

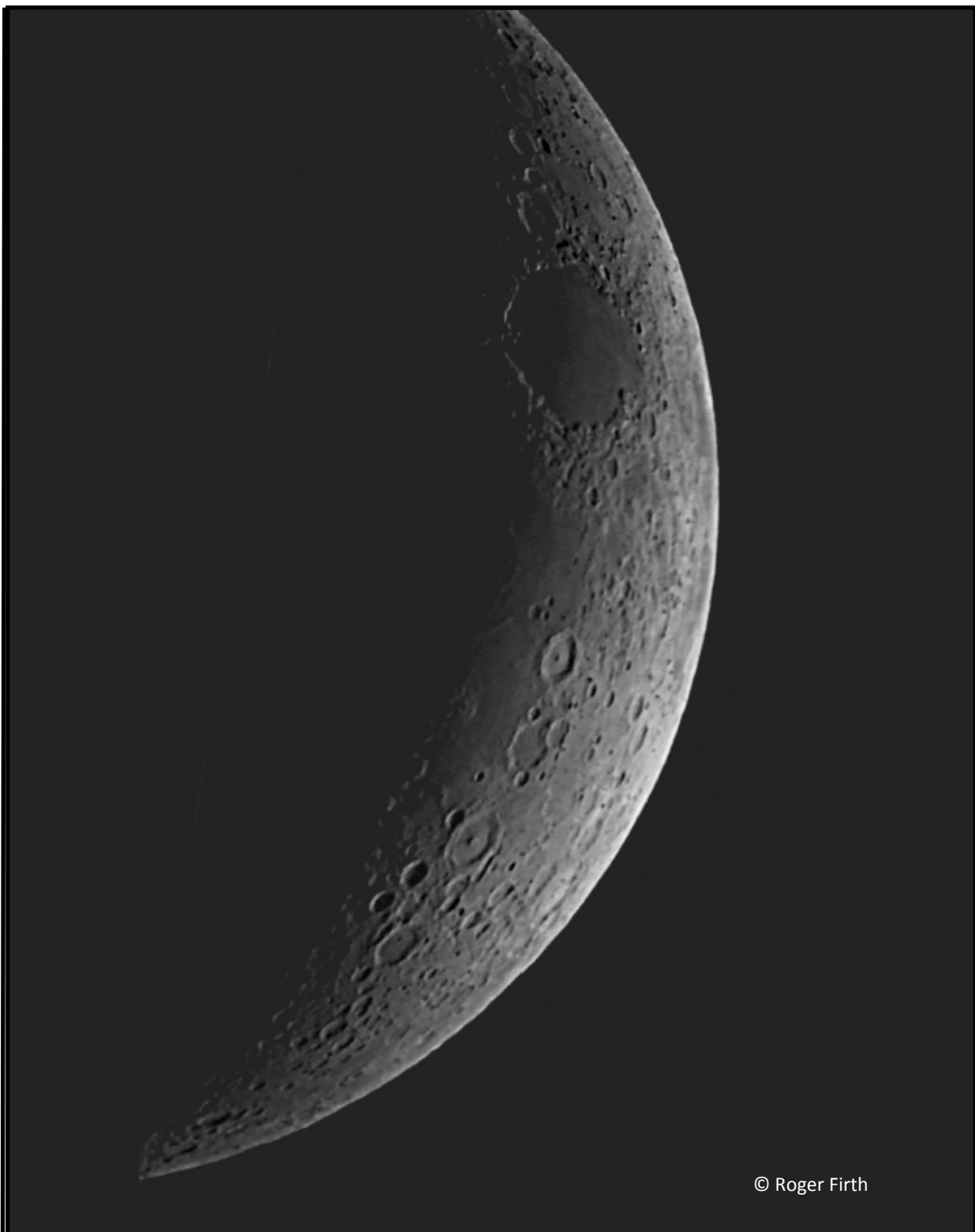
Spring 2021



# *Aries*

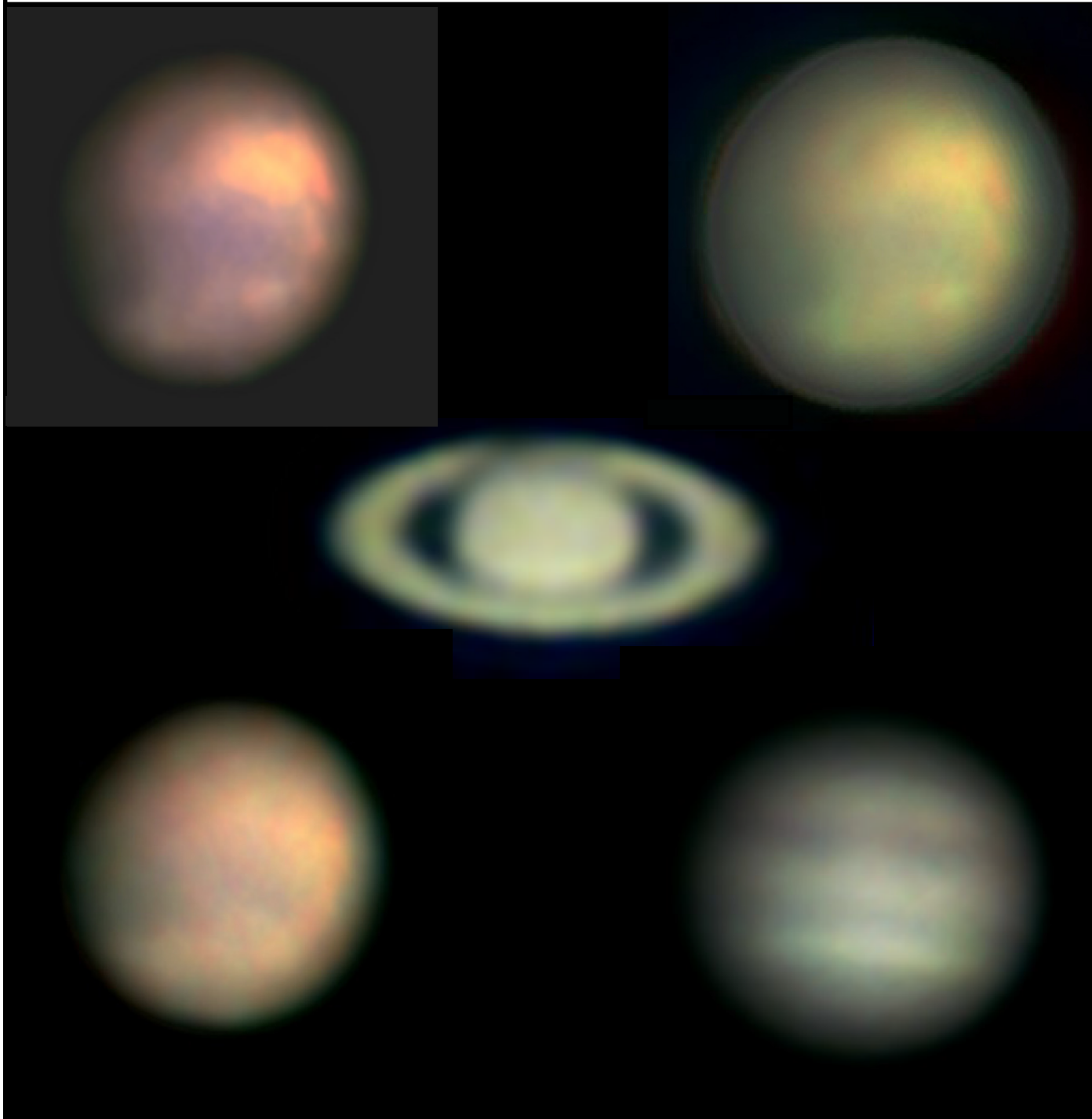
[derbyastronomy.org](http://derbyastronomy.org)

Derby & District Astronomical Society



© Roger Firth

## Member Gallery - Roger Firth



A selection of wonderful images copied, with the kind permission of Roger Firth from his newsletter '**Observatory Newsletter Autumn 2018**'. Which, along with our cover picture, were obtained through a Bresser 70/700 Refractor Telescope (he bought on an impulse from Lidl) that cost just £65.

Read the details about these images in the '**Observatory Newsletter Autumn 2018**' which has been reproduced in part, on pages **16-19** in this edition of Aries.

Roger has been a member of the society for a few years, but due to family commitments is unable to attend many meetings. However, as a fellow semi-professional editor, he is able to produce his own newsletter for family and friends. I will hopefully be showing some of his past editions in future issues of Aries.

He has generously opened the invitation, to join his subscription list, to D.D.A.S. members. It is free to subscribe and from what I have seen so far, there is some really interesting information and images in them.

If you would like to be added to Roger's mailing list, just get in touch with me and I will pass on your details. You can find my contact details on the next page.

Gill Pryor (Assistant Editor)

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### 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 **Summer** edition of Aries, need to reach us by no later than **5th July**.

Email to the editing team at

[arieseditor@derbyastronomy.org](mailto:arieseditor@derbyastronomy.org)

Or

[gillpryor@derbyastronomy.org](mailto: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 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

Hello and welcome to the Spring 21 issue of Aries.

The seasons are changing and as I write this Editorial, we have moved from winter and are now into spring. That means lighter nights, (Boo!), but that does not mean that Astronomy comes to a complete halt, oh no! The nights get darker later, yes, but there are still interesting things to observe in the spring sky. Let's hope for clear skies (crossing my fingers – Editor). With the impending slow relaxing of the COVID-19 restrictions, starting from Monday 29<sup>th</sup> March, we may be able, (again, keeping my fingers crossed! – Editor) to be able to have observing sessions at the Observatory again, so keep your eyes peeled for announcements from the DDAS Committee for future observing session news.

February was a busy month on the Space front, for during that month, three Mars-bound spacecraft arrived at their destination. The first to arrive in Martian orbit, on 9<sup>th</sup> February, was the United Arab Emirates Hope spacecraft. This is an orbiting spacecraft and is the UAE's first planetary spacecraft. Hope's mission is 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 spacecraft to arrive at Mars in February, 10<sup>th</sup> February to be precise, was the Chinese Tiawen-1 spacecraft; vehicle consists of an orbiter and a surface lander. Tianwen-1, which translates as 'Heavenly Questions' is China's first Mars mission. The rover is expected to land in Utopia Planitia in May or June 2021. At the moment the Tiawen-1 Orbiter is scanning the Martian surface to refine the target landing zone for the lander/rover combination. 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 last spacecraft to reach Mars did not even orbit the Planet, it went straight in to attempt a landing, that spacecraft was NASA's Perseverance Rover. Perseverance arrived at Mars on 18<sup>th</sup> February 2021 and after the 'seven minutes of terror' of Entry, Descent and Landing, made a successful landing at Jezero Crater. Perseverance is a rover which is similar to the Curiosity rover, which landed in Gale Crater on 6<sup>th</sup> August 2012. Perseverance has a similar mission to Curiosity, looking for bio signatures within Jezero Crater.

Perseverance will drill core samples of the Martian surface and package them in sample tubes and drop them on the

ground for collection by another rover that will load the tubes on to a return capsule that will rendezvous with an Earth-return spacecraft for the journey to Earth. The sample return mission is scheduled for 2026. Perseverance is carrying a technology demonstrator as well, a mini-copter called 'Ingenuity', if successful, Ingenuity will be the first powered aircraft to fly on Mars. Ingenuity is due to make its flight on 8<sup>th</sup> April 2021.

There is much more to discuss about these missions, but that cannot be done here, so keep your eyes peeled for further coverage of these missions, either in the Astro News Desk section, or as individual articles.

Finally, DDAS Gary Lambert, who is our Social Media guru, made a suggestion on What's App that really resonated with me. He suggested that it would be a good idea to cover previous unmanned Solar System missions, as missions such as the Viking missions are history to him, that made me feel old, I was nine years old when Vikings 1 and 2 landed on Mars in July 1976. But I thought Gary's comment made sense, so I am looking at putting together an occasional series on previous interplanetary missions, as a kind of look back at those times to see how far we have come in the robotic exploration of the Solar System.

And so, what can be found within the pages of this issue of Aries

First off, thanks to Roger Firth for his astro images which appear on the front cover of this very issue and the 'Member's Gallery' page. You can also find an article from Roger's own newsletter within the pages of Aries. Next we have the next two biographies in our regular 'Meet the Committee' feature.

The Astro News Desk feature covers four recent news pieces from around the Solar System and the wider Universe.

Peter Hill has penned an article on the subject of detecting Meteors via Radar techniques.

Our Society Secretary, Brian Dodson has written a review of Martin Griffiths' book 'Observing Nebulae'.

Astro Market Place makes an appearance in this issue too and will hopefully be a regular feature. So grab yourselves a bargain.

A new item from last issue is a precis of the meetings and events between this and the previous issue.

The last item is a schedule of DDAS Meetings for the coming months.

So, another packed issue of Aries is now before you. Sit back and dive into its pages and take a dip in the Cosmic Ocean, come on in, the 'waters' are fine!

Anthony Southwell  
Editor in Chief

Gill Pryor  
Assistant Editor



## Meet Your Committee - Outreach Officer - Don Anderson



I was born in Northern Ireland in 1951. I suppose I have always been interested in Engineering and Science as I spent most of my youth disassembling anything mechanical, electrical or electronic "To see how it worked". I was always FOOTERING with things as they would say in Northern Ireland. It was inevitable that I would end up in engineering. In Grammar school I spent a lot of time in the Science and engineering departments after school clubs. I built my first computer in 1963, from scrap components salvaged from the local electronics junk yards, which was capable of adding and subtracting two Hexadecimal numbers as long as the total was no greater than 256. It was about the size of the lab bench when assembled. In 1964 I designed and built a Magnetically Levitating Linear Train which was exhibited at the Science Exposition in Belfast. I studied Applied Physics at University and on graduation I joined a Telecommunications company "Standard Telephones and Cables" commissioning telephone exchanges. Fascinating times as I was involved with the change from the traditional Electromechanical to Electronic switching networks.

The 60s, 70s were an amazing time for anyone interested in Physics with the launch of Sputnik, the Mercury Program and of course Apollo. I remember the first news of Sputnik breaking and that simple bleep, watching it on a black and white television at my granny's house.

On July 20<sup>th</sup> 1969, the first Moon Landing, I was on holiday in our family caravan in Newcastle County Down. I had been given a new Vespa Scooter for my birthday a few weeks earlier. The only television was in a common room on the caravan site and reception was very poor. At this time "The Troubles" in Belfast were erupting. I asked my mother if I could drive back to Belfast to watch the landing at our home in Belfast. She was extremely worried about this but finally agreed when I told her that I could visit my grandmother at the same time as she was very concerned about her with the rioting and shootings in the city. The thirty-mile trip to Belfast involved passing through two Police Checkpoints and a couple of detours to avoid the "Bad Areas" of the city. But I made it and settled down at home to watch the landings, something I will remember all my life. The city was relatively quiet that night. I suppose even the rioters settled down to watch this historic event.

In 1979 I joined a company called AccuRay, based in Ohio USA. They were specialists in the on-line measurement of the properties of materials using the entire Electromagnetic Spectrum. Working in the tobacco, plastics, metals and sheet manufacturing industry allowed me to travel the world. I lived in the USA for two years and Canada for 2 years working on the development of new measurement technology. The company was bought by ABB, an enormous electrical engineering company. I worked with them for 30 years in product development, field engineering and Maintenance Management. I can truly say that I loved every day of my working career. To see the world doing something I loved made it very difficult for me to make the decision to eventually retire 5 years ago.

On retiring we moved from Glossop to Derby to be closer to my daughter Claire and our two grandchildren. My wife Diane had retired from teaching at age 55.

I joined DDAS shortly after moving to Derbyshire. I had always been interested in Astrophysics but had never looked through a telescope before. I had a very warm welcome from the club members both at the club meetings and especially in the pub afterwards. I joined as an ordinary member on the committee and took a keen interest in the clubs' public events which I really enjoyed attending. I saw a need for us to engage with the local schools and colleges to pass on our knowledge to future generations. The committee decided to make a new role of "Outreach Officer" to develop and support contact with the local schools. This was very successful in 2019/20 pre Covid. We will be continuing with the program from May this year with the schools we worked with last year but hope to be able to engage with more schools and clubs later in 2021. If any society members can support us in the schools, I would be happy to hear from you. I can promise you some rewarding and fun days.

I would like to finish with a huge thankyou to everyone in the society for their support, friendship and help but especially to Brian Dodson without whom the club would not be the success it is today.

Don.



## Meet Your Committee - Ordinary Member - Gary Lambert



Hi, I have been a member of the astronomical society for around 2-3 years. I am currently an ordinary committee member and have been enjoying every minute of it.

I am originally from Worksop which is a small little pit town outside of Sheffield and a little known fact about me is that I am a triplet with two brothers but no, we are not identical. Ever since I can remember I have always had a fascination with the night sky. I always remember reading a small book on space as a child and reading about Olympus Moons on Mars and that it is even larger than Everest. I have been hooked ever since! My Dad bought me a telescope when I was around 13, it was just a Newtonian department store telescope but nevertheless it gave me my first views of the moon and I was astounded by what I could see.

However, from around 15 I never really followed or pursued my passion much.

Something which I now deeply regret. When I left school I went on to study my A levels (which I completed but didn't enjoy) and as result I decided I didn't wish to go to university at that age so I applied to become a prison officer at HMP Lowdham Grange. From the age of 18 to around 20 I was working in the Prison service and this is where my passion for astronomy began to resurface.

In 2012 however, I became unsettled and decided that after all I wanted to go to university to study English of all subjects! I applied to Derby university and was successful and have been in Derby ever since. It was around this time and having much more time on my hands that I began to actively engage in astronomy again. What really kicked it off was a pair of Celestron binoculars I was given as a present to observe the night sky with. At first I was rather disappointed thinking that they wouldn't show me much. However, after a little reading and thanks to some modern day apps, I was amazed at what I could see through them. The first time seeing the Andromeda galaxy through them was something I will never forget!

After I completed my university degree I decided to follow a career in education and that is why I now work as a senior training and education manager at Key College which is part of YMCA Derbyshire. It was also after leaving university that I read about astronomy clubs that are all over the country. I decided to google Derby Astronomical Society and the rest is history! The first meeting I attended was an 'Introduction to Astronomy' meeting at the Friends Meeting House. It was a talk on the messier catalogue. I was amazed at what I learnt in one night and was mesmerised by a huge universe that I had no idea was within reach with the most basic of equipment. Since joining the society my knowledge and interest in the subject has expanded tenfold. I am now a proud owner of a 12 inch Dobsonian telescope (see picture) as well as a very neat and portable astrophotography set up with a Zenithstar 61, and yes, I still have my binoculars which I still use the most!

Finally, I would like to end by saying as we all know this past year has been terrible one for all of us. However, in July last year my partner and I sadly lost a baby during a late pregnancy. As you can imagine the last 12 months really have been some of the hardest I have experienced. I can honestly say that through the friends I have met at DDAS and the meetings that have taken place despite lockdown through DDAS has been a life saver. I always remember attending the AGM last year shortly after it had happened and it was space where I could forget all about it and I was delighted to be allowed to join the committee. I want to thank the society for being so welcoming and to thank all the members and friends I have made throughout my relatively short time with the society. I wish everyone the very best and hopefully it won't be too long until we can all meet up for a little chat in person.

Kind regards Gary.



### BBC News Website 19<sup>th</sup> February 2021

## Mars landing: NASA's Perseverance rover in 'great shape'

There's a new robot on the surface of Mars.

The American space agency has successfully landed its Perseverance rover in a deep crater near the planet's equator called Jezero. "The good news is the spacecraft, I think, is in great shape," said Matt Wallace, the mission's deputy project manager.

Engineers at NASA's mission control in California erupted with joy when the confirmation of touchdown came through. The six-wheeled vehicle will now spend at least the next two years drilling into the local rocks, looking for evidence of past life.

Jezero is thought to have held a giant lake billions of years ago. And where there's been water, there's the possibility there might also have been life.

The signal alerting controllers that Perseverance was down and safe arrived at 20:55 GMT. In the past they might have hugged and high-fived but strict coronavirus protocols meant they had all been separated by Perspex screens. A respectful fist bump was about all they could manage.

Nonetheless, the excitement was evident. And the applause continued when the first two images came in. They were taken by low-resolution engineering cameras. There was dust covering the still-attached translucent lens covers, but it was possible to see a flat surface both in front and behind the rover.

Post-landing analysis indicated the vehicle had come down about 2km to the south east of the delta feature in Jezero that Perseverance plans to investigate.

"We are in a nice flat spot. The vehicle is only tilted by about 1.2 degrees," said Allen Chen, who led the landing team. "So we did successfully find that parking lot and have a safe rover on the ground. And I couldn't be more proud of my team for doing that."

Steve Jurczyk, the acting administrator at Nasa, also saluted the achievement: "What a credit to the team. Just what an amazing team to work through all the adversity and all the challenges that go with landing a rover on Mars, plus the challenges of Covid. Just an amazing accomplishment."

And Mike Watkins, the director of Nasa's Jet Propulsion Laboratory, the home of the agency's Mars missions, added: "There is something special about the first few days (of the mission) because we have just landed a representative of Planet Earth on a place on Mars that no-one has ever been to."

Landing on Mars is never easy, and even though Nasa has become expert at it, everyone on the Perseverance team had spoken with great caution going into Thursday.

This is the second one-tonne rover put on Mars by the US space agency.

The first, Curiosity, was landed in a different crater in 2012. It trialled innovative descent technologies, including a rocket-powered cradle, that Perseverance has also now put to good effect.

Controllers will spend the coming days commissioning the new rover, checking whether any of its systems were damaged in what would have been a rough ride to the ground.

Perseverance's mast, with its main camera system, must be raised. The software that got the vehicle to Mars's surface must now be exchanged for a software system that enables the robot to drive across that surface.

Above all, expect Perseverance to take many pictures in the next week or so as engineers and scientists seek to assess the nature of the nearby terrain.

One near-term objective will be to run a helicopter experiment. Perseverance carried with it a mini-chopper that will attempt to make the first powered flight in another world - what might be described as a "Wright Brothers moment" for Mars.

Only after this will the robot get on with the serious business of its mission. It will head to that vast delta feature detected by satellites.

Deltas are built by rivers as they push out into a wider body of water and dump their sediment. Scientists are hoping that incorporated into the material that built Jezero's delta are the tell-tale signatures of past biology.

Perseverance will sample the base of the delta and then move towards the rim of the crater. It's at the rim that satellites have detected carbonate rocks, which on Earth are particularly good at trapping biological activity.

Perseverance has a suite of instruments that will examine all these formations in detail, down to the microscopic level.

Why is Jezero Crater so interesting?

Forty-five-km-wide Jezero displays multiple rock types, including clays and carbonates, that have the potential to



preserve the type of organic molecules that would hint at life's bygone existence.

Particularly enticing is the "bathtub ring" of sediments laid down at what would have been the ancient lake's shoreline. It's here that Perseverance could find what on Earth are called stromatolites.

"In some lakes you can get microbial mats and carbonates interacting to form these big structures, these large layered mounds," explained science team-member Dr Briony Horgan from Purdue University in West Lafayette, Indiana.

"If we see anything like that kind of structure in Jezero, we'll be making a beeline straight for it because that could be the holy grail of Mars astrobiology," she told BBC News.

Perseverance's most interesting rock finds will be packaged into small tubes to be left on the surface.

Nasa and the European Space Agency (Esa) have devised a multi-billion-dollar plan to go fetch these cylinders towards the end of the decade.

It will be a complex endeavour involving a second rover, a Mars rocket and a huge satellite to ship the Jezero materials home.

Returning samples is the logical - and necessary - next step in Mars exploration.

Even if Perseverance discovers something that looks like a bio-signature, the evidence is almost certain to be contested - as claims for ancient life's traces here on Earth usually are.

Bringing rocks back for further, more sophisticated analysis is therefore likely to be the only way any arguments about past biology on the Red Planet will be settled.

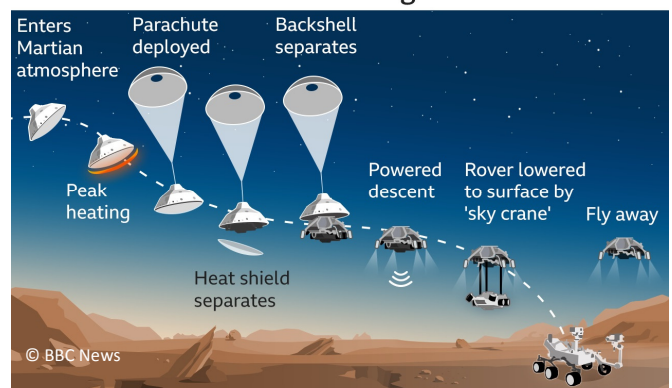


The first picture looks forward. The shadow comes from the rover's robotic arm

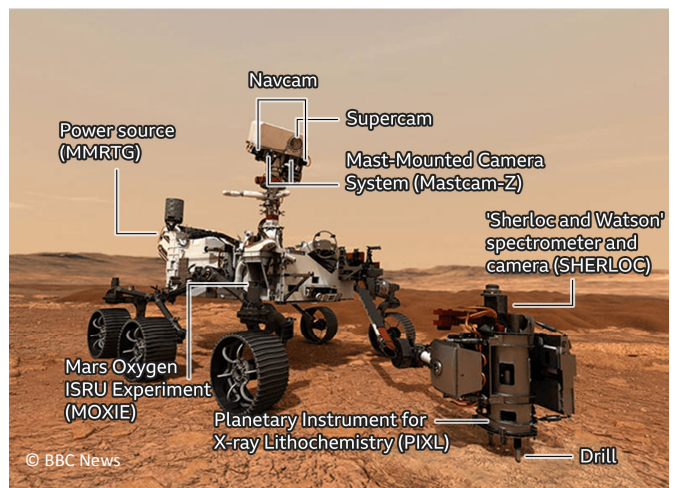


The second image sent back looks behind the rover

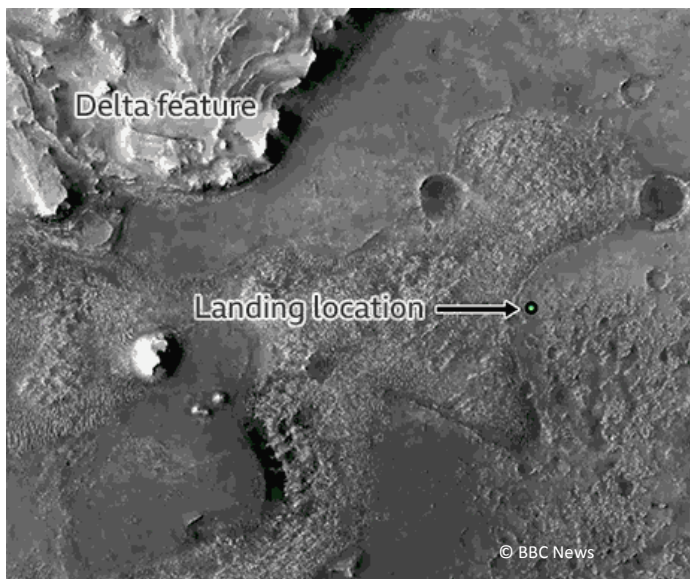
## Nasa's Perseverance landing on Mars



## Mars Rover Perseverance



Source: Nasa



## Space.com Website 11<sup>th</sup> March 2021

### Newfound super-Earth alien planet whips around its star every 0.67 days

We keep getting reminders that the Milky Way's planetary diversity dwarfs what we see in our own solar system.

The newfound exoplanet TOI-1685 b is yet another case in point. Astronomers found it circling a dim red dwarf star about 122 light-years from Earth. "Circling" is too ordinary a word for TOI-1685 b's motion, however; the alien world whips around its parent star once every 0.67 Earth days.

Red dwarfs, also known as M dwarfs, are much smaller and dimmer than Earth's sun, but TOI-1685 b's extreme proximity to its host star, called TOI-1685, makes it a very toasty world nonetheless. The discovery team estimates its surface temperature to be around 1,465 degrees Fahrenheit (796 degrees Celsius).

The researchers, led by Paz Bluhm of Heidelberg University in Germany, first spotted TOI-1685 b in observations made by NASA's Transiting Exoplanet Survey Satellite (TESS). As its name suggests, TESS looks for transits, the tiny brightness dips caused by planets crossing their host stars' faces from the Earth-orbiting spacecraft's perspective.

TESS noted such a dip around the red dwarf TOI-1685. Bluhm and her colleagues then confirmed the planet's existence using data gathered by the CARMENES spectrograph instrument, which is installed on the 3.5-meter telescope at the Calar Alto Observatory in Spain. (CARMENES is short for "Calar Alto high-Resolution search for M dwarfs with Exo-earths with Near-infrared and optical Echelle spectrographs.")

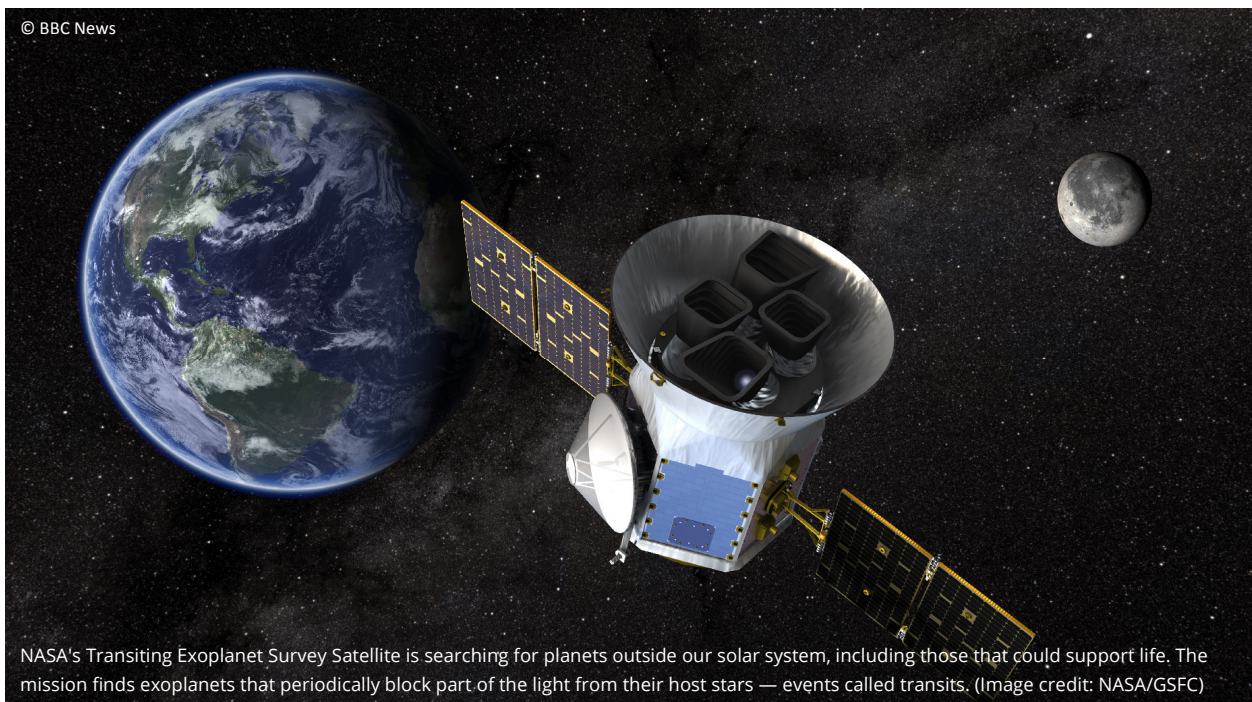
CARMENES hunts for planets using the radial velocity, or Doppler, method — looking for little wobbles in a star's motion caused by the gravitational tug of an orbiting planet.

The combined data allowed the team to determine that TOI-1685 b is a "super-Earth" about 1.7 times bigger, and 3.8 times more massive, than our home planet. The resulting bulk density — about 4.2 grams per cubic centimeter, or 0.15 lbs. per cubic inch — makes TOI-1685 b "the least dense ultra-short period planet around an M dwarf known to date," Bluhm and her colleagues wrote in the discovery paper, which you can read for free on the online preprint site [arXiv.org](https://arxiv.org). (The paper has not yet been published in a peer-reviewed journal.)

For perspective: Earth's bulk density is about 5.5 grams per cubic centimetre, or 0.20 lbs. per cubic inch.

The fact that TOI-1685 b transits and is quite warm makes it a good candidate for follow-up study by other instruments, the researchers wrote. In that regard, TOI-1685 b is similar to another recent exoplanet find made using TESS and CARMENES data, Gliese 486 b.

Bluhm and her team also saw another signal in the CARMENES TOI-1685 data, which could indicate a second planet in the system that orbits once every nine Earth days. If this candidate planet exists, it doesn't transit, because TESS recorded no corresponding signal, the researchers wrote.



NASA's Transiting Exoplanet Survey Satellite is searching for planets outside our solar system, including those that could support life. The mission finds exoplanets that periodically block part of the light from their host stars — events called transits. (Image credit: NASA/GSFC)



## Space.com Website 11<sup>th</sup> March

### Meteorite from brilliant UK fireball is England's first in 30 years

It's the first meteorite found in the UK since 1991.

A piece of the space rock that lit up skies over England on Feb. 28 has been found.



The singed hunk of asteroid was discovered in the driveway of a house in Winchcombe, a small town in the county of Gloucestershire in southwestern England. The rock, which weighs nearly 10.6 ounces (300 grams), is the first meteorite found in the UK since 1991, experts said, and the first known carbonaceous chondrite ever discovered in the country.

Carbonaceous chondrites are especially pristine and primitive meteorites that generally contain lots of organic material, including complex molecules such as amino acids. Studying carbonaceous chondrites can shed light on the early solar system and how the building blocks of life found their way to Earth, researchers say.

Such study is already under way at the Natural History Museum in London, where the meteorite now resides.

"This is really exciting. There are about 65,000 known meteorites in the entire world, and of those only 51 of them are carbonaceous chondrites that have been seen to fall like this one," Sara Russell, a meteorite scientist at the museum, said in a statement.

"It is almost mind-blowingly amazing, because we are working on the asteroid sample-return space missions Hayabusa2 and OSIRIS-REx, and this material looks exactly like the material they are collecting," Russell said. "I am just speechless with excitement."

Japan's Hayabusa 2 mission returned about 0.16 ounces (4.5 g) of the asteroid Ryugu to Earth in December 2020, and NASA's OSIRIS-REx probe collected a large sample of the space rock Bennu in October of that year. The Bennu bits will land here on Earth in September 2023, if all goes according to plan.

The newfound meteorite was spotted shortly after it came down. Residents of the Winchcombe house saw black smudges on their driveway on the morning of March 1, the day after the fireball blazed bright in England's skies. They soon collected pieces of the space rock that had made the marks and contacted the UK Meteor Observation Network, which then got in touch with Natural History Museum personnel.

"For somebody who didn't really have an idea what it actually was, the finder did a fantastic job in collecting it," Ashley King, another meteorite researcher at the museum, said in the same statement.

"He bagged most of it up really quickly on Monday morning, perhaps less than 12 hours after the actual event. He then kept finding bits in his garden over the next few days," King added. "It looks a bit like coal. It is really black, but it is much softer and is really quite fragile. It is exciting for us, because this type of meteorite is incredibly rare but holds important clues about our origins."

The parent bodies of carbonaceous chondrites can hit Earth's atmosphere going more than 150,000 mph (240,000 kph), King said. But the Feb. 28 fireball came in much more slowly, at "only" around 31,000 mph (50,000 kph), which explains why some pieces of the rock survived the fiery ordeal.

"The fact that it was going quite slowly, and then that it was collected so quickly after landing, avoiding any rainfall that could change its pristine composition, means that we've just really lucked out with everything," he said.

A number of fireball cameras captured the Feb. 28 event, allowing researchers to calculate a probable landing zone for meteorites and determine a rough trajectory for the parent body. These analyses indicate that the object came from the outer region of the main asteroid belt between Mars and Jupiter, scientists said.

There may well be more meteorite fragments from the Feb. 28 fireball waiting to be found. If you spot something in the Gloucestershire area that you suspect is a space rock, photograph it and record its location, Natural History Museum personnel said. Then collect a sample using a gloved hand, store the stuff in aluminium foil and contact the museum.



The Winchcombe meteorite weighs nearly 10.6 ounces (300 grams). (Image credit: The Trustees of the Natural History Museum, London)

### Space.com Website 11<sup>th</sup> March 2021

#### Rare supernova relic found at the core of our Milky Way

NASA's Chandra X-ray Observatory has discovered the remains of a rare kind of stellar explosion near the centre of the Milky Way.

Supernovas are stellar explosions that seed the galaxy with elements vital for life. Sagittarius A East (or Sgr A East) is a supernova remnant that lies near Sagittarius A\* — the supermassive black hole in the center of the Milky Way. This supernova remnant is the first known example in our own Milky Way galaxy of an unusual type of white dwarf stellar explosion called a Type Iax supernova, according to a statement from the Chandra X-ray Observatory.

"While we've found Type Iax supernovae in other galaxies, we haven't identified evidence for one in the Milky Way until now," Ping Zhou, lead author of the study from Nanjing University in China, said in the statement. "This discovery is important for getting a handle of the myriad ways white dwarfs explode."

There are different types of stellar explosions, ranging from those triggered by the collapse of massive stars, to those that are triggered by smaller white dwarf stars that have pulled too much material from a companion star or collided with another white dwarf.

White dwarf explosions — generally designated as Type Ia supernovas — are an important source of chromium, iron and nickel in the universe. However, using the Chandra observations, astronomers found Sgr A East produced different

relative quantities of essential elements and created a less powerful explosion than a typical Type Ia supernova, suggesting it is instead a Type Iax supernova, according to the statement.

"This result shows us the diversity of types and causes of white dwarf explosions, and the different ways that they make these essential elements," Shing-Chi Leung, co-author of the study from the California Institute of Technology, said in the statement. "If we're right about the identity of this supernova's remains, it would be the nearest known example to Earth."

To explain the differences observed between these two types of supernovas, astronomers have suggested thermonuclear reactions, which trigger stellar explosions, move more slowly through white dwarf stars that result in Type Iax supernovas compared to Type Ia supernovas. Slower thermonuclear reactions would result in weaker explosions and, in turn, the release of different quantities of elements produced in the explosion. Part of the white dwarf may also be left behind during Type Iax supernovas, according to the statement.

In addition to the X-ray data from Chandra, astronomers used computer models to simulate slow-moving nuclear reactions in white dwarf stars. The computer models supported the Chandra observations of Sgr A East, suggesting it is a Type Iax supernova remnant.

"This supernova remnant is in the background of many Chandra images of our galaxy's supermassive black hole taken over the last 20 years," Zhiyuan Li, co-author of the study from Nanjing University, said in the statement. "We finally may have worked out what this object is and how it came to be."

Their findings were published Feb. 10 in The Astrophysical Journal.



NASA's Chandra X-ray Observatory captured a supernova remnant called Sagittarius A East (Sgr A East) near the center of our Milky Way galaxy.

(Image credit: X-ray: NASA/CXC/ Nanjing Univ./P. Zhou et al. Radio: NSF/NRAO/VLA )



# Meteor Detection by Radar

text/images © Peter Hill

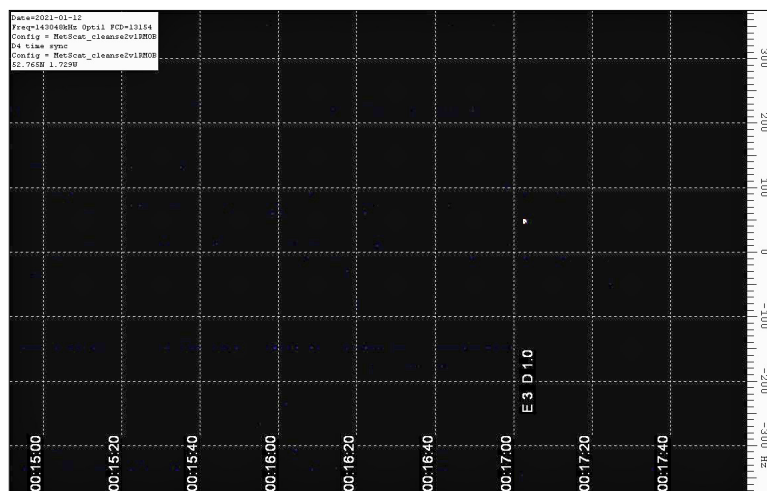
Using a homemade 3 element yagi aerial, a Funcubedongle pro+ and running Spectrum lab software on a laptop it is possible to detect meteor activity , even on cloudy nights.



This set up was suggested by Paul Hyde Co-ordinator of the BAA Radio astronomy section in two articles in Sky at Night in June / July 2014.

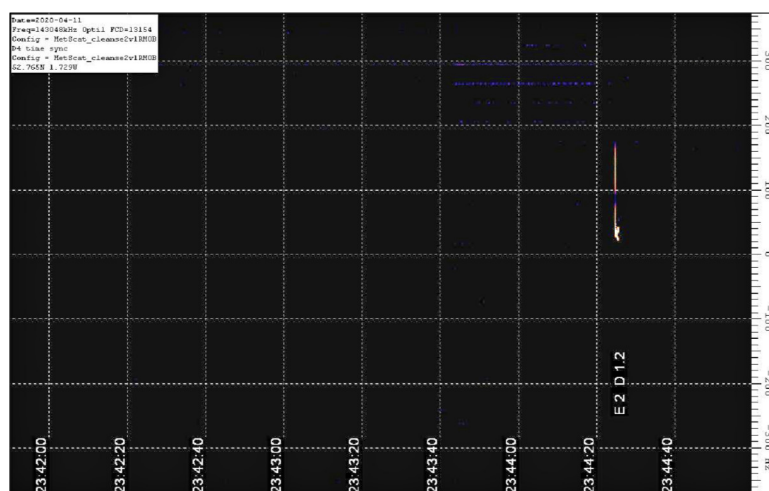
It utilises the output of the French GRAVES installation outside Dijon in France. This unit transmits a 145.05MHz Radar signal in scanning for low earth orbit satellites and space debris.

As meteors pass through the atmosphere they ionise the air and this ionised trail will reflect this radar signal. The Yagi design is tuned to this frequency and the signal is fed into the FUNcubedongle pro+ operating in single side band operation, tuned to 143,048KHz it produces a 2KHz signal when the reflected radar wave from a meteor trail is received. This is processed by spectrum lab, which displays the signal in a horizontal waterfall scrolling across the screen and records signal strength, frequency and duration in a csv file as well as recording screenshots. This allows record keeping of meteor activity as well as analysing trails and measuring Doppler shift. Besides reflections from meteorites it will also pick up reflections from the ISS, the moon and other satellites as well as picking up signals from spurious sources including reflections off the ionosphere as it varies its height due to the weather.

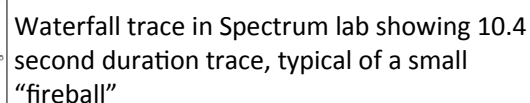


Typical "Head echo" recorded most of the time.

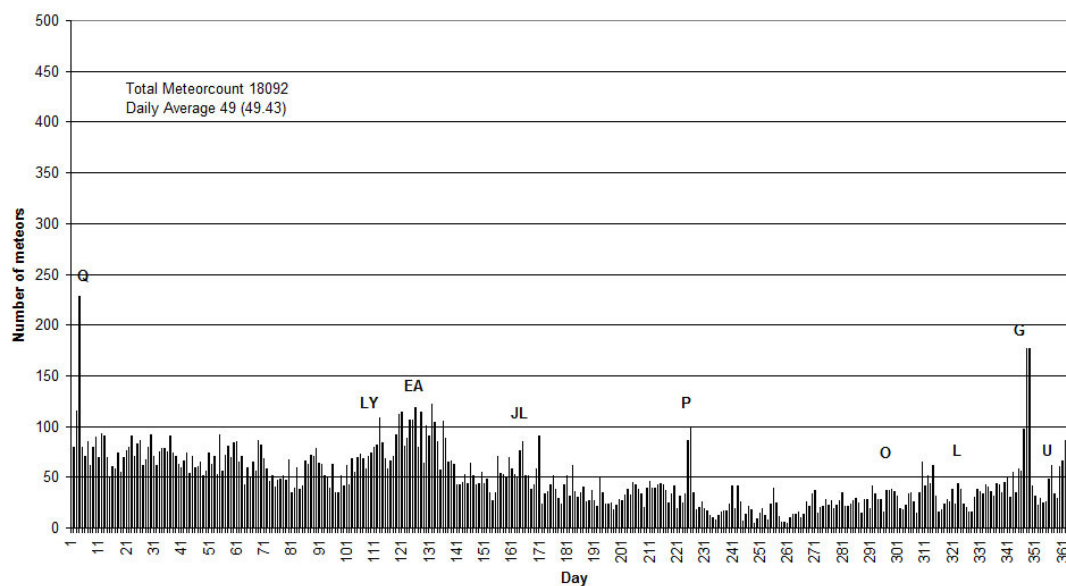
Trace showing slowing meteor, hence change in frequency due to the Doppler effect, this allows the velocity to be calculated but only the line of sight velocity not the actual velocity.



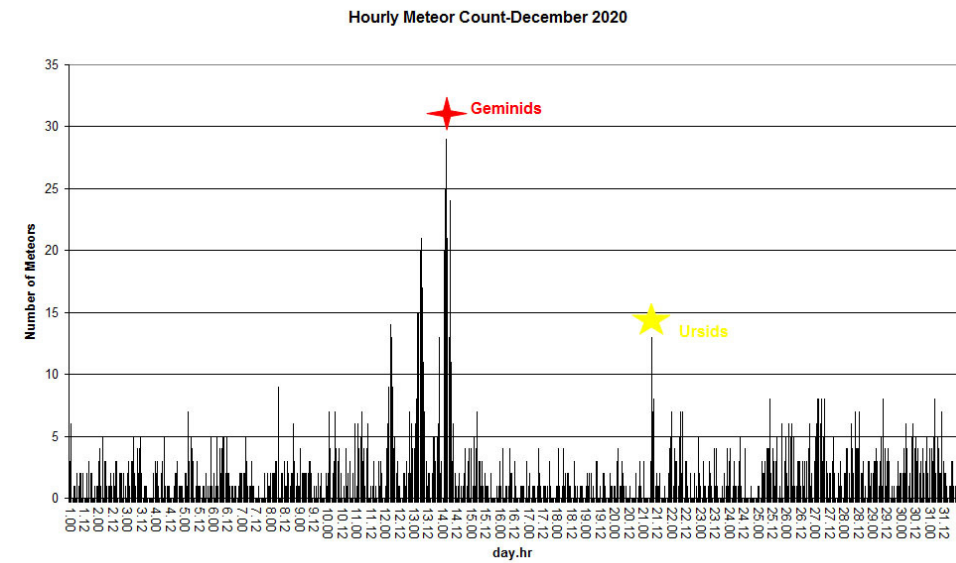




### Daily Meteors counts 2017 - 2019

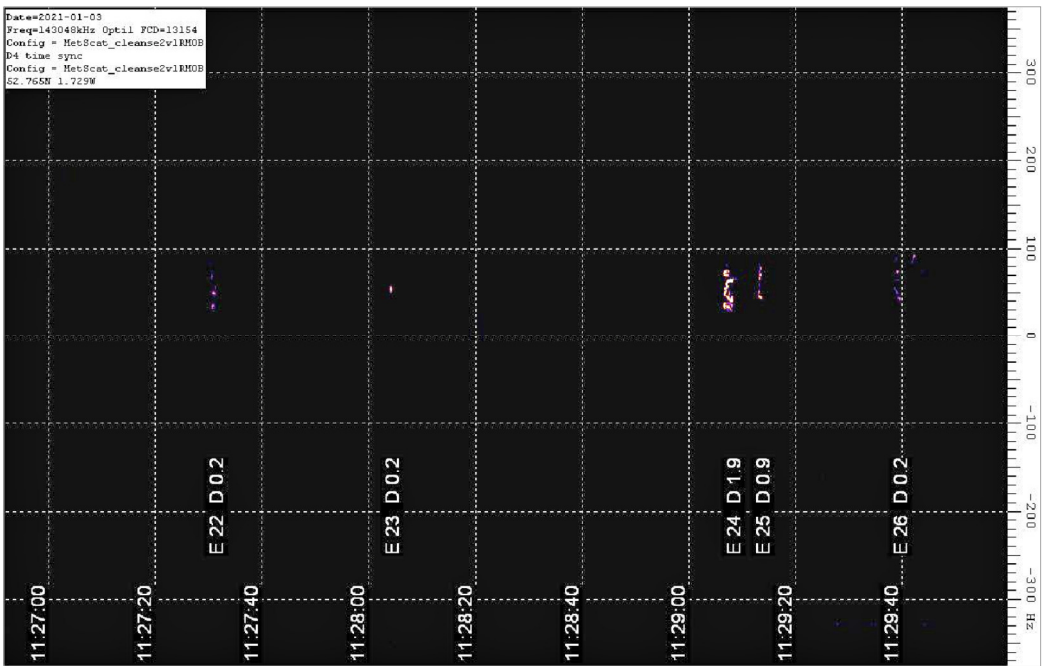
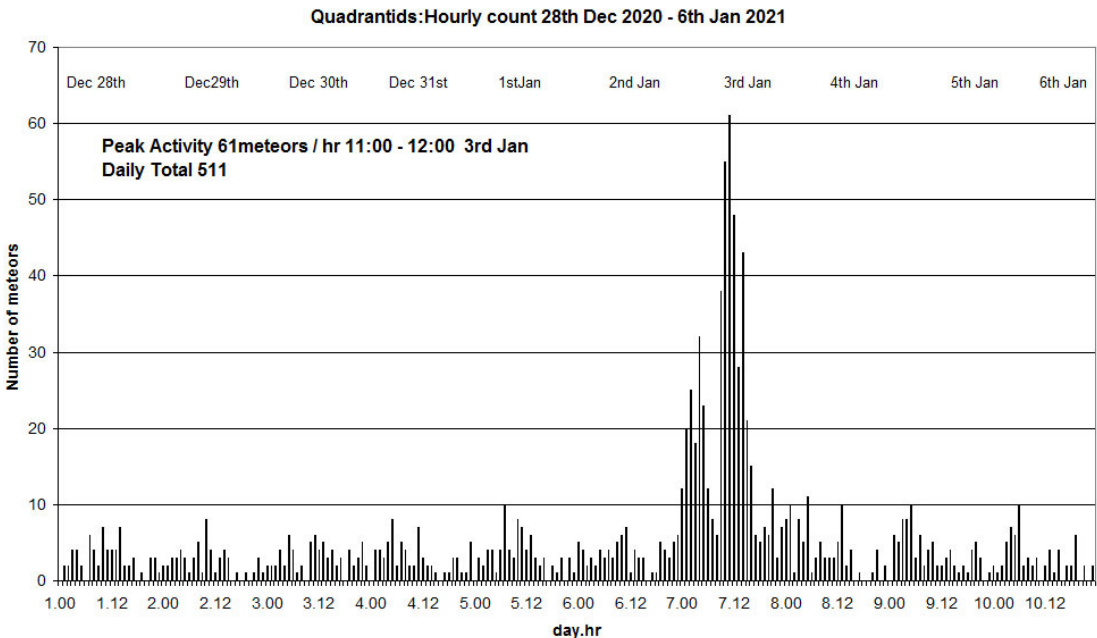


The pattern over each year is fairly similar; the major showers usually prominent, numbers vary as the earth passes through different concentrations of dust and debris in the parent comets orbit.



The end of the year sees the Geminid and Ursid showers, this years are shown below:

The increased activity at the end of December indicated the beginning of the Quadrantid meteor shower, which peaks on the 3<sup>rd</sup> Jan,. It was a shame it was cloudy because 2021 saw a prolific display, although the peak activity was around midday!



3 minute screen shot at the height of the activity.

# Observatory Newsletter - Autumn 2018

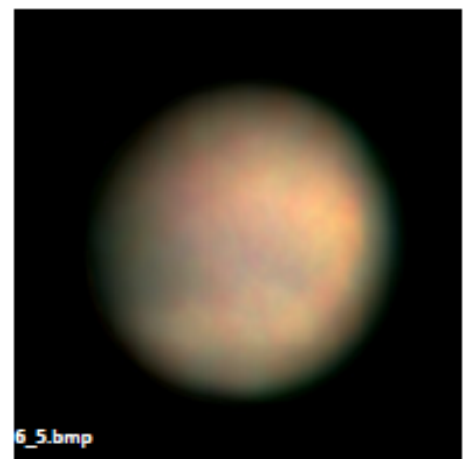
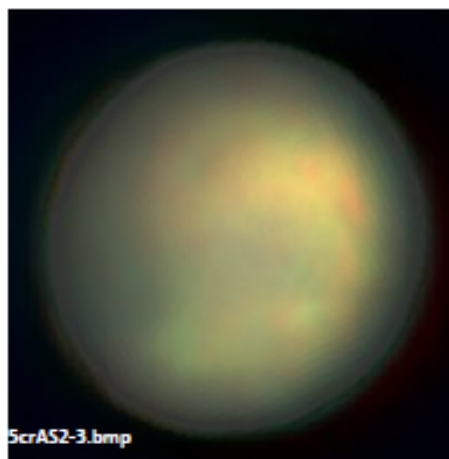
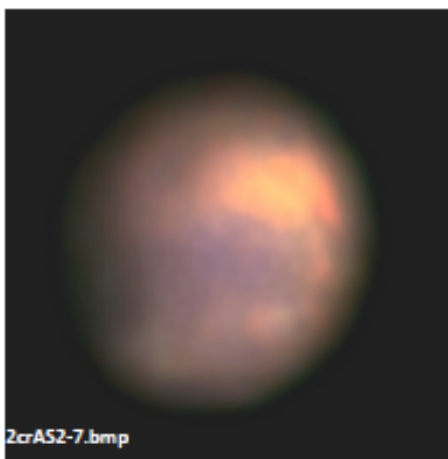
image/text © roger\_a\_firth



Having acquired 42 Giga bytes of imagery during July and August, I decided it was time to sort through it all and see what was any good. A vast array of software is employed in processing the data, and each has an extremely steep learning curve.

This nice image of a young crescent MOON was taken on 14th August. It's actually two images invisibly glued together! "Flat" and "Dark" frames were also needed to correct the optics.

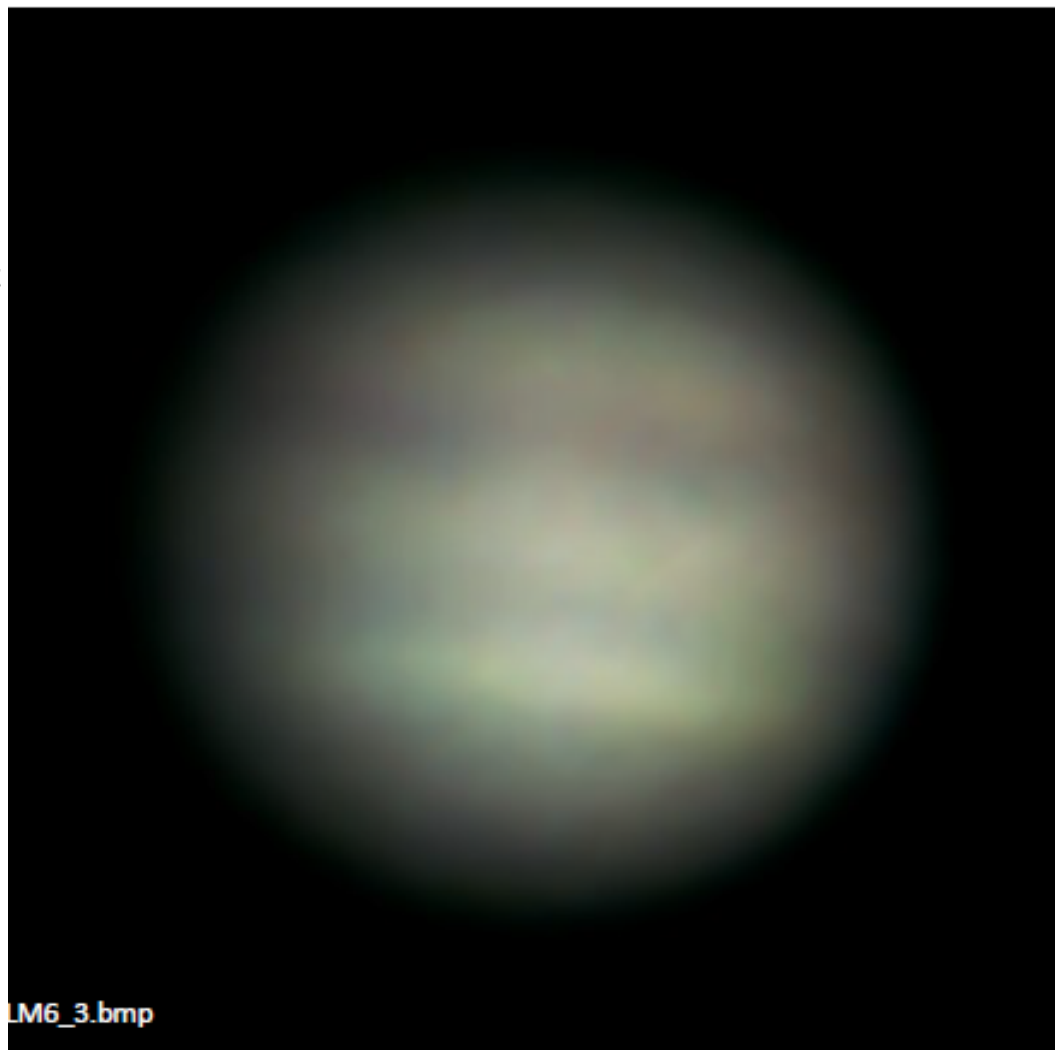
Three images of MARS are shown below. Each one is actually the same image, but subjected to different processing procedures. I think the right hand one is most realistic, but other people may have different opinions!

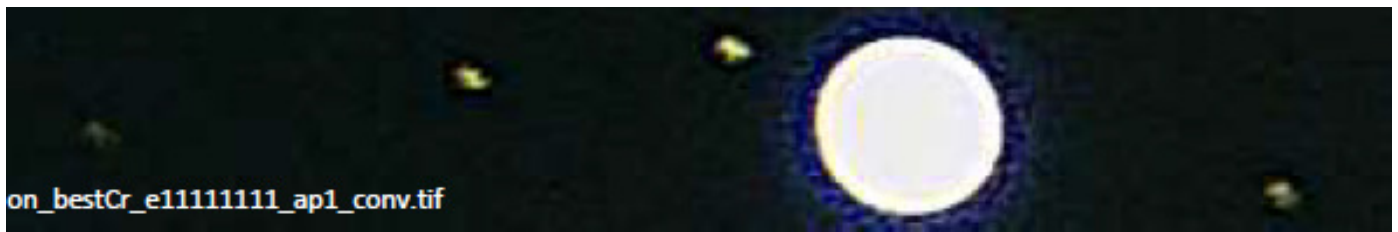




SATURN was surprisingly easy to locate and image, and is without a doubt a most impressive sight – especially for the first time. Some detail is visible, but my telescope has only a 70mm objective lens, and much more is needed to see any real detail or the separate rings.

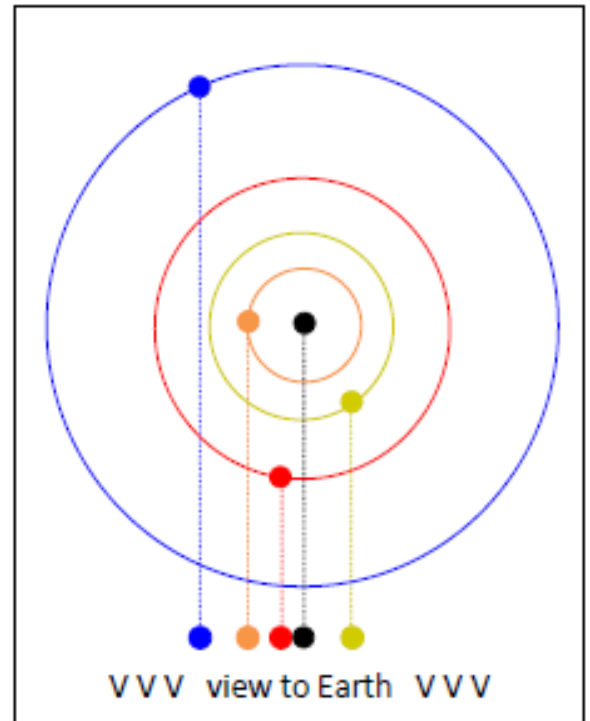
Although it is huge, JUPITER is not always easy to see. Several of its cloud belts are clearly visible in this shot – and, they are inclined at the correct angle! The famous Great Red Spot, is really quite hard to see, and anyway, was on the far side of the planet when this was taken.





Jupiter has four large moons, named the GALILEAN MOONS, for their discovery, by Galileo Galilei in January 1610, using his home-made telescope. This is how they looked on 14 August 2018, 21:18:54 BST, through my £65 Lidl telescope!

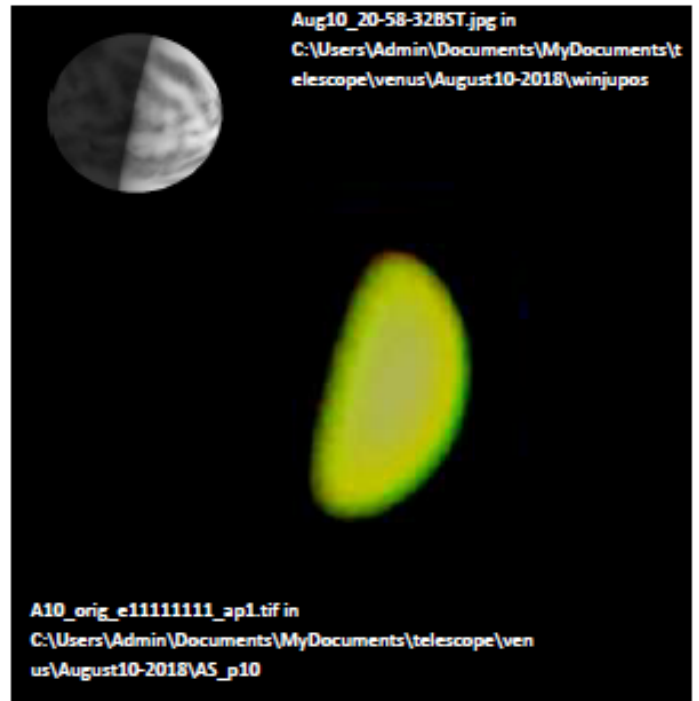
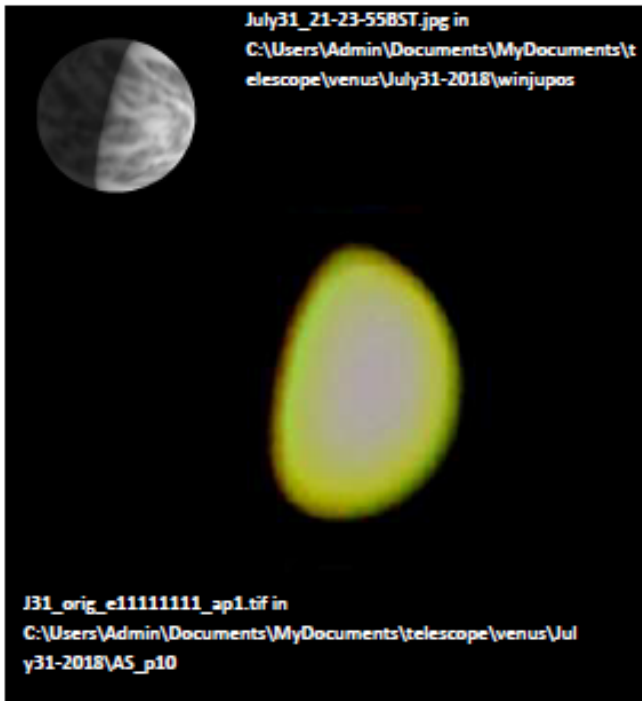
Reading from left to right in the photo above they are; Callisto, Io, Ganymede, , Jupiter, and Europa. The diagram shows approximately how they were arranged in orbit. Rather confusingly, it is obvious from the diagram that the moon nearest to Jupiter in the photo, need not necessarily be the moon that is really nearest to Jupiter. They orbit Jupiter in periods of between 1.7 and 16.7 days, and so regularly appear and disappear behind the planet.



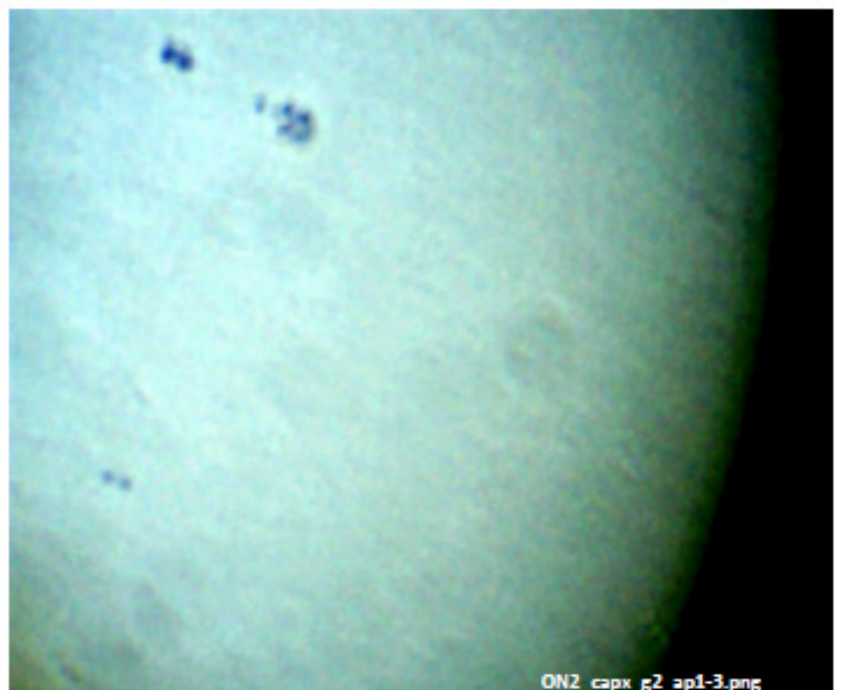
Until about 1773, when Yorkshireman, John Harrison's H5 marine chronometer was adopted by the Royal Navy, observing these "disappearances" was one method of measuring longitude at sea. Galileo himself designed the Celatone, to make this easier for navigators. It never caught on!







It was wishing to see the phases of VENUS that first prompted me to buy the telescope. Here's my photo for July31 & August10, with a predicted image. Quite good I thought. As Venus moves round the SUN, it is illuminated on one side only, & so appears a bit like the moon. Sun spots appear in 11 year cycles, and we are now in a period of minimum activity. I caught a few in these snaps, although you can only just make them out in the "full disk" image above. The crater-like objects are dirt on the lens – too late to conceal now! Remember: NEVER look at the sun. These images were taken using professional (& expensive) filter material.





## **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.**

## BOOK



## REVIEW

# 'Observing Nebulae'

by Martin Griffiths

Reviewed by Brian Dodson

Although the title says 'Observing Nebulae,' the book is much more comprehensive than that. Neither is it just a list of things to observe, although there are some.

There are a few mathematical equations, but don't worry, Martin explains these in sufficient detail to make them understandable even to my standard of maths and of course the reader doesn't have to work through them.

The book starts by Martin explaining the definition of a nebula and a history lesson in when and who discovered (or catalogued) them. Martin then introduces us to a little bit of astro-physics and the science behind the birth of stars and development of the nebulosity. He even explains how to work out how dark your skies are for observing them. I must admit, he does take every opportunity to mention the Brecon Beacons Dark Sky National Park, but who can blame him.

There are sections on equipment, such as binoculars and telescopes, mounts, photographic equipment, filters to use for observing and photographing the nebulae and even one on processing your images.

Now come the lists, the first being labelled Planetary Nebula but is in fact the extensive Lynds list on bright nebulae, of which there are 1125, followed by Barnards Dark Nebulae. Martin then gives a few of his own, but this time he gives a description and accompanies them with a photograph. He Starts with Dark Nebulae and goes through H11 Nebulae, Planetary Nebulae, Emission Nebulae and finally, Supernova Remnants such as the Crab Nebula. Each one is accompanied by the constellation within which they reside, plus their celestial co-ordinates.

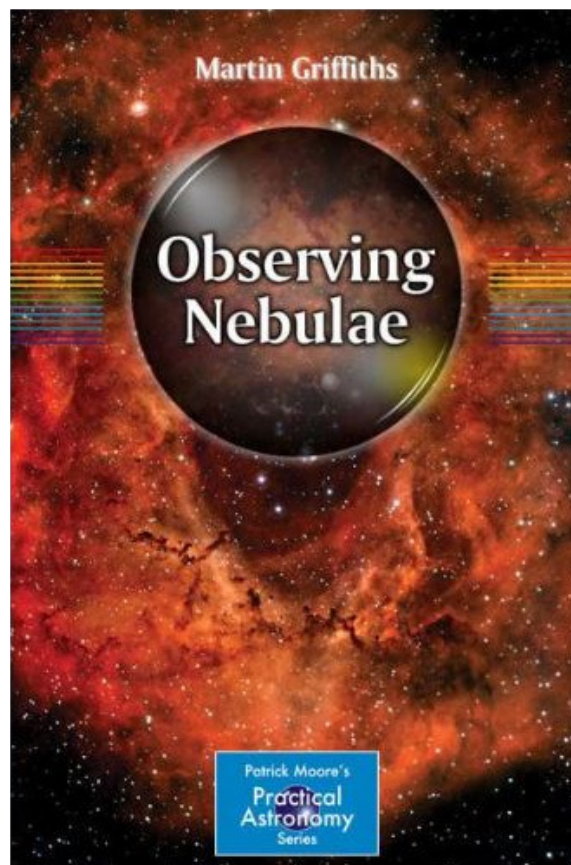
To summarize: This book has been carefully constructed not only to tell the reader where to look, but to give them enough knowledge to understand (without becoming boring) the processes at work that make these wonderful structures we strive to see or image.

I think it should be a must for any astronomer to have in their collection and I shall be taking it with me to the observatory (should we ever get out there again) and exploring its content more closely.

Probably nothing less than we've come to expect from Martin.

My opinion, Excellent!

Brian



# 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)





## Velbon GEO POD E-54 Carbon Fibre monopod

The Monopod has 'quick release snap locks' for smoother, faster operation.

4 section leg - min height 51cm to max of 159cm.

It is light weight, weighing just 371g with a diameter of 25mm. It has a foam handgrip and strong wrist strap.

Convenient and extremely portable and ideal to steady binoculars for astrophotography.

Only used a couple of times.

Same as the one pictured on the right.

**£30 ono** - contact [gillpryor@derbyastronomy.org](mailto:gillpryor@derbyastronomy.org)



Image credit Microlobe.co.uk

## Skywatcher 130

### Newtonian Reflecting Telescope

(Optical Tube Assembly only)

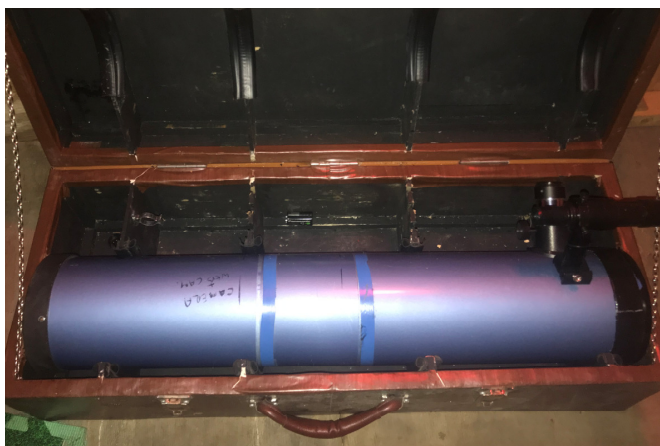
(No tripod or mount)

Comes in its own case with:

Rings & Eye pieces, 10mm, 25mm and 2 x Barlow

**£30 - ONO**

For more details contact: [secretary@derbyastronomy.org](mailto:secretary@derbyastronomy.org)



# Past Events

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

## January

22<sup>nd</sup>



This Introduction to Astronomy evening Mike Lancaster took us through a few of the more prominent Messier objects for the time of year and Peter Branson gave us a little tuition on imaging them.

23<sup>rd</sup> — 31<sup>st</sup>

We were invited to take part in the Alvaston Park Star Party once again, but rather than an evening of stargazing and exhibits we joined Katie Smith and her friends for a week of online talks and Q&A sessions. Katie had themed it around the days of the week and explained how the days got their names and we talked about things like the infra-red astronomy, telescope advice and our fantastic Moon globe. We had visitors from places like Italy and even South Africa so all in all a highly successful week.

29<sup>th</sup>

We were invited to join MKAS (Mid Kent Astronomical Society) in their Zoom presentation by Colin Stuart entitled 'How to Weigh the Universe and Planet X.'

## February

5<sup>th</sup>



We were joined by one of the DDAS's favourite speakers, Martin Griffiths, who took us on a wonderful journey through various nebulae and how to observe them, even with a small telescope. Explaining along the way what we are missing because we don't take the time to look properly.

9<sup>th</sup>

Brian informed us of a free online astronomy course through OpenLearn. The course is titled 'Astronomy with an Online Telescope' and is still available.

10<sup>th</sup>

D.A.S (Doncaster Astronomical Society) invited D.D.A.S members to join them for a talk by our old friend Colin Steele. Colin's talk was 'Corona Conundra and Prominent Puzzles'.

12<sup>th</sup>

We joined MKAS again for a talk by Jonathan Tate on 'Near Earth Objects and the Risks to Humanity.' In the talk Jonathan explained the work that the Spaceguard Centre UK, based in Wales is doing in finding and tracking the many near earth objects.

19<sup>th</sup>



The second instalment of the Astro-photography talks by Peter Branson. Peter explained how to process the images that you have captured.

24<sup>th</sup>

D.A.S hosted a talk by the exuberant Paul Money on 'Why are there no green star

26<sup>th</sup>

Was the HAPP Discussion Panel on 'SPACE TRAVEL ACROSS THE DECADES AND BEYOND' **you can catch the video of this online** at <https://www.stx.ox.ac.uk/event/space-travel-across-the-decades-and-beyond>

## March

5<sup>th</sup>



Another popular speaker was Chris North who joined us on 5 th March to talk about Gravitational Waves. Chris explained how we are detecting gravitational waves using LIGO and VIRGO and just how sensitive the detectors are, detecting a difference of 1,000 th of a proton in the length of a 4km long laser beam.

19<sup>th</sup>



Don and Brian gave us a very informative presentation on the James Webb Telescope. It is through their work with this that links have been formed with other societies and we have joined each others meetings.

26<sup>th</sup>

M.K.A.S meeting was Dr Megan Argo talking about 'When Galaxies Collide'

## April

3<sup>rd</sup>

Grand re-opening of the D.D.A.S Observatory. Well as grand as COVID would allow.

9<sup>th</sup>



The Dark side of the Universe was the subject of this talk by Peter Edwards of Durham Universit. Pete took us through some of the latest thinking about Dark Matter and Dark Energy, although he did say "No-one has a clue about Dark Energy". He obviously knew his Wimps and his method of putting over the information was really good, making what can be a very difficult subject, very easy to understand and is well worth a look.

# 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
April 17th - 8.30 PM	OBSERVING SESSION	<b>Dependent on COVID Restrictions</b> Please email the Secretary to book.	The Flamsteed Observatory
April 23rd - 7:30 PM	INTRODUCTION TO ASTRONOMY	Mike Dumelow TBC	Zoom
May 7th - 7:30 PM	ANNUAL GENERAL MEETING	Details and link from the Secretary will be sent in email to members	Zoom
May 15th - 9:30 PM	OBSERVING SESSION	<b>Dependent on COVID Restrictions</b> Please email the Secretary to book.	The Flamsteed Observatory
May 21st - 7:30 PM	INTRODUCTION TO ASTRONOMY	Mike Lancaster What's in the night sky The Summer Months	Zoom
June 4th - 7:30 PM	<b>Footprints of the Big Bang</b>	Dr Susan Cartwright Department of Physics and Astronomy The University of Sheffield	Zoom Please email the <a href="#">chair</a> or <a href="#">secretary</a> for further details
June 12th - 9:30 PM	OBSERVING SESSION	<b>Dependent on COVID Restrictions</b> Please email the Secretary to book.	The Flamsteed Observatory
June 18th - 7:30 PM	INTRODUCTION TO ASTRONOMY	Anthony Southwell Mars Probes & Missions	Zoom

## SUMMER BREAK

Depending on COVID restrictions there will be observing sessions during the summer break and the Society BBQ.  
The Secretary will be giving more information when the time comes by email or Whatsapp.

Remember you can keep in touch and up to date over the summer  
via the Website, Facebook, Twitter, Whatsapp and Emails.

AUTUMN/WINTER PROGRAMME WILL BE REVEALED IN THE SUMMER ISSUE OF ARIES.

Hopefully...

## 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)