

# NWAS NEWS

Volume 25, Issue 3

November 2019

Newsletter for the  
Wiltshire, Swindon,  
Beckington Astronomical  
Societies

Wiltshire Society Page	2
Swindon Stargazers	3
Dark Sky Wales sky preview	4-5
Beckington AS and Star Quest Astronomy Group page.	5
Space News NASA electronics cooling Boeing Escape Capsule Test ISS new oven and Spacewalk suits Space X Moon landings by 2022 Power grid nad Satellite Risk from Solar Flares Bigger Than Thought.	6-10
Transit of Mercury notes	10-11
Members Logs, images and notes	12-17
What's Up November 2019 & Leonids	18-19
Constellation of the Month Pegasus	20-21
LED Lighting Changes	22
Space Station Timings	23
IMAGES, VIEWING SESSIONS and OUTREACH	24

The Palma to Aberdeen flight BY1213 flying across the Moon at 8:57 from Chippenham. Absolute chance capture I have been chasing for years...

Not the particular flight but any aircraft going across the surface of the Moon. Using flight radar app after the event I could work out which flight was in this direction, about 15 miles east of my window shot using P1000 Nikon Coolpix with it's extraordinary zoom.

Andy

## Please read the full edition.

I normally put out a 4 or 5 page selection of pages to the meeting, but this edition has had a large amount of content from members and guests that make this a great full edition. We put this onto our web page and I send it out to our e-mail list that includes quite a few former members who have moved away but like to keep in touch with the Wiltshire Society.

One such member, Mike Alexander has moved out to live in the Canary Islands with his hearing dog Layla. He gets up to the main observatory at the top of Mt Teide and has sent in a submission to the newsletter.

John Dartnell had a picture and a large editorial in the prestigious Space Weather web site with his analemma shots, here is the full text from that NASA run page.

He has then been on a cruise to Iceland, and encountered the usual autumn weather but managed some wavy aurora shots.

PeterChappell has provided his pithy observing notes, and makes a timely reminder to all of us observers. We have enough cloudy nights to occasionally go through our equipment from eyepieces and telescope to mounts and down to the torches we use to find our way about in the dark conditions. Especially if you have to go on a car journey to get to your observing site.

Then the BBC got in touch to do a live radio broadcast about the Cranbourne Chase in the south of Wiltshire getting Dark Sky Status. This area of chalk upland and beautiful valleys is 60% in Wiltshire, with Dorset and Hampshire sharing the rest. There are some great dark skies down there that are now protected.

Meanwhile Dave Buckle picked up on the massive highways lighting changes across the county, promising all lights to be converted to full cut off LED lighting, and within the notes explain that they will be of the warmer type of light, and plan to dim them after 11pm at night.

It will be nice to see a standard that should be consistent across the county.

Meanwhile the International Astronomy Show is due to go ahead on the 15th and 16th of this month just up the Fosse Way to Leamington.

The transit of Mercury on the 11th is the last until 2032, but all the weather charts and predictions are for cloud. But Chris has arranged a meeting at the Lacock viewing area.

Budget cuts at NASA have meant they have cut their articles for out reach to small what's up with extreme US balance so I have moved to a Dark Sky Wales page.

Clear skies Andy Burns.



## Wiltshire Society Page



### Wiltshire Astronomical Society

Web site: [www.wasnet.org.uk](http://www.wasnet.org.uk)

Facebook members page: <https://www.facebook.com/groups/wiltshire.astro.society/>

Meetings 2018/2019 Season.

**NEW VENUE the Pavilion, Rusty Lane, Seend**

**Meet 7.30 for 8.00pm start**

### NEW SEASON 2019/2020

5<sup>th</sup> Nov Andrew Lound 'Uranus – George's Planet'.

3<sup>rd</sup> Dec Dr Dirk Froebrich 'Making Stars and Planets – The Hoys-Caps Citizen Science Project'.

2020

7<sup>th</sup> Jan Open Forum/Beginners Meeting.

4<sup>th</sup> Feb TBA.

3<sup>rd</sup> Mar Dr Lilian Hobbs 'Armchair Messier Marathon'.

7<sup>th</sup> Apr Pete Williamson 'The Moon and Moons of the Solar System'.

5<sup>th</sup> May Martin Griffiths 'The Habitable Zone – What is it and How is it determined'.

2<sup>nd</sup> Jun Paul Money 'Triumphs of Voyager (part 2) – Where no probe has gone before'.



### Andrew Lound.

Andrew has been presenting public lectures and staging exhibitions for nearly 40 years and has participated in over 5,000 events. He regularly tours the UK with his Trademark Odyssey Dramatic Presentations® and Lectures® and is invited back time and again due to popular demand.

He has supported astronomy and space science public awareness in the United Kingdom since the late 1970s having organised and funded many public activities in support of Birmingham Museum of Science & Industry. He was also co-organiser of the National Astronomy & Spaceflight Shows—shows of a style that changed the public view of astronomy events. He conceived and managed a large number of public science projects using developing technologies including telerobotics.

He has worked in USA, Europe, Australia, Russia, Middle East and North Africa. In 2005 he became the first western science speaker to tour Libya following the removal of sanctions. Due to the success of this work he was asked to return to Libya in 2006 to project manage a science and public awareness team to observe the total eclipse of the Sun, promote safe observation and stage a lecture tour.

Andrew is a man of many interests who specializes in space science and astronomy from both a current and historical perspective. In these fields he is renowned for his extensive knowledge which is always up to date. His research into the 18th century *Lunar Society* revealed many new and exciting discoveries about their activities including the discovery that Matthew Boulton, a man ahead of his time, had built an astronomical observatory in the grounds of Soho House, Birmingham.

**Membership Meeting nights £1.00 for members £3 for visitors**

### Wiltshire AS Contacts

Andy Burns Chair, [anglesburns@hotmail.com](mailto:anglesburns@hotmail.com)

Andy Burns Outreach and newsletter editor.

Bob Johnston (Treasurer) Debbie Croker (vice Treasurer)

Philip Proven (Hall coordinator) Dave Buckle (Teas)

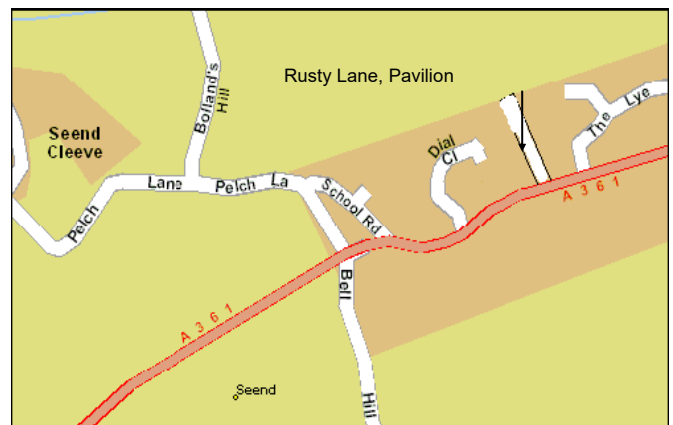
Peter Chappell (Speaker secretary)

Nick Howes (Technical Guru)

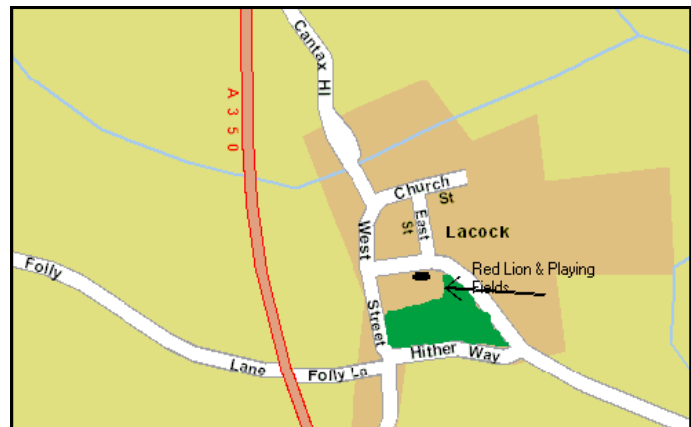
Observing Sessions coordinators: Chris Brooks, Jon Gale,

Web coordinator: Sam Franklin

Contact via the web site details.



### Observing Sessions see back page



### Members for sale/wanted

Hi Andy. I tried to put my for sale stuff on the web page but was unavailable.

Briefly this is. For sale. I EQ6pro. Go to equatorial mount (hardly used) wth controls. 1 Sealy Power Products Road Start. battery. Model RS102 v2. All for £860.00. Inspection anytime just across Rusty Lane in my garage. Phone 01380828407/ [philipproven@gmail.com](mailto:philipproven@gmail.com)

Please advise if you can put in NL or not

As ever Philip Proven

Philip is now well and the mount is for sale and can viewed by mutual timing.

# Swindon Stargazers

Swindon's own astronomy group

## November Meeting: Mark Woodland FRAS



He will be speaking on 'Exoplanets and the Charterhouse Exoplanet Project'

Mark is a fellow of the Royal Astronomical Society and committee member of the

Wells & Mendip Astronomers group.

He is an Astrophysics undergraduate with the Open University and works as an IT specialist in the NHS.

Since December 2014 he has been heading up the Charterhouse Exoplanet Project with the aim

of bringing research astronomy to the public and connecting with universities in the UK & USA to verify KEPLER data.

### Ad-hoc viewing sessions

Regular stargazing evenings are being organised near Swindon. To join these events please visit our website for further information.

Lately we have been stargazing at Blakehill Farm Nature Reserve near Cricklade, a very good spot with no distractions from car headlights.

We often meet regularly at a lay-by just outside the village of Uffcott, near Wroughton. Directions are also shown on the website link below.

Information about our evenings and viewing spots can be found here:

<http://www.swindonstargazers.com/noticeboard/noticeboard06.htm>

If you think you might be interested email the organiser Rob-

in Wilkey (see below). With this you will then be emailed regarding the event, whether it is going ahead or whether it will be cancelled because of cloud etc.

We are a small keen group and I would ask you to note that you DO NOT have to own a telescope to take part, just turn up and have a great evening looking through other people's scopes. We are out there to share an interest and the hobby. There's nothing better than practical astronomy in the great cold British winter! And hot drinks are often available, you can also bring your own.

Enjoy astronomy at it's best!

**Meetings at Liddington Village Hall, Church Road, Liddington, SN4 0HB – 7.30pm onwards**

The hall has easy access from Junction 15 of the M4, a map and directions can be found on our website at:

<http://www.swindonstargazers.com/clubdiary/directions01.htm>

### Meeting Dates for 2019

#### Friday 15 November 2019

Programme: Mark Woodland FRAS: Exoplanets and the Charterhouse Exoplanet Project.

#### Friday 13 December 2019

### Meeting Dates for 2020

#### Friday 7 January

Programme: Chris Starr FRAS MBIS: Introduction to the Night Sky for Beginners

#### Friday 21 February

Programme: Dr Jane Clark: Orbits in the Solar System

#### Friday 7 March

Programme: AGM / Bob Gatton: The Red Planet

#### Friday 17 April

Programme: Gary Poyner - Variable Stars around the Perseus Double Cluster

#### Friday 15 May

Programme: Mike Foulkes: Herschel's Planet

#### Friday 19 June

Programme: Graham Bryant - Pluto from Myth to Discovery

### Website:

<http://www.swindonstargazers.com>

Chairman: Robin Wilkey

Tel No: 07808 775630

Email: [robin@wilkey.org.uk](mailto:robin@wilkey.org.uk)

Address: 61 Northern Road  
Swindon, SN2 1PD

Secretary: Hilary Wilkey

Tel No: 01793 574403

Email: [hilary@wilkey.org.uk](mailto:hilary@wilkey.org.uk)

Address: 61 Northern Road  
Swindon, SN2 1PD



dark sky wales  
dywyllwch awyr cymru

here as an introduction to the knowledge and resources they can provide.

Along with dark sky accreditation for the Brecons, they run schools and mobile planetarium events, GCSE courses, Plus evening and night time events that are by booking in advance and will be run with other agencies across Wales and even over to Dunstable Downs.

I will be working with them at Three Cocks later in November, and at the Brecon Mountain Centre in December.

Here is the submission for November, written by Martin Griffiths, a long time regular speaker at Wiltshire AS.

### The Night Sky in November 2019

The early nights are now well advanced though the nights are colder and bring dew, the eternal enemy of the amateur astronomer. Nevertheless, there are some spectacular sights this month.

#### Moon in November:

**New:** 26th November

**First quarter:** 4th November

**Full:** 12th November

**Last Quarter:** 19th November

#### Planets in November

**Mercury:** reaches greatest elongation west on the 28th of the month and is visible in the morning sky. It will transit the Sun on the afternoon of the 11th.

**Venus:** is not visible properly this month as it is in conjunction with the Sun.

**Mars:** is an early morning object in the constellation of Virgo, rising at 04:00 by mid month.

**Jupiter:** is an evening object in Ophiuchus fading fast and setting a few hours after sunset.

**Saturn:** remains in Sagittarius, visible after sunset and is now fading to magnitude 0.6. Still, the rings are wide open and a spectacular sight though low in the south. Southern hemisphere observers will enjoy two occultations of the planet by the Moon, but these will not be visible in the UK.

**Uranus:** is in the constellation of Aries but is now past opposition and fading to magnitude 5.9. It can be seen as a small disk in a moderate telescope.

**Neptune:** can be found in Aquarius but it shines feebly at magnitude 7.9

#### Meteor showers in November

The first shower of the month is the Taurids, which peak on the evening/morning of the 6/7th November. They are becoming better studied than in former years and some bright meteors have been observed coming from this shower. The ZHR is just 12 but they could surprise.

The second is the better known Leonid meteors which peak on the 18th of November. There could be up to 40 meteors per hour for this shower, which has had storm activity in 1999. Well worth watching this shower as the last quarter moon will not spoil viewing before midnight.

#### Interesting Events in November

There is a transit of Mercury across the Sun visible from the UK on the afternoon of the 11th. The event starts at 12:35 and midpoint of the transit will be reached by 15:20 in the afternoon. Mercury should be visible as a tiny black disk. Remember to use properly filtered equipment to look at the Sun!

On the morning of the 18th, the moon is just one degree from the Beehive cluster M44.

I place I have added a Dark Sky Wales page, and I regularly help out the team, giving talks and running courses in Spain with them.

On their facebook pages (they also run a two level Facebook sites. One to put forward their events and news along with a monthly sky preview the Martin Griffiths writes and I use

Variable star Mira in the constellation of Cetus is at maximum brightness of magnitude 3.5.

#### Comets in November

Comet Borisov is a confirmed interstellar visitor but is not particularly well placed for casual observers as it is very faint. Ephemerides can be found on the minor planet centre website.

#### Constellation of the Month: Cetus

Cetus is the largest constellation in terms of area in the autumn sky, and is an amorphous collection of faint stars that mark the boundaries of the fabled "Sea Monster" that was sent to attack the beautiful Andromeda to compensate for the boasting of her mother, queen Cassiopeia. Thankfully, the hero Perseus was on hand just in time to save the fair maiden. He killed the sea monster by showing it the decapitated head of the Gorgon Medusa, thus turning Cetus into stone. Poseidon, incensed that his monster was dead, placed it in the sky in a position where it could still threaten Andromeda, and roar its disapproval at Perseus. On old star maps, Cetus is always portrayed as a whale, with huge teeth, a dog's head and generally frightful appearance, which belies the nature of these gentle creatures. Big, was obviously not always beautiful to the ancients.

Cetus contains a few objects of interest to the casual observer, but unfortunately, its low altitude as seen from Britain tends to water down the brilliance of some of them and adds one or two magnitudes to others. Identifying the group is not difficult; simply look for the head of the monster, which is the most easterly part of the constellation. Its 5 stars mark out a round outline from which it is relatively easy to figure out the rest of the constellation as it spreads south and westwards. Cetus contains the beautiful variable star omicron Ceti or "Mira", the typical object of this type of celestial wonder, in addition to several galaxies that lie within the range of amateur telescopes.

The best deep sky object in Cetus is the Sb type spiral galaxy M 77, a tenth magnitude smudge of light just under the "chin" of the monster. It is not an easy object in binoculars, but it may be seen on a good night as a faint glowing mass of grey light 60 million light years away. M 77 is a very unusual galaxy, one of the closest of a type known as "Seyfert galaxies", after the astronomer Carl Seyfert who made a study of their ultraviolet excess and their violent nuclei in the 1940's.

Seyfert galaxies are mostly spiral types characterised by very bright nuclei in proportion to their spiral arms, and also the peculiar presence of emission lines in their spectra. Further study of these galaxies has revealed that there is a tremendous amount of energy flowing out of the core of these objects, originating from a very small space at the centre. They are also radio galaxies, and some are also visible in both x-rays and ultraviolet light, evidence of intense activity, the source of which is postulated to be a Black Hole. Astronomers think that a black hole of several million solar masses is shredding stars and gas within these galactic nuclei, and ejecting some of it into space where it collides with the intergalactic medium, creating a shock wave that causes such intense radiation. Seyfert galaxies are thus related to radio galaxies and Quasars, being a little lower down the energy scale.

Galaxies worth seeking out are NGC 157 and NGC 908; two galaxies with a magnitude of 11 so don't expect to see them that well as in a small telescope they will merely be little smudges of light, and all but invisible in binoculars. NGC 157 is an Sc type spiral lying 65 million light years away, which looks a little elongated in a low power eyepiece. NGC 908 is an Sc type spiral at a similar distance to NGC 157 and is a little fainter than it. Both galaxies these can be viewed but their arms will be a dull haze with a faint core.

The flagship of the constellation is of course the beautiful red giant star Omicron Ceti, or Mira as it is commonly known. Hevelius named the star and it was the only variable star known for quite some period of time. The name means "Wonderful", and many observers will agree that it deserves its name. Mira can be seen on any autumn night even when at minimum as it varies between magnitude 4 and magnitude 9 in a period of 331 days.

On occasion, Mira becomes a lot brighter; during the late eighties and again in the noughties the star was a brilliant naked eye object shining at second magnitude, and transformed the autumn sky with its incredible orange glow that was plain to see. The spectral type is M, and the distance is roughly 300 light years, which is relatively close for such a star. Over 4000 Mira type long period variables are known, most of which have periods between 250 and 400 days, thus making convenient distance indicators, as most of these giant stars have a similar intrinsic luminosity. In November 2019, Mira reaches maximum brightness.

Mira is a very large star, probably around 300 times the diameter of our Sun, and one of only three stars in which spectral bands of water vapour have been found. At minima, the star switches most of its energy output into the infra-red part of the spectrum as it becomes an intense red colour and the surface temperature drops to only 1800 degrees Kelvin. Its oscillations can be followed in binoculars or a small telescope and is an ideal object to introduce the amateur to the vagaries of variable star observing. It is also a binary system with a red giant companion. The star is moving through space and leaving a trail of gas behind it as some mass is lost from the system, something that is typical of such large red giants.

One star of interest within Cetus is the third magnitude Tau Ceti. It is not a binary system or variable, but is a G type star of almost the same dimension and luminosity as our Sun. Tau Ceti is only 11 light years away, and due to its Sun like qualities was picked as a target for the SETI programme, the search for extraterrestrial life. In 2012 it was postulated that tau Ceti has a planetary system, with some researchers describing a 5-planet system with one planet in the habitable zone – and area where liquid water could exist on the planetary surface. No telescope yet built will show these planets however, so we will have to await any reply to our radio signals to confirm their presence. As yet no one has answered. One lovely planetary nebula worth noting is NGC 246, the “skull nebula” at RA 00h 47m 18s Dec -11.52m.18s. It is a large nebula that is almost 4 minutes in diameter and shines at 10th magnitude and looks a little like “Pac-man” from the computer game. Cetus contains little else of interest to the observer with modest equipment, although owners of large telescopes will have a red letter day with the dozens of galaxies visible in this area, most of which are around 12th magnitude and are good candidates for the scrutiny of the supernova patrol. Browsing through a good star atlas will give their positions against the star of this

## BECKINGTON ASTRONOMICAL SOCIETY

Society Details & Speakers programme can be found on our Website [www.beckingtonas.org](http://www.beckingtonas.org)

General enquiries about the Society can be emailed to [chairman@beckingtonas.org](mailto:chairman@beckingtonas.org).

### Our Committee for 2016/2017 is

Chairman: Steve Hill (email [chairman@beckingtonas.org](mailto:chairman@beckingtonas.org))

Treasurer: John Ball

Secretary: Sandy Whitton

Ordinary Member: Mike Witt

People can find out more about us at [www.beckingtonas.org](http://www.beckingtonas.org)

Meetings take place in Beckington Baptist Church Hall in Beckington Village near Frome.

See the location page for details of how to find us on our website.....

Post Code for Sat Nav is BA11 6TB.

Our start time is 7.30pm

Date	Title	Speaker
15 <sup>th</sup> November	<i>Marvellous Moons</i>	Chris Starr
6 <sup>th</sup> December	Social Evening/Member Talks/Quiz/Nosh	
17 <sup>th</sup> January	<i>The Herschel 400</i>	Jonathan Gale
21 <sup>st</sup> February	<i>Asterisms: Jewels of the Starry Sky</i>	Bob Mizon
20 <sup>th</sup> March	TBA	Steve Hill
17 <sup>th</sup> April	<i>Planetarium in the Bedroom</i>	Lilian Hobbs
15 <sup>th</sup> May	<i>It's Not Rocket Science</i>	Martin Budzynski
19 <sup>th</sup> June	Annual General Meeting <i>Member Talks</i>	

## STAR QUEST ASTRONOMY CLUB

## SPACE NEWS FOR November 2019

Our Facebook page carries a lot of these news items throughout the month.

### NASA Has a New Method For Cooling Down Electronics Crammed Together in a Spacecraft

One of the most exciting things about space exploration today is the ways in which it is getting more cost-effective. Between reusable rockets, miniaturized electronics, and low-cost launch services, space is becoming more accessible and populated. However, this also presents a challenge when it comes to conventional methods for maintaining spacecraft and satellites.

One of the biggest challenges is packing electronics into tighter spaces, which makes it harder to keep them at operational temperatures. To address this, engineers at NASA are developing a new system known as microgap-cooling technology. During [two recent test flights](#), NASA demonstrated that this method is effective at removing heat and can also function in a weightless environment.

These test flights were funded through NASA's [Flight Opportunities program](#), which is a part of the [Space Technology Mission Directorate](#) with additional support provided by the agency's [Center Innovation Fund](#). The tests were conducted using a Blue Origin's [New Shepard](#) rocket, which transported the system to suborbital altitudes and then returned it to Earth.



*The launch of the New Shepard rocket from Blue Origin's launch site in Texas on Nov. 23, 2015. Credit: Blue Origin.* The entire time, the system's functionality was monitored from NASA's Goddard Space Flight Center by NASA engineer Franklin Robinson and Avram Bar-Cohen (an engineer from the University of Maryland). What they found was that the microgap-cooling system was able to remove large amounts of heat from tightly-packed integrated circuits. What's more, the system worked in both low- and high-gravity environments with nearly identical results. As Robinson [explained](#):

*"Gravity effects are a big risk in this type of cooling technology. Our flights proved that our technology works under all conditions. We think this system represents a new thermal-management paradigm."*

With this new technology, the heat generated by tightly-packed electronics is removed by a non-conducting fluid (known as HFE 7100) that flows through microchannels embedded within or between the circuits and produces vapor. This process allows for a higher rate of heat transfer which can ensure that high-powered electronic devices will be less likely to fail due to overheating.

This represents a big departure from conventional cooling approaches, where electronic circuits are arranged out in a two-dimensional layout that keeps heat-generating hardware elements far away from each other. Meanwhile, the heat generated by electrical circuits is transferred to the circuit board and eventually directed towards a spacecraft-mounted

radiator.



*The microgap-cooling technology developed by Goddard technologist Franklin Robinson and University of Maryland professor Avram Bar-Cohen. Credits: NASA/Franklin Robinson*

This technology takes advantage of 3D circuitry, an emerging technology where circuits are literally stacked one on top of another with interconnecting wiring. This allows for shorter distances between chips and superior performance since data can be transferred both vertically and horizontally. It also allows for electronics that consume less energy while also taking up less space.

Roughly four years ago, Robinson and Bar-Cohen began investigating this technology for the purposes of spaceflight. Integrated into satellites and spacecraft, 3D circuits would be able to accommodate power-dense electronics and laser heads, which are also decreasing in size and need better systems for removing waste heat.

Previously, Robinson and Bar-Cohen had successfully tested the system in a laboratory environment. These flight tests, however, demonstrated that it works in space and under varying gravity environments. For this reason, Robinson and Bar-Cohen believe the technology may be ready for

### Boeing tests crew capsule escape system

[November 4, 2019](#) [Stephen Clark](#)

WHITE SANDS MISSILE RANGE, New Mexico — A Boeing Starliner crew capsule fired off a stand early Monday at White Sands Missile Range in New Mexico on a mile-high test flight to validate the spacecraft's emergency escape thrusters. Only two of the ship's three main parachutes deployed on descent, but Boeing officials do not expect any impacts on the planned launch of an unpiloted Starliner demonstration mission to the International Space Station in December.

The capsule did not fly with any astronauts Monday when it launched off a pad at White Sands on a fast-paced test flight, which lasted around 78 seconds from liftoff through landing. But a lot happened during the flight, called a pad abort test, exercising the Starliner spacecraft's abort engines, control thrusters, flight software, jettison mechanisms and parachutes.

The 16.5-foot-tall (5-meter) capsule propelled itself off its test stand at 7:15 a.m. MST (9:15 a.m. EST; 1415 GMT) Monday. The Starliner used the same launch pad originally built for a pad abort test of NASA's Orion crew capsule in 2010. Other than the parachute deployment failure, everything appeared to work as designed on Monday's pad abort test. "It's designed to operate with two chutes, and operate well," said Chris Ferguson, a Boeing test pilot and astronaut who will fly on the Starliner's first crewed space mission next year. "Everything landed well, all the airbags functioned properly. I was just super-jazzed that we got to where we were."

In a statement after Monday's test, Boeing said engineers will review data from Monday's pad abort test to "determine how all of the systems performed, including the parachute deployment sequence."

"It's too early to determine why all three main parachutes did not deploy, however, having two of three deploy successfully is acceptable for the test parameters and crew safety," Boeing said in a statement. "At this time we don't expect any impact to our scheduled Dec. 17 Orbital Flight Test. Going forward, we will do everything needed to ensure safe orbital flights with crew."

During a crewed launch, emergency escape engines on the base of the Starliner's service module would propel the spacecraft off the top of its United Launch Alliance Atlas 5 rocket in the event of a failure on the launch pad at Cape Canaveral.

The pad abort test Monday proved the Starliner's escape system is up to the challenge.

"This is a system we hope to never use, but it's a system that we have to have so that we can have the ability to abort any time on the way up, whether we're on the pad all the way to aborting to orbit," said Mike Fincke, a veteran NASA astronaut who will join Ferguson on the Starliner's Crew Flight Test. "And today we saw a successful test, where we saw that the our revolutionary pusher abort system could pull us away from a launch vehicle that was in trouble and get us a mile up and a mile across away to safety."

First-time space flier Nicole Mann, a U.S. Marine Corps test pilot, will join Ferguson and Fincke on the Crew Flight Test to the space station. The astronauts are expected to live and work aboard the orbiting research complex for up to six months.

Boeing is developing the Starliner spacecraft under a \$4.2 billion contract with NASA. The space agency also awarded a \$2.6 billion contract to SpaceX for development of the Crew Dragon spacecraft, giving NASA two new commercial crew capsules to fly astronauts to the space station, ending U.S. reliance on Russian Soyuz vehicles for the job.



The Starliner crew module descends under two parachutes.

Credit: Stephen Clark/Spaceflight Now

Monday's pad abort test at White Sands went by quickly, with a few flashes and bangs before two of the three main parachutes opened and six airbags inflated to bring the capsule gently back to the ground.

"While it was unintentional, we demonstrated that you can safely land with two parachutes, so I look at that as a plus," Ferguson said. "We're certainly going to look at what happened to the third (parachute)."

"Parachutes are obviously a very important element in all of this, and there's a fair amount of concern that's arisen lately over parachutes, not just in our program but across all human spaceflight programs," Ferguson said in an interview with Spaceflight Now after Monday's pad abort test. "Even on Mars, you've seen they've had some problems with ExoMars and their parachutes. So we'll take a very good look at this. We'll make sure that we understand what the root cause was, and make sure that we've adequately mitigated whatever caused it before we take humans on-board."

An early assessment of video imagery and data from Monday's test flight suggests the third main parachute never deployed,

Boeing officials said. Engineers will inspect the recovered crew module to search for the cause of the parachute issue.

"Some of the folks who have the opportunity to go back and review it say that the pilot chute did come out, but then we don't know what happened after that," Ferguson told Spaceflight Now. "The pilot chute is designed to pull the main chute out, and we confirmed that the pilot chute came out, which means that the mortar that fires the pilot chute functioned properly, but what happened beyond that, it's too early to speculate."

Ferguson reiterated the official Boeing statement suggesting the company expects the parachute issue to have no impact on the Dec. 17 launch date for the Starliner's first test flight in space.

He said there are "subtle differences" in the parachute system between the pad abort test vehicle, which is not intended to fly in space, and the next two Starliner spacecrafts. The differences "would enable us to confidently go into OFT without having to sort of retract and go and fix a problem that we observed," Ferguson said.

"But again, we have to wait for the ... investigation to sort of play out and make sure we understood what the root cause of it was," he said.

## Space station receives spacewalking gear, new baking oven

November 4, 2019 Stephen Clark



Northrop Grumman's Cygnus supply ship was captured by the space station's robotic arm at 4:10 a.m. EST (0910 GMT) Monday. Credit: NASA TV/Spaceflight Now  
NASA astronaut Jessica Meir took control of the International Space Station's Canadian-built robot arm Monday to capture a Northrop Grumman Cygnus supply ship carrying crew provisions, spacewalking gear to repair an aging particle physics experiment, tech demo satellites for the U.S. military, and an oven to bake the first cookies in space.

The automated cargo freighter arrived at the space station Monday, using GPS and laser-guided navigation to fine-tune its rendezvous along an approach corridor below the research complex. The Cygnus spacecraft held its position less than 40 feet, or about 12 meters, below the station for Meir to command the robotic arm to capture the supply ship at 4:10 a.m. EST (0910 GMT) Monday.

Engineers in mission control were expected to take over commanding of the robot arm to berth the Cygnus spacecraft to the station's Unity module a few hours later, setting the stage for astronauts to open hatches leading to the pressurized cargo carrier to begin unpacking the supplies inside.

The Cygnus spacecraft launched Saturday atop an Antares rocket from Wallops Island, Virginia, with approximately 8,168 pounds (3,705 kilograms) of food, experiments, hardware, and small satellites set for deployment in orbit in the coming months.

Here's a breakdown of the cargo manifest provided by NASA:

4,372 pounds (1,983 kilograms) of science investigations  
1,667 pounds (756 kilograms) of vehicle hardware  
1,499 pounds (680 kilograms) of crew supplies  
262 pounds (119 kilograms) of unpressurized cargo

(NanoRacks CubeSat deployer)

229 pounds (104 kilograms) of spacewalk equipment

77 pounds (35 kilograms) of Northrop Grumman hardware

37 pounds (17 kilograms) of computer resources

24 pounds (11 kilograms) of Russian hardware

The equipment inside the Cygnus cargo freighter's Italian-made pressurized compartment include tools and replacement hardware for an upcoming repair of the Alpha Magnetic Spectrometer. European Space Agency astronaut Luca Parmitano and NASA flight engineer Andrew Morgan will perform the spacewalks to repair the AMS instrument, which was not designed to be serviced in space. The complicated repairs are expected to require four or five spacewalks to complete, beginning in mid-November. Mounted on the space station's truss on the final mission of the space shuttle Endeavour in 2011, the Alpha Magnetic Spectrometer is effectively a powerful magnet that attracts cosmic rays, subatomic particles traveling through space at nearly the speed of light.

Three of the four coolant pumps on AMS's silicon tracker, which measures the trajectory and energy of the cosmic rays captured by the instrument, have failed, prompting NASA engineers to develop a plan to repair the coolant system. The work required the development of special tools to cut into the AMS instrument, install new hardware, and re-seal tiny coolant lines.

The Alpha Magnetic Spectrometer was never designed to be serviced in space. Read our [earlier story](#) for details on the repairs.



The Alpha Magnetic Spectrometer instrument has been collecting data on the International Space Station since 2011. Credit: NASA There were 15 small satellites riding aboard the Cygnus spacecraft for Saturday's launch.

The biggest of the group is a U.S. Air Force satellite named STPSat 4, which weighs roughly 220 pounds (100 kilograms) and will be transferred into the space station's Kibo module by astronauts the Cygnus hatch is opened. Sponsored by the military's Space Test Program, STPSat 4 will be one of the largest satellites ever deployed from the space station.

STPSat 4 carries five experiments from the Air Force Research Laboratory, the U.S. Air Force Academy, and the U.S. Navy. The experiments will test radio frequency module tiles, help develop new solar array technology, collect data with a miniaturized space weather instrument, demonstrate the performance of an advanced U.S.-built star tracker, and assist in nanosatellite tracking. Craig Technologies, based on Florida's Space Coast, is providing integration services for the STPSat 4 spacecraft, which will be released from the Space Station Integrated Kinetic Launcher for Orbital Payload Systems, or SSIKLOPS, deployer. The mechanism, which was first used in 2014, is designed to release small satellites with masses between 100 and 200 pounds.

The other CubeSats on-board the NG-12 mission are sponsored by NASA, the Air Force, and the National Reconnaissance Office. NanoRacks, a Houston-based space services company, arranged the launch of most of the CubeSats.

Some will be ejected from the space station after the Cygnus spacecraft's arrival, and others will be released from the Cygnus itself after the cargo vehicle departs the station in January.

Other payloads aboard the Cygnus supply ship include a rodent research experiment. Scientists loaded mice into the spacecraft to

investigate how the animals respond to changes in their "circatidal" clock in microgravity.

The 12-hour circatidal clock, in which animals experience equal amounts of light and dark phases each day, is associated with maintaining stress responsive pathways. Scientists want to know if exposure to microgravity changes the animals' circadian rhythm.

Recent research shows that genes associated with the 12-hour clock are linked with the most common form of human liver disease. The rodent research experiment on the space station could reveal new insights into liver disease, and give scientists ideas for new pharmaceutical treatments, according to NASA.

The Cygnus also carries an experimental garment that astronauts could use to protect themselves from harmful radiation on future deep space missions to the moon and Mars, outside the natural shielding of Earth's magnetic field.

The Cygnus also delivered an oven to the space station designed to bake cookies in microgravity, demonstrating technology that will help future crews cook their own food on lengthy expeditions to the moon or Mars.

But an oven in microgravity doesn't work the same as one on Earth. The heating elements on the Zero-G Oven, developed by Zero G Kitchen and Nanoracks, are arranged around the oven to focus heat in the center, similar to the way a toaster oven works.

"Currently, on the International Space Station, there is really a limited ability to prepare foods in ways that we're used to," said Ian Fichtenbaum, founder and co-chef of Zero G Kitchen.

Astronauts will load cookies into the oven on a special tray designed to keep the food from floating away in microgravity. Temperatures inside the oven will reach up to 350 degrees Fahrenheit (177 degrees Celsius) during baking, according to NASA.

"Baking in space is different because there's no gravity," Fichtenbaum said. "On earth, that air is churning around in the oven, and that's convection. In space, that is not happening. Instead, we have to use conduction through the oven, conduction through the air, to warm it up."

The first cookie to be baked in space comes from Double-Tree by Hilton, which provided chocolate chip cookie dough for the baking experiment.

"Science is awesome, food is awesome, and this is just going to be an amazing journey to see what comes out of this," said Jordana Fichtenbaum, founder and co-chef of Zero G Kitchen.

## **SpaceX is Sure They'll be Able to Land Starship on the Moon in 2022**



Things are looking pretty good for Elon Musk and SpaceX, the company he founded back in 2002 with the intent of reinvigorating space exploration. In the last six months alone, SpaceX has deployed the first batch of its Starlink broadband internet satellites to space, conducted two successful untethered tests with the *Starship Hopper*, and finished work on the first orbital-class *Starship* test vehicle (the Mk.1).

And at the [70th International Astronautical Congress](#), which took place last week in Washington, DC, SpaceX president and Chief Operations Officer Gwynne Shotwell provided additional details about the *Starship*'s mission timeline. As she indicated during a series of interviews, the company hopes to



be sending the *Starship* to orbit next year, landing on the Moon by 2022, and sending crews to the lunar surface by 2024.

**Astronomers See Strontium in the Kilonova Wreckage, Proof that Neutron Star Collisions Manufacture Heavy Elements in the Universe**

Astronomers have spotted Strontium in the aftermath of a collision between two neutron stars. This is the first time a heavy element has ever been identified in a kilonova, the explosive aftermath of these types of collisions. The discovery plugs a hole in our understanding of how heavy elements form.

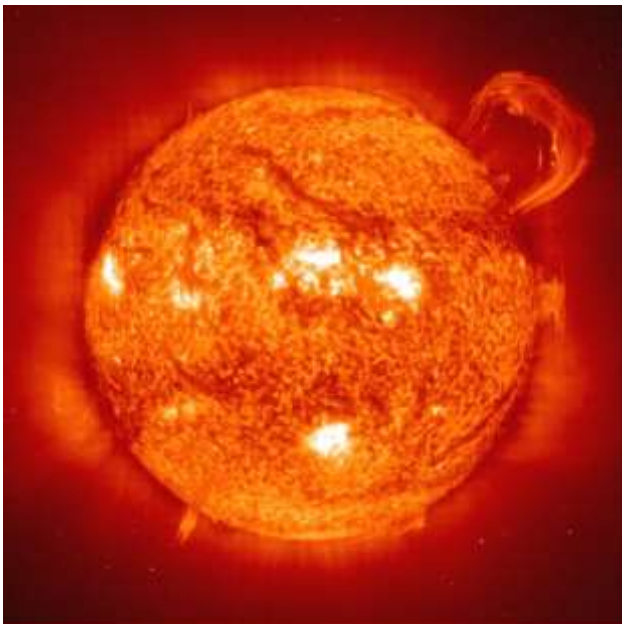
In 2017, the Laser Interferometer Gravitational-Wave Observatory (LIGO) and the European VIRGO observatory detected gravitational waves coming from the merger of two neutron stars. The merger event was named [GW170817](#), and it was about 130 million light years away in the galaxy NGC 4993.

The resulting kilonova is called AT2017gfo, and the European Southern Observatory (ESO) pointed several of their telescopes at it to observe it in different wavelengths. In particular, they pointed the Very Large Telescope (VLT) and its X-shooter instrument at the [kilonova](#).

**Power Grids and Satellites Are More at Risk from Extreme Solar Storms Than We Thought**

Exactly how dangerous are solar storms? Scientists think the Carrington Event was one of the most powerful ones to ever hit Earth. They also think that storms that powerful only happen every couple centuries or so. But a new study says we can expect more storms equally as strong, and more often. The [Carrington Event](#) was a massive coronal mass ejection (CME) that struck Earth on September 1st and 2nd, 1859. CMEs that powerful slam into the Earth's magnetosphere, warping it and causing low-latitude auroras. The Solar Storm of 1859, as it's also known, also caused telegraphs around the world to fail. It's a well-known, well-studied and well-documented event.

But most of what we know about that storm comes from observations and reports from the Western Hemisphere. In a new study published in the American Geophysical Union's journal [Space Weather](#), scientists set out to gather reports and observations from around the world, to try to paint a more complete picture of the storm.



Sun with a huge coronal mass ejection. Usually the Sun's magnetic field lines contain the plasma, but sometimes the lines break and the plasma is ejected. Image credit: NASA  
The lead author of the study is Hisashi Hayakawa, an astrophysicist at Osaka University in Osaka, Japan and Ruther-

ford Appleton Laboratory in the United Kingdom. In a [press release](#), Hayakawa said, "The Carrington Event was considered to be the worst-case scenario for space weather events against the modern civilization... but if it comes several times a century, we have to reconsider how to prepare against and mitigate that kind of space weather hazard."

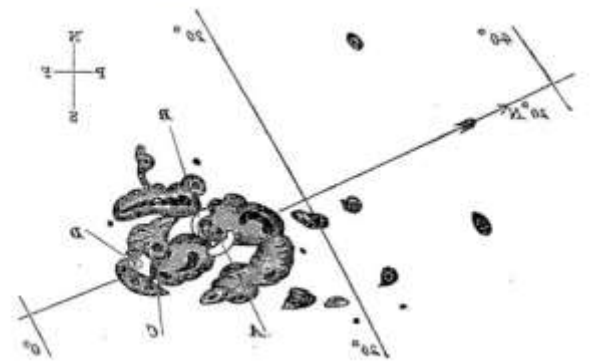
During a coronal mass ejection, a massive blob of plasma is emitted from the Sun's outer atmosphere, or corona. They're often preceded by solar flares, and are associated with groups of sunspots in active regions of the Sun's surface. Usually the plasma is trapped by the Sun's magnetism, but when the magnetic field lines are broken, the plasma can escape.

Our modern world is a lot more vulnerable to these storms than the world of 1859 was. Magnetic storms of that magnitude wreak havoc with our satellites, power grids, communications, and anything else that relies on electromagnetic waves. Hayakawa and his team wanted to know if we really understand how frequent and powerful these storms are.

The team of scientists organized an international collaboration to gather more data on the 1859 storm. They felt that since most of the data and observations were from the Western Hemisphere, there might be a gap in our understanding of the storm. They gathered historical observations and data on the auroras the storm caused from the Eastern Hemisphere and the Iberian Peninsula.

The team also collected reports from newspapers in Portugal, Spain, Australia, New Zealand, Mexico and Brazil. They also got observations of the storm's auroras from the Russian Central Observatory, and from Japanese diaries. From the west, they had data from more newspapers, scientific journals, and even ship's logs. They then compared the two bodies of reports.

Unpublished drawings made by European astronomers during the storm were another source. Those drawings allowed the scientists to find where the storm originated on the Sun's surface, and to track the sunspot as it grew and shrank.



These drawings were made by Richard Carrington, the amateur English astronomer which the Carrington Event is named after. His observations helped show the existence of solar flares. The top drawing is the entire solar disc and the bottom is the sunspot that generated the strongest white-light flares. These drawings are reversed from the originals. Image Credit: Royal Astronomical Society.

### What Did They Find?

Their paper shows that the Carrington Event is not as unique as we thought. The authors think that the sunspots that spawned the 1859 solar storm on September 1st and 2nd launched multiple other bursts. Those outbursts happened from early August to early October, and a solar storm happened in late August. The late August storm, according to the researchers, happened around August 27th 1859. It sent out separate CMEs strong enough to impact Earth's magnetic field. They also think that the August 27th storm helped make the Carrington Event reach the intensity that it did. After reconstructing all that activity, the authors compared the Carrington Event to other storms in 1872, 1909, 1921, and 1989. They found that two of them – in 1872 and 1921 – were comparable to this event. But the 1989 storm caused massive power outages in Quebec, Canada. The researchers concluded, logically, that the Carrington Event wasn't the unique, powerful storm that we think it was. According to Hayakawa, the implication is clear. "While the 1859 storm was certainly one of the most extreme events, this seems at best comparable to the 1872 storm and 1921 storm in terms of its intensity," he said. "So, the Carrington event is no longer something unique. This fact may require us to reconsider the occurrence frequency of this kind of 'worst-case scenario' of space weather events." We are increasingly more vulnerable to these coronal mass ejections. We know a lot more about their source and frequency, and their effects, than we did in 1859. But are we more prepared? For now, most of the preparation for solar storms lies in accurate forecasting. Knowing when one is coming allows everybody from the International Space Station astronauts to power transmission utilities to respond. There are a variety of ways to protect things like transmission lines from intense solar storms. Capacitor banks, Faraday cages, and special dampening devices could all help. But none of them are a perfect solution, and one [2017 study](#) suggested it could cost up to \$30 billion dollars just to protect the power-grid in the USA.



The ESA is considering a LaGrange Mission which would give us more advance notice of dangerous CMEs. Image Credit: ESA/A. Baker, CC BY-SA 3.0 IGO Some scientists have floated the idea of a [massive magnetic shield](#) between the Earth and the Sun. Sitting at the Earth-Sun LaGrange Point 1, the shield would offer the same type of protection that the Earth's magnetic field already does, but more of it. But that's just an idea at this point. In the mean time, the best bet is to know when a storm is coming and to shut down the power system in hopes of minimizing the damage. Future missions like the [ESA's LaGrange Mission](#) might help with that. As far as satellites and communication systems go, protecting them is a work in progress, and nobody seems to have an answer, yet.

### Transit of Mercury

Watch the transit of Mercury live This November, Royal Museums Greenwich will be broadcasting the transit of Mercury live online using state-of-the-art [telescopes](#) from the Royal Observatory. Our live feed with expert astronomers is one of the safest ways of seeing the transit. Don't miss this extremely rare astronomical event. After all, it won't happen again until 13 November 2032...

#### What is the transit of Mercury?

A transit occurs when one object in the sky appears to cross the face of another.

The transit of Mercury occurs when the planet Mercury crosses directly between the Sun and the Earth, blocking out a small part of the Sun's rays. During the transit, Mercury appears as a tiny black dot moving across the disc of the Sun.

Mercury and Venus are the only planets that can be seen transiting the Sun from the Earth, as they are the only planets that orbit within Earth's orbit.

#### When is the next transit of Mercury?

The next transit of Mercury takes place on 11 November 2019.

The transit will begin at around 12.35pm UK time and will continue throughout the afternoon (see the table below for more details). Mercury will be closest to the centre of the Sun as seen from London at 3.19pm; timings for other parts of the country may vary.

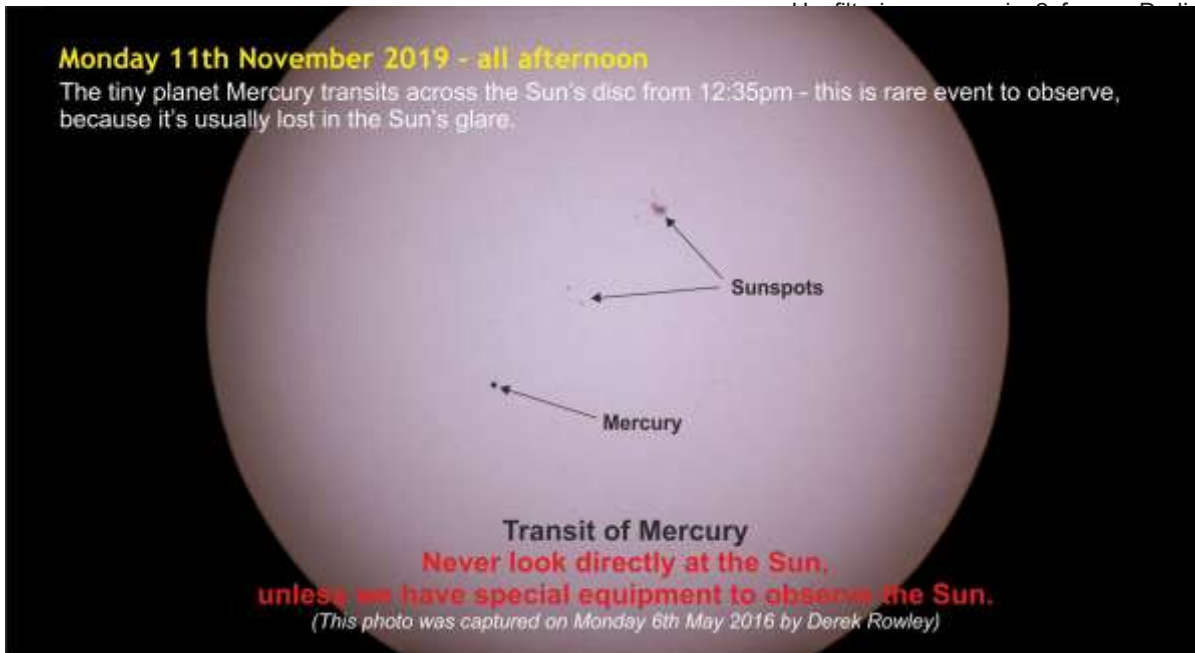
#### How long will the transit of Mercury last?

The 2019 transit of Mercury will last around five-and-a-half hours, although the Sun will have set in the UK before the transit is complete. The table below has full timings for the transit of Mercury as seen from London; timings in other parts of the world will vary.

Transit of Mercury - 11 November 2019 timings		
Time (GMT)	Event	Notes
12.35pm	Transit of Mercury begins	Mercury's outline first touches the Sun's edge
12.37pm	Full transit begins	Mercury fully enters the Sun's disc
3.19pm	Mercury at Sun's centre	Mercury is closest to the Sun's apparent centre
4.17pm	Sunset in London	Transit continues but will not be visible in UK

**Warning: NEVER look at the Sun without the use of proper safety equipment. This can cause permanent damage to the eyes. We will talk about some of the available equipment below, but if you have any concerns at all, please give us a call.**

With the next transit of Mercury coming up on Monday 11th November, you may be thinking about wanting to have a look. Of course, looking directly at the Sun is dangerous, especially through an unfiltered telescope. However, with the right equipment, you can easily and safely observe the Sun and any transit!



...nted solar telescopes, popular dedicated solar and Double Stack telescopes. The Lunts power, and are ready "warm-up" time.

... This product is used behind the diagonal to you to convert any\*

Quark itself. Between UV/IR cut filter, such front of the diagonal. -mounted Energy Re- /IR rays from entering

...ry safe and enjoyable of the Sun is constant- lar flares erupting and ...ots evolving over the up before your eyes.

...due to personal com-

There are 2 types of solar viewing: White light, and H-Alpha (Ha).

#### White light

White light filters work by reducing the intensity of the light passing through by 99.999%. This not only makes the Sun safe to look at, but you can also place it in front of an optical device (including telescopes and binoculars) to view the sun at a higher magnification. In white light, you see the "surface" of the Sun, as well as Sunspots, any granulation on the surface, as well as transits. Transits don't just have to be planets, they can also be satellites (such as the ISS), birds, planes, and also the Moon when eclipses occur!

White light filters are typically very inexpensive and easy to use. They can simply be mounted in front of any optical device you are using (**note: It is important that the filter goes at the front of the optical train. If the filter goes at the back, such as between an eyepiece and your eye, irreversible damage could occur to your vision**). They were most popular in the form of glass filters that sat over the front of a telescope, however more popular recent options come in the form of a metallic sheet, similar in appearance to aluminium foil. These are less fragile to use than glass covers, and are more versatile in that they can be made larger at cheaper prices.

Explore Scientific manufacture the Solarix solar film. If you are looking for a great-value all-in-one solution to see the transit, there is the Solarix telescope, complete with the needed safety equipment. The film is available in A4 sheets [here](#).

Baader Planetarium manufacture the AstroSolar Safety materials. This can be bought in either [A4 sheets](#) if you would like to make your own holder, or can be bought with pre-built holders for [telescopes](#), [spotting scopes](#) and [binoculars](#). If you would like to know which size pre-built you need, please click [here](#). Baader's sheets come in 2 options: ND5.0 for visual use, or ND3.8 for photographic use. Do **not** use the ND3.8 for visual use, as it has been designed to give brighter images of the Sun for shorter photographic exposures, too bright for visual use. Photographs can easily be taken through the ND5.0 as well.

You can also get Solar Wedges (Herschel Prisms) built by Baader Planetarium, Lunt Engineering, and Altair Astro. These are designed to work with refractors without rear elements, and provides a sharper view of the Sun in white light. The Baader and Altair ones even come with a solar finder built-in to the back, making it easy to find the otherwise surprisingly difficult to find Sun!

#### Hydrogen Alpha (Ha)

H-Alpha filters work by passing through a single specific wavelength of light, the 656.3nm Ha wavelength. Powerful eruptions, known as prominences (Solar flares), rise up from the edge of the Sun and fall back down on the surface. Also the surface itself is generous with exciting effects, like turbulences, flares, and filaments. Unbelievable enormous quantities of vibrant energy, directly before your eyes.

Would it be possible to mention the planned observation of the Mercury transit on Monday 11th.

It will be held at Lacock and assuming the weather is kind to us I will be there from around Noon until sunset and will have a couple of telescopes available.

People on the observation mailing list should get a reminder on the 8th and an on/off email on the morning of the 11th.

Cheers Chris

## E Mails Viewings Logs and Images from Members.

Here are my submissions for the November 2019 newsletter.

First, details of my analemma featured on [www.spaceweather.com](http://www.spaceweather.com).

Rare ANALEMMA x 6

Explanation from [www.analemma.com](http://www.analemma.com) :

"If you could record the position of the Sun in the sky at the same time every day, let's say sometime around noon and subtracting one hour if you are observing daylight saving time, you would notice that the Sun takes a rather strange path. You might notice that at certain times throughout the year the Sun's position not only varies higher and lower (North and South) as you would expect with the change of the seasons, but also slightly East and West. This figure-8 path that the Sun makes in the sky is called the *analemma*. On some days you might notice that the Sun is not in the sky where, according to the time on your watch, you would expect it to be.

The difference in time between what your watch reads and the position of the Sun (clock time vs. Sun time) is called the *Equation-of-Time*. If you are in the northern hemisphere and the Sun's position is to the East of where your watch indicates it would be, the Equation-of-Time is negative. If the Sun is to the West, the Equation-of-Time is positive."

The East and West movement is due to the orbit of the Earth around the Sun being an ellipse. As a result the Earth's speed along its orbit varies during the year. It moves fastest when closest to the Sun in January and slowest when farthest from the Sun in July. So, for a point on the Earth's surface as the Earth rotates it may take slightly less or slightly more than 24 hours for the position of the Sun in the sky to be where you expect it to be. This can mean a difference of up to 15 minutes in some cases.

If you study some sundials you will see the analemma figure of eight shape on the dial. On sundials it is used to correct the difference between Sun time and clock time. When the tip of the shadow touches the point on an analemma this is the correct clock time on the dial.

This image shows six analemmas with traces of three others showing the position of the Sun. There are at least six because in this case the position of the Sun was captured every hour not just at noon.

The upper and lower tips of each "8" represent the Summer and Winter solstices--the longest and shortest days of the year. Equinoxes occur near the necks.

In all, this one picture captures the position of the Sun every hour over 12 months of exposure time on a single photographic paper--from Sept. 2018 to Sept. 2019.

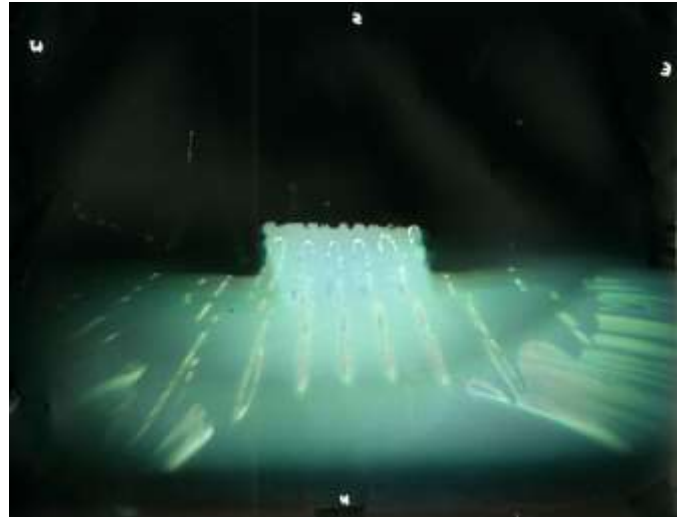
The equipment to get this picture was a pinhole camera made from a biscuit tin. Inside the tin was a battery clock driving a rotating disc with a cut out slot acting as a shutter to give an exposure every hour.

Iflord photographic paper. Post processed for contrast with Photoshop CS2.

Spaceweather links:

[http://spaceweathergallery.com/indiv\\_upload.php?upload\\_id=156615](http://spaceweathergallery.com/indiv_upload.php?upload_id=156615)

<https://www.spaceweather.com/archive.php?view=1&day=04&month=10&year=2019>



Second, a selection of my Aurora (Northern Lights) images from my recent cruise to Iceland with the Plough clearly recognisable. These were all taken at sea with the ship rocking and rolling and me anchoring the tripod against the motion of the ship and the wind! As a result they don't show sharp stars – they are ei-



ther streaks, circles or squiggles! Despite this, I had a



queue of passengers trying to take photographs of my Aurora images from my camera screen with varying degrees of success. Image details – 18/10/2019 Canon 1300D, Samyang 14mm (effective focal length 22mm), F2.8, ISO 1600, 10-15 seconds.



I did manage to see the Aurora for three consecutive nights, two at sea and very briefly in Reykjavik. Unfortunately on arrival at Reykjavik on Saturday the sky was clouding over and I did not get time to set up the camera before they disappeared in cloud for the remainder of the night. Then the weather got worse and even my Northern Lights tour on the Sunday evening was cancelled. We left Iceland on Monday afternoon so I did not get any land based images.



After leaving Iceland the weather really turned against us. The ship was caught up in a storm for approx. 36 hours with 40-50 knot winds and 5 metre plus waves! An interesting experience as those of us still on our feet were left wondering where all the other passengers had gone – empty lounges, empty dining areas, even empty bars but cabin corridors decorated with “Do not disturb” signs on doors!

Clear Skies,  
John Dartnell

*John, I remember these problems from a cruise I did with Sheila, a month before she died, visiting Norway and the Fjords which were to high sided to see aurora then out at sea storms up to force 11... but at least I grabbed some shots...*

### Viewing Log for 27<sup>th</sup> of October

Finally there was a clear sky and I had a free Sunday evening and with the moon not rising until early morning I should have a good session?

I arrived at my usual viewing site near Uffcott just off the A4361 south of Swindon and noticed the hedges could do with a good cut for winter? They must have been over nine feet high, so anything close to the horizon I would not be able to view! Anyway I started setting up my Meade LX 90 GO-TO telescope and found the batteries in my head set to be very dim, I had to use white light from my phone to level the tripod and carry on setting up the telescope using white light (not the best way to keep your night vision!) I found a red torch in the Meade box but that was flat, as well! I found some spare ‘AAA’ batteries in one of my eye piece boxes and replaced the ones in the headset. I noticed while changing them, there was some corrosion on the + terminal which could affect the lighting? Anyway I had the telescope set up and ready by 20:23, with there being no wind it did not feel cold even with an air temperature of + 2°C. While setting up I noticed the last time I had been out with a telescope was 24<sup>th</sup> of August, just over two months ago, I needed a fix!

My first target was the star Fomalhaut in the constellation of Piscis Austrinus, this is the lowest first magnitude star that can be seen from the shores of the UK, and I could pick it up thru some branches in the hedge! Saturn was still above the horizon at this time but was well in the hedge, so the only planets on view would be Uranus and Neptune. Over the last few session I have slewed my telescope to Uranus and not been sure that I have seen it, this was the same tonight, shining at mag 5.8 it should be an easy target to locate and see? Anyway off to Neptune and look at the last planet in the solar system, it was okay to look at.

I thought the seeing condition were very good as I could make out six stars of the Pleiades with my own eyes very clearly (for people who do not know me that well I am not great at making objects out in the night sky?) I could see the Milky Way very clearly overhead going thru Cygnus and heading to the horizon. So I thought I would start in that constellation and look at Messier (M) 39, a very loose Open Cluster (O C), this cluster looked better with the finder scope and not the main scope, I was using a Pentax XW 14 mm eye piece (usual eye piece for this telescope) which gave a magnification of around 143? Off to M 29 which was nearly dead centre in the eye piece, this O C was good to look at. A new challenge for me is the Crescent nebula Caldwell (C) 27, this is fairly hard to see with the naked eye, I think I saw it when I moved the eye piece around the area, something seem to move? Maybe this has taken over from M 97, the Owl nebula as my nemeses? On to the head of the swan and the double star Albireo a very nice yellow and blue star, probably the best double star in the night sky? Going south from Albireo you soon come across M 27, the Dumbbell nebula, this Planetary Nebula (P N) was good to look at. Going in the other direction from Albireo you come across M 56, a small compact Globular Cluster (G C). My second P N of the night and probably the best in the northern sky was M 57, the Ring Nebula, my reaction was brilliant to look at.

When I do a viewing session unless I have a planned viewing list like the Herschel 400 or the Messier list I sometimes just look at pages from my Sky & Telescope Pocket Sky Atlas and see what I can find on different pages in an area? One object I do not often visit is M 71 in Sagitta (constellation that does not often come on the radar), this faint G C was not much better than the faint fuzzes galaxies I have to deal with sometimes? Onto the best G C in the northern sky and M 13, I could make out some stars (good seeing conditions), I followed this up with M 15 in Pegasus, there is not much differences in these G C's, both brilliant! If you are ever doing the Messier marathon of 110 objects in one night (not that you could all of them from the UK in one night?), the last object would be M 30 in Capricornus, this small dim G C

could easily be overlooked? I found the Helix nebula C 63 in the atlas and when I located it was no more than a fussy blob (F B) to look at, at least it was the third P N of the night. C 30 or NGC 7331 is a Spiral galaxy which turned out to be no more than an F B to look at? I had just been here for over an hour and the first car went past me at 21:28, the same car went the other direction about 8 minutes later? With it being reasonable dark at my viewing spot I can normally see head lights a long way off and take the required action before I lose my night vision (that is close my eyes and face the other direction to the lights of the car). Back to astronomy and C 22, the Blue Snowball nebula in Andromeda, I could make out some blue in this P N (fourth and not the last). The Pinwheel galaxy in M 33 was my next target, this galaxy could be missed with not too much trouble as it is quite dim to look at, if I did not use GOTO it would probably not be seen by me? Onto a galaxy even I could not miss and M31, the great Andromeda galaxy, this has a bright centre. Not far away is M 32, a small but bright galaxy to look at. In the other direction from M 31 is M 110, an Elliptical galaxy which is dim to look at. Onto my final P N and M 76, the Little Dumbbell nebula in Perseus, this is one of the hardest Messier objects to find and yes it was dim for me to look at! One or two objects that you would have thought would have made Messier's list in NGC 884 and 869 or better known as the Double Cluster, these O C's are beautiful to look at? Onto the brightest Messier object and M 45, the Pleiades best looked at with the finder scope, too big to be seen with main scope.

By now I could see the star Rigel rising above the hedge, winter is well on its way as this is the right lower corner star of Orion and time to pack up at 22:13. The temperature had not changed in the two hours I was out and there was no wind to be felt? I did not even use gloves thru out the whole session J, sure that is something I will be using pretty quickly?

One of the main reasons for such a clear sky, it had been raining (now that is no surprise for the recent October weather we have been having!) in the morning and cleared the sky of any dust that might have been around?

Clear skies.

Peter Chappell

PS, the following morning I cleaned three contacts in the head torch and put new batteries in, end result a nice red torch. I also changed the batteries in my hand torch, could call it lack of maintenance of my astronomy gear. At least the power cord had no problems this time (new end terminal fitted recently), last session it became loose and tripped the power off three times on the telescope making it impossible to do any real viewing.

*I thank you Peter, especially for 'coming clean' on equipment maintenance. We all forget to do it and regret it at some stage. A good reminder for us all. At least we have been known to get cloudy evenings when we could do some equipment cleaning and maintenance. Andy.*

4 attachments (4 MB)Download allSave all to OneDrive

Hi Andy,

Viewing log and three pictures of Moon pictures rising over the Mediterranean Sea for the magazine.

Tech info for images.

All pictures taken with Canon 70D DSLR camera attached to a Tamron 18 – 400 mm zoom lens.

IMG 9889 (Moon and stars): 30 second shutter speed, f 3.5 and ISO 500.

IMG 9905 (Moon and reflection off of sea): 25 second shutter speed, f4.0 and ISO 1000.



IMG 9915a (Moon close up): 1/50 of a second shutter speed, f6.3 and ISO 1000.



Peter

Andy,

Lyla and I have moved to the Canaries and are settling in well. You kindly let us remain on the WAS mailing list, so we thought we would try to give something back by sending news from here in La Palma which might be of interest to WAS members for inclusion in the newsletter.

To start off I thought a few words about the island and its place in astronomy. I have also included a little about visiting the island. This first effort is in the form of an email as we're not fully set up here yet. Let me know if it is of any use.

Please feel free to edit as you see fit as it is a bit long.

Mike Alexander and Lyla.

'Some WAS members may remember me attending meetings with my Assistance Dog, Lyla. Well we're now retired and living on the Canary Island of La Palma. As many of you will know, La Palma is the home of one of the World's great astronomical observatories. I thought it might be of interest to members if I gave you a little information on the origins of the observatory and La Palma island.

The origins of the Observatorio de el Roque de los Muchachos - Rock of the Brothers (ORM) start with Isaac Newton Telescope. (INT). In 1949 the United States gifted a Pyrex glass blank to the Royal Greenwich Observatory (RGO) left over from an abandoned telescope project. At 98 inches, this at the time, would have been the third largest telescope after the Hale and the Hooker in the US.

The blank was ground into a mirror by Grubb Parsons through the early 1950s until 1956. A mount was ordered from the firm in 1959. This became INT and it was first installed at Hurstmonceux Castle in Sussex, where the RGO was based and saw 'first light' in 1965.

Although the telescope performed well, the conditions at Hurstmonceux were far from ideal. The site suffered from cloudy skies and light pollution from nearby Brighton. At that time the advent of jet travel led to discussions about the feasibility of setting up a Northern Hemisphere observatory somewhere in Europe, similar to that at Mauna Kea in Hawaii.

Several sites were assessed, mainly in the Alps and Pyrenees mountains. One of the sites of interest was on Mount Tiede on the Canary island of Tenerife. In those days, Tenerife was not the holiday island we know today and just getting there was a challenge. A team was dispatched and found the atmospheric conditions to be very good. On speaking to the locals however, it was suggested that seeing conditions were even better at the neighbouring island of La Palma. As the team were in Tenerife it seemed logical to take the opportunity to check this out and a sub-team made the boat trip to La Palma where they made measurements on el Roque de los Muchachos. To their surprise, the local knowledge proved to be absolutely right and they found that the atmospheric conditions were excellent - on a par with those at Mauna Kea.

On their return to the UK, the team made their report recommending that INT be moved to La Palma. After a good deal of discussion, the RGO accepted the report and INT was shut down at Hurstmonceux in 1979 in preparation for the move. The opportunity was taken to make improvements to INT and a new 100 inch mirror of Zerodur, a ceramic material with a thermal coefficient of expansion of practically zero, was ordered from Grubb Parsons. (The original mirror and dome for the INT can still be seen at Hurstmonceux).

A hosting agreement was signed with Spain and new roads and facilities built. INT saw its second 'First Light' at ORM in 1984. It has been here ever since and has been joined over the years by other telescopes, including the 4.20 metre William Herschel (WHT); the 3.6 metre Telescopio Nazionale Galileo from Italy and most recently, the Gran Telescopio Canarias GRANTECAN (GTC). With segmented mirror of 10.4 metres, it is currently the largest single aperture telescope in the World. It's possible they

might soon be joined by the Thirty Meter Telescope (TMT) but that's another story.

ORM is open to visitors, weather permitting. Visits are organised each week on request, by filling out the online application form found on the IAC website ([www.iac.es](http://www.iac.es)). For group visits, follow the procedure to be found at [visitasorm@iac.es](mailto:visitasorm@iac.es).

La Palma possesses certain unique environmental features which have given it the distinction of being named a UNESCO World Biosphere reserve. Over one third of its area is protected land, the highlight of which is the Caldera de Taburiente National Park. ORM sits at its highest point at 4,200 metres. The island is smaller than the Isle of Wight, but taller than Ben Nevis. ORM sits above the 'sea of clouds' where the atmosphere is clear and stable due to the Atlantic Ocean. The government of La Palma is keen to protect this quality, so in addition to being the first 'Starlight Reserve' it was acknowledged in 2012 as a 'Starlight Tourist Destination' this guarantees the possibility of enjoyable stargazing while learning something of the associated scientific, natural and environmental values. On the 20th. April 2007, La Palma hosted the signing of the Declaration in defence of the night sky and the right to starlight. (The La Palma Starlight Declaration).

"An unpolluted night sky that allows the enjoyment and contemplation of the firmament should be considered an inalienable right equivalent to all other socio-cultural and environmental rights..."

La Palma was one of the first places in the World to apply the Sky Law. In 1988, a specific law was passed designed to protect the quality of the night sky for the purpose of astrophysical observation, which was a giant step forward in the defence of the night sky on a world-wide scale. This law protects La Palma from light, atmospheric and radioelectrical pollution, as well as preventing interference from aviation routes.

So why not visit La Palma for your next holiday. Bring your telescope, leave the wife by the hotel pool and the cloudy skies of Wiltshire behind. Various business initiatives have been encouraged to provide services linked with astronomy. Some hotels and many rural boarding houses have acquired basic equipment for observing the night skies, a boon for any amateur astronomer or anyone who wishes to learn more about our universe. There are also companies that arrange activities to promote astrotourism, which provides an excellent chance to try star-gazing guided by experts.

Each municipality on La Palma has an observation point, each covering a different theme, for instance the interpretation of the Sky, with its constellations, planets and moons; simulations of the equinoxes and solstice or a solar system built to scale forming an open-air astronomical museum. Some observation points connect to hiking routes belonging to the nature trail network of La Palma.

What can you see, well at 28° North latitude a large part of the southern sky constellations invisible to the UK can be seen, for instance in the spring, part of the Southern Cross is visible low in the southern sky.

Package holidays to the island are run by First Choice Holidays, a division of the TUI company. I recommend the La Palma Princess Hotel at Fuencaliente, at the South of the island, it is a bit isolated but has 11 swimming pools and everything you need. TUI airways fly directly from Gatwick and Manchester. For the independent traveller EasyJet fly twice weekly from Gatwick from October to March. For more information check out [visitlapalma.es](http://visitlapalma.es).

Mike Alexander

## Stargazing!

Hi Andy.

How are you? I hope you're well and you continue to travel so adventurously.

I am writing to ask about inviting you again to Westbury Leigh primary school for another night of stargazing. Last year we unfortunately had bad weather on our side but it was such a huge hit (we counted 220 people come that evening!) and we would very much like you and the WASNET team to come again.

This time we would like to serve hot dogs as well as hit chocolate!

If this is something you could consider again, we are thinking of sometime in early January. We return to school after the Christmas holidays on 6th Jan so anything within the next two weeks would be great.

Hope to hear from you soon.

Best wishes

Abi

From: Andrew Burns <[anglesburns@hotmail.com](mailto:anglesburns@hotmail.com)>

Sent: 14 October 2019 08:14

To: Abi Isherwood

<[Alsherwood@westburyleigh.wilts.sch.uk](mailto:Alsherwood@westburyleigh.wilts.sch.uk)>

Subject: Re: Stargazing!

Looking at the Moon phase, and other sky objects to look at, later January is very good, on the 28th January there is a fantastic crescent Moon alongside a very bright Venus in the west, and Orion risen in the East with the nebula of star birth...Andy

Hi Andy!

Well 28<sup>th</sup> January sounds so exciting so shall we go with that date?

I have put together a proposed timetable that means we can get out of the hall before Zumba starts at about 7.30pm.

5pm: Talk in hall

5.45pm: hot chocs and hot dogs sold

6pm: outside / inside for stargazing.

6.45pm: Thank yous

7pm out of hall

Can I book you in for this, as well as a preliminary visit?

Many thanks

Abi

We'll go for that. But I miss out on Zumba!

Andy

Hi

My name is Wendy Blankley and I teach at St Mary's primary school in Broughton Gifford. I was wondering if it would be suitable to tell my Year 2 (age 6&7 years) parents about your Nov 22nd & Dec 27th star gazing events.

Would it be ok for the families to just turn up to look at the stars with you? You once came to Christchurch primary school when I did this topic before and the queues were around the playground but the parents and their chn were really impressed. Please could you let me know if this would be appropriate for my 14 year 2s and their families to come to you particularly on Nov 22nd at 22.00pm please.

Thank you

## IAU Office for Astronomy Outreach

Any amateur or professional astronomer, scientist communicator or teacher is invited to participate in the [#IAU100](#) Astronomy Day in Schools global project. School visits are encouraged during or around the week of 10-17 November 2019 to coincide with the World Science Day for Peace and Development and a Mercury transit on 11 November.

This is a special opportunity for students to directly interact and engage with astronomers in their communities,

and to learn about the important role of astronomy in our lives. Help spread the word!

Learn more here: <https://www.iau-100.org/astro-day-schools>

## I had to do a last minute live radio broadcast last month. Part of Wiltshire now has dark skies status. Cranbourne Chase Dark Sky Status



Image copyright PAUL HOWELL Image caption It is the first AONB in the country to be designated in its entirety

**The night sky above parts of Wiltshire, Dorset, Hampshire and Somerset has been designated an international dark sky reserve.**

Cranborne Chase Area of Outstanding Natural Beauty (AONB) is only the 14th such area in the world to be certified.

The status is awarded by the International Dark-Sky Association (IDA) to areas which offer "exceptional starry skies".

It is the first AONB in the country to be designated in its entirety.

The IDA status, which took Cranborne Chase AONB 10 years to achieve, means controls are in place to prevent light pollution.

"We think of our beautiful landscapes as being on the ground, but 50% of our landscape is above our heads, in the sky," said Linda Nunn, director of Cranborne Chase AONB.

"Here in Cranborne Chase we can see the Milky Way and the Andromeda Galaxy, if the clouds allow.

"The AONB has pledged to protect and improve its dark sky for future generations.

"There are huge benefits for nocturnal wildlife, our own human health and wellbeing, for education, tourism and for energy saving. We're thrilled to be playing our part."

Cranborne Chase AONB is the sixth largest AONB in the country. Covering 981 sq km (380 sq mi), it straddles parts of Wiltshire, Dorset, Hampshire and Somerset.

Adam Dalton, from the IDA, said: "It has the largest central area of darkness of any international dark sky reserve in the UK.

"For those living and visiting this beautiful area, this is something to be celebrated and enjoyed."



### Andy notes and views...

Hanging from Orion's Belt this morning, where stars and planets are being born. Unable to sleep with arthritis pain I got up and saw clear skies at 4am. Checked on weather apps and it seemed clear until 7am, so eventually dressed enough to go to the observatory and grab some images. By the time I was all set it 4:36 and bands of cloud sweeping through Orion and over to the North East the Plough area, but trusty Nikon D810a mounted and focused a picked objects that looked clear enough for 60 second exposures at 1250iso.

Firstly the M42 and M43 region with the rest of the Orion dagger, including the running man regions of nebulae around 1400 light years away. The large red tinged region is the M42 shows this cloud of gas is very excited and stars are being born. The brightest part of this is the trapezium and 4 recently created stars are beginning their life. The running man nebula at the top, and Al Shaif at the bottom of the dagger are more blue in colour showing the cloud of molecules are reflecting the light of young large hot stars



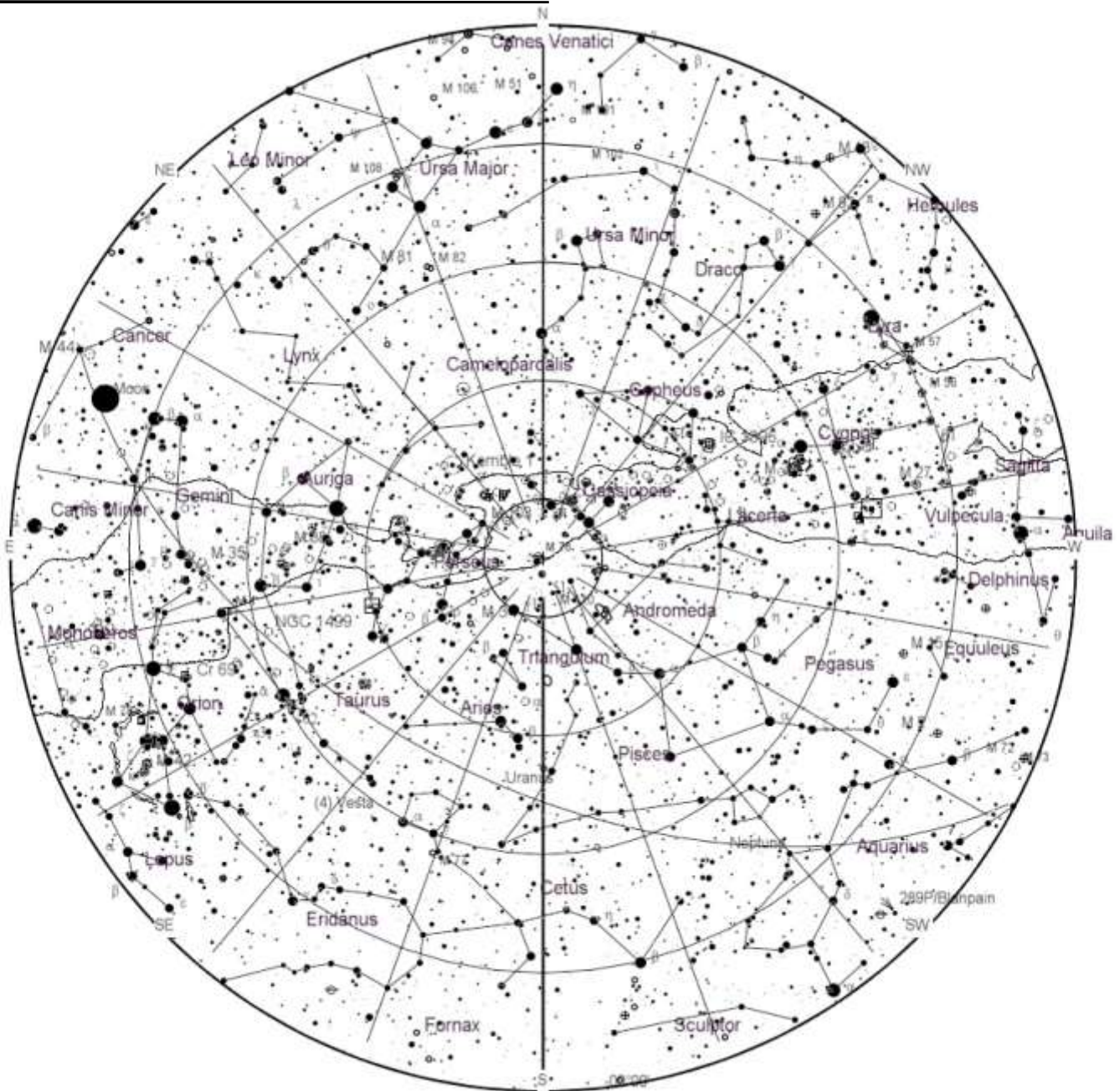
Nice to get out on the telescope this evening, even if the transparency wasn't brilliant with naked eye magnitude limit was around 4.5 even overhead... but with a bit of help from photoshop I could get something out of most of the 60second shots on the Nikon D810a.

First of all the globular clusters that orbit our Milky Way galaxy central halo. This gravitationally grouped balls of stars have 100,000 stars to nearly a Million stars within a small area of space.

M2, M56, M13 (through trees, I am still waiting for my gar-

dener to turn up after contacts in September), and round to M15.





**November 5, 6 - Taurids Meteor Shower.** The Taurids is a long-running minor meteor shower producing only about 5-10 meteors per hour. It is unusual in that it consists of two separate streams. The first is produced by dust grains left behind by Asteroid 2004 TG10. The second stream is produced by debris left behind by Comet 2P Encke. The shower runs annually from September 7 to December 10. It peaks this year on the the night of November 5. The first quarter moon will set shortly after midnight leaving dark skies for viewing. Best viewing will be just after midnight from a dark location far away from city lights. Meteors will radiate from the constellation Taurus, but can appear anywhere in the sky.

**November 11 - Rare Transit of Mercury Across the Sun.** The planet Mercury will move directly between the Earth and the Sun. Viewers with telescopes and approved solar filters will be able to observe the dark disk of the planet Mercury moving across the face of the Sun. This is an extremely rare event that occurs only once every few years. The next transit of Mercury will not take place until 2039. This transit will be visible throughout all of South America and Central America, and parts of North America, Mexico, Europe, the Middle East, and Africa. The best place to view

this event in its entirety will be the eastern United States, Central America, and South America. ([Transit Visibility Map and Information](#))

**November 12 - Full Moon.** The Moon will be located on the opposite side of the Earth as the Sun and its face will be fully illuminated. This phase occurs at 13:36 UTC. This full moon was known by early Native American tribes as the Full Beaver Moon because this was the time of year to set the beaver traps before the swamps and rivers froze. It has also been known as the Frosty Moon and the Hunter's Moon.

**November 17, 18 - Leonids Meteor Shower.** The Leonids is an average shower, producing up to 15 meteors per hour at its peak. This shower is unique in that it has a cyclonic peak about every 33 years where hundreds of meteors per hour can be seen. That last of these occurred in 2001. The Leonids is produced by dust grains left behind by comet Tempel-Tuttle, which was discovered in 1865. The shower runs annually from November 6-30. It peaks this year on the night of the 17th and morning of the 18th. The second quarter moon will block many of the fainter meteors this year, but if you are patient you should be able to catch quite a few of the brightest ones. Best

viewing will be from a dark location after midnight. Meteors will radiate from the constellation Leo, but can appear anywhere in the sky.

**November 24 - Conjunction of Venus and Jupiter.** A conjunction of Venus and Jupiter will be visible on November 24. The two bright planets will be visible within 1.4 degrees of each other in the evening sky. Look for this impressive sight in the western sky just after sunset.

**November 26 - New Moon.** The Moon will be located on the same side of the Earth as the Sun and will not be visible in the night sky. This phase occurs at 15:06 UTC. This is the best time of the month to observe faint objects such as galaxies and star clusters because there is no moonlight to interfere.

**November 28 - Mercury at Greatest Western Elongation.** The planet Mercury reaches greatest western elongation of 20.1 degrees from the Sun. This is the best time to view Mercury since it will be at its highest point above the horizon in the morning sky. Look for the planet low in the eastern sky just before sunrise.

### All you need to know: 2019's Leonid meteor shower

Posted by Deborah Byrd in **ASTRONOMY ESSENTIALS**

Here are all the details you need for 2019's Leonid meteor shower, peaking on the morning of November 18, though under the light of a waning gibbous moon.

November's wonderful Leonid meteor shower happens every year around November 17 or 18, as our world crosses the orbital path of Comet 55P/Tempel-Tuttle. Like many comets, Tempel-Tuttle litters its orbit with bits of debris. It's when this cometary debris enters Earth's atmosphere and vaporizes that we see the Leonid meteor shower. In 2019, the peak of the shower is expected to be from midnight to dawn on Monday, November 18. However, a waning gibbous moon will light up the morning sky this year, to obstruct on this year's Leonid meteor shower. In a dark sky, absent of moonlight, you can see up to 10 to 15 meteors per hour at its peak.

Although this shower is known for its periodic storms, no Leonid storm is expected this year. Keep reading to learn more.

**How many Leonid meteors will you see in 2019?** The answer, as always, depends on when you watch, and the clarity and darkness of your night sky. This shower has been known to produce *meteor storms*, but no Leonid storm is expected this year. The Leonids are usually a modest shower, with typical rates of about 10 to 15 meteors per hour at the peak, in the darkness before dawn.

**When should you watch for Leonid meteors in 2019?** Knowing what time to watch is easy. As with most meteor showers, the best time to watch the Leonids is usually between the hours of midnight and dawn. The expected peak morning is Monday, November 18. That's the *morning* (not the evening) of November 18.

**Where should you watch the meteor shower?** We hear lots of reports from people who see meteors from yards, decks, streets and especially highways in and around cities. But the best place to watch a meteor shower is always in the country. Just go far enough from town that glittering stars, the same stars drowned by city lights, begin to pop into view.

Find a place to watch – or recommend a place – at [EarthSky's Best Places to Stargaze page](#). Zoom out to see dark places worldwide.

City, state and national parks are often great places to watch meteor showers. Try Googling the name of your state or city with the words *city park*, *state park* or *national park*. Then, be sure to go to the park early in the day and find a wide open area with a good view of the sky in all

directions.

When night falls, you'll probably be impatient to see meteors. But remember that the shower is best after midnight. Catch a nap in early evening if you can. After midnight, lie back comfortably and watch as best you can in all parts of the sky.

Sometimes friends like to watch together, facing different directions. When somebody sees one, they can call out *meteor!* Then everyone can quickly turn to get a glimpse.



Regulus, the brightest star in the constellation Leo the Lion, dots a backwards question mark of stars known as the Sickle. If you trace all the Leonid meteors backward, they appear to radiate from this area of the sky.

### Which direction should I look to see the Leonids?

Meteors in annual showers are named for the point in our sky from which they appear to radiate. This shower is named for the constellation Leo the Lion, because these meteors radiate outward from the vicinity of stars representing the Lion's Mane.

If you trace the paths of Leonid meteors backward on the sky's dome, they do seem to stream from near the star Algieba in the constellation Leo. The point in the sky from which they appear to radiate is called the *radiant point*. This radiant point is an optical illusion. It's like standing on railroad tracks and peering off into the distance to see the tracks converge. The illusion of the radiant point is caused by the fact that the meteors – much like the railroad tracks – are moving on parallel paths.

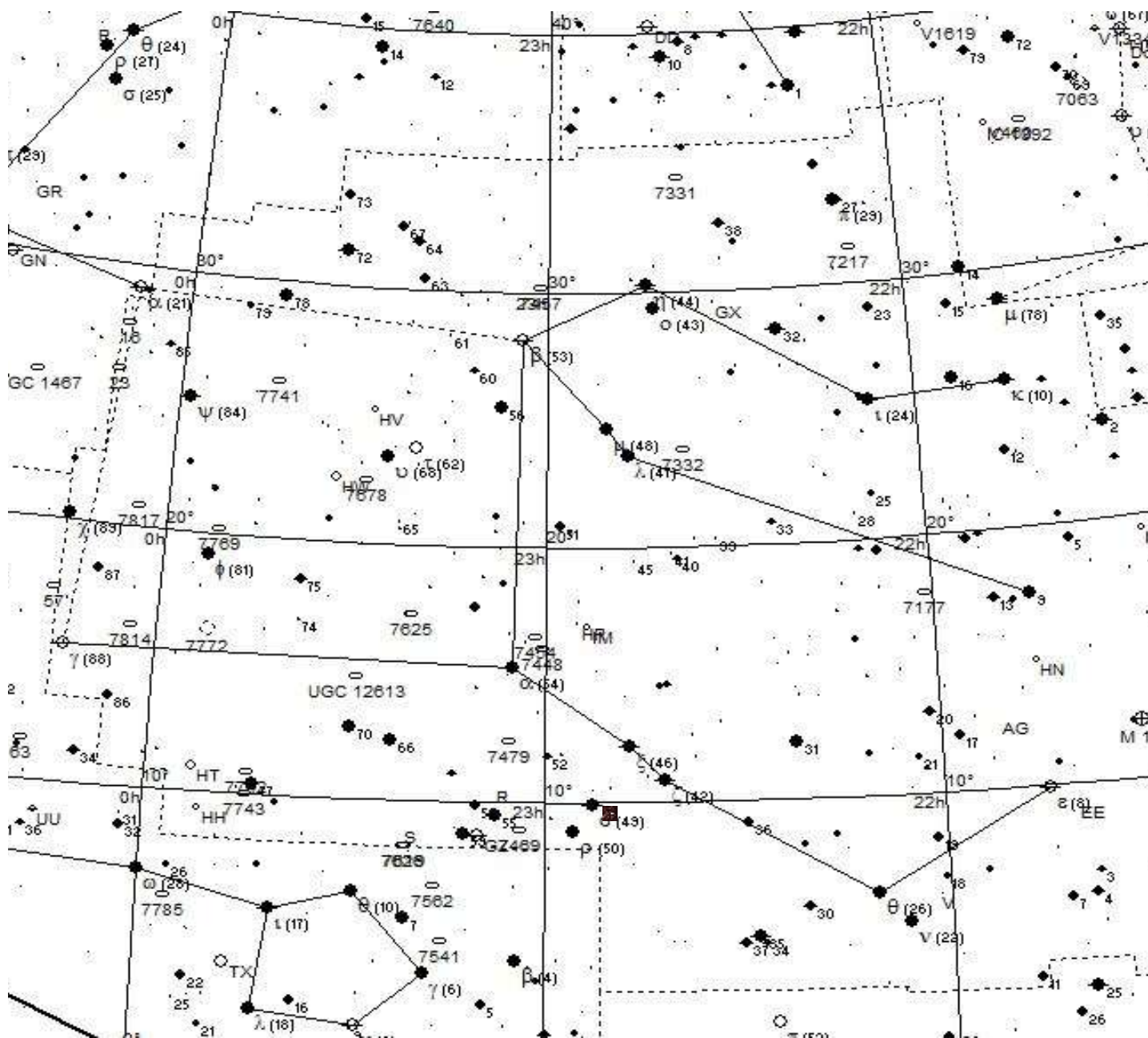
In recent years, people have gotten the mistaken idea that you must know the whereabouts of a meteor shower's radiant point in order to watch the meteor shower. You don't need to. The meteors often don't become visible until they are 30 degrees or so from their radiant point. They are streaking out from the radiant in all directions.

Thus the Leonid meteors – like meteors in all annual showers – will appear in all parts of the sky.

**Will the Leonids produce a meteor storm in 2019?** No. Not this year. Most astronomers say you need more than 1,000 meteors an hour to consider a shower as a storm. That's a far cry from the 10 to 15 meteors per hour predicted for this year. Still, seeing even one bright meteor can make your night.

The Leonid shower is known for producing meteor storms, though. The parent comet – Tempel-Tuttle – completes a single orbit around the sun about once every 33 years. It releases fresh material every time it enters the inner solar system and approaches the sun. Since the 19th century, skywatchers have watched for Leonid meteor storms about every 33 years, beginning with the meteor storm of 1833, said to produce more than *100,000* meteors an hour.

# CONSTELLATIONS OF THE MONTH: Pegasus



Positioned north of the ecliptic plane, the constellation of Pegasus was one of the original 48 constellations listed by Ptolemy, and endures as one of the 88 modern constellations adopted by the IAU. It covers 1121 square degrees of sky and ranks 11th in size. Pegasus contains between 9 and 17 main stars in its asterism (depending on how you depict it) and has 88 Bayer Flamsteed designated stars within its confines. Pegasus is bordered by the constellations of Andromeda, Lacerta, Cygnus, Vulpecula, Delphinus, Equuleus, Aquarius and Pisces. It is visible to observers located at latitudes between +90° and -60° and is best seen at culmination during the month of October.

There is one annual meteor shower associated with the constellation of Pegasus which peaks on or about November 12 of each year – the Pegasids. The radiant – or point of origin – for the meteor shower is near the asterism of the “Great Square”. Activity begins around October 10 and lasts to late November. The average fall rate at maximum during the peak is 10 per hour. This particular meteor used to be spectacular, but Jupiter has perturbed the meteor stream over the years and lessened the activity.

In mythology, Pegasus represents the Winged Horse, and child of Medusa who was slain by the hero Perseus. According to Greek mythology, Pegasus was delivered to Mount Helicon by Bellerophon, where the magnificent horse kicked the source of

poetic inspiration – the Spring of Hippocrene – into flowing. When Bellerophon defeated Chimaera, he became so proud he ordered Pegasus to fly him to Mount Olympus. This action angered Zeus, who ordered an insect to sting Pegasus, resulting in Bellerophon’s fatal fall to Earth. Zeus then went on to recognize Pegasus in the stars as the “Thundering Horse of Jove” – carrier of his lightning bolts.

Let’s begin our binocular tour of Pegasus with its brightest star – Alpha – the “a” symbol on our map. Alpha Pegasi’s proper name is Markab and it marks the southwestern corner of the asterism of the Great Square. Located 140 light years from Earth, Markab is a hot class B (B9) dwarf star which shines about 205 times brighter than our own Sun and is about three times larger. This fast rotator completes a full turn on its axis in just about 36 hours! Right now, Markab sits on the edge of the main sequence, about to die and become a much cooler orange giant star. It’s about as “normal” as a star can be!

Now, turn your binoculars towards Beta – the “B” symbol. Named Scheat, you’ll find this particular star located in the northwestern corner of the Great Square and about 200 light years from our solar system. Scheat is unusual among bright stars in having a relatively cool surface temperature of 3700 degrees Kelvin, compared to stars such as our Sun. Scheat is a red giant star some 95 times larger than Sol and has a total

stellar luminosity of 1500 times solar. It is also an irregular variable star, its brightness changing from magnitude 2.31 to 2.74.

You'll need a telescope to reveal the mysteries surrounding Eta Pegasi – the “n” symbol on our map. Named Matar and located about 215 light years away, this spectral class G2II-III star has a close binary star companion of class F0V. There are also 2 class G stars further away that may or may not be physically related to the main pair. According to Jim Kaler, “Matar is double star and may well be quadruple, consisting of a very unequal pair of pairs, an unbalanced double-double. The brighter of the bright pair is on its way to becoming a much larger giant, and will eventually expand to a radius of a quarter the distance that now separates the two stars, streams of matter running from the brighter to the dimmer creating quite a sight from the smaller pair. Eventually the bright star of the brighter pair will fade to become a white dwarf, this double perhaps looking something like Sirius does today.”

Next up? Epsilon Pegasi – the backwards “3” symbol on our map. Located 670 light years away, Enif is a cool star for more than one reason! To begin with, Enif is orange class K (K2) supergiant star whose stellar temperature only averages about 4460 degrees Kelvin. Even in binoculars you'll notice the reddish hue. It's big, too... About 150 times the size of our Sun and if located in our solar system would fill out the space about halfway to the orbit of Venus. This supergiant star's fate awaits it as a supernova, but there is always a possibility it could become a heavy, rare neon-oxygen white dwarf whose size would be no larger than the Earth. What makes Enif so cool is that it is very unpredictable. According to records, in 1972 Enif had a flare event which caused it to brighten 5 times more than its normal stellar magnitude!

Keep your binoculars handy, because following the trajectory from Theta to Epsilon just another third of the way will bring you to awesome globular cluster – Messier 15 (RA 21:29:58.3 Dec +12:10:01). Located almost equidistantly from both the galactic center and from us, this superior globular cluster was first discovered by Jean-Dominique Maraldi on September 7, 1746 and later listed by Charles Messier on his famous Messier Catalog list of “objects which are not comets”. It ranks third in variable star population and M15 is perhaps the oldest and most dense of all globulars located in the Milky Way Galaxy. Its compact central core may be the result of mutual gravitational interaction, or it could contain a dense, supermassive object – a black hole. One thing we do know that M15 contains is a planetary nebula known as Pease 1 – only four known planetary nebulae in Milky Way globular clusters! Another curiosity is M15 also contains 9 pulsars, the remnants of ancient supernova explosions leftover from its youthful beginnings. While you can easily see M15 with binoculars, even a small telescope can begin resolution on this great deep sky object!

For telescopes, have a look at spiral galaxy NGC 7217 (RA 22:07.9 Dec +31:22). This magnitude 10 jewel displays a bright nucleus and hazy frontier over its generous 3.7 arc minute size. Taken photographically this particular galaxy exhibits very tight spiral galaxy structure and is sometimes considered an “unbarred” spiral galaxy with a dark ring of obscuring material around the nucleus.

Try your hand at spiral galaxy NGC 7814 (RA 0:03.3 Dec +16:09), too. At magnitude 10 and a huge 6.3 arc minutes in diameter, this particular galaxy is easily seen in small telescopes and larger binoculars. Often referred to as Caldwell 43, it's located about 40 million light years from Earth and gives a great edge-on presentation! It is sometimes referred to as the a miniature version of Messier 104, or “the Little Sombrero”.

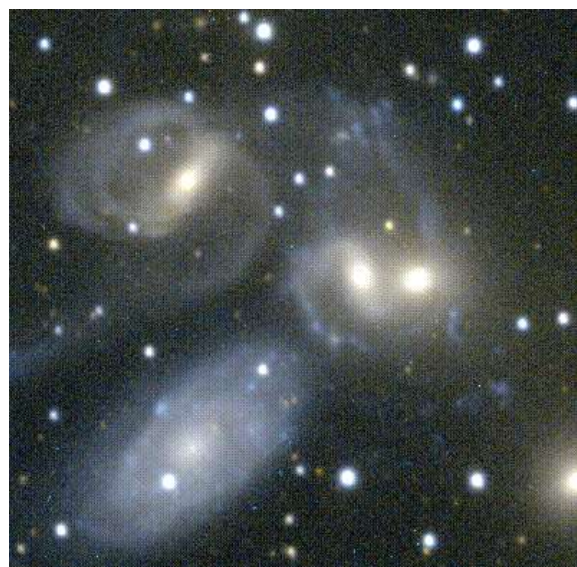
Now, it's time for NGC 7331 (RA 22:37.1 Dec +34:25). Easily spotted in big binoculars and small telescopes under dark skies, it was first discovered by Sir William Herschel. This beautiful, 10th magnitude, tilted spiral galaxy is very much how our own Milky Way would appear if we could travel 50 million light-years away and look back. Very similar in structure to both our own Milky Way and the Great Andromeda Galaxy, this particular galaxy gains more and more interest as scope size increases – yet it can be spotted with larger binoculars. At around 8” in aperture, a bright core appears and the beginnings of wispy arms. In the 10” to 12” range, spiral patterns begin to emerge and with good seeing conditions, you can see “patchiness” in structure as nebulous areas are revealed, and the western half is deeply outlined with a dark dustlane. But hang on... Because the best is yet to come!

Return to NGC 7331 with a big telescope. What we are about to look at is truly a challenge and requires dark skies, optimal position and excellent conditions. Now breathe the scope about one half a degree south-southwest and behold one of the most famous galaxy clusters in the night. In 1877, French astronomer Edouard Stephan was using the first telescope designed with a coated mirror when he discovered something a bit more with NGC 7331. He found a group of nearby galaxies! This faint gathering of five is now known as “Stephan's Quintet” and its members are no further apart than the diameter of our own Milky Way galaxy.

Visually in a large scope, these members are all rather faint, but their proximity is what makes them such a curiosity. The Quintet is made up of five galaxies numbered NGC 7317, 7318, 7318A, 7318B, 7319 and the largest is 7320. Even with a 12.5” telescope, this author has never seen them as much more than tiny, barely-there objects that look like ghosts of rice grains on a dinner plate. So why bother? Because I've seen them with large aperture... What our backyard equipment can never reveal is what else exists within this area – more than 100 star clusters and several dwarf galaxies. Some 100 million years ago, the galaxies collided and left long streamers of their materials which created star forming regions of their own, and this tidal pull keeps them connected. The stars within the galaxies themselves are nearly a billion years old, but between them lie much younger ones. Although we cannot see them, you can make out the soft sheen of the galactic nuclei of our interacting group. Enjoy their faint mystery!

There are many more faint galaxies and deep sky objects in Pegasus to be enjoyed, so grab a good star map and fly with the “Winged Horse”!

Sources:  
Chandra Observatory  
SEDS  
Wikipedia



Hi Andy,

Just spotted this on Wiltshire council website:

<http://www.wiltshire.gov.uk/highways-improvements-led-lighting>

Starting Oct 2019 street lights are beginning to be replaced throughout Chippenham and surrounding area. Work is scheduled to take approx. 2 years to complete.

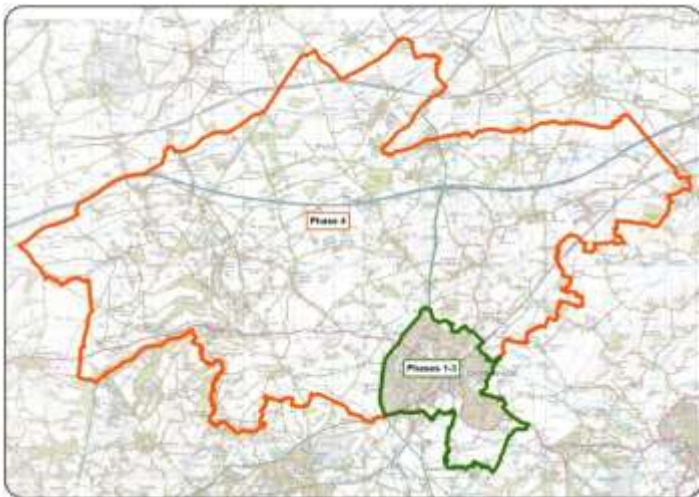
#### Wiltshire Council LED Street Lighting Project

Wiltshire Council is making a £12 million investment to convert its street lighting to LED lighting. The older types of lights are going out of production and the cost of energy is becoming prohibitive. The new lights are much more energy efficient and have a reduced carbon footprint.

The light from the LED units looks different as it is not orange in colour as some of the older lighting is. The new lights will provide similar lighting levels with less light spill and be considerably cheaper to operate and maintain. Instead of being turned off for part of the night many of the lights will be dimmed during off peak periods to further reduce energy consumption.

The conversion will be carried out quickly in most locations with little disturbance and disruption as it is only the electrical equipment being changed. However, in a few cases it may be necessary to renew the lighting column which will require excavation in the pavement to provide and connect the new column.

The operation of the lighting and the dimming regime will be reviewed after six months. The Frequently Asked Questions below have been developed below to aid any queries regarding this project.



#### Programme of work

Work is starting in Chippenham and the surrounding area in October. The first three phases of the project will focus on the replacement of lighting within the Town of Chippenham highlighted within the green area above. Phase four will see the lighting replaced in the surrounding Chippenham community area highlighted within the orange area above. These initial phases are expected to take around two months to complete. Following the completion of the Chippenham Community area the project will move forward, this website will be updated to show the upcoming phases.

Whilst most of the lights will be changed to the new type during the planned visit there will be occasions when special units are required. In such circumstance the special units will be fitted later in the programme.

The advantages of LED lighting include:

- LEDs are much more efficient and use much less electricity than other lamps or bulbs for similar output, reducing energy costs.
- Have extremely long lives compared to traditional lights.
- Produce very little heat.
- Produce much fewer carbon emissions through energy generation.
- Contain no mercury.
- Can operate effectively in both cold and hot environments.
- Produce a white light to enable the human eye to see natural colours at night.
- Are much more directional than other lights, reducing 'sky glow' and glare.
- LEDs are instantaneous and function at full output when switched on. No warm-up times as with most street lighting.
- They can be dimmed at off peak times.
- They provide improved uniformity of light.

Variation in colour temperatures are available for specific applications.

There are massive energy savings possible with the modern units. Older low pressure sodium lights will no longer be in production from 2020, and it will be necessary to replace them eventually.

Street lighting has benefits in terms of road safety and public safety. It supports the night time economy and helps reduce the fear of crime.

It is proposed to use LED units with what is known as a colour temperature of between 2700k and 3000k for most of the lights, which are often referred to as warm. Some other LED lights have a higher colour temperature of 4000k which some campaigners have had concerns about. The units to be used for this project will be Axia 3 lights manufactured by Urbis Schreder.

It is proposed to dim most of the lighting between 8pm and 6am, with additional dimming after 11pm. Lights at zebra crossings, areas with greater highway safety requirements, and areas with significant night time activity would generally not be dimmed.

The introduction of the new lighting will provide the opportunity dim and reduce lighting levels at sensitive locations. The scheme has the potential to have environmental benefits compared to most existing lighting types due to significant reduction in the emittance of UV light.

Older street lighting tends to spread light in all directions, including upwards. LED street lighting is less wasteful and directs the distribution of light down towards the road and pavement. This helps in reducing any light intrusion into homes and gardens. Where appropriate additional dimming or shielding could be applied to further minimise concerns.

# ISS PASSES For November 2019

From Heavens Above website maintained by Chris Peat

Date	Brightness	Start			Highest point			End		
	(mag)	Time	Alt.	Az.	Time	Alt.	Az.	Time	Alt.	Az.
05 Nov	-3.2	04:47:20	59°	E	04:47:20	59°	E	04:50:09	10°	E
05 Nov	-3.4	06:20:13	11°	W	06:23:27	54°	SSW	06:26:45	10°	ESE
06 Nov	-0.7	04:00:41	16°	E	04:00:41	16°	E	04:01:30	10°	E
06 Nov	-3.7	05:33:35	35°	W	05:34:51	70°	SSW	05:38:12	10°	ESE
07 Nov	-3.0	04:46:58	51°	ESE	04:46:58	51°	ESE	04:49:34	10°	ESE
07 Nov	-2.6	06:19:51	11°	W	06:22:42	31°	SSW	06:25:42	10°	SSE
08 Nov	-0.6	04:00:21	14°	E	04:00:21	14°	E	04:00:55	10°	E
08 Nov	-3.1	05:33:15	34°	WSW	05:34:08	42°	SSW	05:37:21	10°	SE
09 Nov	-2.4	04:46:41	35°	SE	04:46:41	35°	SE	04:48:50	10°	ESE
09 Nov	-1.7	06:19:35	10°	W	06:21:46	16°	SW	06:23:56	10°	S
10 Nov	-0.4	04:00:10	10°	ESE	04:00:10	10°	ESE	04:00:15	10°	ESE
10 Nov	-2.3	05:33:04	23°	SW	05:33:16	23°	SW	05:36:00	10°	SSE
11 Nov	-1.4	04:46:37	18°	SSE	04:46:37	18°	SSE	04:47:46	10°	SE
12 Nov	-1.2	05:33:07	11°	SSW	05:33:07	11°	SSW	05:33:28	10°	SSW
22 Nov	-0.9	18:57:02	10°	SSW	18:57:21	12°	SSW	18:57:21	12°	SSW
23 Nov	-1.8	18:08:49	10°	S	18:10:42	18°	SSE	18:10:42	18°	SSE
24 Nov	-1.4	17:21:03	10°	SSE	17:22:37	13°	SE	17:23:58	11°	ESE
24 Nov	-1.5	18:55:29	10°	SW	18:56:52	22°	SW	18:56:52	22°	SW
25 Nov	-2.9	18:06:53	10°	SW	18:09:58	35°	SSE	18:10:03	35°	SSE
26 Nov	-2.2	17:18:26	10°	SSW	17:21:14	25°	SSE	17:23:12	15°	E
26 Nov	-1.8	18:54:17	10°	WSW	18:56:04	29°	WSW	18:56:04	29°	WSW
27 Nov	-3.7	18:05:28	10°	WSW	18:08:47	60°	SSE	18:09:09	55°	SE
28 Nov	-3.1	17:16:44	10°	SW	17:19:57	45°	SSE	17:22:12	17°	E
28 Nov	-1.9	18:53:11	10°	W	18:55:05	31°	W	18:55:05	31°	W
29 Nov	-3.9	18:04:17	10°	WSW	18:07:39	85°	SSE	18:08:06	64°	E
30 Nov	-3.7	17:15:24	10°	WSW	17:18:45	72°	SSE	17:21:06	18°	E
30 Nov	-1.9	18:52:06	10°	W	18:53:58	31°	W	18:53:58	31°	W
01 Dec	-3.9	18:03:09	10°	W	18:06:32	85°	N	18:06:59	64°	ENE
02 Dec	-3.8	17:14:13	10°	W	17:17:35	88°	N	17:20:00	18°	E
02 Dec	-1.9	18:50:57	10°	W	18:52:52	31°	W	18:52:52	31°	W
03 Dec	-3.9	18:02:00	10°	W	18:05:22	87°	S	18:05:54	61°	ESE
04 Dec	-3.8	17:13:02	10°	W	17:16:24	86°	N	17:18:59	16°	E
04 Dec	-1.9	18:49:46	10°	W	18:51:51	31°	WSW	18:51:51	31°	WSW
05 Dec	-3.5	18:00:47	10°	W	18:04:07	63°	SSW	18:05:00	42°	SE
06 Dec	-3.7	17:11:48	10°	W	17:15:09	78°	SSW	17:18:14	12°	ESE
06 Dec	-1.7	18:48:42	10°	W	18:51:07	26°	SW	18:51:07	26°	SW
07 Dec	-2.4	17:59:34	10°	W	18:02:43	37°	SSW	18:04:30	20°	SSE
08 Dec	-2.9	17:10:31	10°	W	17:13:47	51°	SSW	17:17:03	10°	SE
08 Dec	-0.9	18:48:07	10°	WSW	18:49:56	14°	SW	18:50:58	12°	SSW
09 Dec	-1.2	17:58:35	10°	W	18:01:08	20°	SW	18:03:40	10°	SSE
10 Dec	-1.7	17:09:19	10°	W	17:12:16	29°	SSW	17:15:12	10°	SSE
12 Dec	-0.6	17:08:32	10°	WSW	17:10:33	15°	SW	17:12:34	10°	S

## END IMAGES, OBSERVING AND OUTREACH



A spherical cloud of gas that has given birth to a cluster of stars that have blown the gas clear of the centre so we see this as a huge ring... this is the rosette nebula, ngc 2244.

Nikon D810,  
60seconds,  
ISO 1250,  
120mm Sky  
Watcher Esprit,  
Albion mount  
from middle of  
Chippenham

Andy

Wiltshire Astronomical Society	Observing Sessions 2018 – 2019	And 2019-2020
Date	Moon Phase (%)	Moonrise
<b>2019</b>		
22nd November		
27th December		Early start. Around 6:30pm
2020		
24th January		
28th February		
27th March		
24th April		
22nd May		

### OUTREACH

Our November or December observing sessions may also have some members of Broughton Gifford school as mentioned in our e-mail pages. Any one with telescopes please.

28th January Westbury Leigh School Talk the observing session from 5pm. Help needed. We will need 4/5 telescopes manned.