



NEWSLETTER

September - December 2016 Issue 176



Meteor captured at Dyffryn Gardens Observatory during recent Perseids shower

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Editorial

John Richards

I welcome you, to the 1st newsletter of our 42nd year. This issue has the usual mixture of articles that we hope you'll enjoy. Edward Cooper provides insight into the Society's contribution to the UKMON project; a UK wide camera network to detect and track meteors and fireballs. Theresa Cooper, keeps us up to date with some of our recent outreach events, and Hugh Lang provides us with his regular quarterly review of the night sky. We have a warning from our Chairman Phil, should any member of the Society be thinking of building a time travel device. Finally, I round up recent spaceflight activities.

For the majority of members, it's that time of the year again: '**SUBSCRIPTION TIME**'. For an individual subscription of just £15, the benefits of joining the Society are multiple, and include:

- A top class lecture programme, featuring world renowned astronomical experts
- A well equipped observatory with up to date equipment
- A well stocked library and the ability to borrow telescopes
- Frequent observing sessions held at Dyffryn Gardens as well as public events
- A vibrant newsletter, website and social media presence

For those members whose subscription expired during the Summer, you can pay at a meeting by visiting our membership secretary (Kath Compton), or using the Society website, via the [JOIN NOW](#) link on the home page of the site (see address below).

As you should be aware, the Society is in the process of becoming a CIO, and we will inform members of any developments on that subject, as they become available, most likely via the website. Our lecture programme is very much a joint effort by the committee, and has, we think, something for everyone. The committee hopes you enjoy the programme of talks we have devised, and look forward to your continued support in the coming year.

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).

Visit CAS on the web at

<http://www.cardiff-astronomical-society.co.uk>

General enquiries can be sent to:

info@cardiff-astronomical-society.co.uk

As a CAS member you can use the Members Area of the web site to view Society handbooks, committee minutes, newsletters and other Society material of note.



CAS is now on twitter, to follow us, follow **CardiffAS**

CAS on facebook at

<http://www.facebook.com/CardiffAS>

BEHIND THE SCENES Theresa Cooper

Extraordinary General Meeting (EGM)

At an EGM, held on Thursday 21st July, a motion seeking to establish and register the Cardiff Astronomical Society with the Charity Commission as a Charitable Incorporated Organisation was placed before members. Cedric Longville provided some insight into the process and what benefits this may provide to the Society. The motion was then voted on, by the members present, and passed with an overwhelming majority. Our amended constitution has now been passed to the Charity Commission, who will hopefully approve it in due course. As the process moves forward, the committee will, of course, keep the membership fully informed.

Solar Viewing Day at Brecon - 30th July

or Viewing People Upside Down on Pen Y Fan

An enjoyable day out sums up the event. Optimistically the CAS team spread out all the equipment on the field in front of the Visitor Centre at Libanus and it looked impressive with Bob Biss and Spencer manning the Dobsonian, Bob Love with all sorts of telescopes set up in safe viewing mode, and Alan and Jeff following up at the rear with the solarscope. The public were soon attracted and



It's what we do!!

came wandering around to see what we were intending to do. Groups then gathered and the team were quickly into full flow informing everyone about safe solar viewing, what we hoped to see on the Sun and what we, as CAS members were involved in.



Now all we need is the sun!!

Kayleigh had printed off a stash of programme flyers and these quickly disappeared as the public learnt we have a full talks programme and have regular observing and stargazing evenings. Picnicking began early as we waited for the clouds to part, but eventually they did clear and some views of the Sun were obtained. But yes, it has to be admitted that until we were packing up the clouds were very persistent. Certainly not a wasted journey though; new members keen to join the Society, contact made with two new speakers, a current member interested in making a contribution by joining the committee or serving as a Trustee, and a large number of people became more informed about astronomy in general.

A sad part of the day was in saying goodbye to a number of the staff we have come to know over the years, they have always been helpful and very welcoming, but now have to face redundancy as the Centre will not be manned full time after September.

And yes, Spencer did entertain the public with demonstrating that astronomical telescopes can give very good images, but without a corrective lens you do see things upside down, even walkers on top of Pen Y Fan!

Our next public event is the **Telescope Workshop on Saturday September 24th** at the **National Museum, Cathays Park**, in central **Cardiff**. It's sure to be an enjoyable day, so if you would like to volunteer, please see anyone on the Committee. (*Editor: If you're wondering what some of us actually look like, the Society officers page on the web site may help!*)

Alternatively, if you, or a member of your family, are thinking of buying a telescope for Christmas, then why not come along and get some help. The advice will, of course, be impartial, and the money you could save will easily fund your CAS membership for many years to come!

CAS - Meteor Observation

Edward Cooper (CAS UKMON Coordinator)

Cardiff Astronomical Society (CAS) have been recording meteor, sprite and fireball events since joining the United Kingdom Meteor Observation Network (UKMON) in November 2013. UKMON was set up in early 2012 with the aim of becoming the first UK-wide network using CCTV cameras to capture meteor trails across the night sky and has the following objectives:

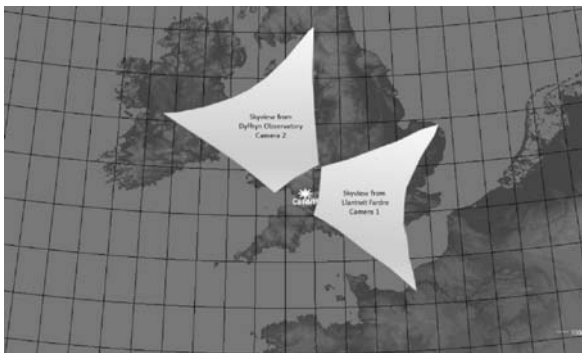
- Establish a network of relatively cheap CCTV cameras to monitor continuously meteor activity over the UK;
- Assist members with analysis of meteor data and publishing papers;
- Enable members to contribute to, and collaborate with, other networks across Europe using video data acquisition technology.

- Bring together individuals who are already working independently
- Encourage involvement by individuals and organisations (including astronomy societies, schools and colleges)
- Provide a platform for sharing knowledge and experience.

In September 2013 UKMON members from across the South of England and South Wales came together (see left) for the first time in an informal gathering held at the Norman Locker Observatory, Sidmouth. Over 20 people attended the event from Hampshire AG, the NLO Solar, Planetary and

Meteor Detection Group, Cardiff AS, Newbury AS, and Farnham AS. Bob Love & Claude Vallee from CAS were captured by the camera!

The Society have two static cameras in operation each with a different direction of view, the different direction of view is important to link in with the rest of the camera network operated under the UKMON banner. CAS Camera 1 is located at Llantwit Fardre under the supervision of Martin Chick, the axis of the field of view is to the East. I look after CAS Camera 2 which is located at the CAS Observatory in Dyffryn Gardens, the axis of the field of view is to the North West.



The installation at the CAS Observatory consists of a CCTV camera in a weatherproof enclosure connected via a video decoder to a standard PC with a large hard drive for data storage.

The PC is powered via an Uninterruptable Power Supply to try to protect the system from power outages. The PC has an application (**UFOCapture**) which is a motion detection program that scans the video stream for moving objects and when an object is detected, UFOCapture is developed by SonotaCo in Japan, writes a short AVI (movie clip) sequence to the computer's hard disk.

With a remote acquisition station, the data is transferred monthly for further analysis.



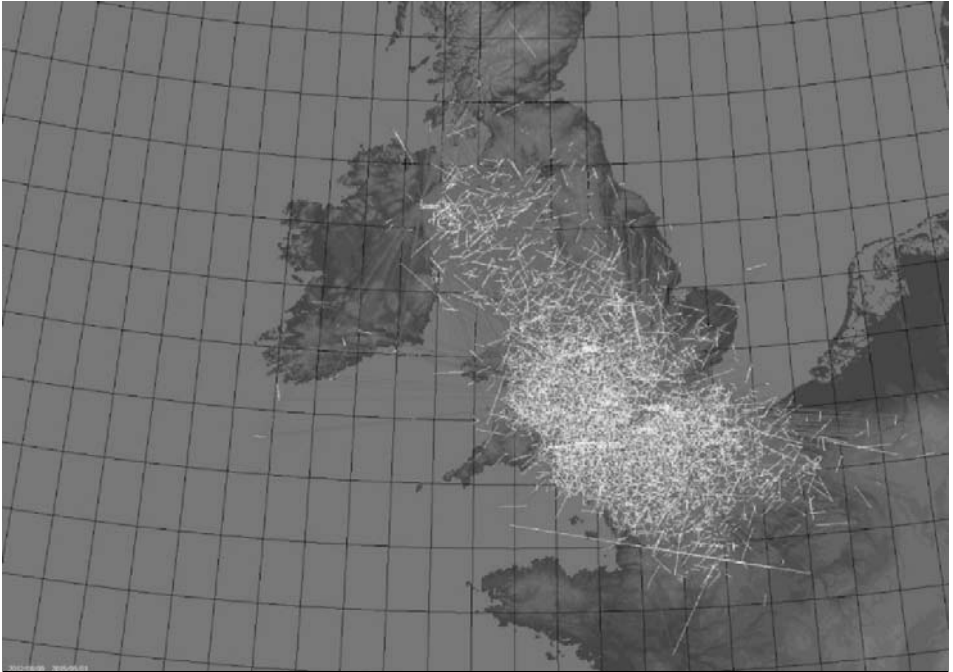
There are a number of steps to be completed before the processed data is uploaded to a central database maintained by UKMON where the data can then be integrated with the observations from

other stations.

Typically, the raw data is scanned and edited by eye to remove events that are evidently not natural events such as planes, helicopters, birds, insects and even laser pens used at Stargazing events. Once this reduction has been completed an image is selected which has a good selection of stars visible, using this image there is an iterative process conducted within UFOAnalyser to confirm the orientation of the camera using the stars to confirm alignment. The next step is to process a batch (one month's data) of AVI files. This will determine the types of event recorded, performs photometric and astrometric analysis to determine meteor properties and, if applicable, associates the meteor with a particular shower. Within this data there will be some events (too faint, too bright, too slow or just in view) which cannot be automatically identified and hence could not be categorised by the automatic process; for this data it is necessary to apply a manual approach to provide some assistance/guidance to the processing software.

Having completed the processing, the data is then uploaded to the central database.

In May 2013 Richard Kacerek of UKMON reported that 50,000 meteors had been added to the UKMON worldwide catalogue by the 19 members and 24 cameras across the United Kingdom.



Meteor Tracking data from UKMON

Accessing the **NEWS** tab at:

<http://www.ukmeteornetwork.co.uk/>

will give insight into some of the most significant recorded United Kingdom meteor events since 2012.

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 December for issue 177. **Why not send your article, on an email and send it to me, the Editor at *Publications.Officer@cardiff-astronomical-society.co.uk*.**

The Night Sky - Sept.- Nov. 2016

Hugh Lang

The planets

The innermost planet **Mercury** dashes around the sun once every 88 days, thus approximately every 44 days this planet alternates between eastern and western elongation as seen from Earth. I say approximately, as we also have to take into account the annual motion of the Earth also orbiting around the Sun, meaning that the elongations of Mercury slips throughout the months of the year. Mercury is relatively close to the Sun so it never gets to be seen in a true astronomically dark sky with a fairly high eccentricity, elongations east or west ranging from around 18 degrees at perihelion (46 million km) to 29 degrees at aphelion (70 million km)

Unfortunately for us northern observers, Mercury tends to be at perihelion during its most favourable elongations, so you'd need to travel to the southern skies to get the best from this planet. Having said that, Mercury has two reasonable appearances each year for us northern folk. Thankfully one of these is now during the autumn mornings when Mercury appears in the morning sky from around September 20th, starting at apparent visual magnitude +1.5. The planet steadily increases in brightness and reaches perihelion (West 18 degrees) on September 28th, at around apparent visual magnitude -1.8, with an apparent angular diameter of around 6 seconds of arc. Mercury should be easily observable in the morning twilight sky until around the end of the first week of October, and is in conjunction with the Jupiter on October 11th (Apparent visual mag -1.1 apparent angular diameter 5.4 seconds of arc.) The planet will disappear into the glare of the morning twilight sky around October 15th, and makes conjunction with the Sun on the 16th. The next appearance will occur with Mercury at eastern elongation from the middle to the end of November (Apparent visual mag -0.7 apparent angular diameter 5.0") but you will need a flat clear eastern horizon to spot the planet.

September finds **Venus** shining brightly, low in the western evening sky at around apparent visual magnitude -3. Venus slowly

brightens to apparent magnitude -4.0, increasing in apparent visual angular size to 15.7", though its lit phase will slowly decrease over the duration of this article. The planet slowly moves into the darkening winter sky as the month's progress, but unfortunately won't be well placed for observing until the end of the year.

At the start of September **Mars**, though fading and decreasing in angular size, can still be found shining in the south west at magnitude -0.3, angular size 10.5" located amongst the stars of the constellation of Ophiuchus. Mars moves into the constellation of Sagittarius by October 22nd, at apparent visual magnitude 0.3, apparent visual diameter 7.9", reaching perihelion on the 29th of the month. It then makes its way into Capricornus on the 8th of November, at apparent visual mag +0.5, apparent visual angular size of 7.5" in diameter and sets in the south west by the end of the month. Alas, we'll have to wait another two years for the next favourable opportunity to observe the red planet!

Jupiter has now vanished into the twilight sky, to be in conjunction with the Sun on September 26th, but will re-appear as a morning object low in the eastern dawn twilight sky in the constellation of Virgo around mid month of October, at apparent visual magnitude -0.7 and apparent angular diameter of 30.7". For those interested in observing the planets during the daytime, November 11th offers the opportunity to observe a Jupiter/Mercury conjunction at 0.9 degrees separation. Jupiter will remain low in the morning sky, but slowly brightens to reach apparent magnitude -0.5, apparent visual diameter of 32.8" by the end of the month of November.

Saturn is another planet that has passed its best for 2016, and at the start of September is found setting in the low south western sky in the late evening at apparent magnitude +0.5 and some 16.7" in apparent visual diameter. On September 7th, Saturn forms a rough equilateral triangle with the red star Antares and the red planet Mars. On October 30th Saturn will be found in conjunction with the glaringly bright planet Venus (3 degrees North of Saturn.) Saturn then vanishes into the evening twilight sky during mid November.

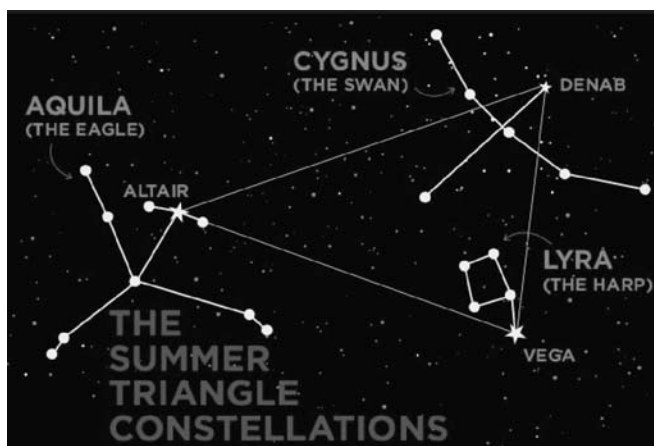
The planet **Uranus** is just about on the edge of visual detection with the naked eye, but now is the time to observe the planet as it is

reaches opposition on October 15th in the constellation of Pisces at apparent magnitude +5.7 and apparent visual diameter of 5.7" of arc. If you do get a chance to locate it, then the light you detect with your eyes will have taken around 2.6 hours to reach you from the cloud tops of this Super-Earth sized planet. Uranus remains in the constellation of Pisces at +5.7 and 3.7" diameter for the remainder of this year.

If you think Uranus is a bit of a challenge, then **Neptune** should really "test your mettle". At apparent visual magnitude +7.8 and apparent visual diameter of 2.3", the planet will remain at this brightness and diameter for the duration of this article. During early September, Neptune resides in the constellation of Aquarius and is at opposition on September 2nd; some 29 AU from the planet Earth. This means that the light you see from the last of the giant planet takes some 4 hours to reach your eye. Neptune then begins to retrograde in Aquarius, its angular size increasing very slightly. It continues to retrograde until November 20th, before resuming its eastward motion amongst the stars of Aquarius.

Late summer and autumn night sky.

The first days of autumn have arrived; This has the advantage of longer nights, but unfortunately the likelihood of poor weather. Oh to be an astronomer! Looking overhead, the trio of first magnitude stars **Deneb**, **Vega**, & **Altair**, forming the asterism known as "The



Summer Triangle" can be seen straddling the soft glow of the Milky Way. Deneb the highest point of the triangle is the brightest star in **Cygnus**, the Swan. Deneb is Arabic for tail, and the constellation looks

like a large cross in the heavens, and for that reason is also known as the Northern Cross. Cygnus can be easily traced out down to its

head, a amber and bluish green double star called Albireo or Beta Cygni. Following the Cross down southwards, a line of three stars will catch your eye, these are the head of the constellation of **Aquila** the Eagle, of which the brightest star, the middle of the three, is Altair. To the right hand side of the Milky Way we find the third star Vega, or Alpha Lyrae shining like a suspended diamond in the clear night sky. Vega, with a bluish white colour is the fifth brightest star in the sky. If you trace a line in the sky between the bright stars Vega in Lyrae and Albireo in Cygnus, at the mid point, the bottom two stars; Beta and Gamma Lyrae should be fairly prominent. Mid way between Beta and Gamma resides **M57**; more commonly known as the **Ring nebula**. As the sky darkens, observed through a small telescope, It appears as a dim smokey ring. Up and close to the left side of Vega is the star Epsilon Lyrae, a double, and a good test for the naked eye observers. Through a telescope each of the two stars can themselves be split into double stars; so in fact it's a double double!!

Now drawing a imaginary line from the bottom two stars of Lyrae and turning North West, we should be able to locate the well known keystone, which forms the centre of the constellation called **Hercules**. Three-quarters up the western side of the keystone we find **Messier 13**, a globular cluster just visible with the naked eye if the sky is clear and dark. It looks like a small non-stellar dot in a pair of binoculars, but is a splendid object to look through with a small telescope. If you trace out the constellation of Hercules, you'll find that he is almost upside down in the sky; this is so he can be portrayed as kneeling with his foot stepping on the head of Draco the dragon. Draco is a long dim constellation that winds around the North celestial pole. Located between his tail, toward the northern horizon we come cross the constellations **Ursa Major** and **Ursa Minor**; the Big and Little Bear respectively. They are currently low in the northern sky, slipping under Polaris the pole star. We are now looking north. Ursa Major is a unmistakable constellation in the sky, and is more commonly known as the Plough, or in Wales as the Saucepan, with two of its stars Merak and Dubhe pointing the way to Polaris the pole star The second star in the handle is another good visual double star, Alcor and Mizar that will test your eye's

resolving abilities! Toward the North east, we spy Auriga the Charioteer, with its first magnitude, circumpolar star, **Capella**. Circumpolar simply means the star never disappears below the horizon. Heading upwards toward to the west, we come across Perseus; with the Demon star **Algol**, a short period variable star. Above Perseus is the familiar W shape of **Cassiopea**. This constellation has two open clusters **M52** and **M103** situated either side of the W shape. Both are good binocular objects. Still facing north, drawing a line from the two stars, Scheder and Caph on the right hand side of the W of Cassiopea, we alight on the faint constellation of **Cepheus**. Located around Cepheus are a number of galaxies, clusters and nebulae that will challenge the avid astronomical imager with a moderate telescope and camera. Looking southward again, below Cassiopea, and to the west of Perseus, is **Andromeda**; home of the only easily visible naked eye galaxy, **M31**. Originally thought to be a cloud of gas in our own galaxy, Edwin Hubble (with a great deal of help from astronomers Milton L Humason and Vesto Slipher) established its true distance and nature in 1923. M31 is a +4.4 magnitude spiral galaxy and is the largest member of the Local Group of galaxies. M31 a faint misty smudge by eye, located one degree west of the star NU Andromedae; but stretches out to nearly six Moon diameters in size. With a telescope, its companion galaxies **M32** and **M110** can also be easily located. A medium sized telescope will display a star like core and a patchwork of luminous clumps filling the telescopes field of view. Below Andromeda, to the west, we find **Triangulum**. Between the stars Alpha Triangulum and Beta Andromeda resides **M33**. Known as the 'Pin wheel', it is a face on spiral Galaxy. M33 is also a naked eye object, but only in very dark and clear skies. For the older amongst us a pair of 10x50 binoculars may be required to spot it! At a distance of approximately three million light years, it is the furthest object to be seen by the human eye! Passing westwards from Pegasus, we find three small quite faint constellations situated in the haze of the Milky Way. **Equulesus** the little horse, **Delphinus** the dolphin and **Sagitta** the arrow. Located at the top end of Sagitta is **M27**, more commonly known as 'The Dumbbell'. Through a small telescope it looks like a faint amorphous blob, this is the shroud of a dead star. Passing onwards

we again meet up with Aquila and then, finally, setting in the west is the unofficial thirteenth zodiacal constellation of **Ophiuchus**, who is portrayed in the sky as holding two serpents Caudia and Caput. Turning toward the North West, we find the constellation of **Bootes** setting, with bright star Arcturus close to the horizon. Above and between Bootes and the head of Serpens Caput, we pass across the constellation of the Corona Borealis, a group of stars more commonly known as the Northern Crown. Facing south and rising in the East, following the ecliptic towards the west, we have, Taurus the Bull, just peaking over the horizon. Announcing the arrival of Taurus is a faint misty patch of stars known as **The Pleiades** or **M45**, but also known as the Seven Sisters They are a group of recently formed stars about 380 light years from Earth, and are a major highlight in the Autumnal sky for many observers. Another is the bright star **Sirius** in **Canis Major**, part of the constellation of the hunting dogs, which will be a beacon in the south eastern sky during the hopefully dark, clear evenings to follow.

The Perils of Time Travel Phill Wallace

As CAS members may know (or suspect), I have something of a fondness for catastrophe. I started small with atom bombs before moving upwards to apocalypses and supernovae, so now I feel we can move on to something even worse: the annihilation of not just the human race, but it's very erasure from history. Yes, I'm talking about Time Travel. More specifically, the dangers that careless time travel can cause, and how easy it might be for some moron with a time capsule to erase all life as we know it. This is the bottom line; Time Travel is obscenely dangerous!

We all know the dream. You've finished your greatest invention and decide to sample the 'Delights of History'. The Fall of Troy, the Battle of Trafalgar, Jimi Hendrix in concert. But Time Travel packs a dangerous set of problems that you need to be wary of.

First, let's look at the two basic models of time travel. Model number one: A single, fixed timeline. Once something has happened it cannot be changed. This might sound safe, but it contains its own share of terrifying possibilities. To expand upon the basic model, the

supposition is that time travellers will not be able to change history as they know it. So, no going back and killing Hitler unfortunately.

There are two variations to this model however. The first is that some kind of TimeCop or cosmic censor stops time travel from messing with history. The sniper lining up to blow away Hitler will find his rifle jams, or he gets discovered by the Gestapo, or he misses, or Jean-Claude Van Dam turns up and drags him back to the future. Suffice to say, it's impossible to mess with the past. This is a version that is safe from paradoxes and Universe-ending side effects, luckily.

The second variation is more of a problem. It states that any time traveller seeking to prevent or alter a historical event will instead wind up causing that event to happen. To use the Hitler example; we go back in time to kill Hitler as a child, but the attempt fails and traumatises the young boy, turning him in to the monster that history remembers. Now that's a problem. Not least because you could trace all of the suffering Hitler caused to the actions of that one time traveller. You would be directly responsible for millions of deaths. Which is bound to land you in some legal trouble if you return.

It also leads us to one of the nastier paradoxes that occurs. Let's take a nicer example. You are a big Shakespeare fan, and go back in time to meet the Great Bard, taking with you a copy of his completed works as a gift. However, you unknowingly make a cock-up and wind up meeting old Will before he's finished writing, say, Hamlet. Seeing him struggling, you give him the book to serve as inspiration. Will, being an opportunistic git, simply copies the play verbatim from the book. The paradox arises from the question: "If Shakespeare copied his plays from a book of his plays brought from the future, who actually wrote them?" It's a good one. That book is a record of the original play that is a copy of the book. It's become a time loop. This is known affectionately as "the free lunch paradox" as history gets something for nothing. It's the time travel and intellectual version of a perpetual-motion machine.

This model of Time Travel also leads to the bizarre problem with changing bad events. Would the event have happened if you hadn't tried to change it? The answer is: most likely not. But since it has

happened, someone has to go back and make it happen. Keep thinking along those lines and you'll get a nasty headache. This single-timeline model, while not being free of paradoxes and perils (predestination paradoxes are a real pain; you go back and change something, and that change is the reason you went back in the first place) it does at least have safeguards that stop Humanity being erased.

The second model is much more problematic. In basic terms: Time is fluid and can be changed with ease, as easily as stepping off a pavement or sneezing. Yes, it's the good old Butterfly Effect. And although some may scoff it actually makes sense. You arrival in the past will displace air, which pushes more air. This makes a small breeze with enough force to rustle the trees, which startles a small animal, making it dart out of a hunter's sights. The hunter then changes target and nails something else. **BOOM!**, history has changed, but (I hear you say) in a tiny way. But...suppose that this new animal is harder to kill, making the hunter leave later. He's driving home but the traffic is different and he's tired from a longer than planned day. He doesn't see that cyclist coming out of the side road and bam, someone's dead. That's a BIG change to history, and all because you just arrived in the past.

That's an extreme example, so let's go for the ultimate one. You go back in time to meet your grandfather, who died before you were born so you only have stories of him. You meet him as planned and you get chatting, and eventually get so engrossed in talking that he misses his train; the same train that he coincidentally met your grandmother on. Your grandparents never meet, your father is never born and neither are you. Congratulations, you've just wiped out your own timeline.

Or even worse, you go back in time to stop yourself making a mistake a decade ago. You get into an argument with your younger self (who, naturally, considers whatever choice you made a brilliant idea, no matter how dumb it is in retrospect) and in a fit of rage, you punch yourself in the face (time travel even messes with grammar and pronouns, that's how bad it is!). Your younger self falls awkwardly and smacks his head on a desk, killing him and negating

your history. Somehow you just committed both manslaughter and suicide and no longer exist. But if you don't exist, you can't have killed your younger self, so you do exist to go back and kill yourself and so on.

A weirder version is one shown in Futurama. In an attempt to stop himself from killing his grandfather while in the past, Fry hustles the man to "safety" in an isolated house, which happens to be on a nuclear testing range. Fry doesn't disappear, making him realise the man wasn't his ancestor. Consequently he has no problem with comforting the dead man's widow. Fry winds up sleeping with her and consequently becoming his own grandfather. Now that is bound to make family reunions awkward. Plus it also would make you horribly inbred.

The grand-slam version of this problem though is that you travel far enough back in time that your slight change makes humanity never evolve. Suppose you went back in time to a beach and saw a weird-looking fish struggling on the sand. In a fit of kindness you throw the fish back into the sea. Well done, you just stopped the first creature crawling on to land and mammalian life, let alone Homo Sapiens, never evolves.

There's one final pitfall that seems to crop up time and again. It's called Godwin's Law of Time Travel. Basically: "As the amount of time-traveling you do increases, the probability of Hitler winning World War II approaches one." In other words, every Time Travel adventure gives Hitler another chance to win. Even the slightest change could irrevocably alter the future and make it something far worse. Indeed, in fiction, it is usually the case that time travel results in a Nazi triumph.

So then, between paradoxes, killing your ancestors in an eternal loop and, by the way, letting Hitler win WW2 over and over again, you have a whole heap of problems. Simplest answer to these problems? Don't use your fancy new time machine. Destroy it. Destroy all details of it. Better yet, don't build it in the first place. Just don't decide to go back and stop yourself building it...

Up-coming CAS Public Events

Date	Time	Event	Venue
24 th Sept	10am - 4pm	Telescope Workshop	National Museum of Wales
22 nd Oct.	To be confirmed	Stargazing evening	Brecon Beacons Visitor Centre
29 th Oct.	To be confirmed	Stargazing evening	Dyffryn Gardens
19 th Nov.	To be confirmed	Stargazing evening	St. Fagans

For further details of the events we are organising, or times of the Stargazing evenings, please visit the CAS web site (address is on page 2 of this newsletter)

CAS Lectures September to November

Date	Title	Lecturer
1 st Sept.	The Great Dane: The Astronomy of Tycho Brahe	Dr. Allan Chapman, Oxford University
15 th Sept.	Creative Space	Melanie Davies, FRAS
29 th Sept.	A Cosmic Miscellany of Talks	James Fradgley. 3 or 4 short talks on variety of topics.
13 th Oct.	Is Pluto a Planet?	Jerry Stone FBIS/Spaceflight UK
27 th Oct.	The James Webb Space Telescope	Dr Helen Walker, Science and Technologies Facility
10 th Nov.	"Cosmology in the Far-Infrared"	Dr Mattia Negrello, Cardiff University
24 th Nov.	Imaging the Cosmos	Phillip Perkins, Astrocruise

Observing Sessions

Date	Day	Time	Venue
2 nd or 3 rd Sept.	Fri or Sat	20:30 - 00:00 BST	Dyffryn Gardens
30 th Sept or 1 st Oct	Fri or Sat	20:30 - 00:00 BST	Dyffryn Gardens
21 st or 22 nd Oct.	Fri or Sat	20:00 - 00:00 BST	Dyffryn Gardens
11 th or 12 th Nov.	Fri or Sat	20:00 - 00:00 GMT	Dyffryn Gardens
25 th or 26 th Nov.	Fri or Sat	20:00 - 00:00 GMT	Dyffryn Gardens

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 information.

Almanac

Compiled by John Richards

Sun Rise/Set & Twilight

Date	Astronomical Twilight Begins	Sun Rise	Sun Set	Astronomical Twilight Ends
1 st September	03:20	05:25	18:59	21:04
8 th September	03:36	05:36	18:44	20:44
15 th September	03:51	04:47	18:28	20:24
22 nd September	04:05	05:58	18:11	20:05
29 th September	04:18	06:10	17:55	19:47
1 st October	04:21	06:13	17:51	19:43
8 th October	04:33	06:24	17:35	19:26
15 th October	04:45	06:36	17:20	19:11
22 nd October	04:57	06:48	17:05	18:57
29 th October	05:08	07:00	16:51	18:44
1 st November	05:12	07:06	16:46	18:39
8 th November	05:23	07:18	16:34	18:29
15 th November	05:33	07:30	16:23	18:20
22 nd November	05:43	07:42	16:15	18:14
29 th November	05:52	07:53	16:08	18:09

Meteor Showers

Date	Meteor Shower	RA	DEC	ZHR
8 th Sept.	Piscids	0h36m	7 ^o	10
21 st Sept.	Piscids	00h24m	0 ^o	5
13 th Oct.	Piscids	1h44m	14 ^o	5
22 nd Oct.	Orionids	6h24m	15 ^o	25
3 rd Nov.	Taurids	3h44m	14 ^o	8
18 th Nov.	Leonids	10h08m	22 ^o	10

Star Party and Observers Club Meetings

Date	Day	Time	Venue
2 nd Sept.	Friday	19:30 - 21:30 BST	Dyffryn Gardens
30 th Sept	Friday	19:30 - 21:30 BST	Dyffryn Gardens
21 st Oct.	Friday	19:30 - 21:30 BST	Dyffryn Gardens
25 th Nov.	Friday	19:30 - 21:30 BST	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 September

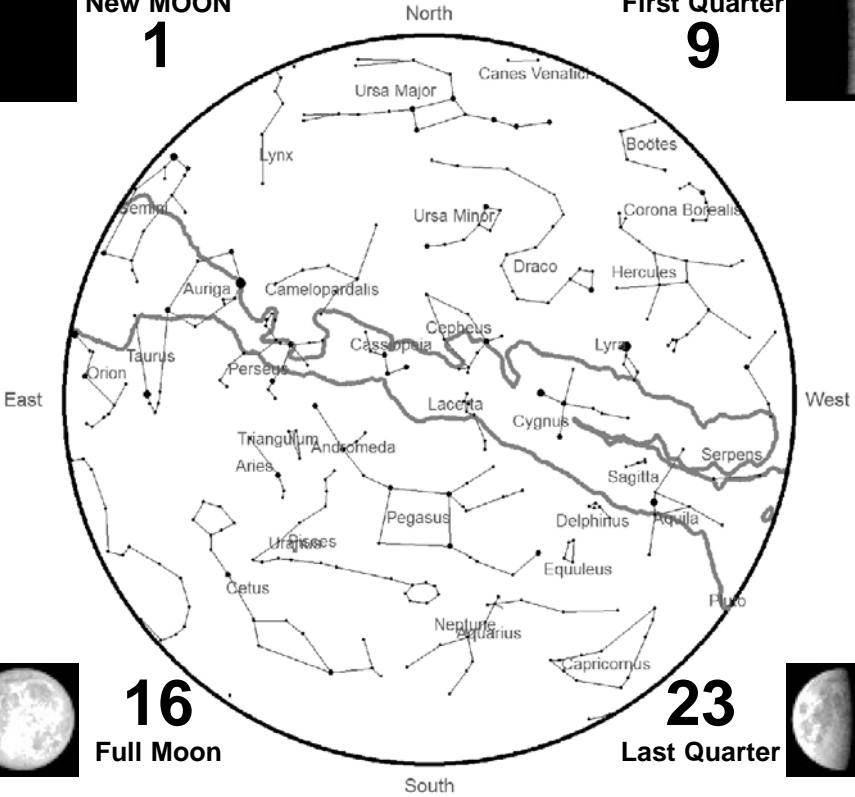


New MOON

1

First Quarter

9



16

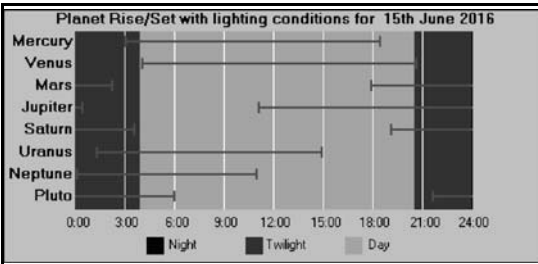
Full Moon

23

Last Quarter



	Constellation	R.A	Dec	Rises	Sets	Mag.
Mercury	Leo	11h13m47s	+01°52'06"	05:34	17:58	4.4
Venus	Virgo	13h12m44s	-07°07'36"	08:18	19:11	-3.9
Mars	Ophiuchus	17h25m14s	-25°47'44"	14:22	21:31	-0.1
Jupiter	Virgo	12h06m06s	+00°31'45"	06:33	18:43	-1.7
Saturn	Ophiuchus	16h36m58s	-20°33'26"	12:57	21:19	+0.5
Uranus	Pisces	01h28m35s	+08°35'47"	19:12	08:49	+5.7
Neptune	Aquarius	22h55m06s	-07°49'38"	18:02	04:52	+8.0
Pluto (Dwarf)	Sagittarius	19h20m04s	-21°12'52"	15:44	23:58	+14.3



Planet Events

- 2nd Neptune at Opposition.
- 12th Mercury at Inferior Conjunction.
- 26th Jupiter at Conjunction.
- 28th Mercury at Perihelion (0.31 A.U.).

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

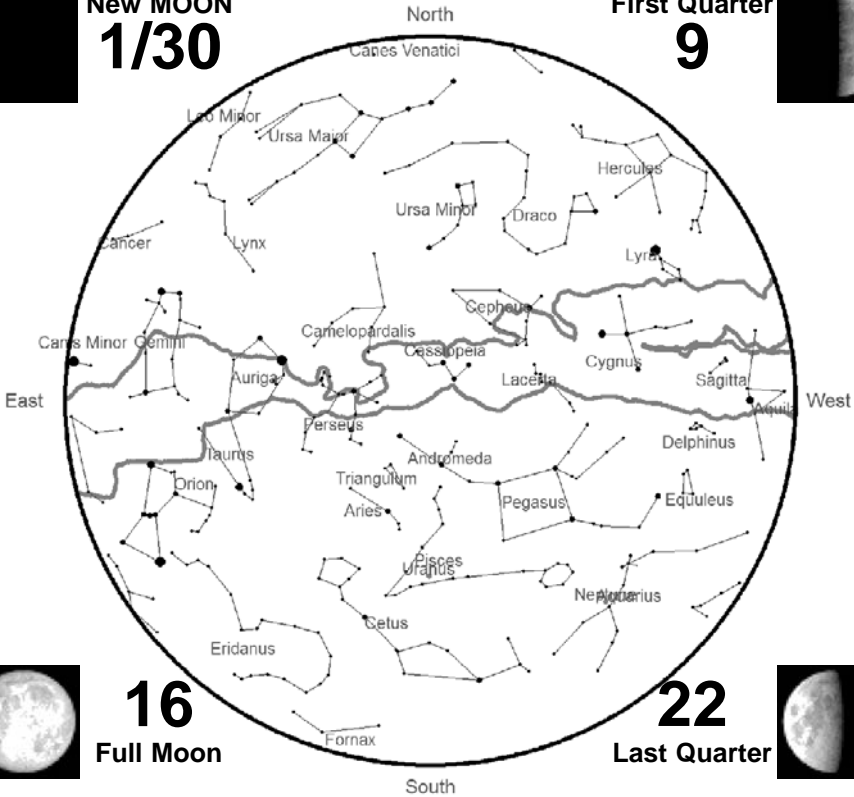
Almanac October

New MOON

1/30

First Quarter

9



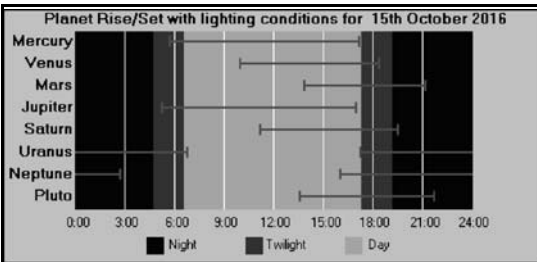
16

Full Moon

22

Last Quarter

	Constellation	R.A	Dec	Rises	Sets	Mag.
Mercury	Virgo	12h50m54s	-03°35'54"	05:40	17:09	-1.2
Venus	Libra	15h33m50s	-20°09'25"	09:54	18:21	-4.0
Mars	Sagittarius	18h52m45s	-25°05'48"	13:46	21:06	+0.2
Jupiter	Virgo	12h29m50s	-02°01'18"	05:11	16:56	-1.7
Saturn	Ophiuchus	16h45m55s	-20°55'54"	11:10	19:28	+0.5
Uranus	Pisces	01h24m18s	+08°10'21"	17:12	06:44	+5.7
Neptune	Aquarius	22h55m14s	-07°48'47"	16:04	02:54	+8.0
Pluto (Dwarf)	Sagittarius	19h20m09s	-21°12'46"	13:46	22:00	+14.3



Planet Events

- 15th Uranus at Opposition.
- 27th Mercury at Superior Conjunction.
- 29th Mars at Perihelion (1.3 A.U.).
- 31st Venus at Aphelion (0.73 A.U.).

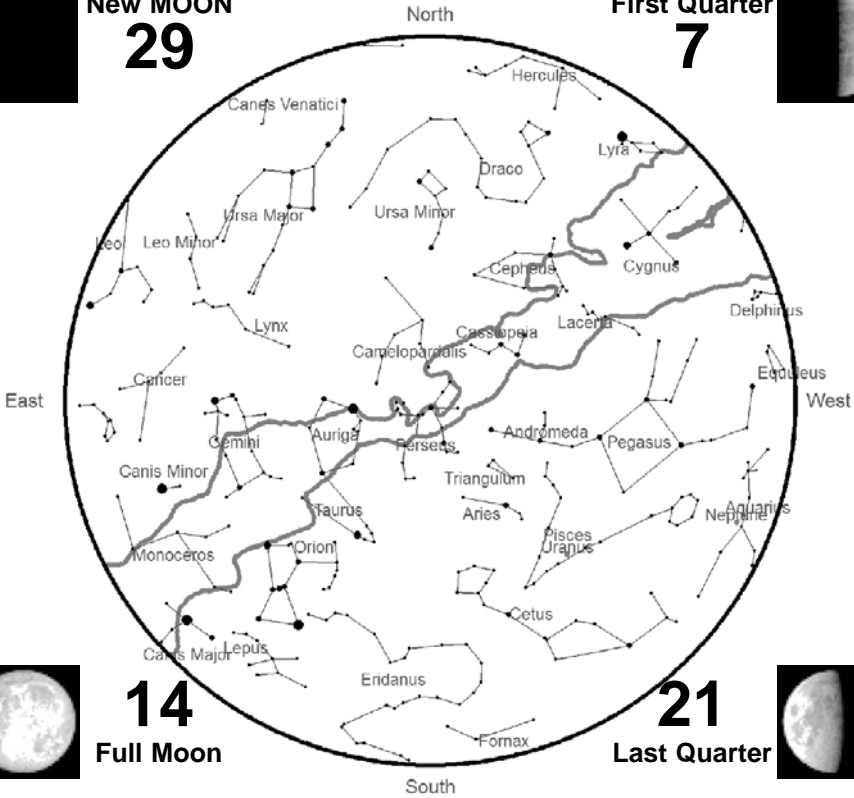
The data presented here is for the 15th October positional data is at 00:00 GMT/UT

Almanac November



New MOON
29

First Quarter
7

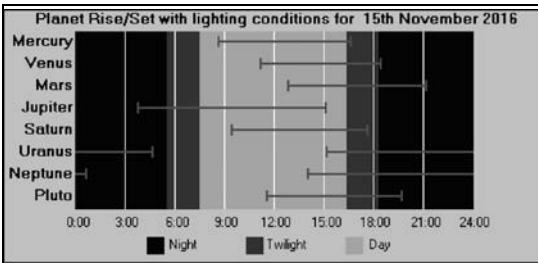


14
Full Moon

21
Last Quarter



	Constellation	R.A	Dec	Rises	Sets	Mag.
Mercury	Scorpius	16h05m26s	-22°18'01"	08:37	16:37	-0.6
Venus	Sagittarius	18h14m48s	-25°35'22"	11:10	18:22	-4.1
Mars	Capricornus	20h27m59s	-20°50'56"	12:49	21:08	+0.5
Jupiter	Virgo	12h53m09s	-04°26'45"	03:45	15:05	-1.7
Saturn	Ophiuchus	16h59m18s	-21°21'47"	09:25	17:36	+0.6
Uranus	Pisces	01h19m51s	+07°44'24"	15:08	04:36	+5.7
Neptune	Aquarius	22h55m23s	-07°47'57"	14:03	00:53	+8.0
Pluto (Dwarf)	Sagittarius	19h20m14s	-21°12'42"	11:44	19:58	+14.3



Planet Events

None

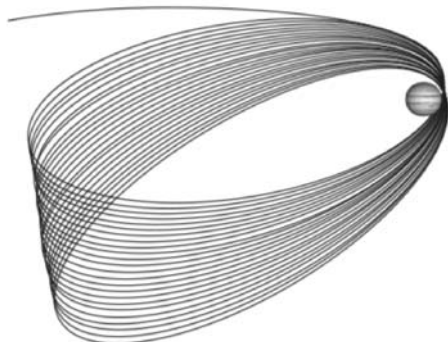
The data presented here is for the 15th November, positional data is at 00:00 GMT/UT

Spaceflight Round-Up John Richards

After a mission extension of 2 weeks, British Astronaut **Tim Peake** returned safely to Earth on June 18th, marking the end of the journey for the second "Brit" in space. During his 6 months in space, Tim completed more than 2700 orbits of the Earth, travelling more than 71 million miles. His return, broadcast live on British television, saw the Soyuz craft, carrying Tim Peake, **Tim Kopra** and **Yuri Malenchenko** undock from the ISS at just after 6am, and after what appeared to be a flawless return, landed safely in Kazakhstan around 3 hours later. Highlights of the mission include Tim's space walk, running the London Marathon while in orbit, remote piloting an Earth based robot from the ISS, and (hopefully) inspiring UK school children with the many experiments Tim conducted while in orbit. After a slightly dodderly return, where he needed help to get off the plane, its reported that Tim continues to recover well after his journey into space. In early July, a modified Soyuz, MS-01, flew its maiden flight to the ISS. While visually similar to the previous Soyuz capsule, the new craft carried significant modifications including an enhanced propulsion system, improved astronaut protection system, and an all digital communication system. After a two day shakedown mission, the Soyuz craft, carrying Russian **Anatoli Ivanishin**, Japanese astronaut **Takuya Onishi** and Kathleen **Rubins** successfully docked to the ISS on July 9th. An interesting payload aboard the July **SpaceX** resupply mission to the **ISS** was the International Docking Adaptor (IDA). The IDA will allow the privatised crafts of SpaceX, Boeing, Sierra Nevada and others to dock automatically with the ISS. NASA astronauts **Jeff Williams** and **Kathleen Rubins** successfully installed the IDA to the outside of the space station during a six-hour spacewalk on August 19th.

Dream Chaser, the mini space shuttle craft, being developed by Sierra Nevada Corporation (SNC) says it will start the 2nd round of test flights, as it continues to develop a vehicle to transport cargo, and eventually crew, to the International Space Station. SNC said a test vehicle, will be sent to NASA's Armstrong Flight Research Center in California for a series of tests, including at least one glide flight test scheduled for later this year. After a journey of more than

5 years, and almost 2 billion miles, **Juno** successfully entered orbit around Jupiter on July 4th . The primary aims of the 20 month mission, during which the probe will complete 37 highly elliptical orbits of the giant planet (see below), are to determine how much water is in Jupiter's atmosphere. This will allow astronomers to determine, which, if any, of planet formation theory is correct. It will



Juno will travel on a series of elongated 14-day orbits. Its trajectory will repeatedly take the craft over Jupiter's poles and keep it away from the radiation belts most of the time.

also look deep into Jupiter's atmosphere to measure composition, temperature and cloud motions. It will map Jupiter's magnetic and gravitational fields, revealing the planet's deep internal structure and it will explore Jupiter's magnetosphere, paying particular attention to the auroras – Jupiter's northern and southern lights – hoping to explain the complex relationship

between the planet's enormous magnetic force field and its atmosphere. Juno is carrying a "citizen camera", called JunoCam, Mission specialists hope the public will help them operate the camera. Details can be found at:

<https://www.missionjuno.swri.edu/media-gallery/junocam>

In February 2018, at the end of the mission, Juno will literally be slammed into the atmosphere of Jupiter, causing it to disintegrate and burn up in a matter of seconds.

News in Brief June 19th saw **Blue Origin**, a commercial space company run by Amazon founder Jeff Bezos, launch a successful sub-orbital flight and land the reused booster: the fourth launch and landing of the same rocket. **Moon Express**, a privately funded company, aiming to win the Google X Prize, received approval from the American FAA to fly a mission to the Moon during 2017. **Virgin Galactic** has been awarded an operator license for its SpaceShipTwo ship. This allows for tests to be conducted on the craft, the 1st of which was a "Taxi" Test, with the SpaceShipTwo ship taxied down the runway, attached to a Land Rover.