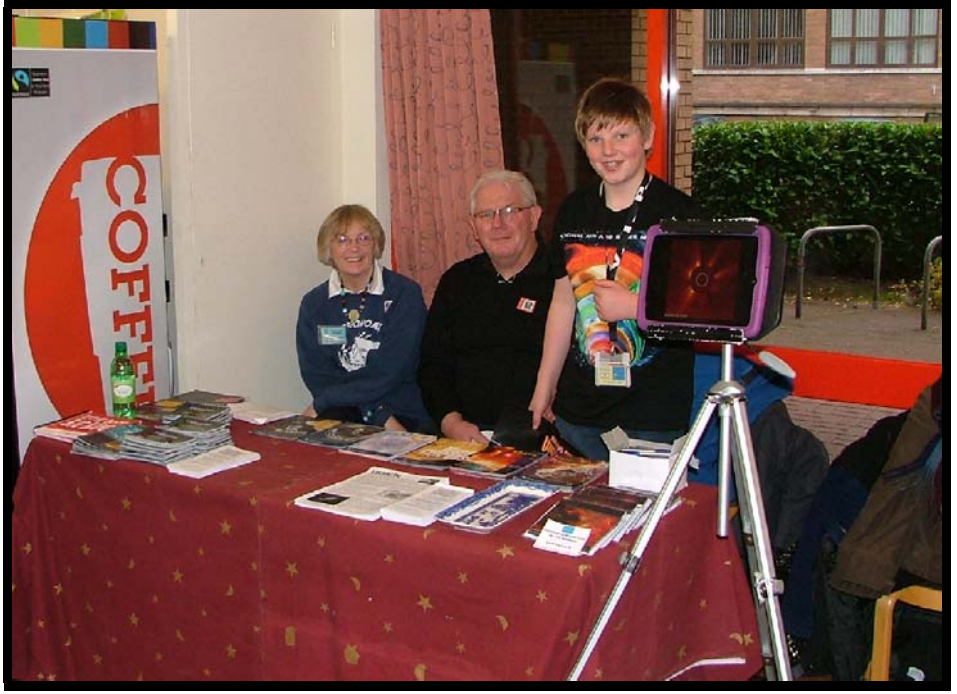
NEWSLETTER

March - May 2014 Issue 166



Theresa, Jim and Owen manning the CAS stand at the recent SPA anniversary meeting held at Cardiff University. Photo Ian Davies.

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Editorial — Ian Davies

Last time I discussed the then upcoming passage of comet 2012 S1 ISON through our skies, well it didn't make it passed its perihelion passage. Looking at images and videos from various solar observing spacecraft we see that as the comet approached the Sun its nucleus became disrupted even before the Sun's tidal forces could act. This is likely due to the vast amounts of heat supplied by the Sun evaporating the volatiles in the nucleus and thus destroying its structural integrity. At perihelion, the weakened comet, was then ripped apart by the Sun's tidal forces. Initially it was thought that maybe something of ISON had survived, even in a heavily disrupted state. However this soon dissipated and disappeared from view. There are some nice videos of the perhelion passage at:-

http://sohowww.nascom.nasa.gov/hotshots/index.html

Wishing you dark skies - Ian.

Contact Details

Have you changed your email address or other contact details recently? Some that we hold appear to be out of date. You could be missing out. 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).

Publication Dates

The CAS newsletter is published at the first society meeting of September, December, March and June. The deadline for submissions is 4 weeks before the publication date (deadline for Issue 167 is 15th May).

Visit CAS on the web @

http://www.cardiff-astronomical-society.co.uk
General enquiries email info@cardiff-astronomical-society.co.uk
Remember as a CAS member you can use the Members' Area of the web site. You will need you 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

Annual General Meeting Dave Powell

This will be held on Thursday April 17th.

You have the chance to suggest to, and question committee on all matters relating to the running our society.

To comply with rule 9 this newsletter contains the names and posts of the committee. Any members wishing to apply for committee membership shall complete a nomination form, supported by not less than two ordinary members, which must be received by the secretary not less than fourteen days before the date of the Annual General Meeting.

Sky Detectives Roger Butler

Every year, coming up to Christmas time, some astronomer will publish an account of the latest attempt to explain the mystery of what and when was the ‘Star of Bethlehem’. The problem with this task is that only one of the gospel writers mentions this heavenly phenomenon, with scant detail. Matthew was writing around 90 years after the alleged event and no other astronomical records anywhere refer to anything unusual occurring in the skies around the beginning of the first century. Furthermore it was normal for Greek and Roman historians to authenticate their accounts with ‘signs from the gods’. But despite the lack of evidence, the searches continue because it is such a good story.

This is an example of astroforensics. The use of astronomical data and methods to determine the true facts of historical events. Tables of ephemera and, more latterly, planetarium software can help reconstruct the skies at any point in the past and help solve mysteries of time and place.

In 1857, Abraham Lincoln successfully defended William Armstrong on a charge of murder. By consulting an almanac, he proved that the key witness was lying when he claimed to have witnessed the crime clearly by the light of the full moon. Lincoln showed the moon that night had been much less than full and certainly not bright enough to have identified the murderer.

Methods of astronomy have proved useful for determining the place

and time of creation of a particular work of art, literature or of the event that inspired it.

Classical literature often refers to signs and omens in the sky. “These late eclipses in the Sun and Moon portend no good to us,” says a character in Shakespeare’s *King Lear*. Scholars have never been sure when Shakespeare wrote it; estimates ranged from about 1604 to 1606. But in 2001, astronomer David Levy (co-discoverer of comet Shoemaker-Levy 9, which crashed into Jupiter in 1994) began a doctoral thesis on “The Sky in Early Modern Literature”. In 1605, he determined, Londoners were witness to both a lunar eclipse and a near-total solar eclipse, one in late September and the other in October. Odds are that Shakespeare had these in mind when he wrote his play. If so, he was still working on it in late 1605.

Donald Olson, an astrophysicist at Texas State University, is a leading practitioner of forensic astronomy, examining classic works of arts and literature that include references to celestial phenomena. Each summer he brings a team of research students over to Europe to visit the locations of historic events. For example, by combining Julius Caesar’s own account in ‘De Bello Gallico’ with astronomical software, Olson has shown that the first invasion of Britain began when the Roman forces landed at Deal on August 22nd 55 BC and not on August 26thas previously claimed by Sir Edmund Halley.

Monet’s ‘Étretat Cliff

The Texas State team explored the circumstances surrounding Monet’s painting ‘Étretat Cliff: Sunset’. They found that the view matched the scene depicted at only one location--a spot 425 yards from the Porte d'Amont on a rocky beach under an overhanging cliff. They discovered that on Feb. 3

Monet was working on nearby Jambourg Beach and that the artist spent all day Feb. 4 entertaining his visiting brother. The tides of Feb. 6 did not match the painting, and Monet's letters show that he paid close attention to the tides. On Feb. 7 cloudy weather and rain storms began. The researchers then used planetarium software to compare the modern sky to that of the 19th century and calculated that the Sun would have set along that path on Feb. 5, 1883 at 4.53pm.

Olson has been able to determine the precise spot in France and the exact time of Vincent van Gogh's 'Evening landscape with Rising Moon' as 9.08pm, July 13th 1889. Similar examination of van Gogh's 'White House at Night' has shown that the house in the painting is further along the road from the one where tourists are given guided tours. And the large bright object in the sky is the planet Venus. It depicts the scene as at 8pm on 16 June 1890. Van Gogh often painted scenes that include sky objects which are greatly exaggerated to emphasise their influence over him: "For my part I know nothing with any certainty, but the sight of the stars makes me dream."

van Gogh's 'White House at Night'

Olson's researches include the blood red sunsets found in several of Edvard Munch's canvases, including the very famous 'The Scream' which he claims are a result of the spectacular sunsets created by volcanic ash in the upper atmosphere following the explosion of Krakatoa ten years before, in 1883.

These and other astroforensic research can be found in Olson's new book: 'Celestial Sleuths', published by Springer.

Last year we enjoyed a dramatic presentation on the Titanic

Edvard Munch's The Scream

disaster given by Andy Lound. The sinking of the Titanic, with such tragic loss of life, was the accumulation of so many small and otherwise insignificant factors. Few accounts mention the crucial part played out by the sky. It was the clearest of nights and brightest of skies with a flat calm sea. There was no Moon visible and it was impossible to make out the horizon; what were stars and what were reflections of stars in the inky blackness? Making out icebergs, with or without binoculars, would have been nigh impossible. The lack of perspective was completely disorientating and distress rockets gave no sense of bearings.

On February 16th 2013, a superbolide meteor shot across the early morning sky in Russia, exploding over Chelyabinsk. This unexpected event was captured automatically by many in-car video recording devices, popular with Russian motorists. From these low quality recordings, eye witness accounts and examination of fragments of the meteor, scientists have been able to reconstruct the event with amazing accuracy:

It is estimated that the meteor began its fateful journey to Earth as an asteroid of between 12,000 to 13,000 metric tonnes, measuring 20 metres across. It travelled at 19.16 kilometres per second / 42,900 mph and, because of it's shallow angle of approach, exploded in an air burst at a height of 29.7 kilometres. It had the kinetic energy of 500 kilotons of TNT, which is 20 to 30 times more than the Hiroshima atom bomb.

Many universities now offer joint degree courses in astronomy and forensics. Forensics degrees usually have main components of

astronomy, biology and chemistry. Graduates of astronomy and astrophysics can often be found pursuing careers in forensics as the practical discipline and methodology are so very similar. After all, we astronomers are already forensicists: we observe, collect evidence and create hypotheses as to what has occurred. Merely by looking up into the sky, we are always travelling back in time and witnessing the past.

The Universe presents astronomers with an abundance of puzzles to analyse. Scientists are keen to solve the mysteries of these events and explore the origins, evolution, and mechanics of the universe. But these events may have happened millions or billions of years ago, and trillions of kilometers from Earth. The primary evidence astronomers can collect is electromagnetic radiation—light. A new venture from NASA's education programme is the 'Space Forensics Project' which takes audiences through astronomy problem-solving narratives that parallel crime scene forensics. The 'corpse' could be a massive star that ended its life in a brilliant supernova explosion. The 'theft' might involve stellar material, swirling into an unseen singularity at the centre of a galaxy.

And finally, an astro-anecdote of the finest forensic detective of them all: Sherlock Holmes – though not from the pen of Conan Doyle. Sherlock Holmes and Dr. John Watson are on a camping trip. After sharing a good meal and a bottle of wine, they retire to their tent for the night.

At about 3am, Holmes nudges Watson and asks, "Watson, look up into the sky and tell me what you see?" Watson says, "I see millions of stars." Holmes then asks, "And what does that tell you?" Watson replies, "Astronomically, it tells me there are millions of galaxies and potentially billions of planets. Astrologically, it tells me that Saturn is in Leo. Theologically, it tells me that God is great and we are small and insignificant. Horologically, it tells me that it's about 3am. Meteorologically, it tells me that we will have a beautiful day tomorrow. What does it tell you, Holmes?" Holmes retorts, "Someone has stolen our tent!"

The Final Countdown Before a Supernova By Phil Plait

I'm sometimes asked what I think the next exploding star in our galaxy will be. Most people expect I'll say Betelgeuse, the red supergiant marking Orion's right shoulder.

But Betelgeuse may not go supernova for another million years, which is a long, long time. There are several stars much closer to The End, and I recently learned of a new one: SBW1.

SBW1 is about to make quite a splash in the galaxy. Photo by ESA/NASA; acknowledgement: Nick Rose

The star is a blue supergiant, a hot, energetic beast probably about 20 or so times the mass of the Sun. Stars like that don't live long, just a few million years tops. But we know (we think) it'll explode much sooner than that, because of that ring you see in the Hubble picture above. How does that ring tell us anything? Ah, glad you asked.

We've seen another star like this: Sanduleak -69 202. That was a blue supergiant that blew up, and its light reached Earth in February 1987, so we called it Supernova 1987A, (or just SN87A). It too was a massive star, but slightly less so than SBW1. (That's important so keep it in mind.)

SN87A also had a ring of gas around it, ejected by the star about 20,000 years beforeit exploded; we know the age due to how fast the gas was moving and how far it had expanded (like saying you know how long a car has been on the road by knowing its speed and distance). That means once the ring formed, Sanduleak -69 202 had just 20 millennia to live.

Massive stars run through their fuel faster than less massive ones. Since we already see a ring around SBW1, that means all things being equal, it most likely has less than 20,000 years before it goes kablooie.

That's pretty soon, on a galactic scale. But are all things really equal? It's a good question.

There's a professional journal paper detailing SBW1 that was a fascinating read for me; I studied SN87A and its ring for my Ph.D. thesis. I asked the paper's lead author, Nathan Smith (he's the S in SBW1, in fact), if he could send me higher-res versions of the images in the paper, and he kindly sent me this striking shot of SBW1 that's a combination of Hubble imagery with a ground-based infrared shot from the Gemini observatory:

Sometimes when you look at a star, it appears to be looking back. Courtesy of Nathan Smith

The pink fuzz is dust, complex carbon molecules like soot, blown out from the star, and the blue is gas. Interestingly, the gas is different than what was in SN87A's ring: The ring around SBW1 doesn't have nearly as much nitrogen, whereas SN87A's had plenty. Nitrogen in the ring would come from the star when it was a red supergiant; the deficiency of nitrogen in SBW1's ring means the star hasn't turned into a red supergiant (yet).

But with SN87A, we think it had to have been red before it exploded; its ring was likely the result of winds of gas blown out from the star when it was red getting blasted from the dins blown out later when it

was blue (the reasons for this are subtle, and I've explained them before if you're interested in details). If SBW1 has not been red, then there must be some other reason it has a ring.

This is the part I love about all this. Smith and his co-authors have an idea for what formed SBW1's ring: It ate a companion star.

It used to be two stars, a massive one and a smaller one. As the massive one expanded, it would have engulfed the smaller one. The smaller one would've been orbiting it rapidly, so when it got engulfed it would've spun up the big one like a whisk stirring a bowl of eggs. When this happened, the star ejected a huge amount of gas and dust in a single eruptive event. Because the star was spinning rapidly, this material would have been blown out preferentially in the plane of the star's equator. All that junk flew away from the star where it expanded and cooled, forming a clumpy ring. The tremendous energy of the light coming from the central blue supergiant star lit it up, which is why we see it in the Hubble images.

Now we don't know this for sure, but it fits the data. It's different than what's proposed for the formation of SN87A's ring, which was winds from the star interacting over thousands of years. So the two rings may be very different, but we don't know. It's possible they both formed the same way. They are both about the same size and mass, though, which means they're similar in some regards. So maybe SBW1 is on the same timeline that Sanduleak -69 202 was before it went off.

That puts 20,000 years tops on SNW1's clock. But again, we're not sure; it may be longer. I'll note that two other stars, Sher 25 and HD 168625 (pictured below, also c/o Smith), are also blue supergiants with rings, and both are more massive and hotter than SN87A (before it blew) and SBW1. Either one of them might go first. We just don't know.

As you can see, this gets a bit confusing. It gets weirder, too: We think, on average, a star should blow up once per century in a galaxy our size, but it's been many centuries since the last supernova in the Milky Way (SN87A was in a companion galaxy to

The complex ring system around the star HD 168625, which may well blow up before SBW1, Courtesy of Nathan Smith

us). That's a statistical average, so it's not like we're overdue.

But it tells you that there are probably lots of stars that might explode before any of those four (well, three, since 87A already exploded). Or it may very well be one of these guys. I'll note that all of them are too far away to hurt us when they explode; they're thousands of light years away, and a supernova has to be less than 100 to hurt us significantly. So we're safe.

The good news is that SN87A was 170,000 light years away when it exploded and we learned a huge amount about how massive stars end their lives (answer: not well). SBW1 is about 20,000 light years away, so we'll have a much better view. It seems weird to say, but I rather hope it blows up soon. It's in the constellation of Carina, which isn't visible from where I live, but still, the pictures would be spectacular, and the science would be fantastic.

The heavy elements in the Universe were literally created in such explosions; the calcium in your bones and the iron in your blood were forged in the hearts of supernovae. Without such destruction there would be no creation. In that sense, studying exploding stars is just another way of studying ourselves. We are literally a part of the Universe, and the Universe is in us. It's funny to think that looking outward helps us see inward, but astronomy is full of delightful ironies like that.

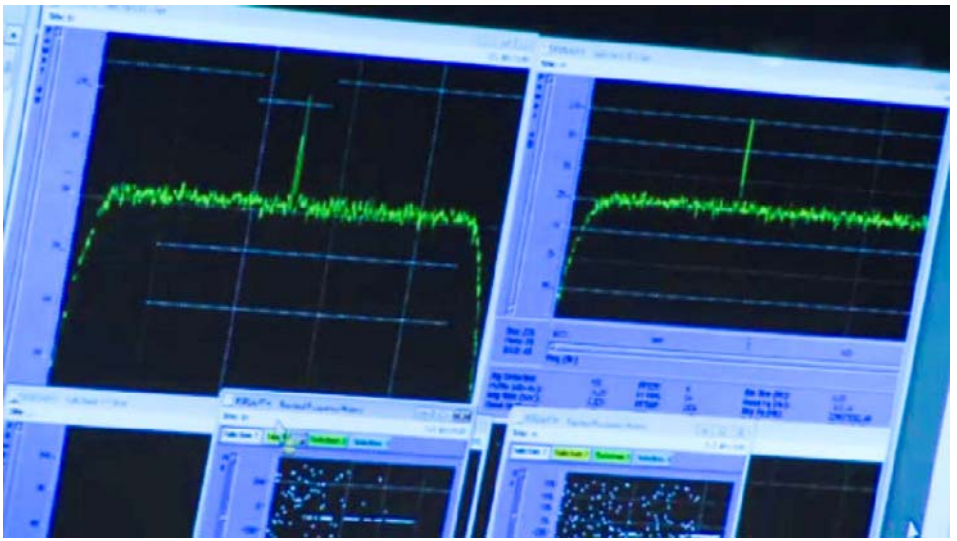
Spaceflight Roundup John Richards

ESA receives signal from probe, EVENTUALLY…….

After a deep space hibernation of more than 31 months, during which time it travelled around 400 million miles from the Sun, the ESA centre at Darmstadt sent a wake up signal to the Rosetta space probe on the morning of the 20th January and waited…… ESA scientists expected a signal to be returned from the probe at around 17:45 GMT, on the same day. Tension was high, as the time approached and past without a signal being received.

An additional 5 minutes passed, followed by another. The success of the mission was hanging by a thread. The next 5 minutes seemed to take an age. Twitter and social media went into meltdown. #WakeUpRosetta became a trending subject worldwide on twitter. Rumours started permeating the twittersphere. Was there a problem with the probe? Did it receive the signal? The worry on the faces of the ESA engineers was clearly visible as time moved on, inexorably.

Then suddenly 18 minutes late, a tiny speck appeared on the non-descript monitor screen. It didn't seem to be much, but Darmstadt suddenly exploded, whooping and hollering.



Is it a signal from Rosetta?

YOU BET!!!!!

It was the signal they'd been waiting for, for an agonising 18 extra minutes. But why the delay? It turned out that when Rosetta received the signal, the probe, millions of miles from home, rebooted itself. Only then, after doing some probe diagnostics, did it send the reply.

Now it's switched on, Rosetta is currently 'orbiting' the comet 67P/Churyumov-Gerasimenko (now unofficially called 67P CG). It will undergo a series of tests, while getting even closer to the comet. The pinnacle of the mission (outlined at the recent astrofest conference in London) will be the release of the 100kg probe called Philiae that will land on the comets surface. One of the most interesting experiments will be when the probe, now attached to the comet, will fire ultrasounds through the comet to be received by the Rosetta probe. This will give a clue to the internal composition of the comet.

ESA launch GAIA

In a busy period for ESA, they launched the GAIA space probe from French Guiana atop a modified Soyuz rocket on the 10th December. After moving to a position around 1 million miles from

the Earth's dark side, Gaia's mission is to map the position of up to 1 billion stars in the galaxy. Multiple images will be created during the duration of the mission to build up a 3D image of the portion of the galaxy. This will allow scientists to create the most accurate estimate of the shape of the spiral arms within our part of the galaxy.

After taking more than a month to travel 1 million miles, ESA released a test image, the only image from the probe most people will ever see.

International Space station

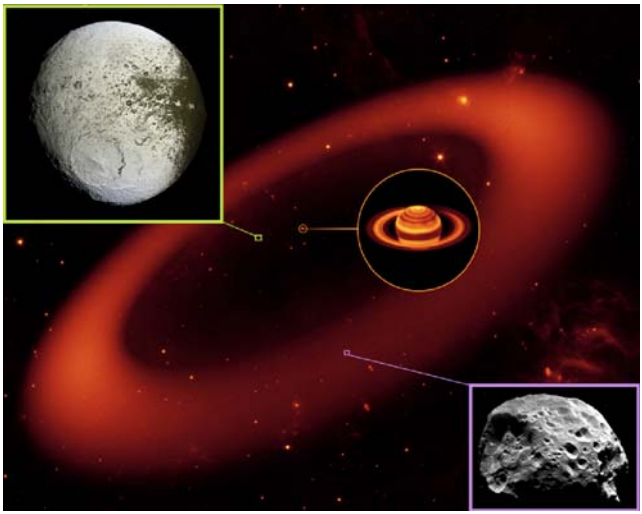
Christmas was a busy time for the astronauts aboard the ISS, as US astronauts, Michael Hopkins and Richard Mastracchio had to perform 2 unscheduled spacewalks, when a coolant module aboard the station malfunctioned. While a backup was brought into action, the astronauts replaced the defective module in combined spacewalks taking more than 13 hours…

The latest Russian resupply mission to the ISS, Progress 52 undocked on the 3rd February. It contained junk from the ISS, and burnt up in the Earth's atmosphere on 11 February. New resupply crafts launching to the ISS include flights by Space X (scheduled for 16th March) and a traditional Russian Progress resupply mission in early April. New tenants, Russian cosmonauts Alexander Skvortsov, Oleg Artemyev and US astronaut Steve Swanson will be transported to the ISS at the end of March. NASA has decided to continue funding the ISS until at least 2024, and ISS administrators in both Washington and Moscow have agreed to start 1 year missions from 2015.

A Two-Toned Wonder from the Saturnian Outskirts

Dr. Ethan Siegel

Although Saturn has been known as long as humans have been watching the night sky, it's only since the invention of the telescope that we've learned about the rings and moons of this giant, gaseous world. You might know that the largest of Saturn's moons is Titan, the second largest moon in the entire Solar System, discovered by Christiaan Huygens in 1655. It was just 16 years later, in 1671, that Giovanni Cassini (for whom the famed division in Saturn's rings—and the NASA mission now in orbit there—is named) discovered the second of Saturn's moons: Iapetus. Unlike Titan, Iapetus could only be seen when it was on the west side of Saturn, leading Cassini to correctly conclude that not only was Iapetus tidally locked to Saturn, but that its trailing hemisphere was intrinsically brighter than its darker, leading hemisphere. This has very much been confirmed in modern times!



Images credit: Saturn & the Phoebe Ring (middle) - NASA / JPL-Caltech / Keck; Iapetus (top left) - NASA / JPL / Space Science Institute / Cassini Imaging Team; Phoebe (bottom right) - NASA / ESA / JPL / Space Science Institute / Cassini Imaging Team.

In fact, the darkness of the leading side is comparable to coal, while the rest of Iapetus is as white as thick sea ice. Iapetus is the most distant of all of Saturn's large moons, with an average orbital distance of 3.5 million km, but the culprit of the mysterious dark side

is four times as distant: Saturn's remote, captured moon, the dark, heavily cratered Phoebe!

Orbiting Saturn in retrograde, or the opposite direction to Saturn's rotation and most of its other Moons, Phoebe most probably originated in the Kuiper Belt, migrating inwards and eventually succumbing to gravitational capture. Due to its orbit, Phoebe is constantly bombarded by micrometeoroid-sized (and larger) objects, responsible for not only its dented and cavity-riddled surface, but also for a huge, diffuse ring of dust grains spanning quadrillions of cubic kilometers! The presence of the "Phoebe Ring" was only discovered in 2009, by NASA's infrared-sensitive Spitzer Space Telescope. As the Phoebe Ring's dust grains absorb and re-emit solar radiation, they spiral inwards towards Saturn, where they smash into Iapetus—orbiting in the opposite direction—like bugs on a highway windshield. Was the dark, leading edge of Iapetus due to it being plastered with material from Phoebe? Did those impacts erode the bright surface layer away, revealing a darker substrate?

In reality, the dark particles picked up by Iapetus aren't enough to explain the incredible brightness differences alone, but they absorb and retain just enough extra heat from the Sun during Iapetus' day to sublimate the ice around it, which resolidifies preferentially on the trailing side, lightening it even further. So it's not just a thin, dark layer from an alien moon that turns Iapetus dark; it's the fact that surface ice sublimates and can no longer reform atop the leading side that darkens it so severely over time. And that story—only confirmed by observations in the last few years—is the reason for the one-of-a-kind appearance of Saturn's incredible two-toned moon, Iapetus!

Learn more about Iapetus here:
http://saturn.jpl.nasa.gov/science/moons/iapetus.

Kids can learn more about Saturn’s rings at NASA’s Space Place:
http://spaceplace.nasa.gov/saturn-rings.

Behind the Scenes

Rosa Adams and Ian Davies

With spring just around the corner many of us will be looking forward to some clear nights and a respite from the rains and almost constant cloud cover of the winter.

Many of the observing sessions planned to take advantage of cold crisp winter nights had to be cancelled.

By the time you read this the photographic course at Dyffryn Gardens will have taken place and doubtless the participants will also be longing for clear nights to practice some of the tips and techniques they will have learnt.

A notable exception and after a long absence, we returned to observe at a site above Castle Heights and which is now known as Mountain View Ranch under its new ownership.

We were rewarded with clear skies for most of the evening, and the session itself was well attended. An auspicious start, we wish the new venture every success.

At Dyffryn Gardens the meteor camera with a little tweaking performed well and returned its first pictures. Part of the UKMON network we will learn a little more about this when we visit The Norman Lockyer observatory in Sidmouth Devon in May, also part of the UKMON network.

Dave Powell was invited to the official opening of an observatory at a junior school in Penarth. A number of CAS members attended and had a very enjoyable evening. The event was well covered by the media, so many of you might have seen or heard of this.

Hopefully one of the spin offs from young people becoming involved with astronomy in this way will be a greater awareness of light pollution and we all know how much children can nag their parents, don't we?

The star gazing live event hosted by The National Museum of Wales and in which CAS took part was as usual very well attended. It was a beautiful day, clear and sunny and so we were able to give

A busy CAS stand at the National Museum of Wales Cardiff.

the solar scopes a good airing. We welcomed a number of new members; we hope they have enjoyed their membership so far.

The xmas meal which now seems a long time ago was deemed a success by everyone who joined us at The Aubrey Arms. The food and the service were excellent.

December also saw CAS at the last of the Society for Popular Astronomy's anniversary meetings. The event took place on the 6th December in the Trevithick building, the exhibition and traders being in the ground floor in the Junior Common room and the talks taking place in our usual lecture theatre. There were several trade stands and exhibitions and a full programme of talks. The event was well attended and enjoyed by all who attended. During the afternoon while we were chatting to the people from Astronomia's stand we saw a wonderful example of a double rainbow out of the window, it showed all the classic features of a rainbow.

The well attended SPA anniversary meeting.

The Rainbow seen at the SPA anniversary meeting.

July 2015 is the Cardiff Astronomical Society's 40th anniversary. 40 years in which the society has grown and developed to become one of the largest and least expensive societies in the UK.

We are going to mark this occasion with a special dinner in Cardiff. Numbers will be limited so it will be on a first come first served basis. A deposit will be required at the time of booking. Look out for the advert coming soon.

Wishing you clear skies.

Up-coming CAS Public Events

Date	Time	Event	Venue
5th Mar.	7:00pm to 9:00pm	Star Gazing at a Dark Site	Dyffryn Gardens
29th Mar.	7:00pm to 9:00pm	Stargazing from a Dark Site	Brecon Beacons National Park Visitor Centre
26th Jul.	10:00am to 4:00pm	SAFE solar viewing	Brecon Beacons National Park Visitor Centre
4th Oct.	10:00am to 4:00pm	Telescope Workshop	National Museum of Wales Cardiff
18th Oct.	7:00pm to 9:00pm	Stargazing from a Dark Site	Brecon Beacons National Park Visitor Centre
29th Nov.	7:00pm to 9:00pm	Stargazing from a Dark Site	Cwmcarn Forest Drive and Visitor Centre

CAS Lectures March To July

Date	Title	Lecturer
6th Mar.	The Changing Face of Astronomy over the last 30 years.	Guy Hurst, Basingstoke.
20th Mar.	Basic Astrophotography.	Dr Steve Wainwright, Swansea Astronomical Society.
3rd Apr.	66 Big Telescopes in Chile.	Neil Phillipson, Astronomia, Surrey.
17th Apr.	Annual General Meeting.	Cardiff Astronomical Society
1st May	The Formation of Planetary Systems.	Dr Peter Hargrave, Cardiff University.
15th May	Amateur/University Astronomical Collaboration.	Graham Bryant, Hampshire.
29th May	The Moon: what is, what was, what might have been.	Steve Balbus, Savilian Professor of Astronomy, Oxford University.
12th June	The Astronomical Society of Wales 1894-1914.	Dr Bryn Jones, London.
26th June	Who keeps killing the Galaxies.	Dr Chris Fuller, Cardiff University.
10th July	Three Short Talks.	Members of CAS.

Dave's Star Parties

Date	Day	Time	Venue
4th March	Wednesday	19:30 to 21:30	Dyffryn Gardens/Observatory
2nd April	Wednesday	19:30 to 21:30	Dyffryn Gardens/Observatory
5th May	Wednesday	19:30 to 21:30	Dyffryn Gardens/Observatory

Almanac Compiled by Ian Davies

Sun Rise/Set & Twilight

Date	Astronomical Twilight Begins	Sun Rise	Sun Set	Astronomical Twilight Ends
01st March	05:07	06:58	17:51	19:42
08th March	04:52	06:43	18:03	19:54
15th March	04:35	06:27	18:15	20:08
22nd March	04:17	06:11	18:27	20:21
29th March	03:58	05:55	18:29	20:36
01st April	03:50	05:48	18:44	20:42
08th April	03:30	05:33	18:56	20:58
15th April	03:09	05:17	19:07	21:16
22nd April	02:47	05:03	19:19	21:35
29th April	02:23	04:49	19:31	21:56
01st May	02:16	04:45	19:34	22:02
08th May	01:50	04:32	19:45	22:27
15th May	01:20	04:21	19:56	22:57
22nd May	00:32	04:11	20:06	23:45
29th May	--:--	04:04	20:15	--:--

Meteor Showers

Date	Meteor Shower	RA	DEC	ZHR
12th April	Virginids	14h04m	-9°	5
23rd April	Lyrids	18h08m	+32°	12
29th April	alpha-Scorpiids	16h32m	-24°	5
6th May	eta-Aquarids	22h20m	-1°	35
13th May	alpha-Scorpiids	16h04m	-24°	5

Observers Club Meetings

Date	Day	Time	Venue
28th March	Fri	20:00 - 22:00 GMT	Black Cock Inn
25th April	Fri	20:00 - 22:00 BST	Black Cock Inn
30th May	Fri	20:00 - 22:00 BST	Black Cock Inn

Observing Sessions

Date	Day	Time	Venue
7th or 8th March	Fri or Sat	20:00 - 24:00 GMT	Dyffryn Gardens
14th or 15th March	Fri or Sat	20:00 - 24:00 GMT	Mountain View Ranch
4th or 5th April	Fri or Sat	20:30 - 24:00 BST	Dyffryn Gardens
18th or 19th April	Fri or Sat	20:30 - 24:00 BST	Mountain View Ranch
2nd or 3rd May	Fri or Sat	20:30 - 24:00 BST	Dyffryn Gardens
16th or 17th May	Fri or Sat	21:00 - 24:00 BST	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 information.

Mountain View Ranch was formerly Castle Heights Golf Club.

Almanac March

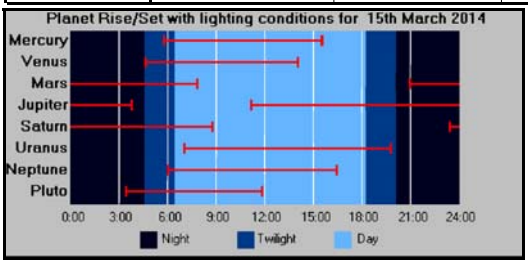
New MOON
1/30

First Quarter
8

16
Full Moon

24
Last Quarter

	Constellation	R.A	Dec	Rises	Sets	Mag.
Mercury	Capricornus	21h57m21s	-13°26'30"	05:44	15:30	+0.2
Venus	Capricornus	20h38m56s	-15°33'27"	04:38	14:00	-4.5
Mars	Virgo	13h42m10s	-07°31'34"	20:55	07:48	-0.9
Jupiter	Gemini	06h46m03s	+23°16'11"	11:10	03:42	-2.3
Saturn	Libra	15h25m37s	-16°14'28"	23:25	08:44	+0.2
Uranus	Pisces	00h43m04s	+03°55'27"	07:00	19:45	+5.9
Neptune	Aquarius	22h37m59s	-09°25'28"	06:03	16:32	+8.0
Pluto (Dwarf)	Sagittarius	18h55m58s	-20°07'11"	03:23	11:53	+15.1



Planet Events

19th Mercury at Aphelion (0.47 A.U.)

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

Almanac April

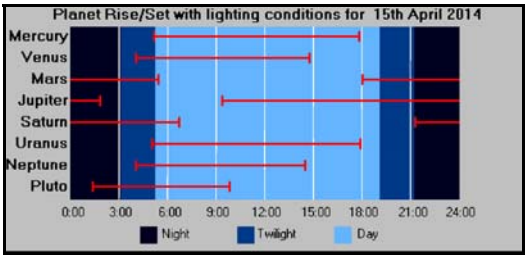
New MOON
29

First Quarter
7

15
Full Moon

22
Last Quarter

	Constellation	R.A	Dec	Rises	Sets	Mag.
Mercury	Pisces	00h51m42s	+03°28'58"	05:09	17:49	-0.9
Venus	Aquarius	22h45m58s	-08°06'30"	04:02	14:45	-4.2
Mars	Virgo	13h04m42s	-04°26'00"	18:00	05:24	-1.4
Jupiter	Gemini	06h55m56s	+23°06'06"	09:19	01:49	-2.1
Saturn	Libra	15h20m16s	-15°49'48"	21:16	06:39	+0.1
Uranus	Pisces	00h49m33s	+04°36'40"	05:01	17:53	+5.9
Neptune	Aquarius	22h38m08s	-09°24'38"	04:01	14:31	+8.0
Pluto (Dwarf)	Sagittarius	18h56m59s	-20°06'16"	01:22	09:52	+15.1



Planet Events

1st Uranus at Conjunction.
8th Mars at Opposition.
26th Mercury at Superior Conjunction.

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

Almanac May

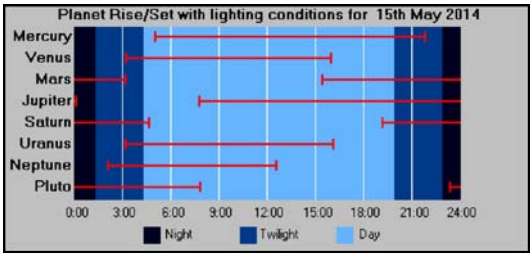
New MOON
28

First Quarter
7

14
Full Moon

21
Last Quarter

	Constellation	R.A	Dec	Rises	Sets	Mag.
Mercury	Taurus	04h46m13s	+24°39'17"	05:01	21:49	-0.5
Venus	Pisces	00h53m06s	+03°43'22"	03:11	15:54	-4.0
Mars	Virgo	12h35m20s	-02°43'41"	15:24	03:06	-0.9
Jupiter	Gemini	07h14m53s	+22°38'16"	07:44	00:03	-1.9
Saturn	Libra	15h11m42s	-15°15'41"	19:06	04:36	+0.1
Uranus	Pisces	00h55m23s	+05°12'59"	03:06	16:04	+5.9
Neptune	Aquarius	22h38m16s	-09°23'48"	02:03	12:33	+8.0
Pluto (Dwarf)	Sagittarius	18h56m02s	-20°08'19"	23:23	07:52	+15.0



Planet Events

2nd Mercury at Perihelion (0.31 A.U.).

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

There are eight of these things called planets in our solar system. Planets are bodies of rock that orbit the sun. They have to be a particular size as well to be classed as planets. If they are smaller they are classed as dwarf planets.

They are formed by a process called accretion. This is the same process that happens when you roll a snow ball in the snow. The snow ball gets bigger as it collects more snow from the ground and therefore gets larger. When a chunk of rock gets into orbit around a star it gravitationally attracts matter from the formation of the star. As it gets larger and attracts more matter it goes back around the same cycle. Belts of left over matter then get into orbit around the star and this matter can be pushed into the inner solar system.

There are eight planets. Our local star is the Sun, the light takes eight minutes to reach us on the earth. The Sun will blind you if you look at it directly. That is why you use telescopes with special filters on. The Sun can blind you if you do not have a filter on the telescope that you are using. You should always have people who know what they're doing with you. When you look at the Sun, you will notice black spots, these are called sunspots. These regions show intense magnetic activity which causes a drop in temperature.

Solar flares are an intense release of energy normally followed by coronal mass ejections.