



# NEWSLETTER

March - May 2015 Issue 170



*Comet Lovejoy. Image taken by Ed Cloutman (CAS Member) using 2000mm FL Astrograph telescope on 6th February 2015. Total exposure time 1hr 12 minutes*

| <b>Contents</b>             | <b>Page</b> | <b>Contents</b>     | <b>Page</b> |
|-----------------------------|-------------|---------------------|-------------|
| Editorial                   | 2           | My story            | 24-25       |
| Behind the scenes           | 3 - 6       | Upcoming CAS Events | 26          |
| Great balls of fire!!       | 6           | Observing Sessions  | 26          |
| The Night Sky - March - May | 7 - 11      | Almanac             | 27-30       |
| Spaceflight roundup         | 11 -14      | Junior Pages        | 31-32       |
| Photographing the night Sky | 14- 23      |                     |             |

**Editor** **John Richards 17 Lan Close Graigwen, Pontypridd CF37 2HB**

Tel. (01443) 480 987 email [Publications.Officer@cardiff-astronomical-society.co.uk](mailto:Publications.Officer@cardiff-astronomical-society.co.uk)

**Junior Editor** **Kayleigh Churchill, 34A Swansea Road, Merthyr Tydfil, CF48 1HT.**

Tel. (01685) 382 866 email [Junior.Representative@cardiff-astronomical-society.co.uk](mailto:Junior.Representative@cardiff-astronomical-society.co.uk)

Welcome to the first newsletter of 2015. This is one of the most exciting programmes in the society's history. Every speaker Dave has provided can be said to be a leader in their field, and the programme this year is second to none. There are a few changes being made to the society and some of these are reflected in the newsletter. Some eagle-eyed readers will notice that the society logo has changed. You will now see this in all official CAS material, and other changes to the web site are also in the offing. Stay tuned. Issue 170 contains many great articles. We welcome Ed Cloutman with the first of 2 articles about his adventures in astrophotography. Robert Lang has produced his quarterly preview of the night sky. Along with the information provided in the Almanac, the society hope it encourages you to experience the night sky. And of course, there's the regular update of Society notices by Dave. Finally, to coincide with the partial solar eclipse, 'Stargazing Live' returns on March 18<sup>th</sup>-20<sup>th</sup>. Visit the CAS web site for information about some exciting events we're running.

---

## 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](mailto:membership.secretary@cardiff-astronomical-society.co.uk)) or Secretary ([secretary@cardiff-astronomical-society.co.uk](mailto:secretary@cardiff-astronomical-society.co.uk)).

## 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, & is the 7<sup>th</sup> May for issue 171.

---

## Visit CAS on the web @



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

General enquiries email [info@cardiff-astronomical-society.co.uk](mailto:info@cardiff-astronomical-society.co.uk)

As a CAS member you can use the Members' Area of the web site. You will need your password to access this area. If you don't know your password it is your surname followed by your membership number.



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



CAS on facebook at

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

---

## Behind the scenes.

The last Saturday of November we were back at the Cwmcarn Mountain Centre. For the first time at this venue we were unable to view the sky so we entertained a full house with two talks. We got lots of very nice comments and I think we can say the evening was a great success.

The December star party was a complete washout, the January one was also weather affected but we had a great PowerPoint show of Ed Cloutman's marvellous astronomical images. Because these are not advertised on the website some members think they don't take place, but they do. Please look in the newsletter for future dates.

The Christmas meal was a great success. This is what Kath Compton, a long time member, had to say:

*"The Christmas meal took place in the Deri Inn. It was the first CAS meal I attended in 20 years. I was a little nervous but people made sure I had company and I found CAS members are a friendly bunch, and I felt perfectly at ease. The meal itself was very good and everyone around me seemed to enjoy theirs.*

*As for the people who forgot what they ordered, Rosa was on hand with her list to remind them. Unfortunately, Dave Powell was unwell and could not make the evening, but on the plus side, this meant that the only corny jokes we had to listen to came from the Christmas Crackers. For me, it was the perfect opportunity to catch up with some people I hadn't spoken to for 20 years and also to start to get to know some of the new members that I hadn't met before. (by "new" I mean only joined in the last 20 years.!).*

*Finally, I would like to thank Rosa for organising the evening. It seems effortless when the event goes so smoothly but it takes a lot of work for that to happen!"*

Saturday January 10<sup>th</sup> saw us at the National Museum of Wales for a fun packed astronomical day, and **NOT** as the South Wales Echo said, a "fun free" day! We had a big team on hand and boy were they needed. Over 2000 people turned up!! There were various stands which proved very popular and our trade stand really stood out. Theresa Cooper and Kath Compton manned the 'The Campaign for Dark Skies' stand which was constantly busy throughout the day offering advice to members of the public. Emma

Wride from South Wales University brought her road show and she and her team put on several marvellous 3D shows. These proved **SO** popular that members of our team were unable to view them because the room was so packed. Never mind, she will be back with us at our event in April. It was good to see so many members of our society present and helping out. In fact, so many members of the public thanked us for a “very interesting day”, we all went home tired but happy.

## **Web Site and membership**

Due to the ongoing issues with the web site, the committee has decided to engage the services of an outside company to build and maintain it. We hope to have it back up and running very soon. I apologise once again the time this has taken.

We also decided to bring our membership system into the 21<sup>st</sup> century, an all singing all dancing electronic system. It's no secret things have not gone well with this at all. I am aware some of you have paid but not received your cards, please be patient. It also means we have not been reminding people when subscriptions are due, so I am asking all members to have a think, and if you suspect yours are due, please pay up. I can only apologise for any inconvenience caused and ask for your cooperation.

## **Events**

### **Observers Club Meetings.**

From March these will move from the Black Cock Inn Caerphilly, to Dyffryn Gardens. This monthly event will now take place on the same evening as our star parties. The reason for the move is because the car park of the Inn is now lit up like a Christmas tree, and the venue itself is too crowded. At Dyffryn we also have use of the Cory Centre. It's warm, and dry for when the weather is against us.

**An Exhibition** of astronomically-related work by Chris Williams, featuring work by Nik Hart, will be held at the Workers Gallery, Ynyshir, Porth between 10<sup>th</sup> April-17<sup>th</sup> May. For more details, contact [www.facebook.com/WorkersGallery](http://www.facebook.com/WorkersGallery), [wood4tt@gmail.com](mailto:wood4tt@gmail.com) or telephone 07981 859075.

On Saturday April 18<sup>th</sup> we will hold a one-day Astronomy festival in

partnership with The National Museum of Wales. There will be various stalls, a planetarium, and a talk by Andy Lound, plus a 3D show presented by Emma Wride. Entrance is free.

On March 20<sup>th</sup> we will be at St Fagan's National History Museum, armed with our solar scopes to view a rare event: a partial solar eclipse. Around 90% of the Sun, will be covered at maximum. The event begins at 8.23am, maximum is at 9.28am, and it ends at 10.38am.

If you go onto Google, type in 'eclipse calculator March 20<sup>th</sup> Wales' you can watch a video of what it will look like, weather permitting of course.

Remember, you will need eclipse glasses or view through a special solar telescope. **NEVER LOOK DIRECTLY AT THE SUN WITH OR WITHOUT OPTICAL AID.**

The Annual General Meeting takes place on Thursday April 16<sup>th</sup>. This is the meeting where you have the chance to question members of the committee and/or put forward your suggestions. I do hope you will attend. You also have the opportunity to stand for election yourself or nominate someone else. The forms are available from me, and should be returned, to me, no later than Thursday April 2<sup>nd</sup>. No less than two ordinary members must support any nominations. We require at least two ordinary committee members who will stand for one year only.

### **40<sup>th</sup> Anniversary dinner**

Our special **40<sup>th</sup> Anniversary dinner** is being held on Friday 11<sup>th</sup> September at the **Cardiff and County Club, Westgate St, Cardiff**. Cost is £28 per head. Members can pay a small deposit and the balance can be paid in June. To reserve your place, please see Kath Compton, our Social Secretary to book your place.

### **Joan Thomas.**

It is with great sadness I record the death of Joan after a short illness. She was our Librarian since 1993. Her love of books knew no bounds. Every year she made sure the committee made funds available to keep the library up to date. Her one big problem was understanding the library case was not the Tardis and once in a while she had to dispose of some of the older volumes. Asking Joan to do this was like asking her to give up her own children.

Joan was dedicated and loyal to the society. Everything she did was

in the hope of improving what we already have. She stood up for the underdog, and resisted any attempt to make the society elitist.

For most people this would have been enough but Joan volunteered her services to look after our speakers. She accompanied Theresa on many a draughty railway station, taking them for a hot meal before bringing them back in time to entertain us.

If they required overnight accommodation it was Joan who made her house available. In fact when I asked various speakers to return, they agreed asking if I would make sure they stayed in the same place as before. This is how good Joan was, and how valuable she was to us. The only thing that ever worried me was if Joan took the speaker home in her own car. She famously had no sense of direction, and I always expected to get a call from a University asking what we had done with their speaker as they had not yet returned.

The impact on the society to the loss of Joan will be huge, and long lasting. I doubt very much we will see her like again.

There will be no funeral. Many years ago Joan decided she would donate her body to medical science. I understand from her family that sometime, later in the year, they will host an open house day, when friends and relatives can meet up and celebrate her life. In the meantime we extend our deepest sympathy to husband Corris and Joan's family.

## **Dave**

---

### **Great Balls of fire!!!**

Nigel Thomas, a member of the society recently reported seeing a fireball over Cardiff, and was wondering if any other members witnessed it? The details are as follows:

Time : 00.10

Date : 20th January 2015

Observed from Whitchurch, Cardiff

Bright meteor seen fragmenting into two pieces. Possibly travelling North to South, very low landing West or North West of Cardiff.

As far as Dave is concerned, none of it landed in his garden, but if anyone else saw it, and has further details, please pass them onto a member of the committee at a future meeting.

# The night sky March-May 2015.

Robert Lang

The month of mid-March, late evening, will find Ursa Major high with the pole star situated below the pointer stars. Looking overhead, we will see the constellation of Auriga with its conspicuous pentangle shape in the early evening. We are now actually peering through ever deeper portions of our galaxy's Orion arm, so you will see an increasing number of stars and galactic clusters. If you get the chance have a look at Auriga on a dark clear night you should be able to spot a number of bright star clusters, especially M36, M37 and M38. Looking toward the southeast, Taurus will be setting while due south Orion the hunter will be standing high. To the lower left of Orion and its great nebulae M42, you will see bright Sirius the star that represents the eye of Canis Major; otherwise known the Great Dog. Sirius is the Greek word for scorching. At a distance of 8 light years it's one of the suns closest stellar neighbours. Scattered throughout Canis Major and rising towards Orion are many open clusters just awaiting for the keen observer to search them out.

Residing to the East of Auriga are the constellations of Gemini and Leo. Gemini, with the bright stars Castor and Pollux, each star representing the head of one of the twins, and further to the East the bright star Regulus, in Leo. Both constellations are currently ascending into the night sky. After Leo comes the constellation of Virgo, also now rising in the east. Between these two constellations are many galaxies of the Virgo cluster, a rich telescopic hunting ground for deep sky objects.

Perseus, sitting on Auriga west side, is also accompanied by the constellations of Cassiopeia and Taurus. Toward the North of Auriga are the faint constellations of Camelopardalis (The Giraffe.) and Draco (The Dragon). Andromeda is now approaching the north western horizon, while Cetus the Whale is sinking into the North West, and as the month passes Taurus slowly sinks below the western horizon followed by the Pleiades open cluster.

In mid-April, the sky will have progressed by some two sidereal hours, and we will see that the constellation of Hydra the great sea serpent will have practically cleared the southern horizon. The constellation of Virgo is now completely visible, its brightest star Spica being very conspicuous in a dark night sky, and the constellation of Serpens is rising above the eastern horizon. Above the serpent the constellation of Bootes with the bright star Arcturus cannot be mistaken, while to the left of Serpens, the constellation of Hercules, who is supposedly kneeling on the head of Draco is now rising into the night sky. Around mid-April the constellation of the Lyra with the brilliant star Vega is now seen to be rising in the north east.

We move the sidereal clock on another two hours to mid-May. Andromeda has now disappeared below the north western horizon closely pursued by Perseus. Orion has all but disappeared though you may just glimpse the bright red star Betelgeuse. Castor and Pollux, the two principle stars of Gemini, are still visible toward the west. Also just above, but disappearing over the south western horizon, may be seen Canis Minor the lesser of Orion's two hunting dogs. The constellation of Virgo can be seen due south while below Virgo resides the small constellation of Corvus the Crow with Virgo's bright star Spica shining above. Toward the east Ophiuchus is rising. Between Ophiuchus and Virgo now in the South resides Serpens. Looking toward the south east the constellation of Libra The Scales is rising, closely followed by the summertime constellation of Scorpio. The pointer stars of the Great bear are now over in the westward sky and are pointing down toward the pole star.

On Friday the 20<sup>th</sup> of March there will be good sized **partial eclipse of the Sun** seen from the UK. The Moon will touch the Sun's edge when the Sun is 18.6 degrees above the horizon at 08:23. Maximum eclipse occurs at 09:28 with some 90% of the Sun's surface been covered by the Moon. The Partial ends at 10:39. The timings given are for Cardiff, and may vary slightly, depending on your location.



## The Planets March-May 2015.

**Mercury** starts the month at Mag 0.0 and apparent diameter of 6.5 seconds of arc, and over the next three months its size will slowly cycle by a few arc seconds to maximum size of 11.1 arc seconds by the end of May, though its apparent magnitude will only be +3.0. The planet is at aphelion on the 6<sup>th</sup> of March, and is best placed for observers in the southern latitudes. On March 23<sup>rd</sup> the planet will be 1.6 degrees south of the planet Neptune. By March 27<sup>th</sup> it will have reached its greatest south heliocentric latitude. On April 15<sup>th</sup> Mercury is at its ascending node. By April 19<sup>th</sup> the innermost planet will be at perihelion and superior conjunction so will be hidden from view. On April 23<sup>rd</sup>, Mercury and Mars will be 1.4 degrees apart. On the April 30<sup>th</sup> Mercury will have reached its greatest heliocentric latitude north. By May 7<sup>th</sup> Mercury will be at its greatest elongation north (21 degrees), so will be ideally placed for Northern observers. This is its best apparition for this year and should be visible from the beginning of the month until May 21<sup>st</sup>. On May 19<sup>th</sup> the planet will be placed 6 degrees north of the Moon and stationary. By the 23<sup>rd</sup> May the planet will be in its descending node and moving towards inferior conjunction that takes place on May 30<sup>th</sup>.

**Venus** is a very bright object in the early March evening sky at magnitude -3.9 and slowly brightens to magnitude -4.3 over the next three months. Its angular size also increases from 12.0 to 19.0 seconds of arc by the end of May, though the planetary phase, that is the amount of illuminated surface presented to us, will be reducing. On April 4<sup>th</sup> the planet passes by the planet Uranus with a separation of 0.1 degrees, so giving a good opportunity to easily locate this normally overlooked planet. On the 22<sup>nd</sup> of March Venus passes the Moon with a separation of three degrees. Venus continues to slowly brighten (Mag -4.0) and reaches perihelion by April 18<sup>th</sup>. By May 10<sup>th</sup> the planet is at greatest heliocentric latitude north. On May the 19<sup>th</sup> the 'veiled planet' will be found 8 degrees north of the Moon at magnitude -4.3.

**Mars** starts off as a faint object at magnitude 1.3 and slightly reduces brightness down to magnitude 1.5 over the next three months. Its apparent angular size will also diminish from 4.2 to 3.7

second of arc over the same period. By the middle of April this planet will have vanished into the Sun's glare and won't be seen again until mid-August. On March 11<sup>th</sup> it will be low in the western twilight sky accompanied by Uranus which will be 0.1 degrees south of it. On March 22<sup>nd</sup> Mars will be 8 degrees north of the Moon.

**Jupiter** even though the planet has passed opposition (Feb 6<sup>th</sup>.) it continues to dominate the evening sky. Its apparent magnitude decreases from -2.5 to -2.0 during the next three months, as its angular size decreases from 44.5 to 35.7 seconds of arc. On March the 3<sup>rd</sup> Jupiter is visible 5 degrees north of the Moon, the planet will now be retrograding in the constellation of Cancer. On April 30<sup>th</sup> Jupiter will again be found 6 degrees north of the Moon. By April 8<sup>th</sup> Jupiter will be stationary having completed its retrograde loop. On 26<sup>th</sup> April Jupiter will be again be visible some 5 degrees north of the Moon and on 24<sup>th</sup> May will be just 5 degrees west of the Moon. By late May Jupiter will be slowly moving eastward through the constellation of Cancer and setting just after midnight.

At the start of March **Saturn** is rising around midnight in the constellation of Scorpius. Over the next three months the planet will slowly increase in brightness, from magnitude 0.5 to Magnitude 0.0, while its apparent angular diameter will increase from 16.9 to 18.5 seconds of arc. On March 14<sup>th</sup> Saturn will be stationary and then begin to retrograde through the constellation of Scorpius. On April 8<sup>th</sup> Saturn will be found 2 degrees south of the Moon. On May 5<sup>th</sup> Saturn will be located 2 degrees south of the Moon. On 12<sup>th</sup> May Saturn moves from the constellation of Scorpius into Libra and reaches opposition on May 23<sup>rd</sup>, when the planet will be 75 light minutes from Earth. With the planets rings inclined to our line of sight by some 24 degrees the planet will be a nice object to view.

**Uranus** is well past its best, now at magnitude 5.9 and an apparent angular diameter of only 3.4 seconds of arc. This planet will vanish into the twilight sky by mid-March, and will be in conjunction with the Sun on April 6<sup>th</sup>. Uranus will re-appear in the constellation of Pisces during mid-May for northern observers. On the 12<sup>th</sup> May the planet will be visible 0.2 degrees from the Moon.

**Neptune** is in conjunction with the Sun on March 6<sup>th</sup> and re-appears as a morning planet in the constellation of Aquarius around mid-April. Unfortunately the inclination of the ecliptic favours southern observers. The planets magnitude will be +7.9 and it will remain at this value until mid-July. The planets apparent angular size will also be only 2.2 to 2.3 seconds of arc and so Neptune will be a difficult object to observe. Perhaps one for our 'hardened observers'?

Finally, March is the time to look for the **zodiacal light**. It's caused by the thick band of dust which resides in the same plane as the ecliptic. Look toward the point the Sun had set, a few hours after actual sunset (after twilight.) and you just may see a faint glimmer of white light extending along the ecliptic. It's not easy to spot unless you're at a very dark site. Unfortunately, any light pollution or Moon light will obscure it.

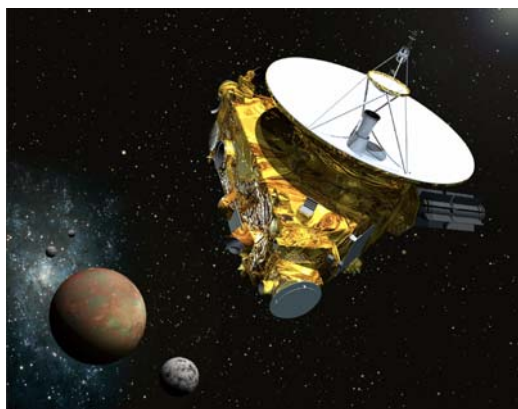
For more information, relating to the rising and setting of the planets, consult the Almanac .

---

## Spaceflight Roundup

### New Horizons

After waking up from the last of its 18 hibernations, the New



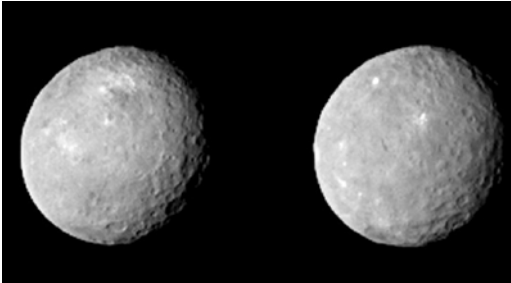
Horizons probe successfully woke on 6<sup>th</sup> December 2014. After a few weeks of tests on the probe, January 15<sup>th</sup> 2015, marked the start of the 'Approach phase'. It is currently measuring the concentration of high energy particles, as well as the dust-particle concentration in this inner part of the Kuiper belt.

Also, images captured by the Long Range Reconnaissance Imager (LORRI) will help the flight dynamics team navigate a successful path through the Pluto system, before its closest approach on 14<sup>th</sup> July 2014 at 11:45:59

UTC. The probe is currently around 1 A.U. from Pluto, travelling around 33,000 mph.

## **Dawn**

Is currently 52,000 miles from Ceres, the largest body in the asteroid belt. Dawn is scheduled to arrive on March 6th, when it will



*Ceres viewed from a distance of 52,000 miles*

enter a polar orbit around Ceres, at an initial altitude of 8,400 miles before spiralling toward the surface to reach a closest approach of just over 200 miles above Ceres in November. Expect more big discoveries from this little probe.

## **SpaceX**

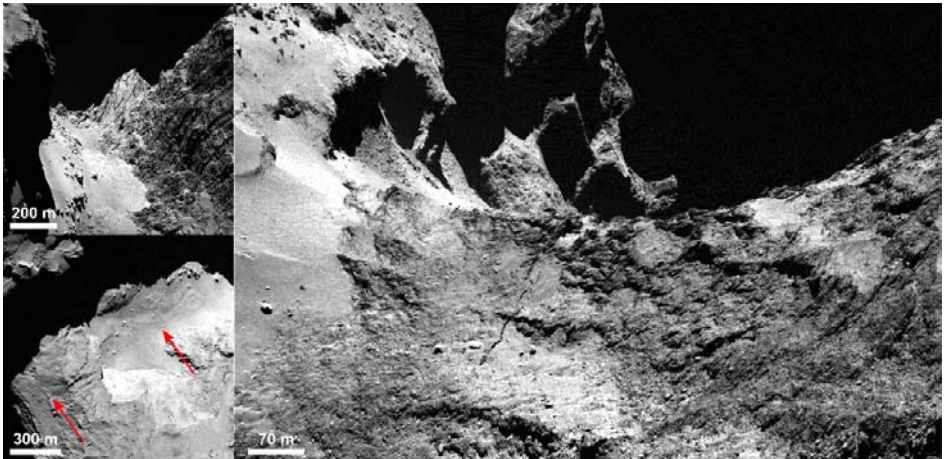
Two launches from SpaceX have occurred recently. The first was a now "routine" resupply mission to the International Space Station. The 2nd was the launch of the Deep Space Climate Observatory (DSCOVR). This probe will fly to a point 1 million miles from Earth (at Lagrange Point) and is designed "to provide a point of early warning whenever it detects a surge of energy that could trigger a geomagnetic storm on Earth". What made both launches interesting was the attempt by SpaceX to land the first stage on a platform in the Atlantic Ocean. The first attempt, came agonisingly close, crashing (and exploding!) very close to the landing platform, while the weather wasn't favourable for the second attempt, though SpaceX reported the first stage successfully soft landed in the Atlantic Ocean, within 10 metres of its target.

## **Rosetta**

The Rosetta probe continues to return breathtaking photographs of Comet 67P. ESA are issuing regular photos, and each new set surpasses the last in terms of beauty and clarity. Recent observations suggests a huge crack is appearing on the 'neck' of the comet.

While no contact has been made with the probe Philae that landed

on the comet in late 2014, engineers at ESA , who spoke at Astrofest in February, stated they had high hopes for contact and continued science from the probe during the Summer of 2015. Watch this space.

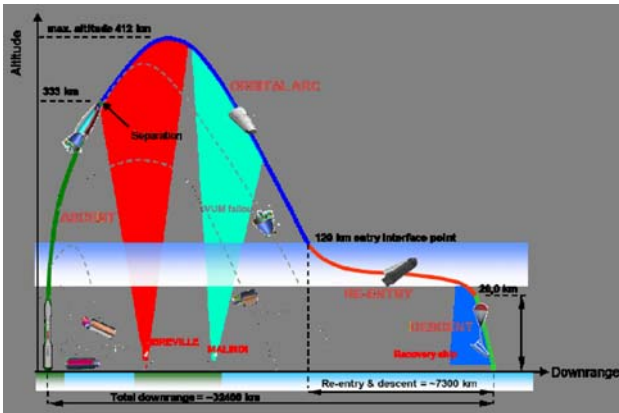


## ESA launches reusable 'space plane'

On February 11th ESA launched the unmanned Intermediate eXperimental Vehicle (IXV) atop a Vega rocket on a 90 minute transatmospheric flight. Launched from the ESA launch facility



in French Guiana, the space plane separated from the rocket at an altitude of 211 miles and continued to an altitude of 256 miles. As it descended, the 5 metre, 2 tonne vehicle manoeuvred to re-enter the atmosphere to simulate the vehicle returning from low Earth orbit. The IXV then glided through the atmosphere and a safe splash down in the Pacific Ocean. The IXV was the largest payload carried by the newest ESA rocket, and was also the first to require an equatorial launch trajectory, instead of travelling northwards, as



*Flight plan of the IXV's maiden voyage*

on previous missions. It is hoped that IXV could, one day, provide Europe with a reusable space vehicle for returning astronauts from future ESA missions.

### **And Finally.....**

In possibly the strangest story for a

while, NASA is to develop a conceptual design for a submarine to travel under the largest 'sea' on Titan; Kraken Mare. If you don't believe me, type: 'Nasa titan submarine' and see what it returns.

## **Photographing the Night Sky**

**Ed Cloutman**

I was asked by our Secretary, Dave Powell, to write a little about my experiences in astro-photography. Firstly I must make it very clear that I am not an astronomer, but a photographer who is fascinated by the night sky. I know from coming to some of CAS's meetings that there are some very experienced astronomers in the Society and that a lot of the talks go over my head, particularly as I am a botanist by training! However I was lucky enough to be born in the south of England in the 1940s, when you could look up and see all the stars and the Milky Way spread out before you as Bob Mizon reminded us in his excellent article in the December 2014 CAS Newsletter. Every child must have been taught and been very familiar with the constellations, and by adulthood could navigate by them without a second thought. We have lost all of that in 'civilised' society and in fact the young seem to spend most of their time looking downwards at their iPads and mobile phones

rather than upwards, where you realise just how small we are in cosmic terms. I have also read a lot about the Egyptians and how important the night sky was to them and other ancient cultures; and particularly regarding time, as when I retired from botanising I took up the renovation and conservation of antique clocks and joined the committee of the Wales and Marches Horological Society. It is mind-boggling when we have to measure distance in terms of light years, and yet only a couple of hundred years or so ago there was no standard time on earth, just local time adjusted to the midday sun! Since the introduction of the CCD, it has revolutionised astrophotography, and now there are amateurs taking superior pictures to ones taken on conventional film by professional astronomers with their large telescopes. This fascinated me and must have subconsciously set a seed in the back of my mind which required a push to eventually germinate it!

About ten years ago, my wife (for her sins) bought me a small four inch reflector as a Christmas present; a Russian made TAL-1. I remember this came in a nice wooden box directly from Russia, with little bags of silica gel hand-wrapped in small pieces of cloth tied with cotton - all hand sewn! I was soon looking up at the stars, but after a while I was disappointed and wanted something bigger, with more light-grasp. In fact the quality of the optics was very good, but everything was so dark.

So what did I do? I looked on the internet and somehow came across the name Nick Hart (I think I must have contacted someone at CAS - probably Theresa). Nick really started me off by telling me that he had a ten inch reflector and that a fast one was best for deep sky work. Well I really did not know what I wanted to look at, but as it turned out he gave me sound advice and I bought a twelve inch reflector at about f4. Though I don't do much visual work, I have kept the telescope because it is much the best for visually observing star clusters and introducing friends to astronomy. As I am not a good astronomer, and can only recognise the major constellations, I rely on a GOTO mount to guide me to the features I want to observe, so I purchased a very old second-hand Losmandy G-11 mount and set about taking it to pieces and reconditioning it.

Until now I had just been visually observing, and was disappointed that I could not see any colour, except for stars of course. Sadly the human eye is just not sensitive enough to see colour, and it requires the long exposure of a camera to bring out the wonderful colours that are there for us to see. So I tried my DSLR in place of my eye, and sadly in the Barry area there is so much light and atmospheric pollution that all I managed to get was a yellow sodium glow. Also I was having trouble tracking accurately for anything longer than thirty seconds or so.

### *My first telescope for imaging - a five inch refractor*

But I have always liked a challenge and was determined not to be beaten, especially as I had seen what talented amateurs were doing and what was possible even in our polluted Island. My first thought was that I needed a better telescope and mount. I saw a Takahashi TOA-130F for sale in Surrey and it came with a super reducer which could make it a lot faster with a wider field of view; thus I could use it at 1000mm focal length at f7.7, or 760mm focal length at F5.8. The person that I bought the telescope from mentioned Ian King as a good source for equipment and sound advice, and Ian has been my guru ever since, together with his colleague and friend Nik Szymanek. I have only to email either of them if I have a problem and usually they have been able to sort me out, particularly with regard to the best camera to suit the telescope that I am using, or how to get the best out of auto-guiding or pole star alignment, etc. But as with most technical subjects, there is no substitute for experience and I have been astro-imaging for some five or six years now and still have much to learn.

### ***The mount - probably the most important bit of equipment to spend your money on***

The mount I eventually chose was an Astro Physics 900GTO which I had to order direct from the USA and be put on a waiting list. Eventually the company informed me that my mount was being manufactured and kept me updated during the stages of manufacture. It was fun with the wonders of Google Earth to drive past the factory in 'street view' and imagine the pieces of my mount inside the building being made and assembled (sad isn't it - get a



life)! At last I was informed that the mount was on its way. I decided to make my own stainless steel counterweights as the cost of sending them was as much as they were worth, weighing in at 36lbs! The mount is beautifully machined and comes in two pieces which dovetail together to make it much lighter and more portable. It is also extremely accurate and if I ask it to point to Neptune for example, the planet comes pretty near the centre of the frame even at high magnification.

So now I have a telescope and a mount which I have to learn to setup and use. I adapted the Losmandy tripod which is excellent and very sturdy and sprayed three yellow spots on our patio (I have a VERY understanding wife) so that I could quickly align the telescope prior to each observing session. Rough polar alignment was achieved with a viewing scope which passes through the RA axis and the time, date and longitude and latitude were programmed in using the hand controller.

### *The CCD cameras*

Next it was time to purchase a camera, and this was where I asked the advice of Ian. I wanted to cover as much sky as possible and as



I use a full 35mm chip in my DSLR, I decided that I would go for this size in my CCD camera. It is also very compatible with the Takahashi with the super reducer. I was advised to buy a camera with an auto-guider built-in. I ended up with an SBIG STL-11000M, which as well as the main chip has an extra small chip for auto-guiding. The only disadvantage of this is that it is behind the filters and so when using narrow band filters it does restrict the light somewhat falling onto it.

The final setup can be seen in Figure 1. The laptop has a planetarium program on it as well as the software controlling the camera and the mount. The planetarium program is useful in that I

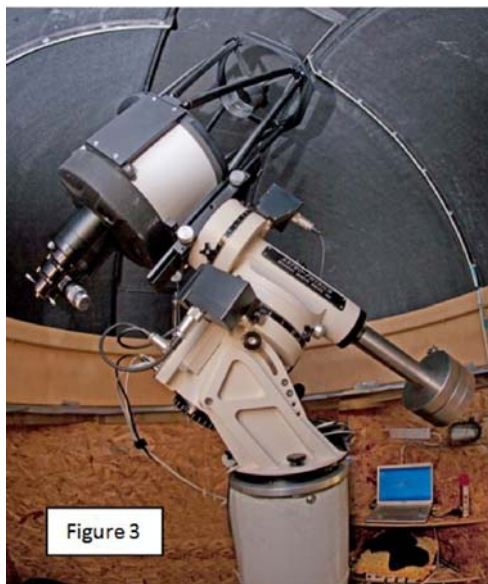
can see immediately what features are in a suitable place for imaging (usually approaching the zenith where atmospheric pollution is less) and I can click on the feature with the mouse and the mount will track to it. Underneath is a homemade power supply made up for four power supplies of varying voltage and isolated from each other to protect the vulnerable camera equipment. I very soon realised that around 11 o'clock everything gets covered with dew and becomes saturated, so I had to buy some heater bands to put around the camera and objective, and a large cardboard box in which to put the laptop! It takes about an hour and a quarter to setup and roughly align to the pole star. Invariably by this time it had started to rain, or worse snow, and I had to take it all down again. In general the clearest nights are in November, but the last couple of years have been very poor in South Wales.

I used this setup for a couple of years, but to take imaging a stage further I really needed an observatory of some description, so that I could begin imaging almost immediately. I decided on a conventional dome design as this gives more protection from wind and from street-lighting than the sliding roof. Although I have seen do-it-yourself domes, they require a lot of work and so I went for a fibreglass dome which came



in eight sections and is bolted together using white bathroom silicone sealant to waterproof it (Figure 2). Amazingly it has remained dry throughout all the major storms we have had in the past year or two, though I do run a dehumidifier through the winter months. The base is homemade in shiplap treated timber and is lined with chipboard and insulated with Rockwool. The pier is mounted on a block of concrete which weights about a ton and like an iceberg, most of it is underground sitting on the liassic limestone bedrock that is so characteristic of this part of South Wales.

The mount is so stable that with auto-guiding I can take exposures for an hour or longer and maintain perfectly round stars, although in practise I take many much shorter exposures and stack them as we shall see later.



One final twist in the story is that after several years of using the Takahashi refractor, I was offered the chance to buy a ten inch Ritchey Chretien astrograph from Ian at a sum I would have been silly to refuse (Figure 3). This has a focal length of 2000mm at f8, and as I was keen to image galaxies it was exactly the telescope I required. I also required a more modern camera, as CCDs develop rapidly and I also wanted to have the option of imaging in narrow band. The

present camera has six filters and a luminance (clear filter). Thus I have the option of imaging in red, green, blue, H alpha, O<sub>3</sub> and S<sub>2</sub>. The latter three are the narrow band filters which I have been able to use under moonlight. H alpha is particularly useful and can often be combined with red in post production. The camera also has the facility to fit a second camera for auto-guiding which is situated in front of the filters, thus there is no light loss when imaging in narrow band.

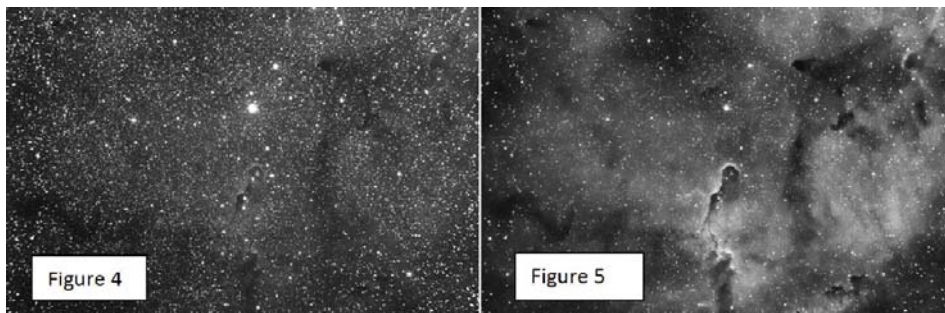
### **Producing the images**

In Britain imaging the night sky is not easy. Besides the light and atmospheric pollution, one is restricted to about two weeks in every month to avoid the moon. Moonlight destroys broadband imaging. The remaining two weeks are governed by the weather, and many nights are ruined by bad weather. Then there are the summer months in which imaging is restricted in South Wales from about 11.30pm until about 3.00am - soon after that the birds begin their

morning chorus! Winter is great, except for the uncomfortably low temperatures! On a good night one can start at about 6.30pm and continue for about twelve hours. Thankfully now that I have the observatory I can start an imaging session and then control it from the house using Windows Remote Desktop via a wireless link. I can either watch a film and use a laptop in the warmth of the lounge, or work on my PC in the study. I have to say though that after a few nights of this I am not fit for anything - I am exhausted. My setup is still not automated enough for me to go to bed and let it do its own thing. Every half-hour or so I have to go outside and check all is OK and rotate the dome; or the mount may have flipped and I have to re-align the object (more on that later).

### *The broad and narrow band filters*

The CCD produces a black and white image and to make a colour picture I have to take three black and white images through a red, green and blue filter, combined to make the RGB colour image. To complicate things further, a black and white image is also taken through a clear 'filter', hence the whole visible spectrum is allowed to fall onto the CCD. It is this LUMINANCE image that is used to produce the high quality definition to the combined result. It is the luminance image that is worked on in various software to acquire this. I have also mentioned narrow band filters which allow a fraction of the visible spectrum to pass through and are excellent at cutting out light pollution. Figures 4 and 5 show the Elephant's Trunk Nebula imaged in broad band and narrow band respectively. You can see clearly how much more detail has been achieved in the H alpha image, and note how the stars are less bloated.



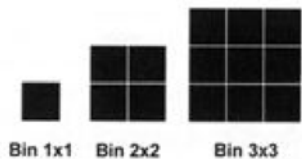
## *Combating noise*

There is also the problem of noise. You well know that the longer the exposure with your digital camera the more 'grain' you will see in the image, particularly in the shadows if you try and lighten them. To combat this, the CCD camera is cooled to -30 or -40 degrees C below the ambient temperature. It is also necessary to take a dark frame and subtract this from the object image (light frame). The dark frame is taken at the same temperature and length of exposure as the light frame, but with a cover over the lens (or with the shutter closed). This produces a black image which just contains noise. In practise we take a series of about ten dark frames at various lengths of exposure and at various temperatures and make a set of master dark frames. This is because dark frames themselves contain noise, so by averaging over a number of them we come to a compromise. We may also take several red light frames and add these together to make a master red, and similarly with the greens, blues and luminance frames. Thus we end up with one master red, green, blue and luminance image. The RGB images are put into their corresponding colour channels in Photoshop, while the luminance is put onto its own luminance layer which sits on top of the colour layer. As our eyes are not so sensitive to colour, the colour channels do not need to be so sharp, or show as much subtle detail. As soon as the luminance image is inserted, the true magnificence of the object is revealed.

## **A typical observing session**

### *Setting the temperature and fixing on a star*

Once all the equipment is switched on and connected to the software (I use Maxim DL Pro), the camera is left for about 5 minutes to reach a stable temperature which I have set to -20 degrees centigrade. In the meanwhile, I can open up the observatory and slew to the first object using the hand controller. As I have a set of dark frames already stored, I do not need to take any, and this saves a



lot of time as I only need to take light frames. I centre on a 3rd or 4th magnitude star and take a 2 second exposure binned 1x1. Binning is similar to setting your ISO, 1x1 being a low ISO say 100. In 1x1 binning every pixel is an individual and this gives the finest detail but requires the longest exposure. Because our eyes are not so sensitive to colour, we can bin 2x2 for colour images which halves the exposure time (the equivalent of using a higher ISO, say ISO 400). All binning 2x2 means is that one 'grain' on our image is now made up of a square containing 4 pixels. Thus four times as much light is gathered. Similarly binning 3x3 means that nine pixels form a square on the image. Even more light is gathered, but of course there is a trade-off in that the resolution of the final image is reduced.

### *Focusing*

So having fixed on our chosen star I take a picture of it and enlarge it, so that I can focus the telescope accurately. I can crop the rest of the image, reducing the download time. I have found that although I have an auto-focuser, the atmospheric conditions in Britain are so changeable that it is simpler to focus by eye. So I set the camera to take multiple images and adjust the focus until I get the sharpest result. The astrograph is made of carbon fibre, so once I have focused I do not need to worry about refocusing during a night session, even if the ambient temperature changes.

### *Plate solving to centre the image in the frame*

Now with the wonders of modern software I can take a full image with the main camera and plate solve it using Pinpoint. This software uses an internal database and can recognise and identify the image I have just taken by studying the positions of the stars in the image. Once it knows exactly where the mount is pointing, I only have to right click the mouse on the part of the image I want in the centre of the frame and 'bingo' it moves to it. This saves so much time and means I don't need a sighting scope on the telescope. It also means that I could image the same object in a week or year's time and still align perfectly so that I could add to the data I have already collected.

## Auto-guiding

Auto-guiding is probably one of the most important developments that the amateur has at his/her disposal, and with the use of a second camera (or CCD chip) a good mount is able to track accurately for hours. The mount does not even have to be very accurately polar aligned, so it is invaluable with a portable setup. To auto-guide I first take a picture with the auto-guiding camera, usually about 2 seconds, and perform a calibration. The calibration causes the RA and Dec axes of the mount to travel away from the centre for a short distance and then back. This tells the mount how far to move to correct a positional error. If the calibration is successful I can set the mount to auto-guide and a graph is produced every two seconds showing the mount error (Figure 7).

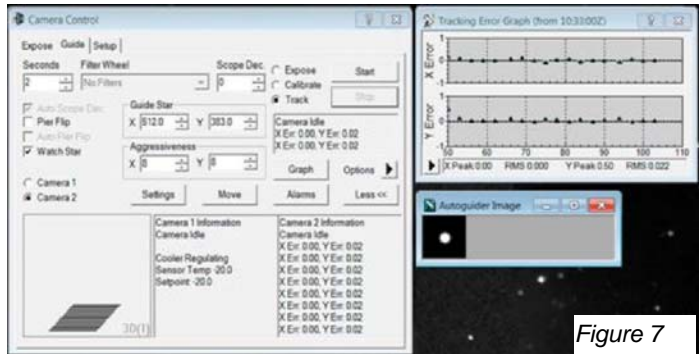


Figure 7

The image generally stays within half a pixel for as long as I can see the object. All this seems to have taken a long time, but it can all be done in minutes; in fact probably in a shorter time than it has taken you to read and absorb it.

*In the second installment of this article Ed details how he sets up filters and considers exposure times, and the ever important 'processing step'.*

Front cover image details: Comet Lovejoy total exposure 1hr 12m. 18x60second frames each through red, green and blue filters and Luminance. Camera temperature was -20 degrees C, and binning 1x1. Telescope 2000mm FL Astrograph Date: 6<sup>th</sup> February 2015 between 18.34 and 20.47 UT. Location: Barry. Processing in Maxim DL Pro & Photoshop.

How did **YOU** get interested in astronomy? We'd love to know. Send your ideas to either the Secretary or the Editor (email addresses are on page 2 of this issue) and your story could appear in a future edition of the newsletter.

# My story

# John Richards

One of my earliest astronomical memories is going on holiday to the south of England; Bournemouth as I recall in the early 1970's. After an exciting day of building sand castles and eating ice cream, (and maybe some sand too) we wandered back to the campsite just outside the town of Ringwood. While all the other children fell asleep, I remember sneaking out of my parents' tent, lying on the grass, looking up at the night sky and witnessing the mesmerising Perseid meteor shower. I didn't understand the processes involved but it's an image, that as I write this now, I can see with perfect clarity. I collected LOTS of astronomy books as a child. 'Teach Yourself Astronomy' was a personal favourite and featured a rather fetching black and yellow cover. Others followed and some (including a now rather battered 1977 edition of 'The Cambridge encyclopaedia of astronomy') have made it with me to adulthood.

Even though I was born just over a year before Apollo 11 took its historic journey, I, un-surprisingly, have no recollection of the flight. I DO though remember the first launch of a new breed of re-useable rocket: THE SPACE SHUTTLE. I distinctly remember rushing home from school (it was lunch time) to watch an 'aeroplane' strapped to 2 enormous firecrackers and an even larger fuel tank get blasted into space. It was exhilarating. I also remember visiting Stansted airport when Enterprise visited in the UK in 1983. It was my birthday, so how could my father refuse!!

Like most teenage boys, my bedroom was covered with posters, but unlike most boys, my posters were of space shuttles, planets and galaxies. I decided to study 'O' level astronomy. My school or the education board didn't offer this as an option, so I contacted some people in London, was sent the syllabus by post, and I registered for the exam. After lots of hard work, and no-one really to ask if I got 'stuck' (these days were pre-internet) I sat the exam and got a 'B' grade. I did 'A' level Computer Studies and programmed a 'planetarium' application. I remember keying celestial co-ordinates for over 5,000 stars into a hand cranked database I created. Good times!! It's strange looking back now, but I never considered being



an astronomer. I didn't even know jobs like astronomers really existed, except perhaps in America. It felt that astronomy was a 'hobby' and sooner or later I'd need to get a 'proper job'.

Over the next few years, astronomy and rockets took a back seat. I met a girl, got a 'proper job' and had kids. Certain 'major' events though did intrude. The servicing missions to Hubble and the subsequent breath taking imagery, the landings of Spirit and Opportunity on Mars and the Cassini probe are highlights. The loss of the Space Shuttle Challenger in 1986 had a profound effect on me, as did Columbia in 2003. I still can't watch either without feeling great sorrow. My life wandered along quite nicely thank you, until a chance 'phrase' re-ignited my love. My eldest son was going to America with his school and his teacher said:

'Oh, and there's a shuttle launch while he's there'.

My jaw dropped. The shuttle program was ending and I realised I wanted to see a launch, not via the internet, but "in the flesh". 3 months later, I was standing on the NASA causeway, 5 miles from the final launch of the Space Shuttle Discovery. I still remember feeling the heat and wind of the launch, as the shuttle ascended from 5 miles away. Mesmeric. My love rekindled, I was then invited to the first European space Tweetup arranged by ESA, where I met Samantha Cristoforetti (currently aboard the ISS), Paolo Nespoli, and the crew of STS-134. I've been to 2 American spacefests, spoken to Apollo astronauts, used the 60 inch telescope on Mount Wilson in California, been interviewed on Astronomy.fm, do astronomical outreach, and I'm currently studying an astronomy degree with the Open University. Oh, and I edit this newsletter.

I am NOT though an expert. My knowledge of the night sky is not good, but improving. My techniques of astrophotography are rudimentary, but the point is, I **enjoy** doing it. I would call myself an 'enthusiastic amateur who isn't afraid to ask'. You don't need to be an expert to make a difference, you just need a love of the subject.

Astronomy has given me far more than I could ever give it, but who knows, after I finish my degree, perhaps a belated career as an astronomer might not be such a far-fetched idea after all.

# Up-coming CAS Public Events

| Date                   | Time              | Event                     | Venue                    |
|------------------------|-------------------|---------------------------|--------------------------|
| 20 <sup>th</sup> March | see below *       | Partial solar eclipse     | St. Fagan's Museum       |
| 20 <sup>th</sup> March | 19:00 - 21:00     | Stargazing at a dark Site | Dyffryn Gardens          |
| 18 <sup>th</sup> Apr.  | 10:00am to 4:00pm | Astronomy Festival        | National museum of Wales |

\* For more information, visit:<http://www.bbc.co.uk/programmes/b019h4g8>, click 'Events 2015', and navigate to Wales. Also, if the evening event is held on 20<sup>th</sup> March, the observing session at Mountain View Ranch **WILL** be cancelled. Please check the CAS web site to discover which event will be run.

## CAS Lectures March to May

| Date                   | Title  | Lecturer   |
|------------------------|--|--|
| 5 <sup>th</sup> March  | Oceans on other Worlds                       | Prof Andrew Coates, University College London        |
| 19 <sup>th</sup> March | Exploring the Dynamic Universe               | Prof Andy Newsham, John Moores University, Liverpool |
| 2 <sup>nd</sup> April  | All about Telescopes                         | Ninian Boyle, VentureScopes, Hampshire               |
| 16 <sup>th</sup> April | Annual General Meeting                       | Cardiff Astronomical Society                         |
| 30 <sup>th</sup> April | Lunar Observing                              | Mark Radice, Salisbury                               |
| 14 <sup>th</sup> May   | Transient Astronomy with Gravitational waves | Dr. Stephen Fairhurst, Cardiff University            |
| 28 <sup>th</sup> May   | Get ready for the Perseids                   | Tony Markham, Staffordshire                          |

## Observing Sessions

| Date                                       | Day        | Time              | Venue               |
|--|------------|-------------------|---------------------|
| 13 <sup>th</sup> - 14 <sup>th</sup> March  | Fri or Sat | 20:30 - 24:00 GMT | Dyffryn Gardens     |
| 20 <sup>th</sup> or 21 <sup>st</sup> March | Fri or Sat | 20:30 - 24:00 GMT | Mountain View Ranch |
| 10 <sup>th</sup> - 11 <sup>th</sup> April  | Fri or Sat | 20:30 - 24:00 GMT | Dyffryn Gardens     |
| 24 <sup>th</sup> - 25 <sup>th</sup> April  | Fri or Sat | 20:30 - 24:00 GMT | Mountain View Ranch |
| 8 <sup>th</sup> - 9 <sup>th</sup> May      | Fri or Sat | 21:00 - 24:00 GMT | Dyffryn Gardens     |
| 22 <sup>nd</sup> - 23 <sup>rd</sup> May    | Fri or Sat | 21:00 - 24:00 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 info. Mountain View Ranch was formerly Castle Heights Golf Club.

# Almanac

Compiled by John Richards

## Sun Rise/Set & Twilight

| Date                   | Astronomical Twilight Begins | Sun Rise | Sun Set | Astronomical Twilight Ends |
|------------------------|------------------------------|----------|---------|----------------------------|
| 01 <sup>st</sup> March | 05:08                        | 06:59    | 17:51   | 19:41                      |
| 08 <sup>th</sup> March | 04:52                        | 06:43    | 18:03   | 19:54                      |
| 15 <sup>th</sup> March | 04:36                        | 06:28    | 18:15   | 20:07                      |
| 22 <sup>nd</sup> March | 04:18                        | 06:12    | 18:27   | 20:21                      |
| 29 <sup>th</sup> March | 03:59                        | 05:56    | 18:39   | 20:35                      |
| 1 <sup>st</sup> April  | 03:51                        | 05:49    | 18:44   | 20:42                      |
| 8 <sup>th</sup> April  | 03:31                        | 05:33    | 18:55   | 20:58                      |
| 15 <sup>th</sup> April | 03:10                        | 05:18    | 19:07   | 21:15                      |
| 22 <sup>nd</sup> April | 02:48                        | 05:03    | 19:19   | 21:34                      |
| 29 <sup>th</sup> April | 02:24                        | 04:49    | 19:30   | 21:55                      |
| 1 <sup>st</sup> May    | 02:17                        | 04:45    | 19:33   | 22:01                      |
| 8 <sup>th</sup> May    | 01:51                        | 04:33    | 19:45   | 22:26                      |
| 15 <sup>th</sup> May   | 01:21                        | 04:21    | 19:56   | 22:56                      |
| 22 <sup>nd</sup> May   | 00:35                        | 04:12    | 20:06   | 23:42                      |
| 29 <sup>th</sup> May   | --:--                        | 04:04    | 20:15   | --:--                      |

## Meteor Showers

| Date     | Meteor Shower   | RA     | DEC  | ZHR |
|----------|-----------------|--------|------|-----|
| 12/04/15 | Virginids       | 14h04m | -9°  | 5   |
| 23/04/15 | Lyrids          | 18h08m | 32°  | 12  |
| 29/04/15 | Alpha-Scorpiids | 16h32m | -24° | 5   |
| 06/05/15 | Eta-Aquarids    | 22h20m | -1°  | 35  |
| 13/05/15 | Alpha-Scorpiids | 16h04m | -24° | 5   |

## Observers Club Meetings & Dave's Star Parties

**NOTE:** From March, the Observers club meetings will move from the Black Cock Inn Caerphilly, to Dyffryn Gardens. This monthly event will now take place on the same evening as Dave's star parties.

| Date                   | Day     | Time           | Venue                       |
|------------------------|---------|----------------|-----------------------------|
| 17 <sup>th</sup> March | Tuesday | 19:30 to 22:00 | Dyffryn Gardens/Observatory |
| 21 <sup>st</sup> April | Tuesday | 19:30 to 22:00 | Dyffryn Gardens/Observatory |
| 19 <sup>th</sup> May   | Tuesday | 19:30 to 22:00 | Dyffryn Gardens/Observatory |

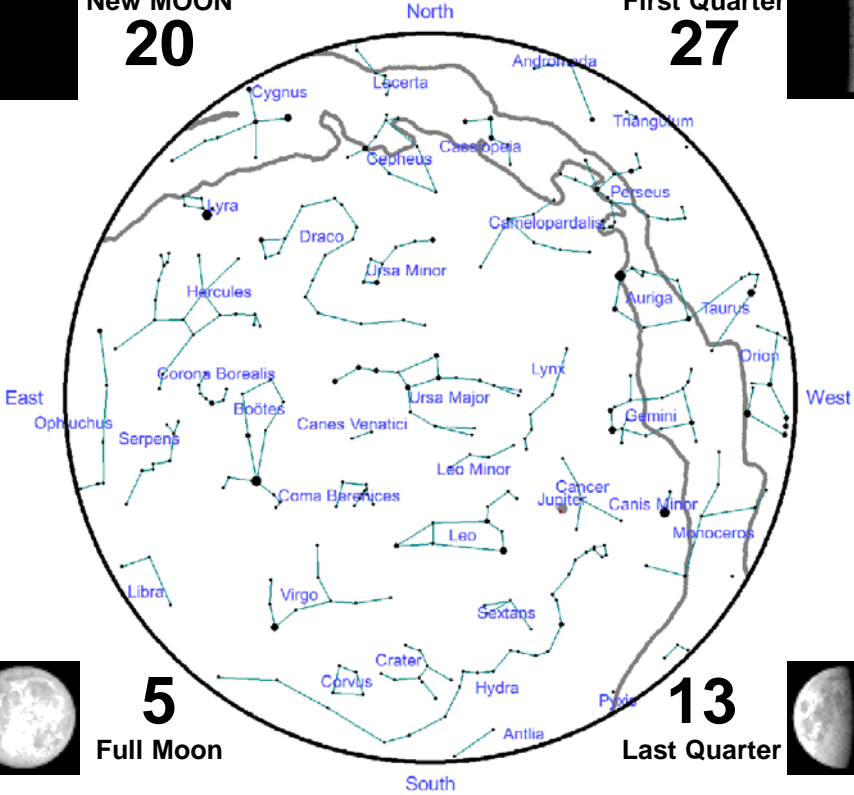
# Almanac March

New MOON

20

First Quarter

27



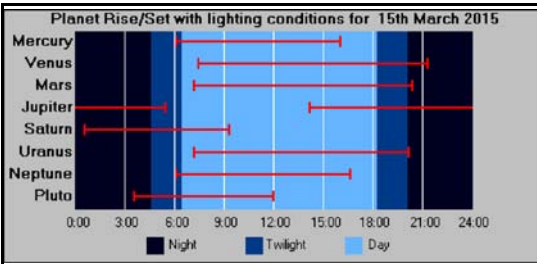
5

Full Moon

13

Last Quarter

|               | Constellation | R.A       | Dec        | Rises | Sets  | Mag.  |
|---------------|---------------|-----------|------------|-------|-------|-------|
| Mercury       | Aquarius      | 22h21m58s | -12°26'10" | 06:04 | 16:01 | -0.2  |
| Venus         | Pisces        | 01h40m31s | +10°23'37" | 07:25 | 21:17 | -4    |
| Mars          | Pisces        | 01h05m07s | +06°34'39" | 07:09 | 20:21 | +1.3  |
| Jupiter       | Cancer        | 09h05m13s | +17°41'41" | 14:07 | 05:25 | -2.4  |
| Saturn        | Scorpius      | 16h13m28s | -19°02'56" | 00:34 | 09:16 | +0.3  |
| Uranus        | Pisces        | 00h56m54s | +05°24'13" | 07:07 | 20:07 | +5.9  |
| Neptune       | Aquarius      | 22h46m04s | -08°40'53" | 06:08 | 16:45 | +8.0  |
| Pluto (Dwarf) | Sagittarius   | 19h11m15s | 20°53'35"  | 03:43 | 12:01 | +14.2 |



## Planet Events

The data presented here is for the 15<sup>th</sup> March. Positional data is at 00:00 GMT/UT

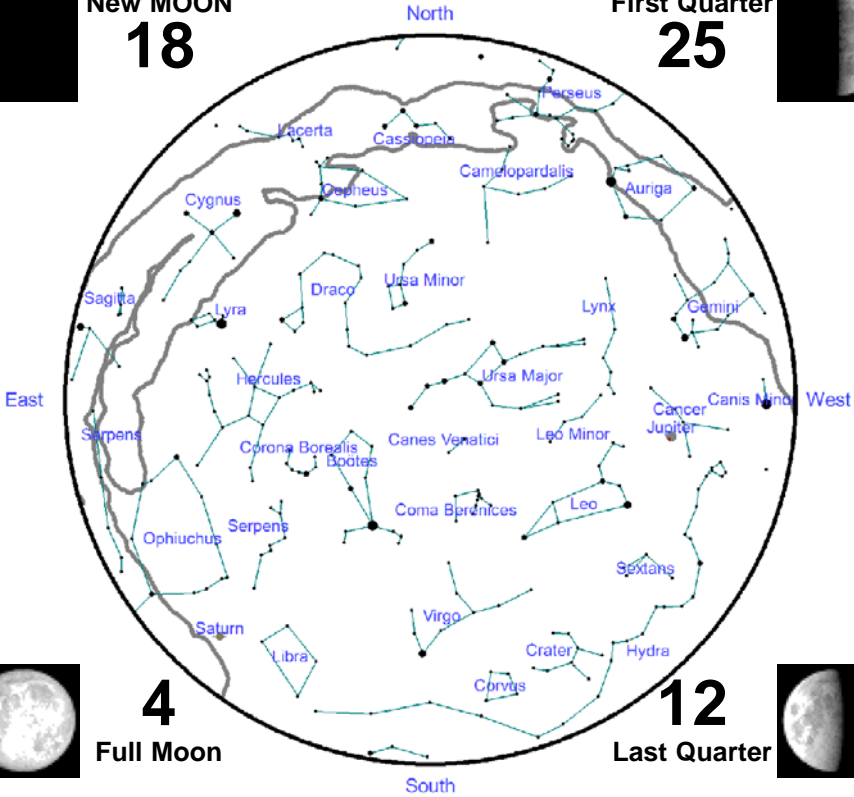
# Almanac April

New MOON

18

First Quarter

25



4

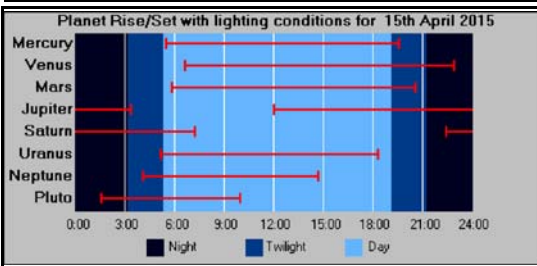
Full Moon



12

Last Quarter

|               | Constellation | R.A       | Dec        | Rises | Sets  | Mag.  |
|---------------|---------------|-----------|------------|-------|-------|-------|
| Mercury       | Aries         | 01h52m04s | +11°28'34" | 05:28 | 19:32 | -1.8  |
| Venus         | Taurus        | 04h06m18s | +22°33'12" | 06:35 | 22:53 | -4.1  |
| Mars          | Aries         | 02h32m24s | +15°00'18" | 05:49 | 20:32 | +1.4  |
| Jupiter       | Cancer        | 09h01m35s | +17°54'58" | 12:00 | 03:21 | -2.2  |
| Saturn        | Scorpius      | 16h10m13s | -18°50'09" | 22:24 | 07:12 | +0.2  |
| Uranus        | Pisces        | 01h03m24s | +06°04'46" | 05:08 | 18:15 | +5.9  |
| Neptune       | Aquarius      | 22h46m12s | -08°40'02" | 04:06 | 14:44 | +8.0  |
| Pluto (Dwarf) | Sagittarius   | 19h11m20s | -20°53'29" | 01:42 | 10:00 | +14.2 |



## Planet Events

- 6th Uranus at Conjunction
- 10th Mercury at Superior Conjunction
- 18th Venus at Perihelion (0.72 A.U.)
- 19th Mercury at Perihelion (0.31 A.U.)

The data presented here is for the 15<sup>th</sup> April, positional data is at 00:00 GMT/UT

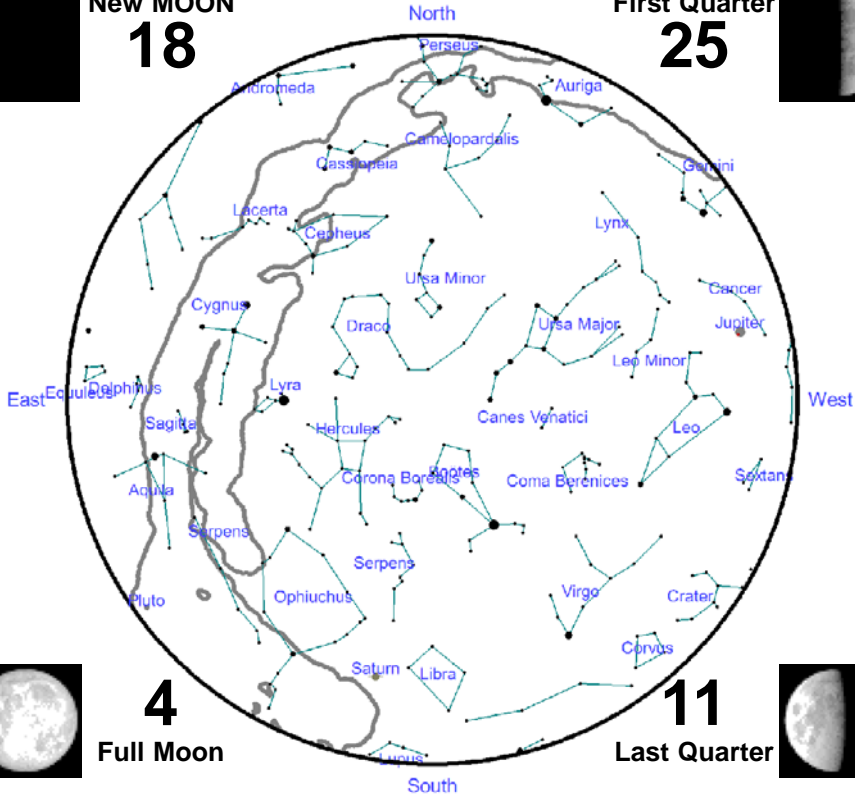
# Almanac May

New MOON

18

First Quarter

25



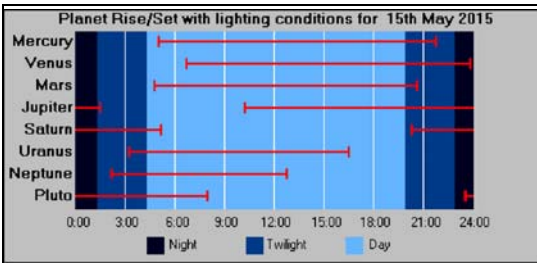
4

Full Moon

11

Last Quarter

|               | Constellation | R.A       | Dec        | Rises | Sets  | Mag.  |
|---------------|---------------|-----------|------------|-------|-------|-------|
| Mercury       | Taurus        | 04h42m56s | +24°10'04" | 05:02 | 21:43 | +1.6  |
| Venus         | Gemini        | 06h34m15s | +25°55'10" | 06:39 | 23:48 | -4.2  |
| Mars          | Taurus        | 03h59m30s | +20°54'01" | 04:41 | 20:37 | +1.5  |
| Jupiter       | Cancer        | 09h09m09s | +17°19'47" | 10:13 | 01:27 | -2.0  |
| Saturn        | Libra         | 16h02m22s | -18°27'13" | 20:16 | 05:08 | +0.2  |
| Uranus        | Pisces        | 01h09m24s | +06°41'26" | 03:13 | 16:26 | +5.9  |
| Neptune       | Aquarius      | 22h46m21s | -08°39'11" | 02:08 | 12:46 | +8.0  |
| Pluto (Dwarf) | Sagittarius   | 19h11m26s | -20°53'23" | 23:40 | 08:02 | +14.2 |



## Planet Events

30th Mercury at Inferior Conjunction

The data presented here is for the 15<sup>th</sup> May, positional data is at 00:00 GMT/UT



# Junior Trip Science Museum London

**Greetings Earthlings!**

To celebrate the 40th anniversary of the society, we are planning a trip to the Science Museum in London, and we want **YOU** to join us.

The trip will be sometime in late April/early May (details to follow at a later date).

To make sure we book enough places for everyone, we need to know how many junior and adult members would be interested in going on the trip.



Please complete the form below and return it to a committee member at one of the talks, or you can post it to:

The Junior Rep. Kayleigh Churchill, 34A Swansea Road, Merthyr Tydfil, CF48 1HT

Parents please note that ALL junior members will need to be accompanied on this trip



I would like to attend the CAS trip to the Science Museum in London.

Full Name \_\_\_\_\_

Membership No. \_\_\_\_\_

Email address or Telephone No.

\_\_\_\_\_

Full Name \_\_\_\_\_

Membership No. \_\_\_\_\_

Full Name \_\_\_\_\_

Membership No. \_\_\_\_\_

Please complete the form below and return it to a committee member at a society event, or post it to:

The Junior Rep. Kayleigh Churchill, 34A Swansea Road, Merthyr Tydfil, CF48 1HT