Winter 2020

Aries

derbyastronomy.org

Derby & District Astronomical Society

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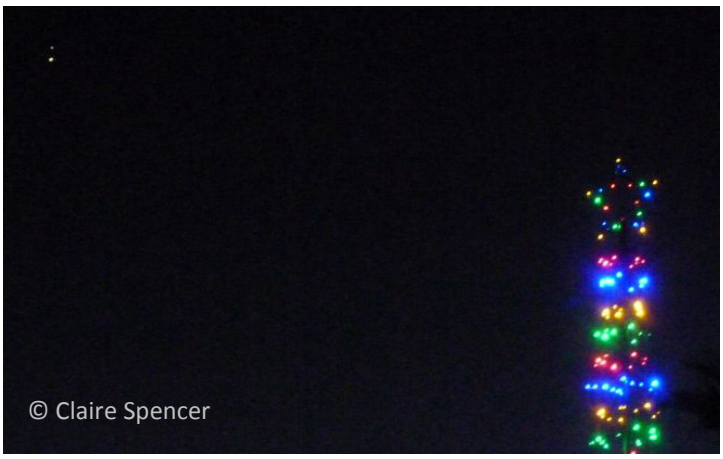
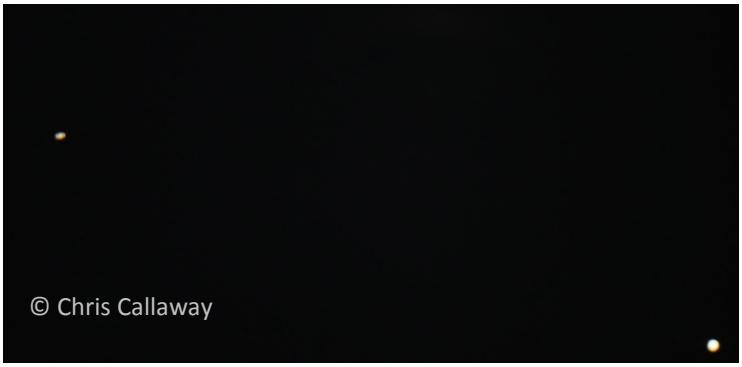
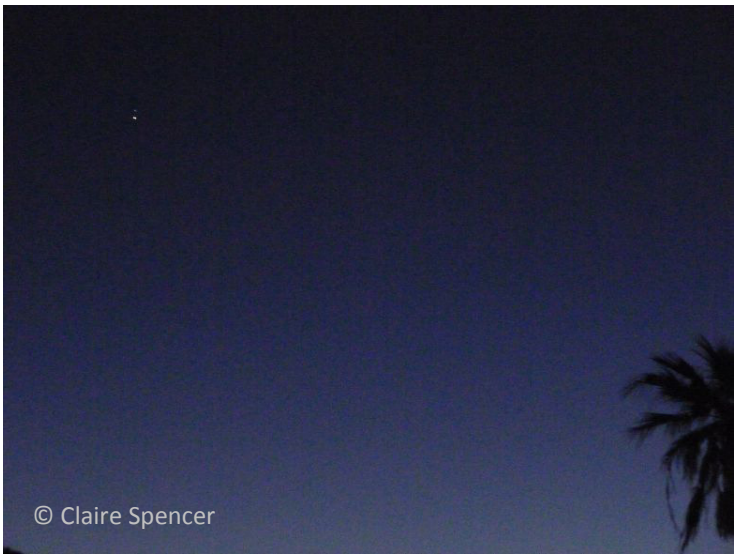
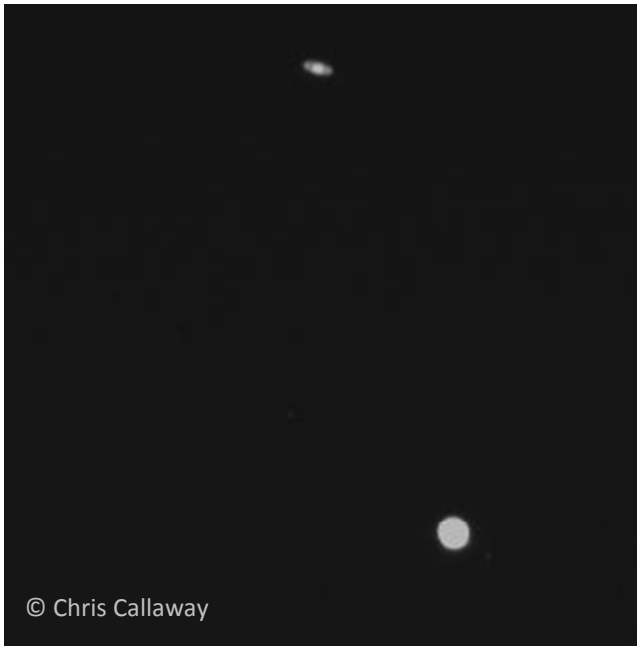
Member Gallery— Great Conjunction









What's inside this issue...

Member Gallery

Each issue we would like to feature some of the fantastic photos taken by members of the society.

We would like to see yours.

So please send me your Astro Snaps.

Articles WANTED

Share your astronomical exploits with the Society.

You don't have to be the next Brian Cox or Stephen Hawking. We would love to hear your story.

Book Reviewers WANTED

Did you win a book in the Raffle? Or have you borrowed one from the Society Library.

Why not tell us what you thought about it in our Book Review . Guide others through the maze

Aries Next Issue

Articles for the **Spring** edition of Aries, need to reach us by no later than **5th April**.

Email to the editing team at

arieseditor@derbyastronomy.org

Or

gillpryor@derbyastronomy.org

Editor Anthony Southwell: arieseditor@derbyastronomy.org Assistant Editor Gill Pryor email: gillpryor@derbyastronomy.org

COVID 19 Statement

The Derby and District Astronomical Society will endeavour to maintain a full programme of meetings during the COVID-19 pandemic.

All our scheduled meetings (see back cover) until Christmas 2020 (apart from observing sessions) will now take place via the Zoom video-conferencing medium.

Our scheduled observing sessions will involve appropriate safety measures and a requirement to provide contact details in line with government Track & Trace policy, the wearing of face masks, use of hand sanitiser, social distancing, limiting the number of people inside the observatory itself, and the cleaning of equipment before the next person uses it.

Visits to the society's observatory for members and small groups can be also be arranged by contacting the chair or secretary of the society, and will involve the same safety measures as our scheduled observing sessions.

If you would like further information about the society, on how you can join in our meetings via Zoom, or to attend observing sessions, then please contact the chair or secretary of our society. (see below)

Chairman

Peter Branson

Vice Chair & Webmaster

Mike Lancaster

Secretary

Brian Dodson

Treasurer

Simon Benkhe

Observatory Curator

Mike Dumelow

Aries Editor & PR Offcier

Anthony Southwell

Outreach Officer

Donald Anderson

Ordinary Committee Members

Harvey Saneria

Gary Lambert

Richard & Gill Pryor

You can also find us on...

Derby and District Astronomical Society and @AstroDerby

Editorial

Hello and welcome to the issue of Aries.

And so we bid farewell (and good riddance) to 2020, but what will 2021 bring? We will have to see. As I write this Editorial we are in the first week of a 3rd national Lockdown for COVID-19.

So what does that mean for the DDAS? Well, to tell you truth, not a lot really. For the time being, we will continue as we did during 2020, in accordance with the guidelines. DDAS meetings, both the main and second meetings, will continue online via Zoom, also any visits to the Observatory will be conducted within the regulations applicable at the time. Although, at the moment, Observatory visits for both members and groups are cancelled whilst Lockdown is in effect. It is a strange situation to be still in and I must admit, I do miss meeting up with my fellow DDAS members at the meetings and then in the Seven Stars for a pint after. But, thanks to using resources such as Zoom, we can keep a meeting programme going and can 'meet' virtually and catch up online.

This is the way Society life will have to be conducted for the time being, but it seems to be working, IT equipment and Internet connections permitting!

Thanks to our Secretary, we have cultivated contact with members of the Mid-Kent Astronomical Society (MKAS), we were invited to attend a Zoom meeting of theirs and we returned the favour, since then we have had a number of MKAS members attending our meetings and a very friendly bunch they are as well.

As for astronomical events of the preceding year, of course there was the appearance of Comet Neowise back in the summer and for once, we had a decent comet to observe. I even managed to image it, using my Canon EOS 1200D DSLR, a 70-300 mm telephoto lens and a tripod; my first ever foray into astrophotography! Yes, ladies and gents, I came over all brave and had a go at astrophotography and got a few good images of Comet Neowise, including not only the Comet but a Meteor on the same image as well, not bad for my first time.

Also during the summer we saw not just one or two but three launches of spacecraft to Mars. The first off the launch pad was the 'Hope' Mars Orbiter spacecraft on 19th July. Hope is a Saudi Arabian spacecraft and both the country's first space mission and first Mars mission. Hope was launched on a Japanese H-IIA rocket from the Tanegashima Space Centre, Japan and will enter Martian orbit in February 2021. The Hope spacecraft's mission will be to study the daily and seasonal weather cycles on Mars and weather events in the lower level of the Martian atmosphere, such as dust storms.

The second Mars-bound spacecraft lifted off on 23rd July, the Tianwen-1 Orbiter/Rover combination. The name translates as 'Heavenly Questions' and is China's first Mars mission. The rover is expected to land in Utopia Plantitia on 23rd April 2021, but the spacecraft is expected arrive in Martian orbit in February 2021. The orbiter part of the spacecraft is expected to have a mission lifetime of two years and the rover is expected to operate for 90 days.

The aims of the mission may include the following: find evidence for current and past life, produce Martian surface maps, characterize Martian soil composition and water ice distribution, examine the Martian atmosphere, and in particular, its ionosphere, among others. The rover will conduct chemical analyses of the Martian regolith to look for possible bio signatures; it will also probe the Martian subsurface via a radar instrument.

The third mission to set sail for the Red Planet was NASA's 'Perseverance' Rover (formally known as Mars 2020); the spacecraft was launched from Cape Canaveral Air Force Station on 30th July. Perseverance is expected to land in Jezero Crater, Isidis Basin on 18th February 2021. Perseverance is a rover which is similar to the Curiosity rover, which landed in Gale Crater on 6th August 2012. Perseverance has a similar mission to Curiosity, looking for bio signatures within Jezero Crater. Jezero Crater, like Gale Crater was once flooded with water, so there may be possible bio signatures within the sedimentary rock strata within it. Perseverance also carries a first for a NASA Mars Rover mission, it will carry to the Martian surface an extra bit of kit known as 'Ingenuity', a small, lightweight, quad copter that will be the first aerial vehicle to fly on Mars.

So 2021 is shaping up to be a busy time for Martian exploration. More on these missions will appear in later issues of Aries.

As we all know, 2020, saw a fair share of bad news and the astronomical community was not immune to this. In December the Arecibo Radio Telescope facility in Puerto Rico, had fallen into a state of disrepair, due to funding issues, so much so that observing operations at Arecibo were shut down due to structural failures. It finally could not take the strain any longer and the 900-ton equipment platform, that had been suspended above the telescope's dish by steel cables attached to 3 pillars at 120 degree intervals, collapsed onto the dish below, when the last of the steel cables finally gave out and gravity took over. Due to the operational shut down, there were no personnel present when the collapse happened.

The final collapse was filmed by remote cameras and the footage was released online not long after the event. It was heart-breaking to watch. This was one of the World's great observatories and it's contribution to astronomical research is immeasurable. It was used to send the first interstellar message from Earth to any ET's who may be listening, orbiting one of the stars in M13 the globular cluster in Hercules, some 25,000 light years away. It also was the hub for the 'SETI @ Home' system, by which you could download the software and download radio data from Arecibo. Your computer can crunch that data in the background, analyse it, looking for that tell-tale sign of a signal from ET, while you are doing something else. One or two possible candidate signals were found, not my me I hasten to add. In all the time I had SETI@Home running on my old desktop PC, I never found anything. But to me it did not matter, I was involved, albeit in a small way, in the search for extra-terrestrial intelligence and I was 'working' with the Arecibo Observatory as well, which gave me a personal attachment to that instrument. So it was all the more heart-breaking to see its end. I was crest fallen. But, there may be hope. Just like the Phoenix, Arecibo may arise from the ashes; there may be a chance that it could be re-built (see the stories regarding Arecibo in the Astro News Desk section of this very issue of Aries – Editor).

But it was not all doom and gloom, the year did end by giving us an early Christmas present, because throughout mid to late December, cumulating on 21st December a conjunction of Jupiter and Saturn would occur and would appear to become a single 'star' in the sky, at least to the naked eye. At conjunction, Jupiter and Saturn will not have been this close since around the year 1229. The planets became closer and closer, night by night properly from around 13th December onwards.

I had an idea, this was back in the days when we go places, I put out the suggestion that we should go out to the Observatory on 21st December to observe and possibly, hopefully, image this event.

So a number of us went out to the Observatory to do just that. As Jupiter and Saturn were to be low on the south western horizon and will have set by around 6 pm we arrived from 3pm onwards. So got set up and besides my 6" Newtonian's tripod breaking on me and having to be brought back into temporary operation by the application of Duct Tape (thanks Brian!) we set up to observe. I picked the wrong spot and didn't get a good view, but I did do a little lunar observing and a bit of time spent looking at Mars. I don't think that we got any images of the conjunction, I know I didn't, I think maybe Richard and Gill Pryor may have got the odd shot. Then the curse of 2020 struck and the clouds rolled in with thunder and lightning thrown in for good measure, then it hammered it down. Typical! But we did at least manage to observe the conjunction!

Continued overleaf...

Editorial continued…..

So, what can be found in this issue of Aries then?

We have the next two victims, err, I mean biographies, yes biographies, in our regular **'Meet the Committee'** feature.

Committee Member Gary Lambert gives us an overview of the **DDAS' presence on Facebook and Twitter**; yes good people we have a presence on Twitter. Gary is overseeing our social media presence.

There is brief information on **meetings held since the last issue of Aries** was published and just in case you missed them, details of how you may get a second chance to be there.

We have the next instalment in our '**How to'** series, where Chris Callaway shows us how to select and image astronomical targets.

Our very own Secretary, Brian Dodson has written a piece entitled **'Misadventures of a Very Amateur Astronomer.'**

We are also introducing **D.D.A.S. Marketplace** - where you can grab yourself a bargain

Malcolm Neal provides a **book review of Mike Brown's book 'How I Killed Pluto and Why it Had It Coming.'** Mike Brown was part of the team that discovered Eris, a dwarf planet which is further out from Pluto, but was slightly larger than Pluto; it was discovered in January 2005. Eris was the object that demoted Pluto from a planet to a dwarf planet and the argument continues to this day.

As well as the usual Aries fair, such as **Astro News Desk**, **Member's Gallery**, list of **DDAS Library books** available, **Observatory Rules** and including COVID rules regarding the Observatory.

So, as you can see, this issue of Aries has a lot going on. Sit back, relax, and grab your favourite drink, Tea, Coffee or something stronger if you wish and dive into the pages of this issue, the Universe awaits you!

Anthony Southwell
Editor in Chief

Gill Pryor
Assistant Editor

Meet Your Committee - Treasurer - Simon Benkhe

Hi, My role within the society is the Treasurer, or as in the past "The tight fisted one that won't let anyone buy anything!" person. Well actually that's not the way I see a treasurer's role!

I became a member of the society several years ago, not from my own interest in astronomy but my wife's. She has always been keen on it so decided to tag along and see what the fuss was all about! Most of the time it was way beyond my understanding apart from recognising words like the Moon, Sun, Mars and a few other planets. The nearest thing I had in common with astronomy was it was done at night, night time, best time to go out racing down old airfields and through woods at crazy speeds in a rally car (Mk1 2.0l Escort) that I had built!

I started off life as an apprentice HGV mechanic and have always been a petrol head from as long as I can remember. I think it started when I was around 6 or 7 when I stripped our lawnmower engine my dad was trying to repair while he went off for a bit. Mum came out and had a icky fit saying I better get it back together before Dad got back or I would get the belt (as we did back then!) Anyway, I got it back together just as dad got back, mum told him what I had done, I was about to leg it when he said let's try it then! Amazingly it started which I think is where I began wanting to take things to pieces and trying to understand how they work!

Fast forward a few years, change of direction to become a Driving Instructor. Still messing with cars etc but still no real interest in astronomy. Came to a meeting with my wife and after attending a few talks was a little bit more aware that there are more things out there but trying to get my head around things like Nebula, Light Years, Gas Giants and Black Holes was still a bit like a foreign language!

You may well ask why are you treasurer if you're not that interested in astronomy then? Well it was more a case of the society were looking for a new treasurer, my wife jokingly suggested that as I do all the accounts for my own business I could do it. Before you could say space rocket there was a nomination, seconded, a vote and I was treasurer!

I still find a lot of it goes over my head but the people that you meet are very interesting and incredibly knowledgeable, I have made some good friends through the society and nearly always find an answer to a question, apart from what holds the planets up and do Aliens really use a probe?

Meet Your Committee - Observatory Curator - Mike Dumelow

Patrick Moore's advice was always to join your local astronomical society. The problem was that I didn't know if there was one, or how to find it. I eventually found Jane Kirk's address in the Year Book. So after a few years I found and joined the society in 1984. I became a committee member in 1985 and after 36 continuous years my roles have included Chairman, Treasurer and Site Curator .I am obsessed with telescopes.

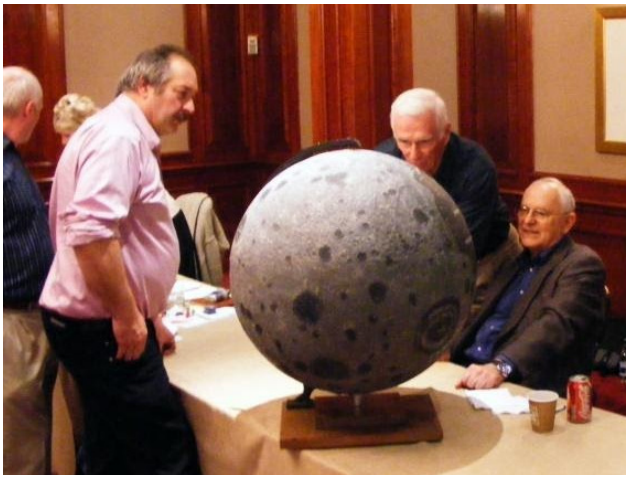
I grew up on the family farm just outside of Ticknall and went to school in Melbourne and Ashby-de-la-Zouch. Watching the stars come out and being outside under a dark sky (feeding animals and helping on the farm) were regular features of growing up. I was lucky that the nearest street light was over a mile away. I discovered the Pleiades several times and the night sky fascinated me.

In the early 1960's space flight was big news. I remember the Americans sending chimpanzees into space and the flight of Yuri Gagarin. At this time visible satellite passes were printed on the front pages of newspapers and I used to regularly watch them with my father. Echo1 was my favourite; I think the name just kept coming back to me. When I was eight, I was given a present about the life of Galileo. It was from the Triang Inventor series. It had a book, a self assembly bust of Galileo and my first self assembly telescope. I was a bit disappointed. It had about 4x magnification and was very blurry. At the time I wished I'd had the Marconi radio instead.

Growing up I heard many stories. My grandfather told me about seeing Halley's Comet in1910 and the total solar eclipse of 1927. He told me about seeing the rings of Saturn through a telescope. My mum talked about the sky being alive with the northern lights as she came home from school in January 1938. My path was being mapped out.

Later, at the Ivanhoe School in Ashby (11 to 14), I came across my first proper library, one with a science section. Two books (right) changed my life. The first was Constellations (Hamlyn) which allowed me to learn the "accepted" versions of the star patterns. It even had planetary positions up to 1980. The other was Handbook for Telescope Making (Howard). I had found a lifelong obsession! Those three years also coincided with Apollo 7 to Apollo 15. Science teachers, astronomy books, eight men walking on the moon –heady days indeed! Apollo 8 was always my favourite, Genesis and Christmas, a game changer.

My first ever view of the belts on Jupiter and the rings of Saturn came through a self-built telescope. I purchased a 6inch F8 mirror and secondary from Henry Wildey and made the tube and tripod.



My interest in astronomy has allowed me to meet some well known people. The picture (left) was a real highlight. I had just met Buzz Aldrin and this shows Gene Cernan (Apollo 17, standing) and Alan Bean (Apollo 12). Gene Cernan was looking at his flight route so he could show me where he landed. They were like old rivals and had tremendous knockabout banter. In all, I have spoken to five moon walkers and also to Fred Haise (Apollo 13), Scott Carpenter and my early favourite, Jim McDivitt. Away from spaceflight I have met Patrick Moore several times and also Jocelyn Bell Burnell.

My interest in telescopes and optics was the reason I was also a member of Birmingham AS. They ran a weekly telescope making workshop. Members could grind and aluminize mirrors, and fabricate telescopes. My telescope heroes include Horace Dall, Jean Texereau, David Hinds and Jim Hysom. I have also met Al Nagler (Televue), and Thomas Baader (Baader Planetarium).

“One small step for man, one Giant Leap for DDAS”

Facebook/Twitter/Whatsapp -

Your society is evolving!

As a society, our members spend night after night pondering the mysteries of the known universe. It will therefore surprise you little, that at one of our latest committee meetings the mysteries of another well known (less spectacular) universe was also a topic for discussion. Yes, the social media universe! DDAS has had a long and very successful presence on Facebook which therefore provided us with a great platform from which to launch.

The past year has been such an isolating experience for many of us and this was very much on our minds when your committee met earlier in 2020. As many of you will know we recently set up our very first DDAS WhatsApp Group which has allowed our members to interact in a safe and exciting new way outside of regular zoom calls, meetings and observing sessions.

However, as successful as this group has been, we also wished to explore other new interesting ways our society could grow digitally. We wished to explore others ways our members could interact with both each other as well as the general public. With Covid restrictions limiting physical meetings throughout the academic year we began to think about other ways our members can engage as a society and how potential new members could reach us. We therefore discussed the wonderful and modern benefits that are on offer through the universe of social media platforms. We decided that as a society we were rather lagging behind on the social media front, despite the continued fantastic efforts of our website and Facebook page we still thought this was a great opportunity for us to progress even further and to compliment these two well established online networks we had! As a committee we had decided to take our next giant leap into the social media frenzy and set up your new DDAS twitter account on the 6th of November 2020. Within minutes, on the very same day the society sent its first tweet shooting off into the twittering universe. Within minutes, our first tweet was being retweeted by Derbyshire Promo, which promoted us to over 13k followers! Within seconds we were reaching audiences we had never had, and members were reconnecting with their society in a new exciting way as they started to follow the account. We would therefore like to encourage you all to find and interact with your society on Twitter. We can now be found on Twitter as @AstroDerby and we would encourage you to ask all your friends and family to follow us. The aim of this account is to announce to all our members and to the world what our society will be up to throughout 2021 and beyond, as well as showcase the excellent and exciting hands on astronomy that our members take part in each and every week.

As a result, we would love to hear from you! We want to be able to show off what we do as a society and as individuals in relation to the fantastic hobby that we all share. We want you to send us your astronomy related stories and pictures that we can share through this social media link. If you have taken any astro-photography images, if you have had a fun night observing, if you have bought a new scope, if you have read an interesting book, we want to know so we can share this with other societies and other members can see what we are all up to!

Moving forward the Twitter account will also be used to interact with our guest speakers and interact with other societies and organisations who we engage with throughout the year. This was put into full affect when we received the following tweet from @WebbTelescopeUK thanking DDAS members for taking part in their online training sessions that were mentioned in many of our meetings towards the end of 2020 along with societies from Liverpool, Norwich, Sherwood and many others.

We hope that you are all encouraged by the steps we are taking as a committee to make DDAS more accessible to our members and new members as we move into 2021.

The recent restrictions have provided us with the challenge and opportunity to think up news ways for us to come together. However, these will only be successful if people get involved! We will also be using our presence on social media to promote our outreach offers to local schools and to encourage other organisations to get involved with what we do. I look forward to seeing you all online and clear skies!

Gary Lambert Ordinary Member
garylambert@derbyastronomy.org

Look What you Missed

Or didn't ...

A Summary of meetings & events since the last issue of Aries.

2nd Oct The first of the two talks that Dr Susan Cartwright gave us, "Supernova Neutrinos". Susan explained that although Neutrinos are sub-atomic particles and Billions pass through us all the time, (without us noticing I might add), they are an all-important part of a stars life cycle and without which the process for a star to go supernova could not happen.

16th Oct ITA Evening (Introduction to Astronomy) Brian showed us what we should be able to see (weather permitting) in the night sky for November.

6th Nov Martin Braddock spoke to us about "The Best of Both Worlds-Space Drug Discovery and Development". Martin as ever was excellent as he told us how drugs developed for space are benefitting us here at ground level, he explained how difficult it was to test such products and gauge their effectiveness due to lack of subjects to test them on. **You can watch or re-watch this talk Facebook**

14th Nov Was the start of National Astronomy Week 2020

20th Nov Brian introduced us to Taurus & Orion, followed by Don giving us a detailed guide on how to use Stellarium and attach it to our telescopes. **You can watch or re-watch this on Facebook**

27th Nov Don & Brian had been attending Zoom seminars about the Web telescope and have made several contacts in other societies.
One of these being Mid Kent AS, who invited us to join them for a talk entitled Eyes on the Sky, given by their member, Ian Hargreaves.
"Eyes on the Sky" reflected on contributions from the giants of astronomy, and some unsung heroes, that have built the understanding of our universe as we know it today. The presentation also brought some of the very latest information on yet to be launched/commissioned observatories, together with the small part that MKAS will be playing in one of them!

27th Nov Q&A Session with ESA Astronaut Samantha Christforetti.

4th Dec Sam Walton from UCL gave us a talk on "Space Weather" and the effects it can have here in Earth, from creating the beautiful aurora to the possibility of destroying all things electronic and impending doom.
You can watch or re-watch this on Facebook

18th Dec To close out the year we invited Dr Susan Cartwright to talk to us all about "The Science of Santa". In which Susan showed us how Santa COULD get to all those houses in one night, provided of course that he hadn't been seen!
You can watch or re-watch this on Facebook

8th Jan The New Year started off with the bang, that is the Society Quiz night, with the societies resident Quiz Master, Dave Selfe
Commiserations to Team Andromeda. Perseus were bound to win.

How to.... How I select and image Astronomical Targets - Chris Callaway

I recently submitted two images of The Elephant's Trunk nebula IC1396 for posting on the society website and was asked at a recent meeting if I would write an article for the Aries Journal on my rationale for selecting an image and the subsequent imaging of it.

My observatory imaging setup gives me a relatively large field of view of 3 Deg by 2.3 Deg, this is approximately 6 by 4.5 moon diameters, so I look for wide field targets that will fill a reasonable amount of the camera sensor. I use a mono camera and a filter wheel loaded with LRGB and Narrow Band filters. To decide on what to image I use sources of information which include Astrobin to see what other North European Widefield Imagers are taking at the moment, Astronomy Now magazine and Stellarium; I have an overlay on Stellarium of the field of view obtained by my imaging system. I also use a book by Ruben Kerr, The 100 Best Astrophotography Targets, as well as a general internet search of what to look for in a particular month.

Criteria that are taken into consideration include:

- How high the object is in the sky and will it remain visible during the anticipated imaging sequence. The higher the object the better will be the result for a given night.
- Will the object cross the meridian or cause my filter wheel to encroach on the mount and require a meridian flip of the mount during the imaging run. Doing so causes me to lose about 5% of an image. I prefer to avoid having to execute a meridian flip if possible.
- Will the moon be in the sky during the observation and at what age. Using Narrow Band Filters can alleviate the effects of the moon but I prefer to image during the first or last quarters of the moon if possible.
- Will I finish imaging at a reasonable hour. I am not the kind of imager who will stay up all night or get up at say 0200hrs to capture an image. I like to start early at the beginning of astronomical twilight and finish before midnight if I can.
- The next step after I have found a suitable target is to decide on whether it will be predominantly a LRGB or Narrow Band image. I live on the outskirts of Coalville and suffer from the effects of light pollution; a LRGB target is best higher in the sky but this does not always happen so the resultant casts and gradients have to be dealt with during processing.

Hydrogen Alpha (Ha) can be added to a LRGB image to enhance it if Ha is present. For most images I use a 10 minutes exposure time for each shot. Why 10 minutes? Two main reasons, I find that 10 minute images give me a reasonable amount of usable data over a 3 hour time period, also, because my darks are 10 min darks, if I use a different exposure time then I will need to take another set of darks for that specific image. Having said that, if I am imaging something that is particularly bright then I will have to shorten the exposure time in order to not overexpose the image. A typical imaging run is 6 x 10 minutes for each filter used. If, as I found with the Elephant's Trunk, there is a lot of noise in the final image then I will do a second imaging run another night and use both sets of data to produce the final image.

Finally, my mount requires a one star calibration to accurately locate objects so I will launch Stellarium and find a first or second magnitude star close to, and on the same side of the meridian, as my imaging target. This star will also be used to focus my telescope.

So, having selected a suitable target, and having selected a calibration and focus star, I now wait for a suitable clear night to image the target.

Imaging

I will just run through the basic steps that I need to undertake to obtain the images. This will vary depending on an individual's mount, scope and imaging equipment as well as the software used. It usually takes me between 20-30 min from power up to being ready to image.

The observatory is equipped with a fan heater used as a frost control and a dehumidifier. If the outside temperature is close to zero Celsius I will switch off the heater and dehumidifier and switch on my dew control early to allow the telescope to get to ambient temperature.

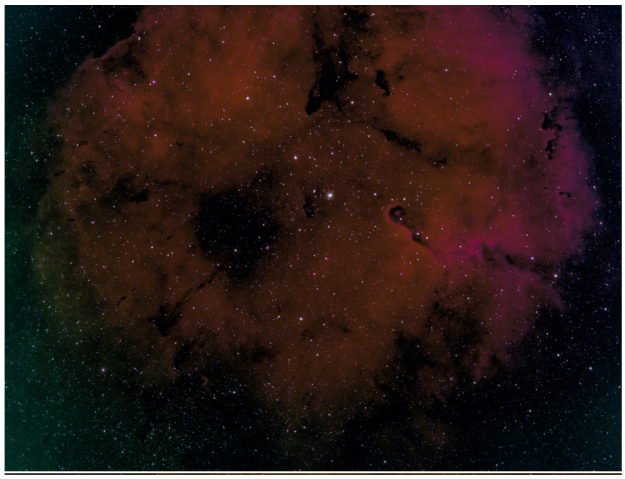
1. Power up laptops, mount, camera, filter wheel and dew heaters (if not already done).
2. Launch TheSkyX Pro to control the mount, Atik Capture to control the camera and filter wheel and PHD2 to control the guide camera.
3. Set imaging camera temperature to -30C. I find I can achieve -30C on most nights of the year.
4. Park the mount; my mount goes to specific coordinates before it can be used.
5. Slew the mount to the selected star.
6. Align the mount on the star using the imaging camera to aid alignment and once the star is centred calibrate the mount to the star (I use 1-2 sec exposure and the luminance filter).

7. Focus the scope on the star using a Bahtinov mask and the camera (I use 1-2 sec exposure and the luminance filter).
8. Slew the scope to the imaging target.
9. Take short exposure and check composition. This may not be possible if the image is dim, on occasion I have to complete a 10 min exposure to do this.
10. Realign mount if necessary to frame target.
11. Start tracking calibration and once complete check that the mount is tracking.
12. Set up camera image sequence including filters to be used. I personally do all images on each filter before switching to the next filter. I have had problems in the past with my filter wheel not locating properly or going to the wrong filter so I prefer to be next to the filter wheel when it changes filter to listen to the relay contact clicking.
13. Start imaging sequence.
14. Frequently check dome and rotate if required to ensure both imaging camera and guide camera have a clear view of the sky.
15. Check focus hourly by examining captured images. If focus has drifted and there is no star bright enough in the image to use for refocus, then it is back to step 4 to refocus followed by the subsequent steps!
16. Finish the sequence and download images (.fits files).
17. Park scope, warm up camera, power down all equipment.
18. Power up observatory dehumidifier and heater.

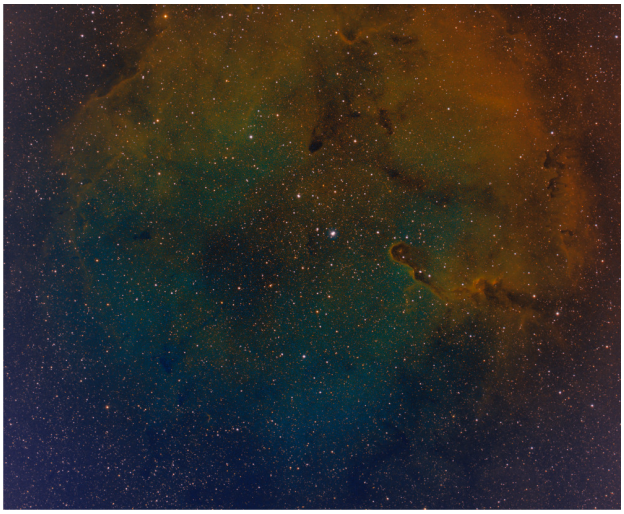
Clear skies… at least during an imaging run!

Chris Callaway

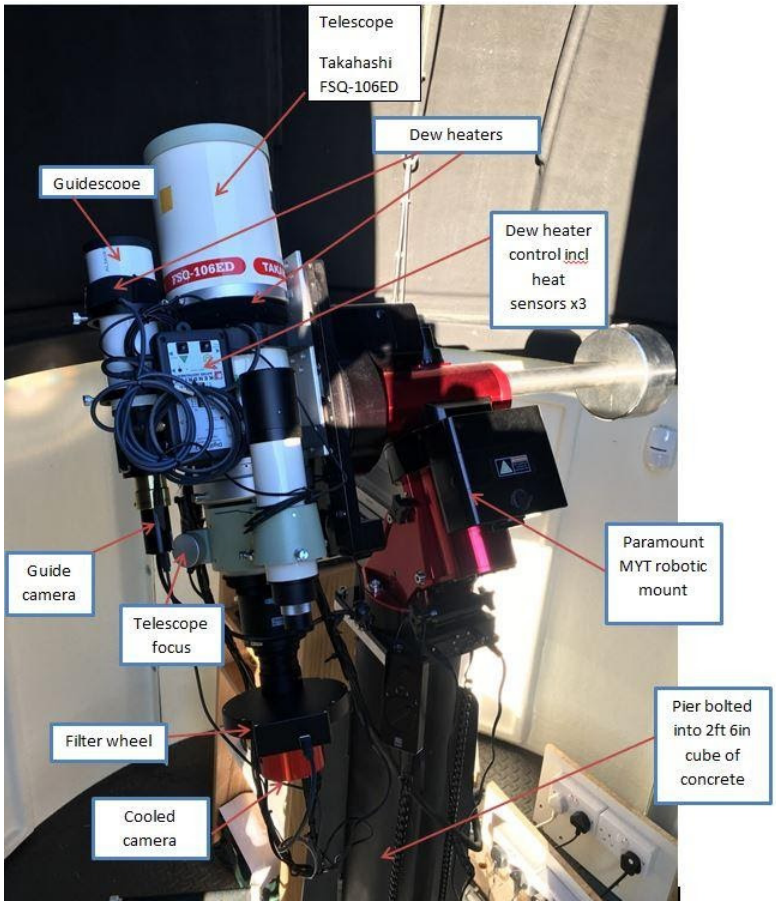
The images comprise 5 x 10 minute subs of Ha, Sii and Oiii. Equipment was a Takahashi 106, the camera was an Atik 16200 with Atik filter wheel and filters, the mount was a Paramount MyT. The images were stacked in Astroart with further processing taking place in Photoshop. In the top image Ha was assigned to the red channel, Oiii to the green channel and Sii to the blue channel. Images © Chris Callaway.



The second image uses exactly the same data as the top image but with Sii assigned to Red, Ha to Green and Oiii to blue. The levels of the individual Red, Green and Blue channels were then stretched to roughly the same size from dark to light before manipulating the colours to create the Hubble palette.



Early photograph of my observatory equipment.
The camera and filter wheel have now been replaced.



Arecibo Telescope Collapses, Ending 57-Year Run – Science Web – 1st Dec

The Arecibo Observatory is gone. Its 900-ton instrument platform, suspended above a dish in the karst hills of Puerto Rico, collapsed this morning, at about 8 a.m. local time, says Ramon Lugo, director of the Florida Space Institute at the University of Central Florida, which manages the 57-year-old radio telescope for the National Science Foundation (NSF). On 19 November, NSF decided to decommission the observatory following two cable breaks that put the platform on the brink of collapse. But in the end, it couldn't survive long enough for a controlled demolition.

"I feel sick in my stomach," Lugo says, fighting back tears. "Truthfully, it was a lot of hard work by a lot of people trying to restore this facility. It's disappointing we weren't successful. It's really a hard morning."

Lugo says no one was near the dish when the platform fell. But he did not have all the details on how the structure came down. He believes it was because of a failure of one of the remaining cables connecting the platform to one of three support towers. These cables were carrying extra stress following the two previous failures. And since the Thanksgiving holiday, Lugo says, wires were breaking in these remaining cables at a rate of about one per day. He says he told NSF the structure only had a week or two remaining before it would collapse.

Engineers will inspect the condition of the three support towers today, says Lugo, and see whether they can piece together how it collapsed. He worries about the 130 observatory staff members and their future. "I can't imagine how they feel," he says.

Puerto Rico Government Supports Rebuilding Arecibo – Space News Website 1st January 2021

WASHINGTON — The outgoing governor of Puerto Rico says she backs rebuilding the Arecibo radio observatory, but a final decision on whether, and how, to reconstruct the giant telescope could take years.

Governor Wanda Vázquez Garced signed an executive order Dec. 28 stating it was the formal policy of the commonwealth to rebuild the 305-meter radio telescope at Arecibo Observatory. The telescope's 900 -ton observing platform fell to the dish below when several cables snapped early Dec. 1, weeks after the National Science Foundation (NSF) said it was unsafe to repair cables at the telescope that previously broke. She signed the order in the final days of her term, which ended Jan. 1.

"The Government of Puerto Rico states, as a matter of public policy, its conviction to the reconstruction of the Arecibo Radio Telescope and the prompt resumption of world class science and education at the Arecibo Observatory," the order states.

The order adds that the Puerto Rican government foresees rebuilding a "newly designed" telescope that would have a larger effective aperture and wider field of view. It also calls for a more powerful radar transmitter, which is used for solar system observations such as characterizing near Earth asteroids.

The order states the government is "assigning and allocating" $8 million to start the reconstruction work. Vázquez Garced, in a separate statement, said the funding is from budget surpluses from previous years, but didn't elaborate further on the source of the funding. The funding, she said, would be used for removing debris from the telescope's collapse and other environmental remediation work.

The $8 million, though, is only a small down payment on the cost of rebuilding the telescope, with informal estimates in the astronomy community projecting it to cost several hundred million dollars. Vázquez Garced, in her executive order, gave no estimate herself but said it would be funded by "state, federal and private sources (including public-private partnerships and state-federal partnerships)."

The NSF, notably, has not committed to rebuilding Arecibo. At a briefing two days after the telescope's collapse, agency officials said their focus was on the assessment of the damage and cleanup efforts.

"NSF has a very well-defined process for funding and constructing large-scale infrastructure, including telescopes," Ralph Gaume, director of NSF's Division of Astronomical Sciences, said at that briefing. "It's a multiyear process that involves congressional appropriations and the assessment and needs of the scientific community. So, it's very early for us to comment on the replacement."

Congress, which would have to allocate any federal funding for rebuilding Arecibo, did not earmark any money for doing so in the fiscal year 2021 spending bill passed in December. However, the report accompanying the bill directed NSF to prepare a study on the telescope's collapse and cleanup efforts, as well as "the process for determining whether to establish comparable technology at the site, along with any associated cost estimates."

That report is due to Congress 60 days after the bill was enacted, which took place Dec. 27. However, it is not uncommon for agencies to deliver such reports weeks, or even months, late.

At the same time, the astrophysics decadal survey, which sets priorities for both space-based and ground-based astronomy for the next 10 years, is completing its study, now scheduled for release in the spring. The NSF said in December that it informed the survey's steering committee of Arecibo's collapse but did not make any special requests for it to evaluate the impact of the loss of the telescope.

For the morbidly curious, the collapse can be seen on YouTube by searching https://youtu.be/T99REQhNlt4 from your internet browser.

BBC News Website – 16th Dec - China's Chang'e-5 Mission Returns Moon Samples

China's Chang'e-5 mission has returned to Earth with the cargo of rock and "soil" it picked up off the Moon.

A capsule carrying the materials landed in Inner Mongolia at 01:59 local time on Thursday (17:59 GMT, Wednesday).

It's more than 40 years since the American Apollo and Soviet Luna missions brought their samples home.

The new specimens should provide fresh insight on the geology and early history of Earth's satellite.
For China, the successful completion of the Chang'e-5 venture will also be seen as another demonstration of the nation's increasing capability in space.

Recovery teams were quick to move in on the returned capsule. It was first spotted by helicopters using infrared cameras. Support staff following up in SUVs planted a Chinese flag in the snow-covered grassland next to the module.

The Chang'e-5 venture was launched on 23/11/2020 and landed on the Lunar surface at Mon Rümker in the Oceanus Procellarum (Ocean of Storms) on 1st Decmber 2020. The ascent vehicle lifted off the Moon on 3rd December 20220 for a landing in Inner Mongolia, China on 16th December 2020.

A probe comprising several elements was sent into orbit around the Moon. These elements then separated, with one half going down to the lunar surface.

The lander system used a scoop and a drill to dig up samples. It's not clear how much, but possibly in the range of 2-4kg.
An ascent vehicle subsequently carried the materials back into lunar orbit where they were transferred to an Earth-return module. This was shepherded home by a fourth element and released just before it had to make the fiery descent through Earth's atmosphere.

Returning from the Moon, the Chang'e-5 module would have been moving much faster than, say, a capsule coming back from the International Space Station.

Engineers had chosen to scrub some of this extra energy by doing an initial "skip" in the atmosphere. This saw the module briefly dip into the gases that shroud our planet, before then plunging much deeper to try to reach Earth's surface.

The Chang'e-5 capsule was targeted to float down on parachute to Siziwang Banner in Inner Mongolia. This is the same location used to bring Chinese astronauts home.

Again, infrared cameras were on hand to follow the action by detecting the heat of the module.

A total of just under 400kg of lunar surface materials were collected by American Apollo astronauts and the Soviets' robotic Luna landers.

But all these samples were very old - more than three billion years in age. Chang'e-5's rock and dust should be quite different.

The Chinese mission targeted a high volcanic region called Mons Rümker in the northwest of the nearside of the Moon.

Samples from this terrain may be no more than 1.2 or 1.3 billion years old, and, as such, should provide additional information on how the Moon is constructed internally.

The samples will also allow scientists to more precisely calibrate the "chronometer" they use to age surfaces on the inner Solar System planets.

This is done by counting craters (the more craters, the older the surface), but it depends on having some definitive dating at a number of locations, and the Apollo and Soviet samples were key to this.
Chang'e-5 would offer a further data point.

Chinese space officials have said the new samples will be shared with the UN and international partners. The Chinese public will also get to see some of the materials when they are put on display in a national museum.

The Moon is once again in vogue. America is planning on returning astronauts to the surface in the middle of this decade. A series of robotic spacecraft will land ahead of these human explorers to do reconnaissance.

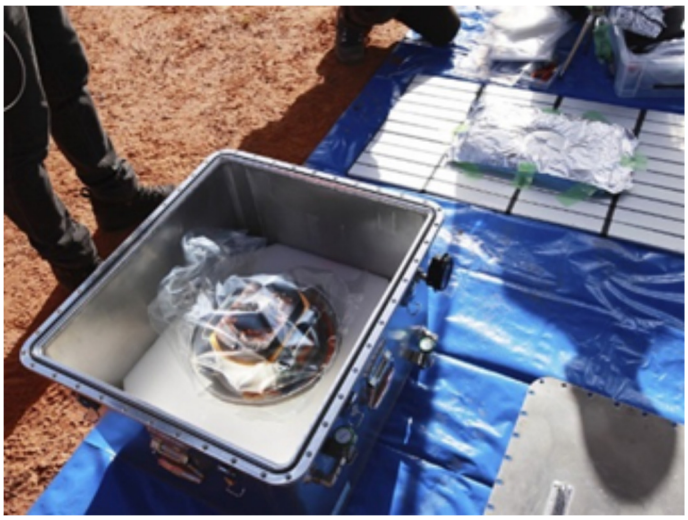
Some of these probes will be from national space agencies; some will be sent by commercial enterprises - including from the UK.

Tony Azzarelli, director and co-founder of the UK industry space body Access Space Alliance, said exciting times lay ahead, and highlighted the start-up Spacebit's quest to put a rover on the lunar surface next year.

"It'll be the first time that a legged robot will walk on another celestial world. Of course, all of these lunar missions are just a prelude to the return of humans to the Moon in the not-too-distant future," he told BBC News.

See China's Chang'e-5 moon probe set for successful return to Earth on
DW News *https://youtu.be/EiOW_bbSI9A*

Nature Website News – 15th Dec – Asteroid Dust Recovered From Japan's Daring Hyabusa 2 Mission



Scientists hope the dark grains from asteroid Ryugu will improve their understanding of the Solar System's formation.

Japan's mission to bring asteroid dust back to Earth has succeeded. The Japan Aerospace Exploration Agency (JAXA) confirmed on 14 December that a capsule from spacecraft Hayabusa2, which landed in an Australian desert last week, contained black grains from asteroid Ryugu.

"The confirmation of sample is a very important milestone for us and for JAXA," says Yuichi Tsuda, project manager for the mission at JAXA, in Sagamihara.

JAXA said in a statement that they observed the sandy material at the entrance of the collection chamber, but have yet to look inside to see whether more asteroid dust is lurking there. It is only the second time that scientists have returned material from an asteroid.

The samples from Ryugu could give researchers important insights into the early evolution of planets, and help to explain the origins of water on Earth.

"The samples containing precious asteroid material will provide scientists with key information about the formation of the Solar System," says Ed Kruzins, director of the Canberra Deep Space Communication Complex at the Commonwealth Scientific and Industrial Research Organisation, which helped to track the spacecraft and its encounter with Ryugu.

The Capsule's Journey

In the early hours of 6 December, a brilliant fireball streaked through the southern skies and landed in the desert in South Australia, setting off a race to locate the capsule that scientists hoped contained material from Ryugu.

"Images that Hayabusa2 took during its landing operations made us confident that the spacecraft collected Ryugu samples," wrote Satoru Nakazawa, deputy manager of the mission, in an e-mail while in Woomera, Australia. But the team couldn't know for sure until they disassembled the capsule and saw the dark dust.

Some 57 hours after the capsule was located, the team delivered it back to Japan. The swift shipment "means that the samples we got from Ryugu are very pure without contamination from the Earth's atmosphere and we confirmed that there was no leakage", says Tsuda.

Plans for the Samples

Once the capsule is fully unsealed, possibly later today, JAXA scientists will measure the material's mass and study its composition and structure. They hope to have collected at least 0.1 grams of material, says Yoshikawa Makoto, mission manager for Hayabusa2 at JAXA.

Some 10% of the material will be sent to NASA in December 2021 in exchange for samples from asteroid Bennu, which spacecraft OSIRIS-REx collected in October and should arrive on Earth by late 2023. Another 15% will be made available to international researchers, and about 40% will be stored for future scientists to investigate.

Hayabusa2 collected the samples over a year and a half of poking and prodding Ryugu — a small asteroid shaped like a squashed sphere, peppered with giant boulders3. Ryugu is a C-type, or carbon-rich, asteroid, which scientists think contains organic and hydrated minerals preserved from as far back as 4.6 billion years ago4. The samples could help to explain how Earth became covered with water. Scientists think it came on asteroids or similar planetary bodies from the outer regions of the Solar System.

Tsuda is interested in finding out whether the samples contain more complex organic material, similar to those found on Earth. "If we find very complicated organics on Ryugu, that is a very big finding."

Hayabusa2 has now begun its 11-year journey to its next destination: a fast-rotating asteroid known as 1998 KY26. To reach it, the spacecraft will fly by another asteroid — 2001 CC21 — and swing past Earth another two times.

ASTRO NEWS

BBC News Website 24th Oct – Osiris-Rex: NASA Probe Risks Losing Asteroids Sample After Door Jams

A NASA probe sent to collect rock from an asteroid several hundred million kilometres from Earth has grabbed so much that samples are spilling out.

Officials behind the Osiris-Rex probe, which landed on Bennu earlier this week, say the collection operation may have performed too well.

Pictures beamed back to Earth show a rock has wedged open the door of a container and a fraction of the sample is leaking, Nasa says.

Nasa is now trying to stow it safely.

"A substantial fraction of the required collected mass is seen escaping," head of mission Dante Lauretta said.

The craft is believed to have collected some 400g (14oz) of fragments, he said.

The probe could not have done better, he added. "My big concern now is that the particles are escaping because we were almost a victim of our own success here."

"Time is of the essence," Thomas Zurbuchen, Nasa's associate administrator for science, told reporters as the space agency focuses on making sure no more is lost.

The collection container will now be stowed within the spacecraft, which means it will not be possible to measure exactly how much sample has been taken.

"Although we may have to move more quickly to stow the sample, it's not a bad problem to have," Mr Zurbuchen said. "We are so excited to see what appears to be an abundant sample that will inspire science for decades beyond this historic moment."

Osiris-Rex touched down on Tuesday on 500m-wide Bennu, some 320 million kilometres (200 million miles) from Earth.

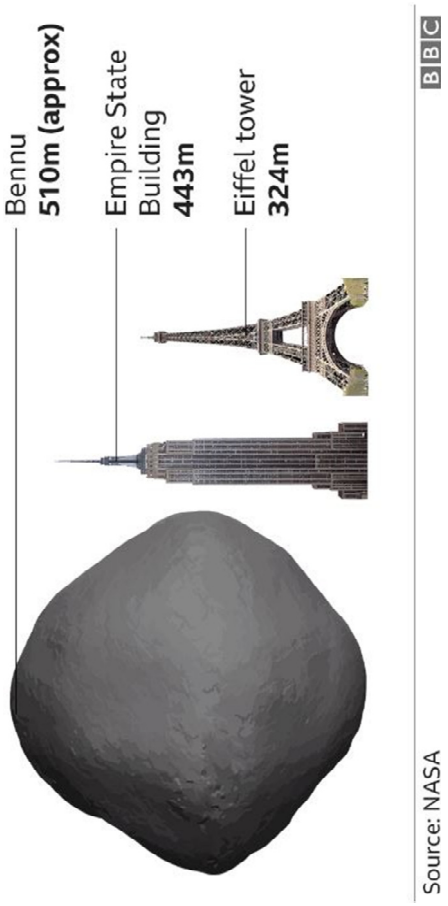
It kicked up debris and dust when it took the samples from the asteroid's surface. "We really did kind of make a mess," Mr Dante said on Tuesday.

Scientists hope the mission will throw light on how the Solar System began 4.5 billion years ago, once the samples are examined when the spacecraft returns home in 2023. Asteroids contain debris from the formation of the Solar System.

The spacecraft launched in 2016 and begins its journey back to Earth next March.

View this video at

https://www.bbc.co.uk/news/science-environment-54672691



The Misadventures of a Very Amateur Astronomer

Hello again everyone, it's been a while. This has been a strange and challenging year to say the least.

I finally got my own observatory built, or rather I finally got my son to complete it as I now have a problem with my back. Just a case of setting the telescope up and observing, right? After spending a couple of days setting up, balancing it etc I was good to go! Bought my new camera, so let's have a go at Mars.

Mars is supposed to be YELLOW isn't it?

I know, I'll turn to an old favourite, Orion. Took a few long exposures and found I was getting a discernible amount of drift and star trailing. Ok says I, next time out I'll drift align the telescope, shouldn't take long, should it? I wasted a good two clear evenings before I realized I had changed the camera which had altered the balance significantly! Now, of course I have to set it all up again!

How about the year's main event? Or as the press would have it…The Christmas Star! Despite the fact that it was a conjunction of two planets.

Yours truly was invited to give an interview at the observatory by the BBC, since almost everyone else was still at work, (and I am off with my back) Don, my son Sean, (who was there to support me) and myself attended. Of course we saw absolutely nothing, it was misty and drizzling. We were there for about an hour and all I did was give the interview, (autographs available on request) and naturally, at the time of writing I am awaiting an invitation from HR to explain why I was on TV and not at work!

I know it wouldn't have been quite the same but had the BBC been able to do the piece on Saturday or Sunday they would have had clear skies.

Speaking of the previous nights, I went out to the observatory on both occasions, hoping to get some pickies. On the Saturday I tried from inside the dome and found there was a rather big tree just where I wanted to look, so I set up a telescope outside just in time to miss it! On the Sunday I thought I would forego the observatory and although I managed to see Saturn and Jupiter, I couldn't see anything on my laptop when I hooked up my camera! Heh Ho! Only another 400 or so years to wait for the next one.

Anyway, that just about sums my year up, so let's hope 2021 brings better fortune for us all.

Clear Skies everyone and best wishes.

Brian.

D.D.A.S.
Marketplace

Skywatcher 130

Newtonian

Reflecting Telescope

£30 - ONO

(Optical Tube Assembly only)

(No tripod or mount)

For more details contact:

secretary@derbyastronomy.org

Comes with:

- Rings
- Eye pieces
  - ◊ 10mm
  - ◊ 25mm
  - ◊ 2 x Barlow

Derby & District Astronomical Society

General Rules and Safety Regulations for the use of the Flamsteed Observatory.

ALL VISITORS MUST:-

Sign the visitor's book upon arrival.

One person to be designated as 'in charge' of the observing session and responsible for the operation of the telescope.

Not enter any areas deemed off limits as designated by 'No Unauthorised Access' signs unless permission is granted.

Be aware of and take notice of all warning signs

Use the handrails when ascending or descending the stairs to and from the upper level.

Ensure the barrier is down at all times whilst inside the dome.

Not lean over any barriers or attempt to exit the dome through the observation opening.

Take every care to look after the telescope and equipment.

Leave the observatory in a clean and tidy condition.

The designated 'Leader' to make sure the dome is closed and secure, all lights and power is off, and the observatory locked and secure before leaving.

Not forget to sign out.

Derby and District Astronomical Society

COVID – 19

Rules and Safety Regulations for the use of the Society's Flamsteed Observatory

ALL VISITORS MUST:-

Enter their Name and contact Telephone Number in the visitor's book.
(In accordance with the Gov't Track and Trace Policy)

Wear a face mask, (unless medically exempt).

Only 3 adults, (including the telescope operator) plus 2 children under t he age of 14 will be allowed inside the observatory at any one time.

Maintain at least 1 metre gap between each person.

Not venture into areas deemed off limits.

Adhere to all other Rules set out by the society for the general use of t his observatory.

THE SOCIETY WILL:-

Provide sanitising and cleaning materials for use at all times

With large groups provide other telescopes for use

Sanitise all equipment and surfaces before and after use.

Make the use of the observatory as safe as possible and try to ensure the safety of their visitors at all times.

The operators of the observatory are all volunteers and these rules and regulations have been put in place to protect us all, please adhere to them.

Thank you.

BOOK

REVIEW

‘ How I killed Pluto (and why it had it coming)’

by Mike Brown

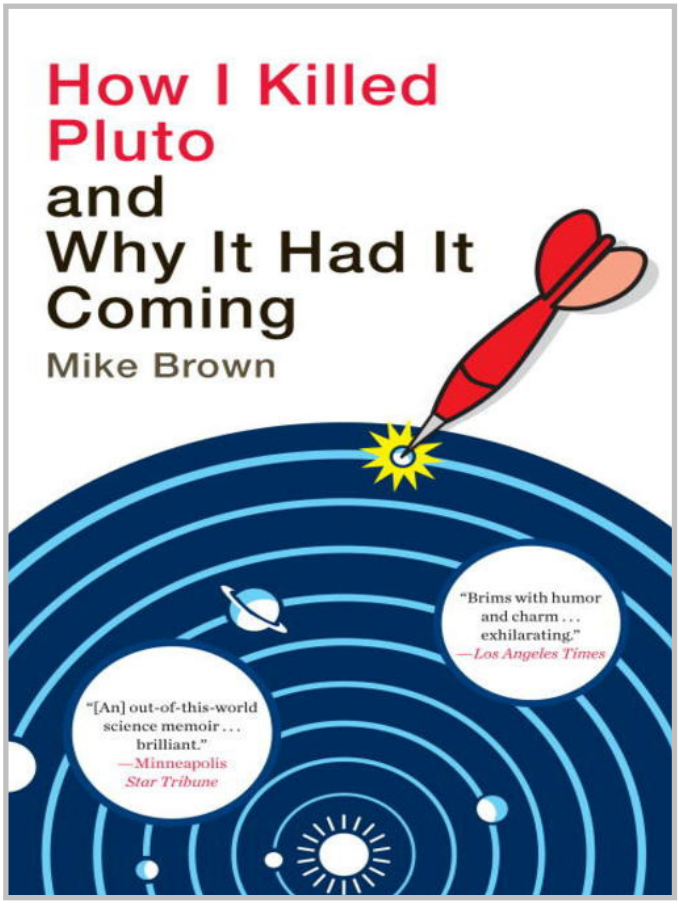
Reviewed by Malcolm Neal

This is not a particularly new book, being first published in 2012, but it is a very interesting read. The book is quite a small paperback of 260 pages and cost about £11 from Amazon.

Like many, I was somewhat bemused when Pluto was relegated to being a dwarf planet and at the time thought it was an unjustified move by the IAU. Since reading this book, I now think it an entirely correct decision.

After the prologue, which is essentially a brief explanation why Pluto had to be relegated, the book first discusses what a planet is. Without a good definition how can you include or exclude a body from the list. At first it appeared that there was no clear definition of what features a body should have to make it a planet. The book then goes on through the history of planetary discovery, which mentions the finding of the outer planets beyond Saturn and then the finding of the minor planets such as Ceres etc. It then moves on to explain why the Moon is the enemy of astronomers who are looking for planets beyond the orbit of Pluto, along with some none astronomy personal information which simply rounds out the book.

Brown includes the work done by other astronomers who were also looking for the 10th planet but, as of yet, still not finding the "*big one*"; instead they were discovering an ever increasing number of smaller bodies. The book does give a lot of detail about how such minor bodies are discovered in conjunction with observations to initially detect the minor / dwarf planet and then by using old photographic plates of previous sky surveys, to work out the proper orbit. This is, to me, one of the most interesting parts of the book. Finding bodies out in the Oort Cloud involved him and others writing computer programs that could search sky survey glass negatives to speed up the process; in the process finding the program was finding many spurious objects up to 30,000 on a single plate. It then goes on to show how he altered the program to cut that down to manageable proportions - again another interest of mine as a retired lecturer in Computing. One of the finds, was spotted at 100 AU distance and when the orbit was worked out this was found to be its closest approach! Many of the objects found were Kuiper belt objects. Yet another interesting feature of the book was the detail it went into in the naming of the newly discovered minor bodies and their moons - as some of them were found to have moons.



There is also quite a detailed account of some academic skul-duggery when some Spanish Astronomers beat the Brown group to announcing the discovery of "Santa" as Brown was calling it. However someone else smelt a rat and by analysing various web sites and email trails it was found that the Spanish group had used the Brown data to "find" the body independently and give it a name. Before he knew of the underhand data mining Brown was congratulating the Spanish group. However eventually the IAU decided that it could not give the discovery specifically to either group but awarded the naming to the Brown group which is tantamount to saying it was their discovery.

The book ends with the defining of what a planet is, by the IAU and also some other conference decisions which ultimately decided that Pluto became a dwarf planet.

A thoroughly interesting book that is well worth a read on many levels.

Malcolm.

DDAS Library

Members may borrow books for free from our growing library. Loans last for one month or more, depending on whether other members may wish to borrow a loaned item. The library is available at our main monthly meetings for browsing, borrowing and returns. A number of these volumes were kindly donated by the estate of the late Keith Plamping, DDAS member. The library contains nearly 70 volumes and the books cover a wide range of astronomy related subjects. For more information please ask for Libby Ray at one of our meetings.

1 **The Road to the Stars** ….. Iain Nicholson (1978)
2 **The Intelligent Universe**: **A New View of Creation and Evolution** ….. Fred Hoyle (1983)
3 **Amateur Astronomy: A Comprehensive & Practical Survey** ….. Colin Ronan (Consultant Editor) (1989)
4 **Earth: A New Perspective** ….. Nicolas Cheetham (2006)
5 **Universe: A Journey from Earth to the Edge of the Cosmos** ….. Nicolas Cheetham (2005)
6 **The Pictorial Atlas of the Universe** ….. Kevin Krisciunas and Bill Yenne (1989)
7 **Moon Flight** ….. Patrick Moore (1970)
8 **The Great Atlas of the Stars** ….. Serge Brunier (2001)
9 **The Cambridge Encyclopedia of Space** ….. Michael Rycroft - Editor (1990)
10 **Brother Astronomer: Adventures of a Vatican Scientist** ….. Brother Consolmagno (2000)
11 **Space is a Funny Place: Fifty Years (and more) of Space Exploration** ….. Colin Pillinger (2007)
12 **Astronomy Before the Telescope** ….. Christopher Walker (Editor) (1996)
13 **Full Moon** ….. Michael Light (1999)
14 **The Guinness Book of Astronomy** ….. Patrick Moore (1983)
15 **Observing the Moon** ….. John S. Folkes (2003)
16 **The Greenwich Guide to Stars, Galaxies and Nebulae** ….. Stuart Malin (1989)
17 **The Greenwich Guide to Astronomy in Action** ….. Carol Stott (1989)
18 **The Story of the Earth** (Geological Museum) (1977, third edition)
19 **A Guide to the Old Royal Observatory** (National Maritime Museum)
20 **Official Guide to the National and Space Museum** (1993)
21 **Rockets, Missiles and Spacecraft of the National Air and Space Museum** (1983)
22 **NASA Kennedy Space Center's Spaceport USA** (English Tourbook) (1992)
23 **Astronomical Observatory of Jaipur** (Tourbook)
24 **Atlas of Uranus** ….. Garry Hunt and Patrick Moore (1988)
25 **Guinness Spaceflight: The Records** ….. Tim Furness (1985)
26 **Space Shuttle: The History of Developing the National Space Transportation System** ….. Dennis R. Jenkins
27 **Philip's Atlas of the Universe** ….. Patrick Moore (1999)
28 **The Story of Astronomy: A New Edition** ….. Patrick Moore (1977)
29 **The Planets: Portraits of New Worlds** ….. Nigel Henbest (1992)
30 **Cambridge Star Atlas 2000.0** (Cambridge University Press) (1991)
31 **Observing the Constellations: The Mitchell Beazley Guide to the Stars** ….. John Sanford (1989)
32 **Patrick Moore's Astronomy Quiz Book** ….. Patrick Moore (1987)
33 **Early Astronomy from Babylonia to Copernicus** ….. W. M. O'Neil (1986)
34 **Practical Amateur Astronomy** (Revised Edition) ….. Patrick Moore - Editor (1971)
35 **Astronomer by Chance** ….. Bernard Lovell (1990)
36 **Star Seekers** ….. Colin Wilson (1980)
37 **Astronomy** ….. John E. Thompson (1979)
38 **The Cosmic Gallery: The Most Beautiful Images of the Universe** ….. Giles Sparrow
39 **The New Astronomy Guide: Stargazing in the Digital Age** ….. Patrick Moore & Pete Lawrence
40 **My Brief History: A Memoir** ….. Stephen Hawking (2013)
41 **A Brief History of Time: From the Big Bang to Black Holes** ….. Stephen Hawking (1988)
42 **A Briefer History of Time** ….. Stephen Hawking with Leonard Mlodinow (2008)
43 **Philip's Moon Observers Guide** ….. Peter Greco (2003)
44 **A Man on the Moon: The Voyages of the Apollo Astronauts** ….. Andrew Chaikin (1995)
45 **Heaven & Earth: Unseen by the Naked Eye** ….. Introduction by David Malin (2002)
46 **Failure is not an Option: Mission Control from Mercury to Apollo 13 and Beyond** ….. Gene Kranz (2000)
47 **Cosmos** ….. Carl Sagan (1980)
48 **Gravity's Lens: Views of the New Cosmology** ….. Nathan Cohen (1988)
49 **The Illustrated Encyclopedia of Astronomy and Space**: Revised edition ….. Ian Ridpath – Editor (1979)
50 **Spacecam: Photographing the Final Frontier – from Apollo to Hubble** ….. Terry Hope (2005)
51 **The Cambridge Enclyopaedia of Astronomy** ….. Simon Mitton – Editor (1977)
52 **The Flammarion Book of Astronomy** ….. Translated from the French Original published 1880 Readers Union
53 **Stars & Telescopes for the Beginner** ….. Roy Worvill (1979)
54 **The Return of Halley's Comet** ….. Patrick Moore & John Mason (1984)
55 **The Backyard Astronomer's Guide** ….. (Dickinson and Dyer)
56 **Turn Left at Orion** ….. (Consolmagno and Davis)
57 **Phillips Stargazing with a Telescope** ….. (Scagell)
58 **Phillips Stargazing with Binoculars** ….. (Scagell and Frydman)
59 **The Rebirth of the Russian Space Program** ….. (Harvey)
60 **The Amateur Astronomer 12th Edition** ….. (Patrick Moore)
61 **2014 Yearbook of Astronomy** ….. (Patrick Moore and John Mason)
62 **Lunar and Planetary Webcam Users Guide** ….. (Martin Mobberley)
63 **A Walk Through The Heavens 3rd Edition** ….. (Heifetz and Tirion)
64 **Complete Guide to Astrophotography** (Sky at Night Magazine)
65 **Astronomy Photographer of the Year 2013** Royal Observatory Greenwich (2013)
66 **The Magellan Venus Explorer's Guide** ….. Carolynn Young, Ed (1990)
67 **Visions of Heaven (revealed by the Hubble Space Telescope)** ….. Tom Wilkie & Mark Rosselli (1998)
68 **The Illustrated Atlas of the Universe** ….. Mark A Garlick (2006)

Meeting Schedule 2021

The following events are subject to change at short notice, please keep updated with the full list on the website
http://derbyastronomy.org/Meetings2021.htm

Date	Title	Speaker	Venue
January 8th - 7:30 PM	Society Quiz	Quizmaster: Dave Selfe	Zoom
January 16th - 7:30 PM	OBSERVING SESSION	**Dependent on COVID Tier Restrictrions** Please email the Secretary to book.	The Flamsteed Observatory
January 22nd - 7:30 PM	INTRODUCTION TO ASTRONOMY	Messier Targets, Cameras & Stellarium	Zoom
February 5th - 7:30 PM	**Observing Nebulae**	Martin Griffiths University of South Wales	Zoom Please email the chair or secretary for further details
February 13th - 7:30 PM	OBSERVING SESSION	**Dependent on COVID Tier Restrictrions** Please email the Secretary to book.	The Flamsteed Observatory
February 19th - 7:30 PM	INTRODUCTION TO ASTRONOMY	Astro Photography - post processing of images	Zoom
March 5th - 7:30 PM	**Gravitational Waves**	Dr Chris North School of Physics and Astronomy The University of Cardiff	Zoom Please email the chair or secretary for further details
March 13th - 7:30 PM	OBSERVING SESSION	**Dependent on COVID Tier Restrictrions** Please email the Secretary to book.	The Flamsteed Observatory
March 19th 7:30 PM	INTRODUCTION TO ASTRONOMY	James Webb Telescope	Zoom
April 9th - 7:30 PM	**Dark Matter and Dark Energy**	Dr Peter Edwards Department of Physics Durham University	Zoom Please email the chair or secretary for further details
April 17th - 8.30 PM	OBSERVING SESSION	**Dependent on COVID Tier Restrictrions** Please email the Secretary to book.	The Flamsteed Observatory
April 23rd - 7:30 PM	INTRODUCTION TO ASTRONOMY	TBA	Zoom
May 7th - 7:30 PM	ANNUAL GENERAL MEETING		Zoom
May 15th - 9:30 PM	OBSERVING SESSION	**Dependent on COVID Tier Restrictrions** Please email the Secretary to book.	The Flamsteed Observatory
May 21st - 7:30 PM	INTRODUCTION TO ASTRONOMY	TBA	Zoom
June 4th - 7:30 PM	**Footprints of the Big Bang**	Dr Susan Cartwright Department of Physics and Astronomy The University of Sheffield	Zoom Please email the chair or secretary for further details
June 12th - 9:30 PM	OBSERVING SESSION	**Dependent on COVID Tier Restrictrions** Please email the Secretary to book.	The Flamsteed Observatory
June 18th - 7:30 PM	INTRODUCTION TO ASTRONOMY	TBA	Zoom

Come and Join Us

We extend a warm welcome to anyone who would like to come along to our meetings and suggest that people come along to a few of them before deciding if they would like to join.

Benefits of being a member include anytime use of our observatory and site, a telescope hire scheme, borrowing books from our library, a discounted room collection, invitation on Society trips, and the right to vote on Society matters at our AGM.

If you would like to become a member please contact our Treasurer Simon Behnke, who is usually available at our main meetings.

Membership is £27 per year (concessions £18)