by the outcome. I think he should be; it’s a good testament to a special time.

One thing I am grateful for, even if it means I am now old, is that I was around to witness the unique event of the first Moon landings. Nothing can ever be quite like that. Maybe the Next One on the Moon will be a woman? I hope so, but in the meantime I've remembered it's a while since I watched Apollo 13, the film as well as the TV coverage. And there are still my original press cuttings of the Apollo missions to drool over.

Publication Dates

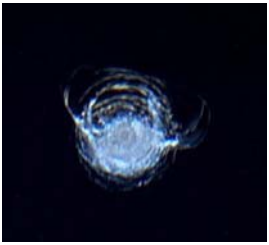
The CAS newsletter is published at the first Society meeting of September, December, March & June. The deadline for submissions is 4 weeks before the publication date, and is 7th September for issue 176. **Why not pen your idea on an email and send it to me, the Editor at *Publications.Officer@cardiff-astronomical-society.co.uk,*** and you could see your article in print before you can say "Tim Peake's back on Earth"

Spaceflight Roundup John Richards

Did The 'Mars Voodoo' strike again with the ESA/Roscosmos ExoMars mission? Launched from Baikonur at 09:31 GMT on March 14th, the launch, of a Proton rocket carrying the ExoMars probe, weighing just over 4 tonnes, appeared to go without a hitch. Trouble may have started when the Breeze-M upper stage, the section that provides extra thrust to the ExoMars probe, appears to have exploded, close to the probe. Instead of two signals, scientists in Brazil appear to capture a cloud of debris soon after Breeze-M & ExoMars separate. The Russians deny any issue with the Breeze-M upper stage and say the mission is progressing normally. In a statement on April 14th, ESA reported the ExoMars spacecraft in excellent health, and no mention was made of the reported Breeze-M 'anomoly'. The ExoMars probe is a two part device, consisting of the Trace Gas Orbiter (**TGO**) and a entry, descent and landing demonstrator vehicle called Schiaperlli. The TGO, consisting the main part of the mission, is looking for rare gases, mainly methane, which is a gas that breaks up quickly in the Martian atmosphere. On Earth, methane is created by biological or geological processes, so if found in the Martian atmosphere it may provide a hint of possible

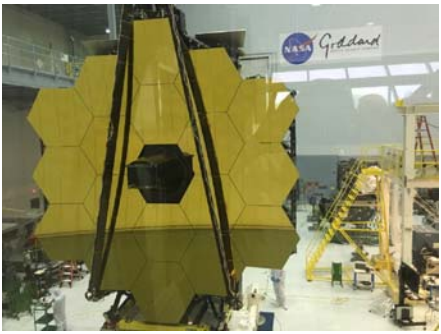
microbial life on the surface. The demonstrator lander, as its name implies, will land on the Martian surface, but the technology is mostly testing concepts for a larger Martian rover that was to be launched in 2018. **STOP PRESS:** On May 2nd, ESA/Roscosmos confirmed the 2nd ExoMars mission will be delayed until 2020.

It's been a busy time aboard the ISS, not just for our "Brit in space" Tim Peake. Tim's mission has been extended to June 18th, a 2 week extension. 3 resupply ships have recently docked at the space station, 1 Russian and 2 American. The Russian Progress docked to the Zvezda module on April 2nd, and carried over 2 tonnes of food propellant, water, oxygen and air. The SpaceX resupply was somewhat more exciting. Launched on April 8th, the CRS-8 flight delivered just over 3 tonnes of supplies to the station. Among the customary hardware was the Bigelow Expandable Activity Module (BEAM) This a module made of a kevlar type material (similar to the material in bullet proof vests) and was transported to the station in a compressed form, much like an accordion. The plan is to expand the unit to its full size at the end of May, and it is hoped BEAM will be docked to the ISS for 2 years. The aim is to test the feasibility of launching non rigid structures into space. Bigelow Aerospace, the company who've made BEAM, hope to have a "space hotel", comprising multiple connected devices by the end of the 2020s. When expanded, BEAM will be around 13 feet long and 10 1/2 feet in diameter and will be monitored for pressure, temperature, radiation and micro-meteorite impact. Astronauts aboard the station will also periodically enter the module to conduct other readings.



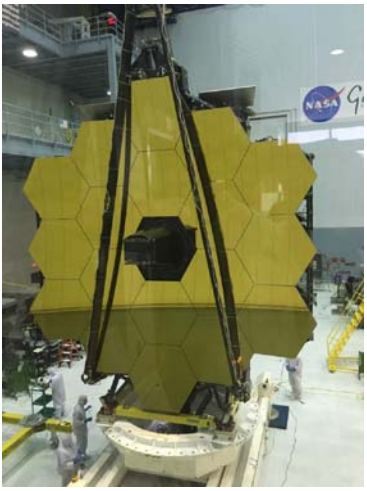
Talking of micro-meteorite impacts, Tim Peake released a picture from 7 mm chip in one of the Cupola windows that overlooks the Earth. Thankfully, ISS residents are in no immediate danger, as the glass is quadruple glazed!

Progress on the James Webb Space Telescope continues apace. On May 5th the first vertical lift of the recently completed mirror was conducted. A friend, and former NASA employee, Ed Razac, was there, and has kindly allowed me to show you these exclusive photos of the lifted mirror in all its finery.



NASA has announced the discovery of the largest collection of confirmed planets to date. The announcement of 1,284 new planets, more than doubles the number of planets previously discovered by Kepler.

May 23rd saw the Indian Space Agency launch a mini space shuttle for a 7 minute test flight. The £14m Reusable Launch Vehicle, or RLV-TD, was launched to an altitude of approximately 40 miles, before re-entering the Earth's atmosphere, exposing it to temperatures of up to 2,000°C, before soft landing in the Bay of Bengal. It was initially assumed the craft would not survive re-entry, but Indian scientists confirmed they had in fact retrieved the device, that's about the size of a camper van.



Welcome Vostochny to the list of newly created launch complexes. Built to lessen reliance on the Soviet-built Baikonur complex in Kazakhstan, and situated close to the eastern edge of the Chinese border, it launched a gamma ray observatory on April 27th,

Getting to Space Without A Rocket

Phill Wallace

We all know how to get into space. You prove yourself as a highly competent and exquisitely-trained pilot and scientist to get sent up by NASA/ESA/JAXA/whatever. Or you wave a few tens of millions of dollars at the Russians and they send you up. Either way, they stick you in a pressure suit, strap you to a few hundred tonnes of

highly explosive chemicals controlled by about twelve million moving parts (all assembled by the lowest bidder) and light the blue touch paper. Whoosh, boom, you're on your way to space. Send me a postcard. But…is this the best way to get there? When you describe it like that it sounds absurdly dangerous. It makes about as much sense as letters being delivered by cruise missiles (which was once seriously suggested in the US). We've seen in the news lately that this process is far from perfect: 2015 saw the failure of the American Falcon 9 and Russian Proton launchers, normally taking a few hundred million dollars' worth of satellite with it. We've also seen the failures of rockets like Atlas, the long-lived R-7 and tragically, the Space Shuttle itself. So is there a better way to move men and equipment into space?

The answer is, possibly. There is a wonderfully interesting concept known as a space elevator. Basically, you run a giant cable from Earth's surface up to geostationary orbit (GSO) altitude (35,786 km). attach it to a counterweight to keep it in tension and have lift cars climbing up and down the cable. It's a brilliant idea really. As the lifts climb upwards they gain delta-v and payloads can be released early to reach lower orbits. At GSO the payloads are in a prime position for communication satellites and can be turned into a true "spaceport" for the construction of larger spacecraft for missions beyond Earth. Since they are a long way up the gravity well this would save a great deal of fuel.

So, we have our brilliant idea but where did it come from? It was first dreamt up by whoever it was that created the Tower of Babel myth, the great tower reaching from Earth into Heaven so Man might meet God. It's just a myth but it's the genesis of the idea. It languished in the depths of the Bible for millennia until one Konstantin Tsiolkovskiy (a name familiar to anyone interested in spaceflight) turned the myth into a real concept. This canny Russian created an idea for a solid tower reaching up to a "castle in the clouds" in orbit that could be used to ferry men and materials into space. The design was picked up in the 60's by Yuri Artsutanov and a group of American scientists and the concept snowballed. Arthur C Clarke (who conceived and popularised the idea of communication satellites in GSO, to the point where it is referred to as the Clarke

Belt) used it in some of his better-known works and in recent years the idea has been picked up by NASA and the Japanese.

It sounds like a great idea, so why haven't we done it yet? Well, firstly, the materials we need to make the cable don't exist yet. You need a cable that can stretch nearly thirty six thousand kilometres without breaking under its own weight. Modern cables can manage about 40 km and that's the super-duper titanium alloy stuff. The solution is to use giant carbon fibres but these are a) still experimental, b) hideously expensive and c) take years to grow to lengths longer than a metre.

So the cable's not here yet. What else? The cable needs to be anchored on the equator somewhere. Which means either central Africa (not the most pleasant of places) or the middle of the Amazon rainforest and/or Amazon river delta. Again, not ideal. You could build a sea anchor, but no one has ever built an oceangoing vessel large enough and no one is certain it can be done. Strike two.

Third, because of the nature of orbital mechanics, any satellite with a perigee of less than 36,000 km will eventually collide with the cable. Since there are well over 6,000 satellites of varying types in orbit and only a few hundred are in GSO, most of the worlds satellites will be either destroyed or have to be removed. Incidentally, that includes all the low-level communications satellites, weather satellites, reconnaissance birds (spy satellites), and the entire GPS system. That's not good at all. Oh, there's also the little thing called the ISS. Yep, that would have to be moved or dismantled. Strike three.

Finally (as if you need another reason) the completed elevator wouldn't be able to carry much to space anyway. And it would be one great big target for hostile nations or terrorist groups. It would not take much to disrupt or break the cable and that's game over. That's twenty years of effort and a few hundred billion dollars down the tube thanks to one guy with a Cessna and a few hundred kilos of C-4.

So then, the space elevator is a great idea. But by the time we can build the damn thing, we won't need to.

Up-coming CAS Public Events

Date	Time	Event	Venue
30th July	10am - 4pm	Solar Viewing	Brecon Beacons Mountain Centre
24th Sept	10am - 4pm	Telescope Workshop	National Museum of Wales

For further details of the events we are organising for the transit, please visit the web site

CAS Lectures June to July

Date	Title	Lecturer
9th June	Astronomy in the News: the Best Discoveries of the Last Year.	Amber Hornsby Cardiff University.
23rd June	Deep Sky Astronomical Imaging Under City Lights.	Nick Hart,Cardiff Astronomical Society.
7th July	To be confirmed	Cardiff Astronomical Society Members.

Observing Sessions

There are currently no observing sessions arranged during the months of June, July or August. The next dates in September are as follows:

Date	Day	Time	Venue
2nd or 3rd Sept.	Fri or Sat	20:30 - 00:00 GMT	Dyffryn Gardens
23rd or 24th Sept	Fri or Sat	20:30 - 00:00 GMT	Mountain View Ranch

NOTE:- Where two dates are given we will attempt to hold the session on the first date, weather permitting, otherwise we will try again on the subsequent date. All dates are subject to weather conditions. For confirmation of any session please check on the CAS Web site or the CAS Observing line. 07817 723 883 for more

FREE ASTRONOMY MAGAZINE

Our friends at Astro Publishing have provided us a free link to their latest **FREE** bi-monthly astronomy magazine.

Articles include finding "strange new worlds", a preview of the ExoMars mission, and finding "monster stars". The link for the magazine is shown below:

http://www.astropublishing.com/FAM-3-2016/index.html

Almanac Compiled by John Richards

Sun Rise/Set & Twilight

Date	Astronomical Twilight Begins	Sun Rise	Sun Set	Astronomical Twilight Ends
1st June	--:--	04:01	20:19	--:--
08th June	--:--	03:56	20:26	--:--
15th June	--:--	03:54	20:31	--:--
22nd June	--:--	03:55	20:33	--:--
29th June	--:--	03:58	20:33	--:--
1st July	--:--	03:59	20:33	--:--
8th July	--:--	04:05	20:29	--:--
15th July	--:--	04:13	20:23	--:--
22nd July	00:48	04:22	20:15	23:50
29th July	01:32	04:32	20.06	23:05
1st August	01:45	04:36	20:01	22:52
8th August	02:12	04:47	19:49	22:24
15th August	02:35	04:58	19:35	21:59
22nd August	02:55	05:09	19:21	21:35
29th August	03:13	05:20	19:06	21:13

Meteor Showers

Date	Meteor Shower	RA	DEC	ZHR
10th June	Ophiuchids	17h56m	-23^0	5
20th June	Ophiuchids	17h20m	-20^0	5
15th July	Capricornids	20h44m	-15^0	5
21st July	alpha-Cygnids	21h00m	48^0	5
26th July	Capricornids	21h00m	-15^0	5
29th July	delta-Aquarids	22h36m	-17^0	20
31st July	Piscis Australids	22h40m	-30^0	5
2nd August	alpha-Capricornids	20h36m	-10^0	5
6th August	iota-Aquarids	22h10m	-15^0	8
13th August	Perseids	3h04m	-58^0	75
21st August	alpha-Cygnids	21h00m	-48^0	5

Star Parties and Observers Club Meetings

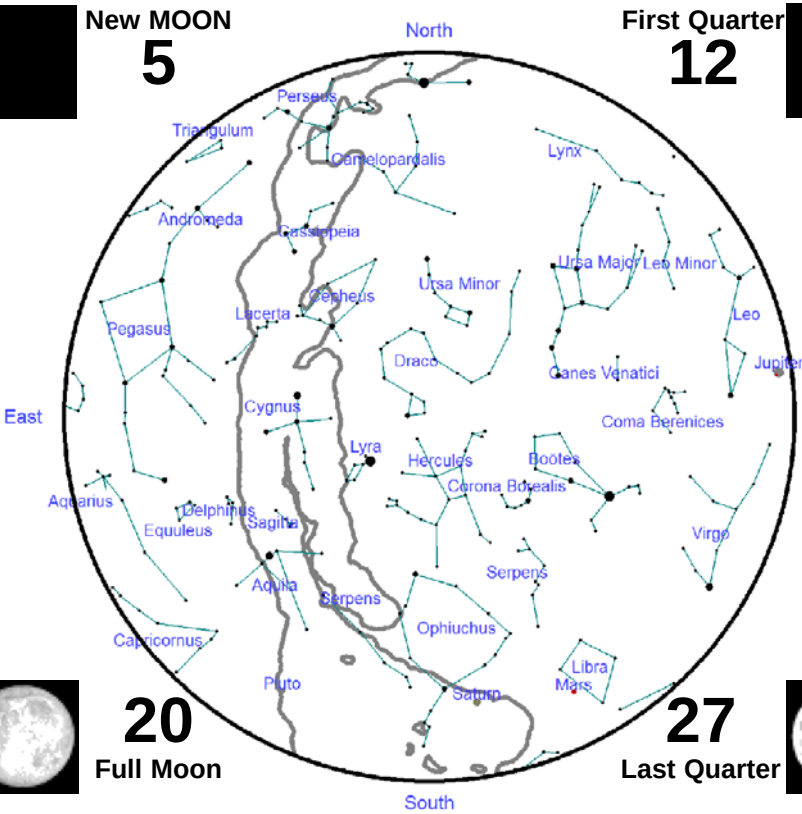
Date	Day	Time	Venue
7th June	Tuesday	20:00 - 22:30 GMT	Dyffryn Gardens

We always hope for clear skies,but the Star Party will go ahead as planned, regardless of the weather, and are held at Dyffryn Gardens unless otherwise stated.

Almanac June

New MOON
5

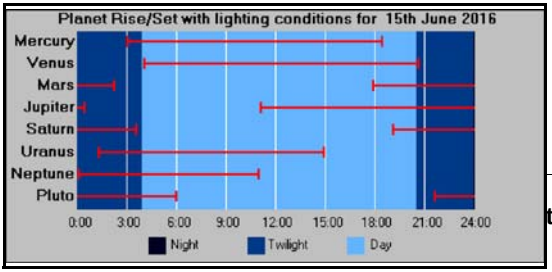
First Quarter
12



20
Full Moon

27
Last Quarter

	Constellation	R.A	Dec	Rises	Sets	Mag.
Mercury	Taurus	04h05m12s	+18°21'00"	02:59	18:22	-0.2
Venus	Taurus	05h44m52s	+23°42'08"	04:02	20:37	-3.9
Mars	Libra	15h26m36s	-21°03'13"	17:52	02:12	-1.7
Jupiter	Leo	11h07m21s	+06°59'08"	11:03	00:23	-2.0
Saturn	Ophiuchus	16h44m03s	-20°29'07"	19:05	03:32	+0.2
Uranus	Pisces	01h28m42s	+09°38'40"	01:17	14:51	+5.9
Neptune	Aquarius	22h54m40s	-07°52'12"	00:04	10:53	+8.0
Pluto (Dwarf)	Sagittarius	19h19m49s	-21°13'09"	21:45	06:03	+14.3



Planet Events

6th Venus at Superior Conjunction

The data presented here is for the 15th June. Positional data is at 00:00 GMT/UT

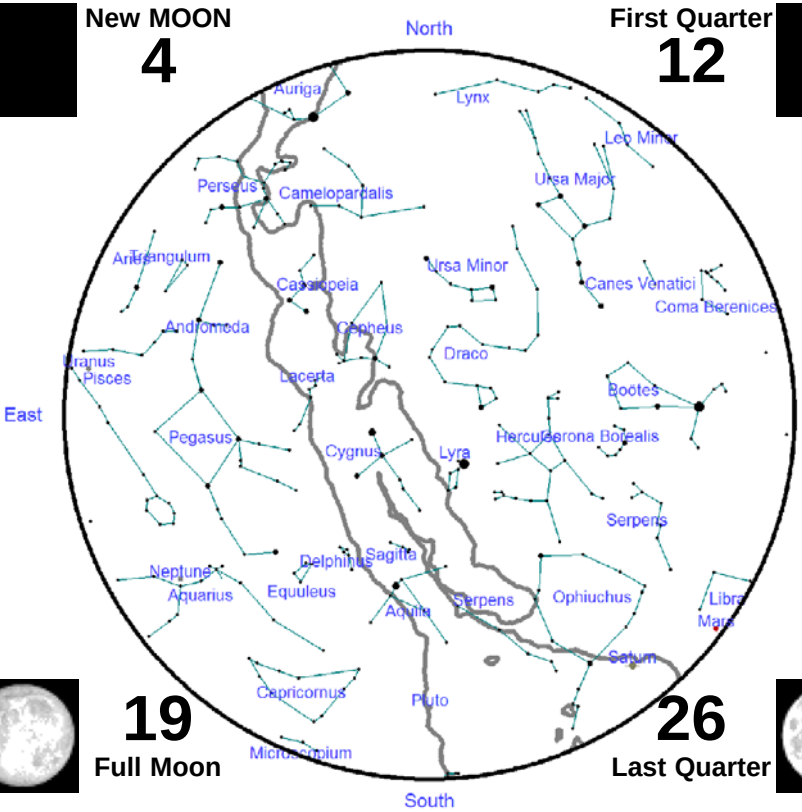
Almanac July

New MOON

4

First Quarter

12



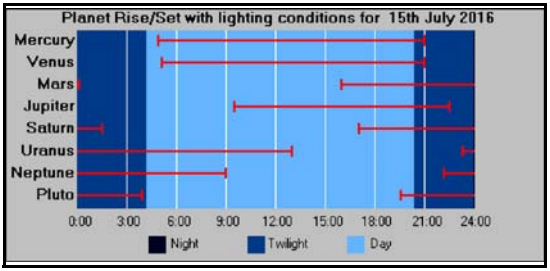
19

Full Moon

26

Last Quarter

	Constellation	R.A	Dec	Rises	Sets	Mag.
Mercury	Cancer	08h18m36s	+21°29'46"	04:53	20:57	-1.2
Venus	Cancer	08h24m04s	+20°37'18"	05:04	20:56	-3.9
Mars	Libra	15h25m49s	-21°37'13"	15:57	00:05	-1.1
Jupiter	Leo	11h21m56s	+05°21'54"	09:28	22:27	-1.8
Saturn	Ophiuchus	17h00m11s	-20°55'30"	23:24	07:46	+0.3
Uranus	Pisces	01h31m22s	+08°53'33"	23:17	12:57	+5.8
Neptune	Aquarius	22h54m49s	-07°51'21"	22:06	08:56	+8.0
Pluto (Dwarf)	Sagittarius	19h19m54s	-21°13'03"	19:48	04:05	+14.3



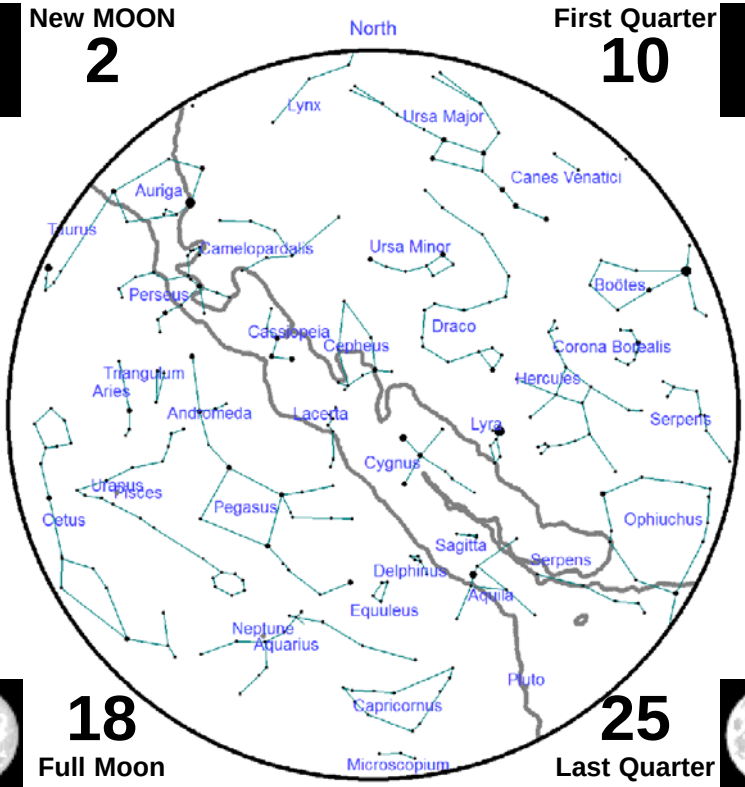
Planet Events

2nd Mercury at Perihelion (0.31 A.U.)
7th Mercury at Superior Conjunction
10th Venus at Perihelion(0.72 A.U.)

The data presented here is for the 15th July positional data is at 00:00 GMT/UT

Almanac August

New MOON
2

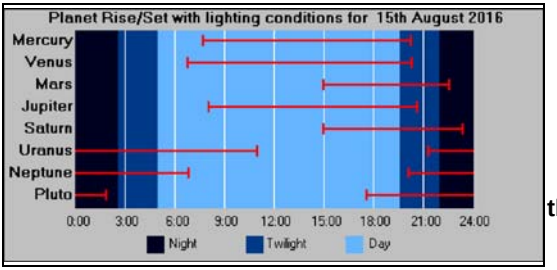


First Quarter
10

18
Full Moon

25
Last Quarter

	Constellation	R.A	Dec	Rises	Sets	Mag.
Mercury	Leo	11h20m24s	+02°31'10"	07:39	20:10	+0.3
Venus	Leo	10h53m53s	+08°33'58"	06:42	20:14	-3.9
Mars	Scorpius	16h10m49s	-23°57'10"	14:56	22:32	-0.5
Jupiter	Virgo	11h42m28s	+03°06'29"	07:58	20:35	-1.7
Saturn	Ophiuchus	16h33m29s	-20°19'33"	14:54	23:19	+0.3
Uranus	Pisces	01h31m20s	+08°52'29"	21:15	10:55	+5.8
Neptune	Aquarius	22h54m58s	-07°50'29"	20:04	06:54	+8.0
Pluto (Dwarf)	Sagittarius	19h19m59s	-21°13'57"	17:46	02:03	+14.3



Planet Events

None

The data presented here is for the 15th August, positional data is at 00:00 GMT/UT