

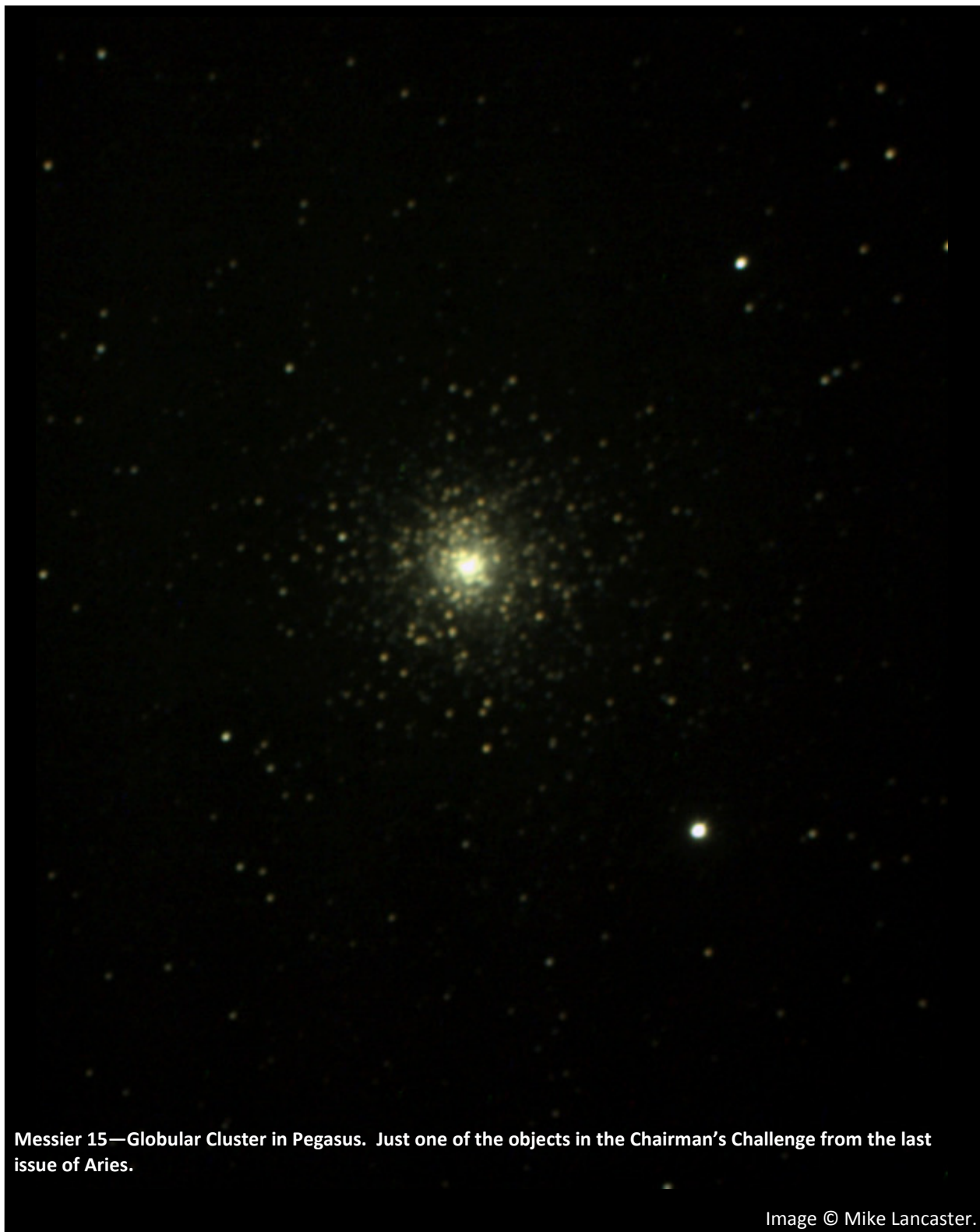
Autumn/Winter



Aries

derbyastronomy.org

Derby & District Astronomical Society



Messier 15—Globular Cluster in Pegasus. Just one of the objects in the Chairman's Challenge from the last issue of Aries.

Image © Mike Lancaster.

Member Gallery— Mike Lancaster



Globular Cluster in Serpens
Messier 5 (NGC 5904)

22nd July 2021.

4 x 2 minute and 1 x 3 minute exposures taken with a Mallincam Universe camera attached to a 10-inch Meade ACF SCT on an EQ-8 mount. A 0.5x Mallincam focal reducer was also used. The camera was set to a gain of 16dB, a gamma of -20, a contrast of 0, noise reduction on, and full resolution. No guiding, flats or dark frames were used. Stacking and processing was done in Nebulosity 3.3 and Photoshop Elements 2020.

© Mike Lancaster

The Dumbell Nebula
Messier 27 (NGC 6853)

8th August 2021.

2 x 4 minute and 8 x 5 minute exposures taken with a Mallincam Universe camera at 16 dB gain through a 10" Meade ACF SCT on an EQ8 mount using a 0.5x Mallincam focal reducer. Processing was done in Nebulosity 4 and Photoshop Elements 2020. No guiding, darks or flats were used.



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The Ring Nebula
Messier 57 (NGC 6720)

21 July 2021.

3 x 5 minute exposures taken with a Mallincam Universe camera attached to a 10-inch Meade ACF SCT on an EQ-8 mount. A 0.5x Mallincam focal reducer was also used. The camera was set to a gain of 16dB, a gamma of -20, a contrast of 0, and noise reduction on. No guiding, flats or dark frames were used. Stacking and processing was done in Nebulosity 3.



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The Crescent Nebula
Caldwell 27 (NGC 6888)

27th September 2021.

1 x 10 minute and 5 x 15 minute exposures taken with a Mallincam Universe camera using 2x2 binning, a gain of 16dB, a 0.5x Mallincam focal reducer and an Astronomik CLS CCD filter through a 10" Meade LX200 ACF SCT on an EQ8 mount. The image was guided using a Lodestar camera through a piggybacked 80mm APO. Stacking and some processing was performed in Nebulosity v4 and Photoshop Elements 2020.



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FEEDBACK REQUIRED

A Request from the Assistant Editor

Hiya Folks

When I joined the editing team the plan was to release an issue of Aries, once a quarter and so far we have nearly managed it. Unfortunately due to unforeseen circumstances I can no longer commit to putting the newsletter together at this regularity. So I need to put a few questions to you that will determine how we progress. (On a cheeky note, it will also show me how many of you actually read this) .

I would like you to email your answers direct to me at gillpryor@derbyastronomy.org

Please answer honestly:

1. Are you enjoying your new look Aries?
2. How could we improve it?
3. Is there anything else you would like to see in it?
4. Given the reason for this mini poll, would you be happy with just 3 or even 2 issues per year?

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 Officer



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

Welcome to this Edition of Aries. Summer has now past and autumn is upon us, the clocks have gone back and it is that time of year when the darker nights return and we dust off of telescopes in preparation for Winter/Spring observing session. Yes, I know you can observe all year round, but in high summer, you do not have enough dark sky to play with. But this is the time of year when we all start thinking about our own winter observing programmes.

It is the time of year to welcome old friends back to the night Sky, I am always pleased to see Orion rising in the sky, as it is my favourite constellation and also it heralds the coming of Winter (my favourite time of year as well).

So what has been going on since the last edition of Aries, well, society-wise, not much really, as you would expect from the usual summer hiatus, there was not much happening during July and August, apart from the Society BBQ.

Society event-wise, we returned to the Brookfield Social Club on 16th October to set up an indoor display and some telescopes in the club's grounds, just in case the skies were kind to us and we could show the people in attendance a few objects, such as the Moon, Jupiter and so on.

The theme for this year's event was "Eyes on the Universe", so the display was very much focussed on telescopes, both ground and space-based telescopes that cover, collectively, the entire electromagnetic spectrum and also the various space probes and rovers dotted around the solar system these days. The theme was chosen to mark the up-coming launch of the successor to the Hubble Space Telescope (HST), the James Webb Space Telescope (JWST). The JWST is due to be launched on an Ariane 5 launch vehicle from Kourou, French Guiana on 18th December 2021. We have waited a long time to see this instrument begin its operational life.

As for the DDAS display and Brookfields, we had, if memory serves, three telescopes stationed outside, including the JK-40, which is a Dobsonian Telescope built around a 10-inch (I think) primary mirror, donated to the Society by Mrs Jane Kirk our Founder Member during the event to mark the Society's 40th Anniversary in 2014 and built by our Site Curator, Mike Dumelow. My 8-inch Skywatcher Newtonian GOTO telescope was stationed inside as a display telescope.

The indoor display consisted of a number of electronic devices provided by our Outreach Officer, Donald Anderson, which included a fully articulated robot that could be commanded via a small hand controller. More on these pieces of kit in a later edition of Aries, as there is an article concerning this event being prepared by your Editor. Hopefully that will appear in the next edition of Aries.

What else? Well, the Hubble Space Telescope has gone into safe mode again recently and engineers are trying to figure out why it has gone back into this mode of operation. Could this be a sign that Hubble is finally on its 'last legs', I hope not. It is hoped that Hubble operations will overlap with the James Webb Space Telescope once it is launched and operational, but can Hubble hang on that long? These episodes of Hubble going into safe mode concerns me greatly.

Talking about the JWST, I came across a story concerning the JWST that got me rather angry, a number of astronomers (around 1,200, wow, what a large protest group!) signed a letter to NASA to get them to change the name of the James Webb Space Telescope! Why? At this late stage? Why? Well it seems that this group has got a bee in their collective bonnet concerning the man himself, James Webb. It would seem that this group find Mr Webb a bit problematic, the accusation is, that during his time in Washington DC and during his time as the second NASA administrator, he supposedly had 'some' involvement with LGBT people losing their government jobs during a period that became known as the 'Lavender Scare'.

I was furious when I read this, absolute poppycock! There is no evidence at all that James Webb; personally got anyone fired from their position due to their life choices, furthermore, without Webb's leadership in the aftermath of the Apollo 1 Fire that killed Astronauts Virgil I. 'Gus' Grissom, Edward H. White and Roger B. Chaffee, there would not have been Apollo programme, no Apollo 8 and certainly no Apollo 11 and no NASA! Without this man's efforts, there would not have been a NASA around to originate, design and build the Space Telescope that bears his name! After the Apollo 1 Fire, NASA's very existence was in doubt, as Senators like Walter Mondale smelt 'blood in the water' and saw it as their chance to get the Apollo Programme scrapped, and as getting to the Moon was NASA's focus at the time, that would kill NASA too.

The JWST was originally known as the Next Generation Space Telescope (NGST), but it was renamed the James Webb Space Telescope by the then NASA Administrator, Sean O'Keefe, who, like Webb had to deal with the loss of a flight crew during his tenure, in O'Keefe's case, that was STS-107/Columbia in January/February 2003. O'Keefe announced the new Telescope's name in 2002. I find the current climate where people can defame others for their purposes, just because they feel offended, especially when the person they are defaming are long since dead, absolutely disgusting! They should be ashamed of themselves.

If all goes well on 18th December and the James Webb Space Telescope is launched, expect an article on the instrument itself and its mission.

Also, this summer saw a new spacecraft launched on a mission to examine the 'fossils' of the solar system. The LUCY spacecraft was launched on 16th October 2021 on a twelve year mission to visit eight different asteroids (seven of them belonging to the Trojan Asteroids that orbit 60 degrees ahead and 60 degrees behind Jupiter). The LUCY spacecraft got its name from the LUCY hominid fossil (*Australopithecus afarensis*) which was discovered in 1974 in Ethiopia and has been dated to 3.2 million years old.

So, you can see why the LUCY spacecraft got its name, as it will be investigating the 'fossils' of the solar system and these fossils are far older, on the order of 4.5 to 4.6 billion years old. All of the asteroid encounters will be flybys; Lucy's mission is to reveal the "fossils of planet formation": materials that clumped together in the early history of the Solar System to form planets and other bodies.

So what is in this Edition of Aries then?

The Front Cover features an Image of M15 taken by our very own Webmaster, Dr Michael Lancaster. The usual Member's Gallery page and the regular Society details and notices, the last instalment of the 'Meet the Committee' series appears in this issue of Aries and this time it is the turn of the Public Relations Officer and Aries Editor, Anthony Southwell and Assistant Editor and Ordinary Committee Member, Gill Pryor and Ordinary Committee Member, Richard Pryor. The results of the Summer 'Chairman's Challenge' appear in this issue as well as an article about the partial solar eclipse on 10th June that saw Peter Branson, Donald Anderson, Brian Dodson, Peter Hill go to Grampian Primary School, south of Derby City Centre to show the pupils the Partial Eclipse.

Then we have an article by Peter Hill, titled 'Plotting the Equation of Time' in which he plots the position of the Sun in the sky over the course of a year.

We have our usual Astro News Desk, which features 4 news stories that have caught the attention of the Editor. We have a book review provide by Malcolm Neal and the subject of this review is a book titled "What We Cannot Know: From Consciousness to the Cosmos, the cutting edge of science explained" by Marcus du Satoy. The book takes the reader on a journey through the frontiers of our understanding of science and the universe.

There is also the DDAS library list, a rolling calendar of DDAS Meetings and events to round out this issue of Aries.

So get a cup of something hot and settle down and explore the pages of this issue of Aries

Anthony Southwell



Want to sell your unwanted astronomy equipment?

Want to find a bargain?

Remember D.D.A.S. Marketplace

For details of telescopes and other paraphernalia that the society has for sale,
just contact Brian (Secretary) at

secretary@derbyastronomy.org

Meet Your Committee -

Aries Editor & Public Relations Officer - Anthony Southwell

Well, where to start? Hmmmm? Well, I think it all started in July 1969, that's when my journey through the Cosmos really began. When I made my entrance on to this ball of rock in May 1967, the "Space Age" was heading towards its tenth year. So you could say that I timed my entrance pretty well, because I have had the privilege to have lived through the first phase of Mankind's exploration of his own Cosmic backyard, the Solar System.

My own personal journey began one day in 1969. I was two years old in 1969 and in July of that year an event took place that will forever be etched into the annals of History, for on 20th July 1969, Mankind landed on the Moon.

My Mother used to put the TV on whilst she was busy with other things and during the period 16th to 24th July, the mission of Apollo 11 was big news, so that was on the TV quite often and I, as a two year old, watched it, obviously. I didn't understand what I was seeing, but to me, they were interesting images to watch and to my Mother, had an electronic 'baby-sitter' whilst she was off finishing a chore around the house. My Mother would come to regret that strategy over the coming days.

Fast forward to late on the 20th July 1969 and the landing of Apollo 11, everyone was around the TV, and I was on the floor watching the screen intently. Apollo 11 with Neil Armstrong and Buzz Aldrin aboard made a safe landing on the Moon. It was decided that Armstrong and Aldrin would go out for their Extravehicular Activity (EVA) 'Moonwalk' earlier than planned.

The Moonwalk was carried live, live pictures from the Moon, ok, by today's standard's the picture quality left a lot to be desired, but this was cutting edge in 1969. It was 3:56 am (BST) on July 21st 1969 and there was this two-year old boy sitting in front of the TV watching these fuzzy black and white images showing two white balloon-like figures bouncing around on this grey plain under a blacker than black sky, the boy was mesmerised. It was at this point that my Mother realised her mistake, she was absolutely shattered and sleep was calling, so she assumed that I would need to make the journey to the Land of Nod myself, so she went to pick me up and as soon as she got hold of me and began to move me, I would scream and clutch for the TV, I would not be taken away from those images. My Mother, desperate for sleep, tried again, hoping against hope that her 'darling child' would just go to bed! Unfortunately, her valiant efforts were in vain, I would not leave that TV!

In later years when I asked my Mother about this 'event' in family history, she would say that I was so determined not to leave that TV and I was watching the screen with wide eyes and an absolutely rapt expression on my face. After a few more attempts to move me my Mother gave up and left me with the Moon and she watched me as I watched Armstrong and Aldrin on the Moon. My Mother would say that it was like watching a switch being thrown, something clicked within me, because from that day, I became obsessed with Space and Astronomy. So you can see how a single event can shape a person's life.

If it was not for Apollo 11, I would not only have my lifelong interest in Space and Astronomy, but Science in general.

It has been a wild ride and I have loved every second of it. I was a bookworm as well, I had a Library card at the age of five and

what kind of books did I get out the Library? Space-related books of course, what else? But I did not only get the kids books on space, but I took out the popular reference books on the subject too. It was about the age

of five that my love for Astronomy really began, when, through my reading that I learnt about the Planets, what the Stars you see at night actually were. The Universe came and tapped me on the shoulder and said "Hello little one. Come with me, you have such an adventure waiting for you!" What five year old boy could resist such a call! The Moon called to me first, but when the Universe came knocking, well that was it!

My interest in Space and Astronomy lead on to my love of Science, in Christmas 1977, at the age of ten, I was given an Encyclopaedia of Science and my Universe expanded yet again (pardon the pun – Editor). My interest and Understanding of Science was enhanced, I was reading about Physics, Biology, Chemistry and I had my first encounter with nuclear physics. Apart from toys, I received books every Christmas and Birthday, it was from the pages of these later books that I was to come face to face with the Monster that would fascinate and terrify me and continues to do so to this day, the Black Hole. Then in 1981, I was 14 at the time, the BBC showed Carl Sagan's "Cosmos", the science programme of all time, I later bought the paperback companion book, which I still have. The journey I went on with Carl Sagan re-kindled my love-affair with the Universe, it if needed re-kindling (which it didn't).

This 'love affair' with the Universe led me to the University of Derby in 1995 to attend their Access Course to get me to A-Level standard so I could progress to apply for a Bachelor of Science (BSc) degree course, which I started in 1996. I studied 'Applied Environmental Earth Sciences', it was a multi-faceted course that featured applied geology and environmental studies and management. I attained a 2:2 Grade BSc (Hons) degree. Later around, around 2008-9, I decided to go for a Master of Science (MSc) degree in Environmental Management, but I did not attain that as I ran out of money to run and complete my Master's thesis, I gained a Post-Graduate Diploma (PG Dip) instead.

So, back to the DDAS and we find ourselves in early 1987 and I decided, now 20 years old, to see if there were any astronomical societies, local of course, that I could join as I felt that was the next step in my space/astronomical journey. I bought a copy of the "1987 Yearbook of Astronomy" edited by Patrick Moore and at the back of the yearbook is a section that lists all the astronomical societies in the UK and Northern Ireland.

To my delight I found that there was an astronomical society in Derby, an outfit called "The Derby and District Astronomical Society" and the entry for it listed where they met and had the Continued overleaf...



Cont...

name and contact details for the Society Secretary at that time, Mrs Jane Kirk (who is our founder member). So I called Jane and she suggested that I come along to a couple of meetings and see how it went and if I liked what I saw, then I would be more than welcome to join and, the rest, as they say, is history. In my time in the DDAS I have held a number of Committee positions and established one Committee position. I have been Chairman, Vice-Chairman, Secretary (twice) and Editor of Aries (twice). The position I established was that of Public Relations Officer (PRO), of which I have been the sole holder. I am currently the Aries Editor in Chief and the Public Relations Officer.

I have given a number of lectures and presentations to the Society over the years (quite a few of them dealing with Spaceflight). I have also contributed display items for DDAS public events and attend these events also, I have given eight public lectures at the QUAD in Derby on a number of topics, such as Black Holes, the Voyager Missions, Interstellar Travel, the Apollo Lunar Landing Programme and so on. Also I design, build and launch model rockets, in recent times, I have collaborated with our Treasurer on such projects, in fact, we are working on the next two rockets 'Pathfinder 2' and 'Endeavour'. I was hoping to try for a launch this year, but it is looking like that will have to slip to 2022.

Anthony

Meet Your Committee - Ordinary Members & Assistant Editor Richard & Gill Pryor

What seems very many years ago, but is a mere blink of an eye in space time, as a young girl I sat on my swing in the back garden on dark winter evenings, staring at the sky and wishing those really high and really dark clouds would move out of the way, so I could see the stars behind them. Little did I know at the time that I was staring into the Milky Way and these dark clouds were actually dust.

Richard's earliest recollection is attending the Astronomy meetings at Alfreton Hall when he was a child, simply because they talked about UFOs. They talked about other stuff too, but being a kid and an avid fan of Dr Who, UFOs were the more important subject.

Fast forward a few decades and after many nights lay staring at the night sky and not knowing what we were looking at or talking about and not seeing any of those UFOs, our interest in the stars and solar system waned. Yes we watched the occasional 'The Sky at Night' program with interest, but with neither of us having a background in science, I have to confess we couldn't understand half of what Sir Patrick Moore was saying.



With anything astronomy related sitting squarely on the back burner, other hobbies and pastimes crossed our paths. We ventured into Field Archery for a while, with what was then Crusader Bowman (for the archers among you, Richard shot a compound with no sights in the Bowhunter Class. He also shot a re-curve and made a Crossbow out of Cherrywood) I was not an archer, so took care of admin and other stuff (making tea and coffee mainly). We have also had a spell at kite flying (yes you did read correctly). Although, this was in no way a return to our childhood as the kites we flew were display kites with Midlands Kite Flyers and Sky Magic Kite Displays. Some were small and agile like the Indian Fighter Kites at no more than 12" across, but others were large display kites such as the MKF Serpent Delta with a 75' tail or a 30' clown fish. Then there were parachuting teddy bears and kite making workshops. Unfortunately injuries and arthritis caused us to leave this behind.

We also tried golf, but when only 1 ball out of 10 goes went where we wanted it to, we decided to give that a miss.

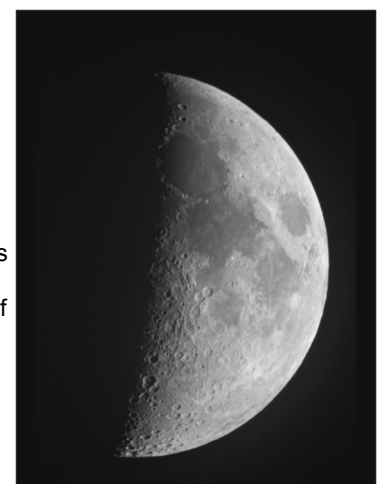
We have hobbies that stayed with us along the way such as fishing for Richard and anything crafty for me (too many to list) then a few years ago, we happened upon a 'decent' telescope which was a bargain. The flame for all things celestial was lit again.

It is/was a 'Skywatcher 127 with Alt-AZ GoTo Mount.' (I can say that now and know what I am talking about, but back just a couple of years it was gobble-de-gook). We knew very little about it, but it was a really good buy. It had been sat in the sellers garage for 2 years unused. It had only ever been put together once and they didn't like it. So I bought it for the price of a second hand coffee machine. Lucky us.

We cobbled it together in the house, as there were no instructions, but we must have done something right, because it worked. Luckily it was a clear evening so we then took it outside and pointed it at the moon. "Wow!" we exclaimed in turn. We were hooked and we wanted more. So the search for an Astronomy group began.

We found D.D.A.S. through an internet search and were tempted by the 'try before you buy' attitude around membership. We were unsure if we would be accepted with our little to no knowledge. We feared that it would be over our heads, but we opted to try one of the meetings anyway. Oh my goodness, how wrong were we. Yes a lot of it was over our heads and yes, the others at the meeting were both professionals and seasoned amateurs, with lots and lots of knowledge, but they were normal. We attended a few meetings, then signed up as fully fledged members. We had heard about the much loved Aries Newsletter but hadn't been fortunate to see any. So I offered my services as Newsletter Editor to assist Anthony...

The rest, as they say, is a very short history...



DDAS – Chairman’s Challenge text/images © Peter Branson

Just before our summer break I issued this year’s Chairman’s Challenge. I’ve always found the Messier Catalogue list a source of inspiration for both observing and taking photographs so once again I turned to this list for ideas about this year’s challenge. After not a lot of thought I decided upon the Messier deep sky*+ objects numbered 10-20. These were all visible during the summer months and whilst some are a little bit more tricky to see - they are quite low down in the south-east – they are worth the effort.

So how did we get on? Well here are the ones I managed to capture –



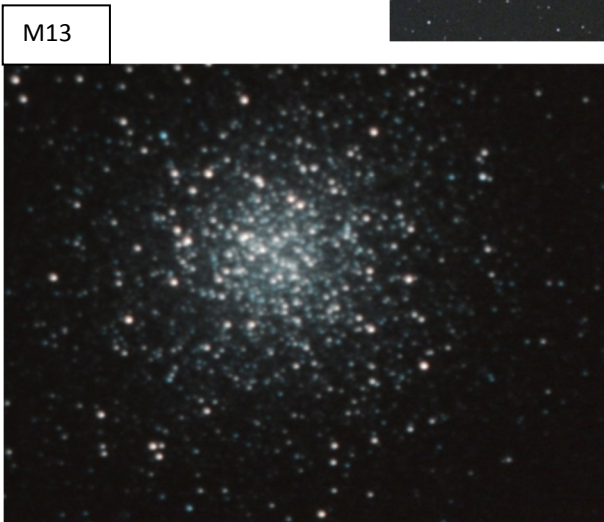
M10



M11



M12



M13



M16

Messier 10, 11 and 12 were all taken with my TS Optics f7 100mm telescope and an Atik 314L+ colour camera and both M13 and 16 were taken with the Celestron 9.25C and a ZWOASI224MC colour camera.

I’m looking forward to the new astronomical year and all those dark nights when I’ll be able to get out and look up – avoiding the cumulus and altostratus clouds - and take a few more photos.

Clear skies

Peter Branson
DDAS Chair

SOCIETY NEWS

Partial Solar Eclipse – June 10th 2021—Grampian School

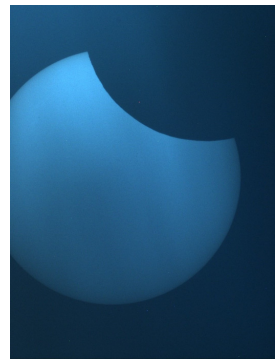
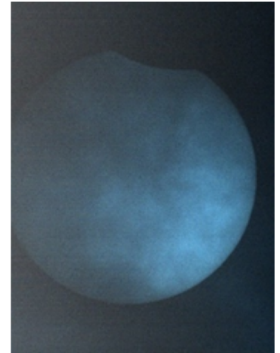
As part of the society's outreach programme Don Anderson has been forging links with a number of primary and secondary schools in Derby. One of the schools we now have very strong links with is Grampian Primary School, just in the south of the city. Several society members have previously been at the school to help with some aspects of the Year 5 and Year 6 science topics and earlier this year we looked at 'The Earth in Space' with Emma Barker and her Year 5 class.

Knowing that a partial eclipse of the Sun was due in June we made arrangements with Emma, for several of us to visit the school, set up some telescopes which would allow the children to observe the partial eclipse from the playground. We also planned to simultaneously live-stream the eclipse via Zoom from a telescope set up in a garden in Mickleover.

'The best laid plans o' mice and men' as Robert Burns said and wasn't it so perverse of the weather that morning. Having had several lovely sunny days beforehand - in rolled the clouds. Nevertheless, Don Anderson, Brian Dodson and Pete Hill set up a variety of telescopes in the playground and during the morning individual pupils, all socially-distanced, caught brief glimpses of the partial eclipse. The children all asked lots of interesting questions which the trio coped with admirably.

We sent the log-in details to all the teachers in the school to drop in at any time - the Zoom streaming worked – and later in the morning three of the classes logged in and had good 'question-and-answer' sessions, even if all that the teachers and children could see was a washed-out image of the sky.

I did manage to get a few photos of the partial eclipse in between the total cloud coverage – just after the start (top) and about half way through (bottom).



Despite the clouds, we all had an excellent morning sharing the delights of astronomy with both staff and pupils. Emma was delighted with all the hard work done by the society to make the morning run smoothly and successfully and is looking forward to our next joint venture.

Don has plans for further links with Grampian Primary and a number of other schools in the city – so if you'd like to get involved have a word with any of us.

Don Anderson, Brian Dodson, Pete Hill and Peter Branson



Plotting the Equation of time vs Declination, Solargraph of an Analemma

At the start of the day the sun rises in the East, dawn, reaches its highest point due S at noon and sinks into the West, sunset, at the end of the day.

Throughout the year the position of sunrise and sunset change and the sun changes its horizontal height above the horizon at noon.. These changes can be monitored and recorded using a simple pinhole camera made from a tin can with a pinhole in some Al foil and containing photographic paper, left pointing due S between the main solstices. (see Sky at Night May 2020) The images are “developed” by scanning the photographic paper with a domestic printer/scanner and processing the acquired image using your preferred image software.

The Suns path from the Summer to Winter solstice of 2020 (**Fig.1**) and Winter to Summer solstice 2020/21 (**Fig.2**) as viewed for my allotment are shown below. **Fig.3** shows the pinhole camera in situ.

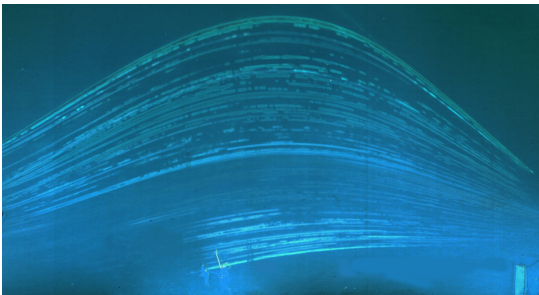


Fig.1



Fig.3

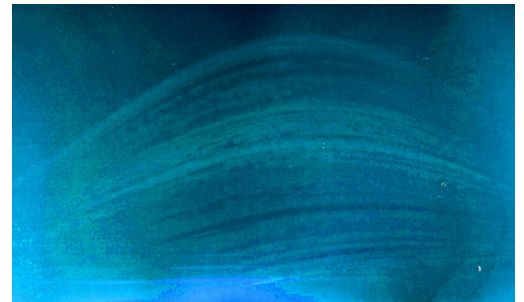


Fig.2

The change in position of sunrise and sunset and the height at noon is linked to the inclination of the earths axis at 23.5° to the vertical. As the earth orbits the sun the Northern hemisphere is tilted towards the sun in our summer and away from it in our winter.

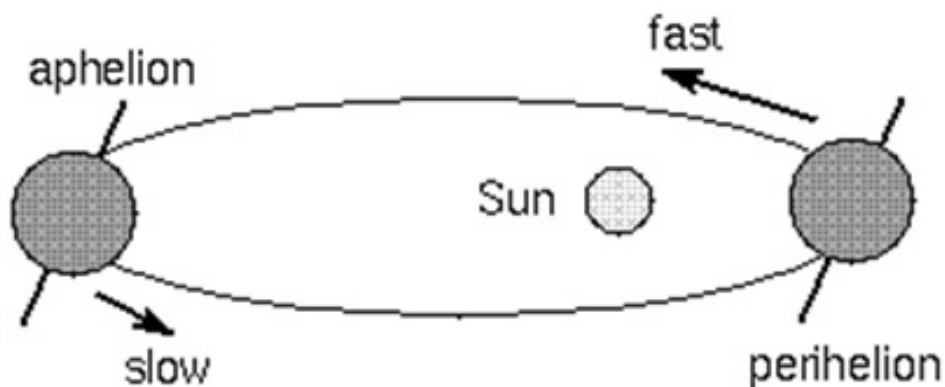


Fig.4 (Teo)

Because we take our timing of 24 hours (Mean **Solar Time**) as one rotation of the earth as measured at the equator, as the Sun's path in the sky follows the ecliptic, its motion has both N-S and East components which vary over the year, their net effect being that the time the sun has taken to return to the same position in the sky (Apparent **Solar time**) appears to be ahead or behind as measured by our clocks. **Fig.5** shows the time difference over the year.

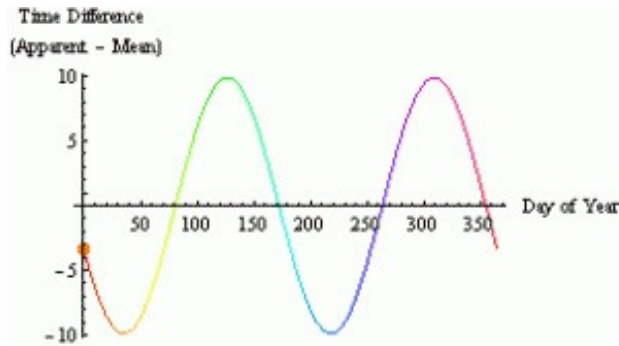


Fig.5 (Siegel)

Fig.6 shows how the Sun's position would appear in the sky at Noon during the year, not reaching its highest point in Jan till nearly 4 mins after 12 by our clocks, but arriving at its highest point 4 mins ahead of clocks in June.

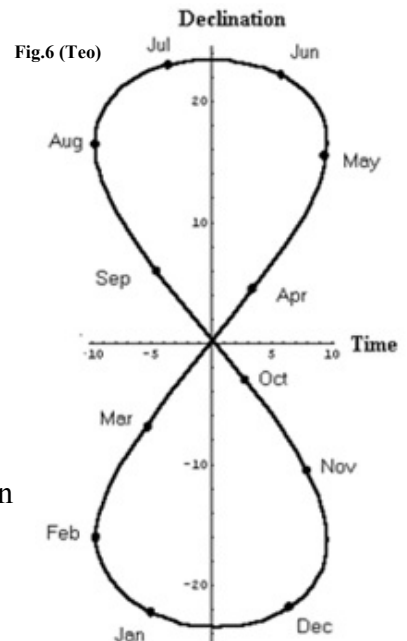


Fig.6 (Teo)

It has been assumed that the earth is in a circular orbit, which of course it isn't, it follows an ellipse reaching perihelion January and aphelion in July. Therefore when closest to the sun in January the earth will be moving faster in its orbit and slowest when furthest away in July, this will effect the time for a point on the earth to return to its same position in the sky. (Apparent solar time) **Fig.7** shows the difference between the apparent and mean solar time over the year due to the earth's orbit eccentricity.

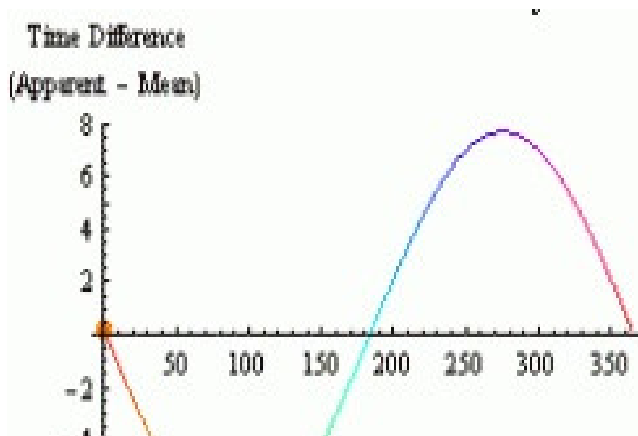


Fig.7 (Siegel)

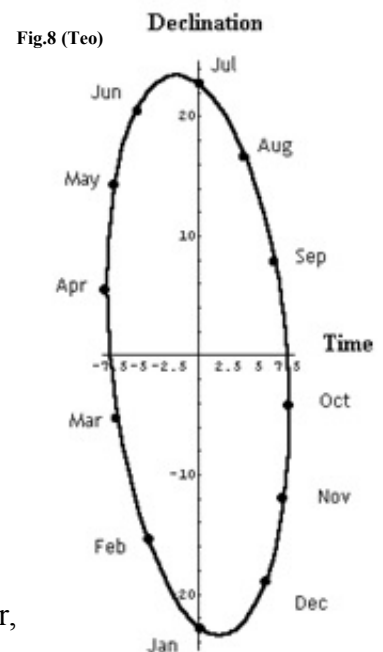


Fig.8 (Teo)

Fig.8 shows the position of the sun in the sky at noon during the year, reaching its highest point after 12 between January and June and before 12 between July and December. In this case the earth's orbit is assumed to be not tilted.

The apparent motion of the Sun through the sky over the year is a combination of the effects of its axial inclination and orbit eccentricity, combining **Figs 5&7** from above gives **Fig.9**, frequently referred to as the Equation of Time.

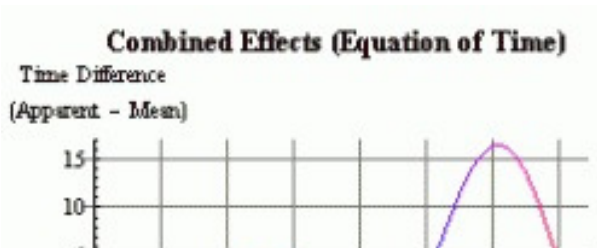


Fig.9 (Siegel)

Fig.10 shows the position of the Sun in the sky at noon due to the Equation of time.

This shape is called an **Analemma**.

It is a plot of the Equation of Time vs declination for the sun at a particular time (in this case noon), showing the suns' position in the sky.

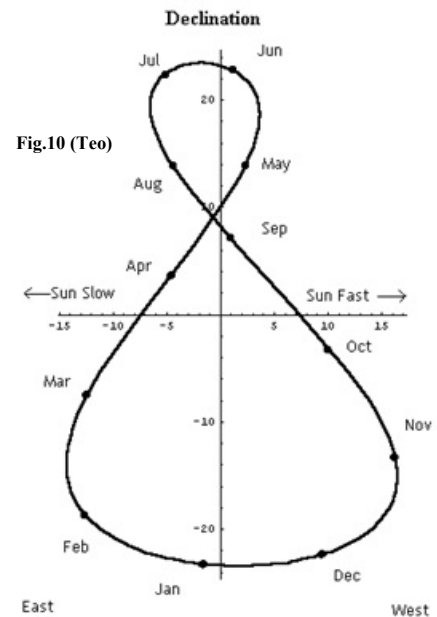


Fig.10 (Teo)

To record an Analemma requires a camera to be placed in a set position for a whole year and multiple exposures taken, ideally one a week, on the same frame. The pinhole camera used for the solargraphs is ideal for this; it just requires the addition of a “shutter” and a quick trial to select a suitable exposure time.

Fig.11 shows the camera in situ, with “shutter” closed **Fig.12**, “shutter” open **Fig.13**

The camera was facing due S and film exposed on 43 occasions for 5mins at 12:00 UT with usually a week between exposures, dependent on the weather from Summer solstice of 2020 to summer solstice 2021.



Fig.11



Fig.12



Fig.13

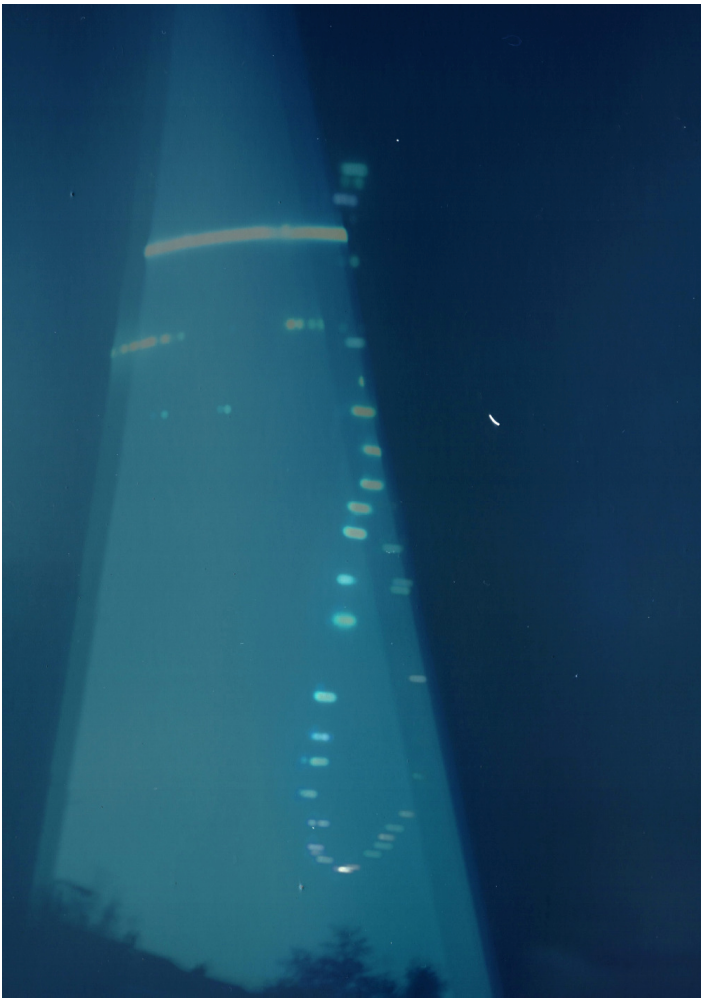


Fig.14

In the best Blue peter tradition , here is one I prepared earlier, taken over 2012/13, using a smaller tin can, this years attempt was with a larger container to try and get a better resolution of the upper part of the curve; back to the drawing board.!

For a more rigorous, mathematical, treatment of the subject see Teo and Sangwin & Budd.

Fig.14 shows the solargraph produced. The Analemma has been recorded, or at least part of it,. Although the photographic paper had been fixed in position in the can the damp conditions over the year had caused the paper to curl and cover itself preventing the full recording of the Analemma.

The large streaks near the top were caused when the tape holding the “shutter” decided to come unstuck and allowed unwanted light in.

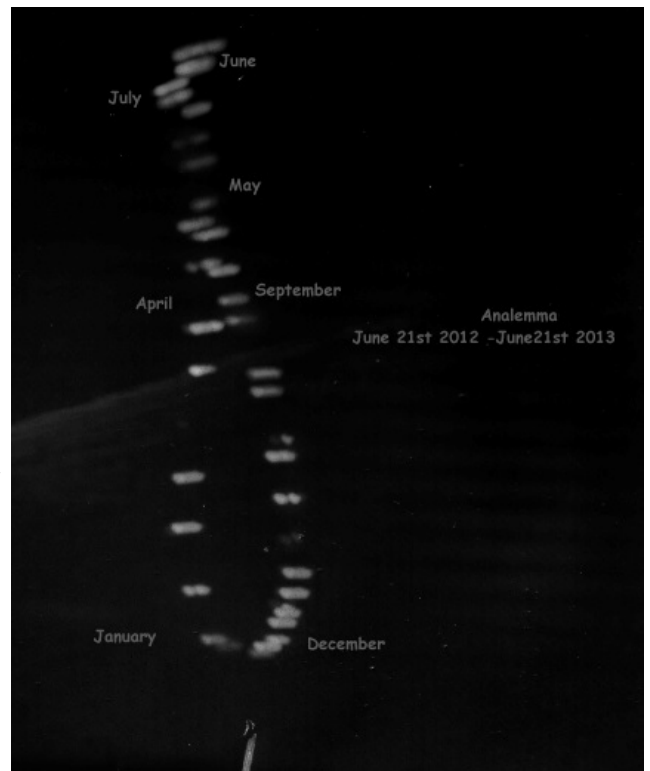


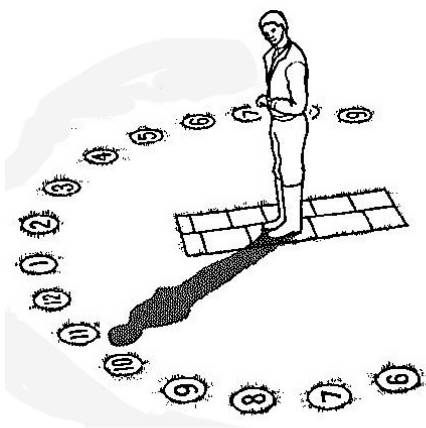
Fig.15



The time as measured by a traditional sundial, **Fig.16** has to be adjusted by up to +16 mins or -14 mins during the year due to the equation of time.

A less common design of sundial, based on the Analemma does away with this necessity.

Fig.16



Analemmatic Sundial..

The hour scale is laid out along an ellipse and the gnomon is replaced by a “body” standing on the appropriate month marker on the central line as shown, the correct time is the shown by the shadow on the hour scale, the only adjustment required is for BST!

If you want to build one see Sangwin & Budd.

Fig.17 (Mount Logan Middle School)

There is an example of an Analemmatic sundial, (**Figs 18 & 19**) at Rosliston Forestry centre, follow the path to the bird hide.



Fig.18 Analemmatic Sundial



Fig.18 Month markers

References and further reading:

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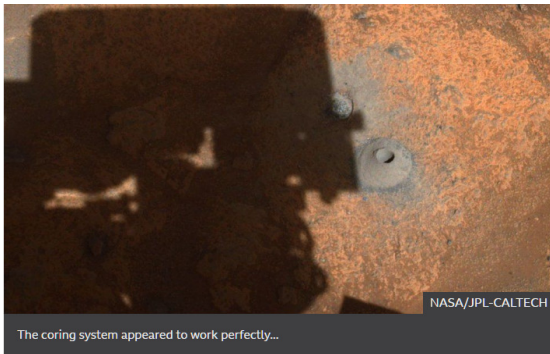
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ASTRO NEWS

BBC News 9th August 2021

Perseverance Mars rover's first rock sample goes missing



Engineers are trying to work out what went wrong when the US space agency's Perseverance rover tried to gather its first rock core on Mars.

The robot's mechanisms seemed to work perfectly but when a metal tube expected to hold the sample was examined, it was found to be empty.

The mission team think the particular properties of the target rock may have been to blame.

More images and telemetry pulled down from Mars should solve the puzzle.

"The initial thinking is that the empty tube is more likely a result of the rock target not reacting the way we expected during coring, and less likely a hardware issue with the sampling and caching system," said Jennifer Trosper, project manager for Perseverance at Nasa's Jet Propulsion Laboratory in California.

"Over the next few days, the team will be spending more time analysing the data we have, and also acquiring some additional diagnostic data to support understanding the root cause for the empty tube."

Perseverance has a drilling and coring system on the end of its 2m-long robotic arm.

This is capable of cutting and retrieving finger-sized samples of rock. These are then passed to a processing unit inside the rover's belly that packages and seals them in titanium cylinders.

But before sealing, a camera and probe are used to assess the amount of material recovered, and when this was done for Friday's coring attempt it became obvious the sample was missing.

This would not be the first time the Red Planet's surface has played hard-to-get with robots' analytical tools.

Nasa's 2007 Phoenix lander found the local soils in Mars' "Arctic" region to have a sticky consistency that made it difficult to get a sample into the robot's onboard laboratory. And the agency's 2018 InSight lander struggled, and ultimately failed, to drive a temperature instrument into the ground. The sub-surface was unexpectedly resistant.

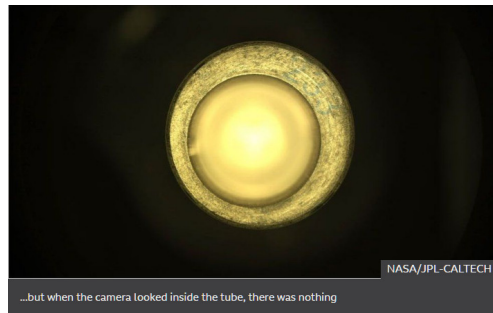
Perseverance landed on Mars in February, in a 45km-wide (30 miles) crater called Jezero. Its mission is to try to determine whether life exists, or has ever existed, on the planet.

One of the ways it hopes to do this is by collecting a range of rock samples for later return to Earth.

The initial attempt at getting a core was targeted at a rock that is suspected to represent the base material of Jezero. Scientists hope that if such a sample could be accurately dated, it would give them a timeline for everything that subsequently happened in the crater.

Jezero looks, from satellite pictures, to have hosted a lake many billions of years ago. It's the kind of environment that might have been favourable to micro-organisms.

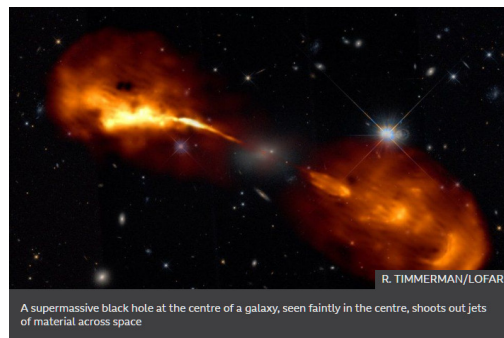
Thomas Zurbuchen, Nasa's science director, said he had no doubt engineers would soon work out why the sample is missing. "I'm confident we have the right team working (on) this, and we will persevere toward a solution to ensure future success," he added.



BBC News 19th August 2021

Astronomers see galaxies in ultra-high definition

Astronomers have captured some of the most detailed



images ever seen of galaxies in deep space.

They are in much higher definition than normal and reveal the inner workings of galaxies in unprecedented detail.

Many of the images could yield insights into the role of black holes in star and planet formation.

The researchers say that the pictures will transform our understanding of how galaxies evolve.

The images are of the radio waves emitted by the galaxies. Researchers often study the radio waves from astronomical objects rather than the visible light they give off because it enables them to see things that would otherwise be blocked by the Earth's atmosphere or dust and gas in faraway galaxies.



Many regions of space that are dark to our eyes, actually burn brightly in the radio waves they give off. This allows astronomers to peer into star-forming regions or into the heart of galaxies.

What is new is that the team has dramatically improved the resolution of radio images by linking together more than 70,000 small antennae spread across nine European countries.

Continued overleaf...

... Combining radio signals from so many antennas is not a straight-forward process. The team has spent six years developing a completely new way of collecting the signal from each antenna, digitising it, transporting it to a central processor, and then combining all the data into images that are not only of enormous scientific interest but also of great beauty.

The accomplishment is a technical tour de force and was led by Dr Leah Morabito from Durham University, UK.

"To work on the data for so long, and then to finally get such images and be able to be the first person to see what it looks like is just incredible," she told BBC News.

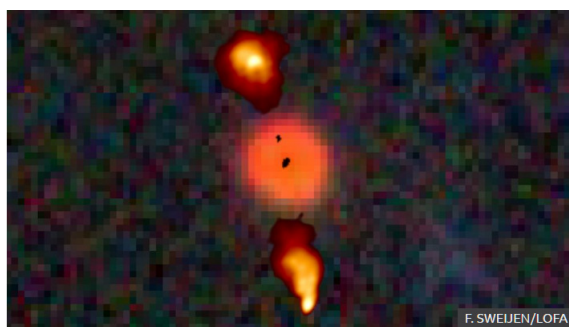
"I walked around with a huge smile on my face for the rest of the day, because I felt so proud that I was able to make these images and be able to see something nobody had ever seen before".

The image at the top of the page was produced by a member of Dr Morabito's team. It shows a galaxy that is barely visible, sitting in the middle of jets of material in orange, shooting out from either side, each one much larger than the galaxy itself.

The jets are caused by a supermassive black hole at the heart of the galaxy- an object with such strong gravity not even light can escape. It normally sucks in material - but the inward pull also creates forces around the black hole that result in material being spat out, far into space.



Such jets have been observed before - but astronomers have obtained new scientific information from the dark bands on the jet on the right, which have not been seen before. These, the astronomers believe, represent periods of relative inactivity by the black hole - when it spits out less material. The image therefore gives researchers an insight into the black hole's "sleep cycle".



The light from the galaxy shown directly above originated when the Universe was only 2.6 billion years old. Above and below it are jets of material thrown out by the black hole within. Normally such early galaxies can't be studied in detail. But now, for the first time, the astronomers have seen the structure of one of them at radio frequencies - which provides critical scientific information about how the black hole is interacting with its surroundings.

The images are revealing that galaxies are much more than a collection of stars. They are dynamic sun- and planet-making factories, powered by black holes, according to Dr Neal Jackson, from the University of Manchester.

"Even seasoned astronomers go 'wow!' when they see these images," he told me.

"It's become very clear that, in order to understand galaxy evolution, we need to understand the black hole right at the very centre, because it appears to have a fairly fundamental influence on how galaxies evolve and that is what these images allow us to do," says Dr Jackson.

"These high-resolution images allow us to zoom in to see what's really going on when supermassive black holes launch these jets of material."

Dr Morabito says that images like these are helping astronomers learn just how these processes, that created stars and planets - including our own Solar System - actually work.

"We are really beginning to understand how galaxies have evolved. And the black holes are a massive part of that because their jets can take away fuel for star formation. And as they push outwards, they can disrupt the galaxies. They can even trigger star formation or quench it and make it happen less," she said.

The first set of results have led to the publication of nine scientific papers on the dynamics of black holes in galaxies. But this is just the start for the team. They plan to scan millions of galaxies over the next few years.

"And that's really what we need to be able to understand, the whole complete picture of how black holes impact galaxy evolution," says Dr Morabito,

"I think we're definitely in for some surprises. Whenever you start doing something new in astronomy you always find out things that you never expected and that's what I really look forward to."

The international network of telescopes is known as the Low Frequency Array known as Lofar for short. Most of the antennas are located in Exloo in the Netherlands.

BBC News 30th July 2021

Russian module mishap destabilises International Space Station

The International Space Station (ISS) was destabilised after engines of a newly arrived Russian module inadvertently fired up.

"Mission control teams corrected the action and all systems are operating normally," [US space agency NASA said](#).

This was done by activating thrusters on other modules of the ISS. An investigation is now under way.

US and Russian officials stressed that the seven crew members aboard the space station were never in any danger.

The malfunction happened three hours after the Nauka module docked with the ISS on Thursday, following an eight-day flight from Earth.

Nasa officials said Nauka's jets started firing uncommanded at 12:34 EDT (16:45 GMT) "moving the station 45 degrees out of attitude".

The Russian Zvezda segment and a Progress freighter then responded to push the station back into its correct pointing configuration. The incident was over by 13:29 EDT.

"What we saw today was just an awesome job by the mission control flight teams," said Joel Montalbano, Nasa's ISS programme manager.



Continued overleaf...

..."Those guys were rock stars again and got us back in attitude control. That also shows you what a robust vehicle we have, and our ability to take these contingencies, recover from them and move on," he told reporters.

Communications with the ISS crew were lost for two periods, of four minutes and seven minutes, during the incident. However, the US agency said that the astronauts were safe. They "really didn't feel any movement", it added.

The mishap forced Nasa and Boeing to push back Friday's uncrewed test flight of Boeing's Starliner capsule, a vehicle intended to carry astronauts in the future.

"We wanted to give the ISS programme time to assess what had happened today, to determine the cause and make sure that they were really ready to support the Starliner launch," explained Steve Stich, the manager of Nasa's commercial crew programme.

"Right now the earliest opportunity would be Tuesday, 3 August, which would be a 13:20 EDT (17:20 GMT) launch.

The 13m-long, 20-tonne Nauka was earlier attached to the rear of the orbiting platform, linking up with the other major Russian segments on the station.

The module should have launched in 2007, but the vessel suffered repeated slips in schedule, in part because of budget difficulties but also because engineers encountered a raft of technical problems during development.

Even after it launched from the Baikonur Cosmodrome in Kazakhstan a week ago, it experienced propulsion issues that required workarounds from controllers in Moscow.

In the end, however, it docked with the station on the planned date.

The new module will result in a significant boost in habitable volume for the ISS, raising it by 70 cubic metres.

Cosmonauts will use the extra space to conduct experiments and to store cargo. They'll also use it as a rest area, and it has another toilet for crew to use on the station.

In addition, the module carries with it a large robotic arm (ERA) supplied by the European Space Agency (Esa).

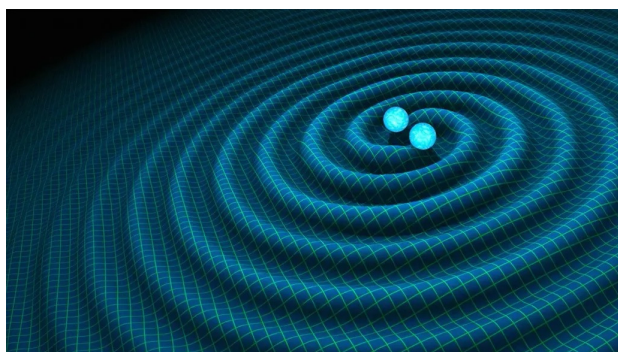
This 11m-long device will be able to operate all around the Russian end of the ISS. With the aid of an "elbow" joint, it will shift position by moving hand over hand.

Nauka's installation comes just as Russia has been questioning its future role in the ISS project.

Moscow officials recently warned about the more-than-20-year age of some of their on-orbit hardware and intimated the country could pull out of the station in 2025. And Russia has shown little interest in joining the US-led lunar platform, known as the Gateway, which will be assembled later this decade.

Space.com 23/08/2021

How do gravitational waves work?



Gravity isn't just a force that keeps things glued together. Through our understanding of general relativity, we know that gravity can make gravitational waves, or ripples in the fabric of space-time.

But how do these gravitational waves work, exactly?

Shortly after formulating his general theory of relativity, Albert Einstein realized that gravity can make waves. However, he

quickly doubted his own conclusions. The realization that gravitational waves exist came from a simplified form of general relativity, and Einstein didn't know if the waves were real or just an artifact of the simplification process.

The equations of general relativity are notoriously difficult to solve, so it's no surprise that even Einstein equivocated about this. It took several decades before physicists came to the firm conclusion that general relativity does support gravitational waves. In other words, they are indeed a real thing.

Pretty much anything in the universe doing anything at all makes gravitational waves. All it takes is a little wiggling, which gravitational waves have in common with pretty much any other wave. If you wiggle around in water, you make water waves. If your voice box wiggles around, it makes sound waves. If you wiggle an electron, you make electromagnetic waves. To make a gravitational wave, all you need to do is make mass accelerate.

These waves travel outward from the source at the speed of light and are literal ripples in the force of gravity. When a gravitational wave passes through you, you get stretched and squeezed as if giant hands were playing with you like a piece of putty.

Did you feel that?

Even though pretty much everything in the universe is making gravitational waves all the time, you don't really notice them. Gravity is, by far, the weakest of the four fundamental forces of nature. Even if gravity were a billion billion billion times stronger than it is, it would still be orders of magnitude weaker than any of the other forces: the weak force, electromagnetism and the strong force. And gravitational waves are weaker still; they are tiny perturbations on top of the normal gravity.

This also means that the gravitational waves that you might make by, say, waving your arms around are almost entirely nonexistent. To make a serious dent in space-time, you need some serious mass and energy action — stuff like black hole collisions, neutron star smashups, supernovas, giant black holes that consume stars whole or even the chaotic forces unleashed in the earliest moments of the Big Bang.

If you were within about half a mile of two black holes merging, the gravitational waves emitted would be strong enough to tear you apart. But if you were hundreds of miles away, it wouldn't even make the hair on the back of your neck stand on end.

From our vantage point on Earth, millions or billions of light-years away from these cataclysmic events, the gravitational waves have an amplitude no bigger than the width of a proton.

Of course it was weird

The extreme weakness of gravitational waves is why it took nearly a quarter century of technological development to detect them. But in 2015, the Laser Interferometer Gravitational-Wave Observatory (LIGO) confirmed the first direct detection of gravitational waves. The source of that particular signal was two black holes merging 1.4 billion light-years away.

There's an upside to the weakness of gravitational waves: Because gravity is so weak, the gravitational waves barely interact with matter, thereby allowing them to propagate freely throughout the universe without scattering or being absorbed. It also means we can see things we normally couldn't.

If two black holes collide in the middle of space, how could we really see them? If they don't emit any form of electromagnetic radiation during the collision, the entire process is invisible to our telescopes. But those collisions release tremendous amounts of energy in the form of gravitational waves — usually more power than that produced by all of the stars in the universe combined.

Since that first confirmed detection in 2015, LIGO and Virgo — its sibling observatory in Italy — have confirmed over four dozen black hole collisions. We've gone from the occasional gravitational wave detection to a full-fledged branch of astronomy. These subtle vibrations have unlocked insight into the inner workings of the cosmos and newfound mysteries for the next generation of astronomers.



'WHAT WE CANNOT KNOW'

by Marcus Du Sautoy

Reviewed by Malcolm Neal

Marcus is a Maths professor at Oxford University and is also the incumbent of the Chair for the Public Understanding of Science. Its previous occupant was Richard Dawkins.

The book as its title suggests is about what we can never know in the fields of Science and Maths and also touches on many other areas of knowledge. It is divided into eight sections called Edges by Du Sautoy and has many recurring themes by way of analogies to try to explain without too much maths the various themes of the 420 page book + notes and the index. The analogies mainly circle around dice and a cello but you will need to read the book as to why a cello. The chapters are of very unequal length with the first being the shortest and revolves around the 'infamous' speech given by Donald Rumsfeld when he was the USA Secretary of Defence (using our spelling) where he talked about known and unknown unknowns, for which he got a lot of unjustified stick from an unknowing press. Du Sautoy, however, raises an additional question about the unknown knowns i.e. where we do not realise we do know something and do not dare admit to that knowledge and this is especially dangerous in the hands of politicians.

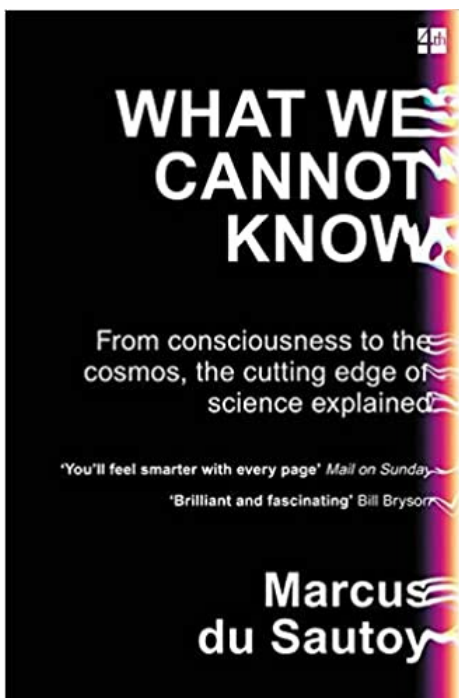
The first edge is about casino dice and is dependent on the explanations given to us by statistics. As mentioned before the dice are just an analogy and the chapter soon segues into Newtonian physics and the discoveries of Newton regarding celestial mechanics. This is only a beginning as it soon moves into the areas of weather forecasting and to a lesser extent population dynamics. As I said this is a very wide ranging book as he links both to chaos theory! It also involves the Mandelbrot set but only as an aside which is a pity as this is a very rich area and quite pictorial.

The second chapter / edge is The Cello. It uses the cello as another analogy this time beginning with infinite series and regressions to compare discrete and continuous variation. This soon leads on to irrational numbers by the way of integers and the science as known by the Babylonians and the Greeks etc. This then moves on to Brownian motion and how Einstein used this idea to infer things about atoms and atomic structure. The book then goes on to talk about atomic structure in terms of the fundamental particles and how they were discovered and a very little about the maths that lies behind them.

The third edge is A pot of Uranium and begins with ideas about the half life of uranium atoms and radiation in general. It soon moves onto idea about whether light is a particle or a wave and the experiments that were done to try to solve these questions. From here it moves into the area where I have least (let us say NO understanding) quantum physics, here almost everything I know is counter intuitive to what is really happening. It is here that Richard Feynman, Schrodinger and Heisenberg get rather more than a passing mention but all in an entertaining manner. Du Sautoy really deserves the chair for Public Understanding of Science for this chapter.

The fourth edge is the Cut Out Universe. It is mainly about relativity and the ideas of Einstein. It does make a very good show of explaining relativity and why we cannot rely on our point of view. It goes into the ideas of space-time and what the limitation to the speed of light means in terms of both space and time. The point of this chapter is about how far we can see into the universe and why we can never see it all. It also briefly discusses different kinds of universe shapes and the ideas of multiverses. Sounds science fiction but is really all about modern physics, astro-physics and mathematical research.

The fifth edge is The Wristwatch and all about time and gravity. It explains how speed acceleration and gravity affect the passage of time with again some very interesting analogies to make this understandable to the non mathematician. As you might expect it goes onto talk about Black holes and eventually why they might not be entirely black taking into account Hawking Radiation. This chapter reinforces the idea that really we can never have complete knowledge about physical structures i.e. atoms and why that leads to us having to treat many things that happen with a statistical approach.



The sixth edge is The Chatbot App. This is a rather more introspective chapter and is about human consciousness and the brain. It talks about how our nervous system works at a very basic level and actually starts at the end talking about consciousness and where it resides. Yet another unknown (at the moment) as medical science etc. Does not know why or where we are conscious. The author goes on to say how the subconscious is important and how this can lead to startling new ideas. It also tries to say how we store information. It fails. The neuroscientists do not really know how words, pictures, sounds, smells etc. are stored but there is beginning to be a little insight into that particular field of research. The chapter also briefly explores a visual trick as a way of trying to explain how the brain operates.

Finally we come to the seventh edge The Christmas Cracker. This is one of the shorter sections and is about paradoxes and mathematical jokes. Though about maths and things that are improvable the chapter is also about the philosophy of science and maths and numbers. It discusses what it is about science and maths that is true and how we can only prove an idea to be false which appears first in one of the earlier chapters. It also shows how science and maths are dynamic areas always subject to change as we discover new things which overturn older ideas which were our "best guess" at the time. This is a theme that actually runs through the entire book - Einstein replacing Newtonian ideas etc as being just one example. Almost the final part of his chapter s headed "Can we ever know anything" and perhaps sums up the philosophical nature of this final part of the book.

It is a thoroughly entertaining and thought provoking read. It covers many of the ideas that have appeared in many other books but to my mind it does seem to make them more understandable and for that reason alone I would recommend reading the book.

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 Nov - Dec 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
November 13th 7:30 pm	OBSERVING SESSION	-	The Flamsteed Observatory Please email the secretary of the society to book
November 19th 7:30 pm	INTRODUCTION TO ASTRONOMY EVENING Planetary Nebulae	Peter Branson	Zoom Please email the secretary for further details
27th November 6:00 pm till late	ELVASTON CASTLE STARGAZING AND EXHIBITION	-	Elvaston Castle, Borrowash Road (A6120), Elvaston, Derby, DE72 3EP
December 3rd 7:30 pm	Variable Stars: How and Why They Vary	Gary Poyner Heart of England Astronomical Society	Zoom Please email the secretary for further details
4th December 6:00 pm till late	ELVASTON CASTLE STARGAZING AND EXHIBITION	-	Elvaston Castle, Borrowash Road (A6120), Elvaston, Derby, DE72 3EP
December 11th 7:30 pm	OBSERVING SESSION	-	The Flamsteed Observatory Please email the secretary of the society to book
December 17th 7:00 pm	CHRISTMAS DINNER Members Only and their spouses/ partners	-	Brookfield Social Club, Barrow on Trent, DE73 7HG Please email the secretary of the society to book a place

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)

New members joining after January 1st will be liable to pay only a third of the Annual Subscription for that year.



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 the 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 this 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.