NWASNEWS

Volume25, Issue 10

June 2020

Newsletter for the Wiltshire, Swindon, Beckington Astronomical Societies

Good Health and Happy Summer Viewing

Trying to keep politics out of the astronomy pages is getting more difficult, and certainly the current state of nation health under the covid 19 restrictions impact us highly as a society.

Viewing groups and outreach have certainly been hit hard, but on the up side the weather could hardly have been kinder for practical astronomy. The only object not playing ball has been the Sun, which is now 32days without any visible Sunspot activity, though at the time of writing a huge anomaly has been seen 'round the corner' that may be a big sunspot coming into view.

Again we have been disappointed by 'promised ' comets of the decade/year/month/week have ended up weak. With Comet Atlas being the first to disappoint and then the vaunted comet SWAN F8 has been a real blot, barely visible through a telescope against the astronomical skies to the north. Over next week it loops around the line of sight to Capella.

Amazing images from the southern hemisphere but a smear around magnitude 8-9 is all we get to see.

But in the northern hemisphere we have had good views of Venus (now in line of the Sun) going to tiny crescent and Mercury at half phase. Jupiter and Saturn are good morning objects that will become midnight objects by July, but they are low to the summer ecliptic and trees etc get in my way from home.

A very bright supernova has been seen in the Virgo cluster, in an outer spiral arm of Messier 61. Supernova 2020 JFO.

Something that has plagued my deep sky viewing still is the starlink %G communications satellites from Elon Musk. We can see the clout he has with NASA now they have brought human launches to the ISS back to USA soil. They are not going to stop him using the sky as a private communications layer, ignoring protests from Earth based astronomers.

Seems they can set up an Artemis Accord to monitor and restrict lunar exploration now that Chinese and Indian probes and landers can get there… once the privateers get there will they be as astute?

Keep good health...

Clear skies Andy Burns.

The summer months bring the Milky Way into the southern skies. From home this is not very easy from my home observatory because of two homes to the south, leaving a 10 degree gap for my to capture the delights.

In May this meant being up at around 2:30am but will will be an evening opportunity by August.

Here is M20 the Triffid nebula, an interesting mix of reflection nebula (blue) and the red emission nebula and associated cluster of stars.

To the upper left is the open cluster M21.

120second exposure, no filters, 1600ISO, Nikon D810a on 120mm Esprit with field flattener.

Andy

Wiltshire Society Page

Wiltshire Astronomical Society

Web site: www.wasnet.org.uk

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

Meetings 2019/2020Season.

NEW VENUE the Pavilion, Rusty Lane, Seend

Meet 7.30 for 8.00pm start

NEW SEASON 2019/2020

2020

2nd Jun Allan Trow: The Story of Dark Sky Wales..

Allan Trow founding Director of the Dark Sky Wales company.

Membership Meeting nights £1.00 for members £3 for visitors

Wiltshire AS Contacts

Andy Burns Chair, anglesburns@hotmail.com

Andy Burns Outreach and newsletter editor.

Bob Johnston (Treasurer) Debbie Croker (vice Treasurer)

Philip Proven (Hall coordinator) Dave Buckle (Teas)

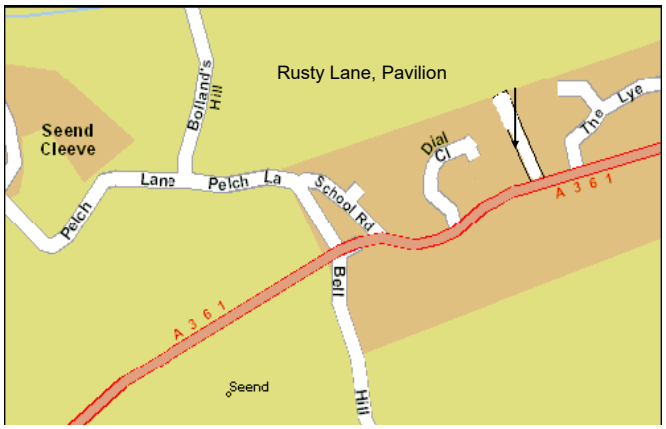
Peter Chappell (Speaker secretary)

Nick Howes (Technical Guru)

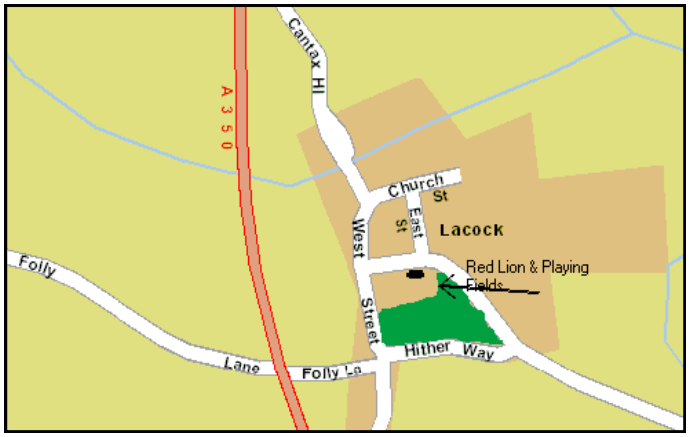
Observing Sessions coordinators: Chris Brooks, Jon Gale,

Web coordinator: Sam Franklin

Contact via the web site details.



Observing Sessions see back page



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Swindon Stargazers

Swindon's own astronomy group

Meetings cancelled

Due to the current crisis our meetings, like many others have been cancelled at least until after the summer break. We hope to reconvene again in September when the postponed AGM will be held.

Ad-hoc viewing sessions postponed

All ad-hoc meetings are currently cancelled until further notice.

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

For insurance reasons you need to be a club member to take part.

If you think you might be interested email the organiser Robin 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 2020

-------Summer Break------

Friday 18 September

Programme: AGM if restrictions lifted.

Friday 16 October

Programme: Dr James Fradgley MSc, FRAS: The Universe - 'A brief overview of what we know, or think we know'

Friday 20 November

Programme: Dave Eagle FRAS PGCE BSc (Hons): 'Comets, Enigmatic and Beautiful Visitors'

Website:

http://www.swindonstargazers.com

Chairman: Robin Wilkey

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Secretary: Hilary Wilkey

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BECKINGTON ASTRONOMICAL SOCIETY

Society Details & Speakers programme can be found on our Website www.beckingtonas.org

General enquiries about the Society can be emailed to chairman@beckingtonas.org.

Our Committee for 2016/2017 is

Chairman: Steve Hill (email chairman@beckingtonas.org)
Treasurer: John Ball
Secretary: Sandy Whitton
Ordinary Member: Mike Witt

People can find out more about us at 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
19th June	To Be Informed	

This young astronomy club meets at the
Sutton Veny Village Hall.
Second Thursday of the Month.

Bath Astronomers are holding webinar sessions linking in with Stargazers web sight.

STAR QUEST ASTRONOMY CLUB

BATH ASTRONOMERS

SPACE NEWS FOR JUNE 2020

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

NASA and SpaceX Make History with Successful Crew Dragon Launch!

Today, on Saturday, May 30th, NASA and SpaceX successfully launched the Crew Dragon to space with two astronauts for the first time. Far from just a demonstration, this launch signaled the restoration of domestic launch capability to US soil! From this day forward, NASA astronauts will no longer be dependent on foreign launch providers (like Roscosmos) to send astronauts to the International Space Station (ISS).

After passing all of its preflight checks, ground controllers signaled that the mission (Demo-2) was a go at 03:22 p.m. EDT (12:22 p.m. PDT), saying "let's light this candle!" A few seconds later, the Crew Dragon spacecraft and astronauts Robert Behnken and Douglas Hurley lifted off atop a *Falcon 9* rocket from Launch Pad 39A at the Kennedy Space Center.

The launch was originally meant to take place on Wednesday, May 27th, at 03:22 p.m. EDT (12:22 p.m. PDT). However, bad weather caused the launch to be scrubbed less than 15 minutes before engine ignition and NASA decided to try again during one of the mission's backup launch windows – either today at 03:22 p.m. EDT (12:22 p.m. PDT) or tomorrow at 03:00 p.m. EDT (12:00 p.m. PDT).

The event was the subject of live coverage by NASA Live and SpaceX, as well as live-updates via their respective Twitter feeds. About a minute into launch, both SpaceX and NASA tweeted success, the latter stating, "We have liftoff. History is made as @NASA_Astronauts launch from @NASAKennedy for the first time in nine years on the @SpaceX Crew Dragon."

Four minutes into launch, NASA declared that the mission had achieved main engine cutoff (MECO) and separation from the first stage. From this point onward, the Falcon 9's second stage continued to push the Crew Dragon into orbit while the first stage began the process of returning to the surface.

At 03:32 p.m. EDT (12:32 p.m. PDT), SpaceX live-tweeted that the second stage engine burn was complete and second engine cutoff (SECO) had occurred. One minute later, they announced that the first stage had been successfully recovered at sea after landing on the deck of the company's drone ship *Of Course I Still Love You*.

Twelve minutes into the flight, NASA announced that the Crew Dragon spacecraft had separated from the Falcon 9's second stage, which meant that spacecraft was in its desired orbit. The spacecraft's nosecone then opened, depositing the Crew Dragon and its crew into space. At 04:09 p.m. EDT (01:09 p.m. PDT) the Crew Dragon conduct the first of several phase burns that will keep it on course for its 19-hour journey to the ISS.

The spacecraft will rendezvous with the ISS tomorrow (Sunday, May 31st) at 10:29 a.m. EDT (07:29 a.m. PDT). Once there, the spacecraft will autonomously

dock with the station – though Behnken will assume control in the event that the autonomous systems are not working. Behnken and Hurley will then disembark and enter the station to complete the mission.

Rearview from the Crew Dragon after it finished separating from the Falcon 9 second stage. Credit: NASA/ SpaceX

Until then, Behnken and Hurley have a few tasks ahead of them, and NASA and SpaceX do too! At 04:55 p.m. EDT (01:55 p.m. PDT), the astronauts will take control of Crew Dragon for the first of two manual flight tests designed to show that astronauts can take control in the event of a system's failure. A broadcast and update on the progress of the mission from the Crew Dragon is expected at 05:55 p.m. EDT (02:55 p.m. PDT).

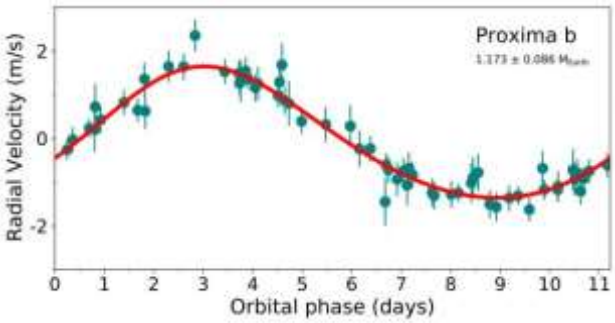
At 06:30 p.m. EDT (03:30 p.m. PDT), NASA Administrator Jim Bridenstine will host a postlaunch news conference from NASA's Kennedy Space Center. Joining him will be NASA Commercial Crew Program manager Kathy Lueders, a representative of SpaceX, ISS Program Manager Kirk Shireman, and NASA Chief Astronaut Pat Forrester.

SN4, We Hardly Knew You. Another Starship Prototype Lost!

Earlier today (Friday, May 29th), at 01:49 p.m. local time (02:49 p.m. EDT; 11:49 PDT), SpaceX *Starship* prototype (SN4) exploded on the company's test pad near Boca Chica, Texas. The explosion occurred two minutes after ground crews commenced a static fire test of its Raptor engine. This test was intended to test the Raptor and the *Starship* design once more in preparation for a major milestone – a 150 m (500 ft) hop test – this summer.

Powerful Telescope Confirms There's an Earth-Sized World Orbiting Proxima Centauri

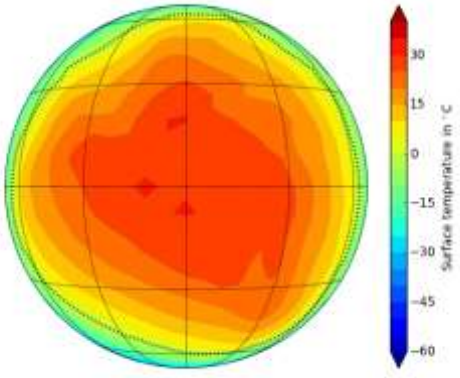
The closest star to the Sun is a small red dwarf star known as Proxima Centauri. It is only 4.2 light-years away and is now known to have an Earth-sized planet in its habitable zone. That doesn't mean there is life orbiting the nearest star, but its proximity should help us understand the possibilities.



The wobble of Proxima Centauri indicating it has a planet. Credit: UNIGE/Mascareño, et al

Known only as Proxima Centauri b, it was first discovered in 2016. While most exoplanets are discovered by the transit method, where the orbit of the planet carries it between its star and us, this particular world was discovered using the Doppler method. As the planet orbits Proxima Centauri, its gravitational pull causes the star to wobble slightly. Because of this, the starlight is slightly blueshifted and redshifted due to its motion relative to us. By measuring the doppler shift of the starlight, we can determine its relative velocity. Since we know the mass of Proxima Centauri, the relative velocity tells us how strong the gravitational pull of the planet is, which in turn tells us its mass.

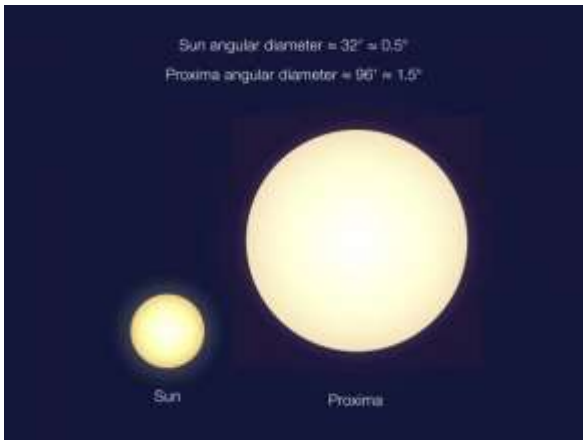
Making a Doppler measurement isn't easy. With red dwarf stars, there is the added complication that solar flares and the like can also give a Doppler shift since a part of the star's surface is rising and falling. When first measured in 2016, the data strongly suggested the presence of a planet, but it wasn't as solid as we'd like. But new measurements using a high-precision spectrometer known as ESPRESSO has confirmed the planet's existence. The study also confirmed the planet's mass and orbit. It is about 20% more massive than Earth and orbits Proxima Centauri at just the right distance to support liquid water on its surface. So it could be a rocky, warm, wet planet similar to our own.



The surface temperature of the planet could be extreme. Credit: M. Turbet/I. Ribas/ESO

Before we get too excited, there are plenty of reasons why it could be a dry, lifeless rock. To begin with, Proxima Centauri is only an eighth the mass of the Sun and

is quite a bit cooler and dimmer. Its habitable zone is very close to the star. Proxima Centauri b is only 0.04 au from its star, which is one-tenth the distance of Mercury from the Sun. It makes an orbit in only 11 days. This is so close that the planet could be tidally locked, meaning that one side of the planet faces the star, similar to the way one side of the Moon faces Earth. The near side of the planet could be much hotter than the Earth, and the far side much colder.



The apparent size of Proxima Centauri as seen from the planet. Credit: ESO/G. Coleman

Another challenge for possible life on the planet is that Proxima Centauri is a flare star, meaning that it often has large flares that create both strong stellar winds and intense x-rays. The planet would need a thick atmosphere to protect life from deadly x-rays, but the strong stellar winds might strip most of its atmosphere away. Could life ever arise on such an extreme and precarious world?

The good news is that this could answer that question. Red dwarfs make up about 75% of the stars in the Milky Way, and thus most potentially habitable worlds orbit these small stars. Proxima Centauri is close enough that we can study its world in detail. By understanding Proxima Centauri b, we can understand the most common of exoplanets. Whether inhabited or not, it is our closest Earth-like neighbor.

Reference: Anglada-Escudé, Guillem, et al. "A terrestrial planet candidate in a temperate orbit around Proxima Centauri." *Nature* 536.7617 (2016): 437-440.

Reference: A. Suárez Mascareño, et al. "Revisiting Proxima with ESPRESSO." *arXiv preprint* arXiv:2005.12114 (2020).

This Rocket Engine's Thrust Chamber was 3D-printed and Only has Three Parts

This week, European engineers hot-fire tested a fully 3D-printed thrust chamber that could one day power the upper stages for rockets. The chamber has just three parts, and was constructed using additive layer manufacturing, another name for 3D printing.

This hot-fire test lasted 30 seconds and was carried out on May 26, 2020 at the DLR German Aerospace Center's Lampoldshausen testing facility. The European Space Agency said that additional tests are planned for next week.

The Solar System Might Not Exist if There Wasn't a Huge Galactic Collision with the Milky Way Billions of Years Ago

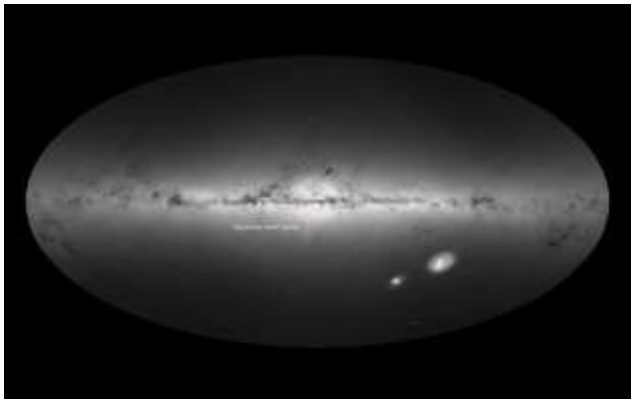
The Milky Way has a number of satellite galaxies; nearly 60 of them, depedending on how we define them. One of them, called the Sagittarius Dwarf Spheroidal Galaxy (Sgr d Sph), may have played a huge role when it comes to humans, our world and our little civilization. A collision between the Milky Way and the Sgr d Sph may have created the Solar System itself.

The Sagittarius Dwarf Spheroidal Galaxy was discovered in 1994, and at the time astronomers thought it was the closest dwarf galaxy to the Milky Way. Sgr d Sph is currently about 70,000 light years away from Earth. It travels in a looping polar orbit around the Milky Way.

In 2018, Gaia data showed that the Dwarf Spheroid passed through the Milky Way in the past 300 to 900 million years. Gaia found a pattern of star movement in the Milky Way that pointed to that fact. Now it looks like Sgr d Sph has passed through our galaxy multiple times.

A new study shows that on one of its passes through the Milky Way, about 4.7 billion years ago, it may have created perturbations which led directly to the birth of our Solar System.

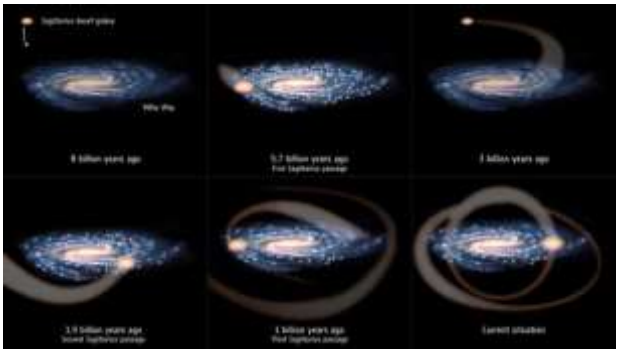
The new study is titled "The recurrent impact of the Sagittarius dwarf on the star formation history of the Milky Way." The lead author is Tomás Ruiz-Lara, a researcher in Astrophysics at the Instituto de Astrofísica de Canarias (IAC) in Tenerife, Spain. The paper is published in the journal Nature Astronomy.



The Sagittarius dwarf galaxy is visible as an elongated feature below the Galactic centre and pointing in the downwards direction in the all-sky map of the density of stars observed by ESA's Gaia mission between July 2014 to May 2016. Image Credit: By ESA/Gaia/DPAC, CC BY-SA 3.0-igo, https://commons.wikimedia.org/w/index.php?curid=77752828

The study is based on data from Gaia, a ESA space telescope. Gaia's mission is to create a 3D chart of the stars in the Milky Way. By mapping the velocity and position of about 1 billion stars in the Milky Way, Gaia hopes to reveal the stellar composition of the galaxy, and how the galaxy formed and evolved over time.

Gaia data has shown the impact that Sag. Dwarf Spheroid has had on the Milky Way over billions of years. According to the data, the dwarf has collided with the Milky Way at least three times in the past 6 billion years. And those rendezvous might have triggered some major episodes of star formation, including the Sun itself.



The three known collisions between Sagittarius and the Milky Way have, according to a new study, triggered major star formation episodes, one of which may have given rise to the Solar System. Image Credit: ESA/Gaia

"It is known from existing models that Sagittarius fell into the Milky Way three times – first about five or six billion years ago, then about two billion years ago, and finally one billion years ago," said lead author Ruiz-Lara in a press release.

"When we looked into the Gaia data about the Milky Way, we found three periods of increased star formation that peaked 5.7 billion years ago, 1.9 billion years ago and 1 billion years ago, corresponding with the time when Sagittarius is believed to have passed through the disc of the Milky Way," said Ruiz-Lara.

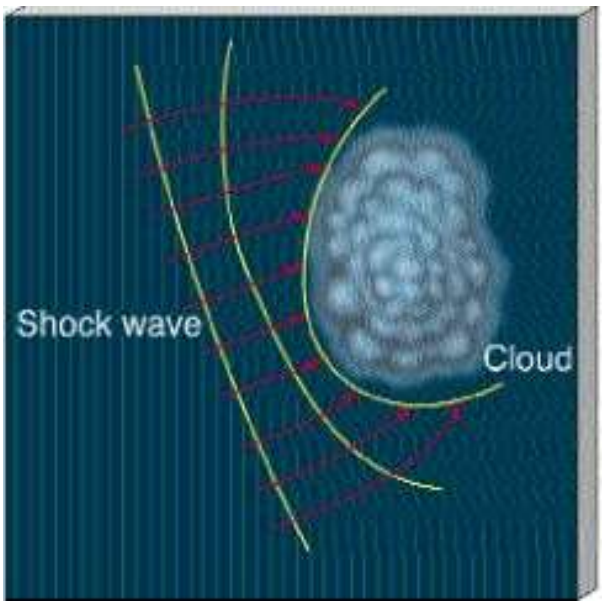
Astronomers have a lot of data and models at their disposal, including on stellar evolution. The authors behind this work looked at existing stellar evolution models, and compared it to stars within about 6500 light years around our Solar System. They looked at the stars' luminosity, colour, and distances. According to their work, all of that data indicated an encounter with the Sagittarius Dwarf Spheroidal Galaxy.

"The Sun formed at the time when stars were forming in the Milky Way because of the first passage of Sagittarius." ***Carme Gallart, Co-Author, IAC***

"At the beginning you have a galaxy, the Milky Way, which is relatively quiet," Ruiz-Lara said. "After an initial violent epoch of star formation, partly triggered by an earlier merger as we described in a previous study, the Milky Way had reached a balanced state in which stars were forming steadily. Suddenly, you have Sagittarius fall in and disrupt the equilibrium, causing all the previously still gas and dust inside the larger galaxy to slosh around like ripples on the water."

These ripples change the density of gas in some regions, and lower it in others. As gas density increases, it triggers star formation, in the same way that the shock-waves from supernovae can trigger star formation.

When a shock wave encounters an interstellar cloud of gas, it doesn't push it out of the way. The outside is thinner material than the dense interior of the cloud, so the shock wave travels around the outside of the cloud, eventually pushing in from all sides and compressing the material, sometimes enough to form stars.



Shock waves compress clouds of gas and trigger star formation. The same thing happened when the Sagittarius Dwarf Spheroidal Galaxy collided with the Milky Way, possibly triggering the formation of our Sun. Image Credit: NASA

"It seems that not only did Sagittarius shape the structure and influenced the dynamics of how stars are moving in the Milky Way, it has also led to a build-up of the Milky Way," says Carme Gallart, a co-author of the paper, also of the IAC. "It seems that an important part of the Milky Way's stellar mass was formed due to the interactions with Sagittarius and wouldn't exist otherwise."

So not only has the Sag. Dwarf Spheroid galaxy changed the structure and movement of stars in the Milky Way, it may have caused the formation of a portion of them. Including our Sun. While at the moment, there's no absolute conclusion that the close encounter did in fact form the Sun, it's a distinct possibility.

"The Sun formed at the time when stars were forming in the Milky Way because of the first passage of Sagittarius," says Gallart. "We don't know if the particular cloud of gas and dust that turned into the Sun collapsed because of the effects of Sagittarius or not. But it is a possible scenario because the age of the Sun is consistent with a star formed as a result of the Sagittarius effect."

But the evidence is compelling. Whether or not scientists can point to the specific stars that were born from the interaction between the Milky Way and the Sagittarius Dwarf Spheroidal Galaxy is not necessarily the most compelling thing about the study. The compelling thing is that a low-mass satellite can cause star formation in its much larger companion.

"The possibility that a satellite dwarf galaxy considerably less massive than its host is able to induce repeated massive events of star formation involving an important part of its disk is striking, the authors write in their paper. "All evidence seems to suggest that recurrent interactions between the Milky Way and Sgr dwarf galaxy are behind such enhancements <in stellar formation>. These findings imply that low mass satellites, not only affect the Milky Way disk dynamics, but also are able to trigger notable events of star formation throughout its disk."

This study speaks to the enormous contribution the Gaia mision has made in our understanding of the

Milky Way. Launched in 2013, it's initial five-year mission ended in September 2019. Now it's been extended to the end of 2022. There've been two data releases from Gaia, and countless papers based on that data.

"Some determinations of star formation history in the Milky Way existed before based on data from ESA's early 1990s Hipparcos mission," said ESA Gaia project scientist Timo Prusti. "But these observations were focused on the immediate neighbourhood of the Sun. It wasn't really representative and so it couldn't uncover those bursts in star formation that we see now."

An all-sky view of stars in our Galaxy – the Milky Way – and neighbouring galaxies, based on the first year of observations from ESA's Gaia satellite, from July 2014 to September 2015.

This map shows the density of stars observed by Gaia in each portion of the sky. Brighter regions indicate denser concentrations of stars, while darker regions correspond to patches of the sky where fewer stars are observed. The two large white patches below and to the right are the Large and Small Magellanic Clouds. Credit: ESA / Gaia / DPAC / A. Moitinho & M. Barros, CENTRA – University of Lisbon.

But Gaia's reach has changed that. "This is really the first time that we see a detailed star formation history of the Milky Way. It's a testament to the scientific power of Gaia that we have seen manifest again and again in countless ground-breaking studies in a period of only a couple of years."

More:

Press Release: Galactic crash may have triggered Solar System formation
Research Paper: The recurrent impact of the Sagittarius dwarf on the star formation history of the Milky Way
Universe Today: The Milky Way is Still Rippling from a Galactic Collision Millions of Years Ago

NASA Proposes the Artemis Accords. The New Rules for Lunar Exploration

As part of Project Artemis, which was announced in May of 2019, NASA will be sending the first woman and the next man to the Moon for the first time since the Apollo Era. To make this happen, NASA has partnered with the private aerospace industry to develop all the necessary systems. At the same time, NASA has entered into collaborative agreements with other space agencies to ensure that lunar exploration is open to all. To formalize these agreements and ensure that all parties are committed to the same goals, NASA recently drafted a framework for cooperative lunar exploration and development. Known as the Artemis Accords, this series of bilateral agreements (which are grounded in the Outer Space Treaty of 1967) establish common principles for international partners who want to become part of humanity's long-awaited return to the Moon.

Earth Life Probably Can't Spread to Mars Today

It's no secret that Mars once had abundant water flowing on its surface in the forms of rivers, lakes, and even an ocean. For this reason, scientists continue to wonder whether or not Mars might have had life in the past. Today, the surface is an extremely cold, dry place where even a single droplet of water would instantly freeze, boil, or evaporate. Unless, of course, the water had salt dissolved in it.

If these "briny" patches still exist on Mars, then it's possible there are small pockets on the surface where microbes can still exist. This presents problems as far as issues of "planetary protection" are concerned. However, a new study led by the Lunar and Planetary Institute (LPI) has shown that if life from Earth were brought over by robotic or human explorers, it probably couldn't survive in these brines.

The study that describes their findings, titled "Distribution and habitability of (meta)stable brines on present-day Mars", recently appeared in the journal *Nature Astronomy*. The team responsible included members from the Universities Space Research Association (USRA), which oversees the LPI, the University of Arkansas Center for Space and Planetary Sciences, and the Southwest Research Institute (SwRI).

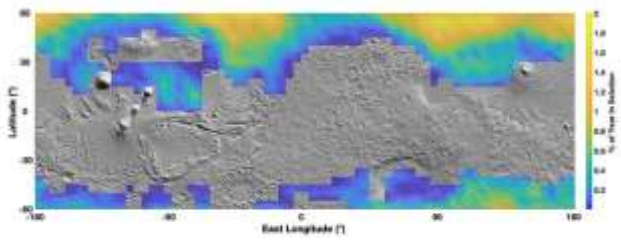
The struts of NASA's Phoenix lander showing potential brine droplets. Credit: Marco Di Lorenzo/Kenneth Kremer/NASA, JPL/UA, Max Planck Inst./ Spaceflight

After the Phoenix lander arrived on Mars in 2008, mission scientists saw evidence of brine droplets forming on one of the struts. This and other observations led to the conclusion that salts are relatively common on the Martian surface. In addition, where temperature and relative humidity conditions are just right, some of these salts can undergo a process called deliquescence – where they take in water from the atmosphere.

While water is unstable on the Martian surface, previous models have shown that stable brines can form and persist between the equatorial region and high latitudes during certain times of the year for up to six consecutive hours. This is a broader range than what was previously thought, but this latest study indicates that the temperatures are well below the lowest temperatures to support life.

As Dr. Vincent Chevrier, co-author of the study from the University of Arkansas, said in an LPI press release:

"We've been conducting experiments under Martian simulated conditions at the University of Arkansas for many years now to study these types of reactions. Using what we've learned in the lab, we can predict what will likely happen on Mars."



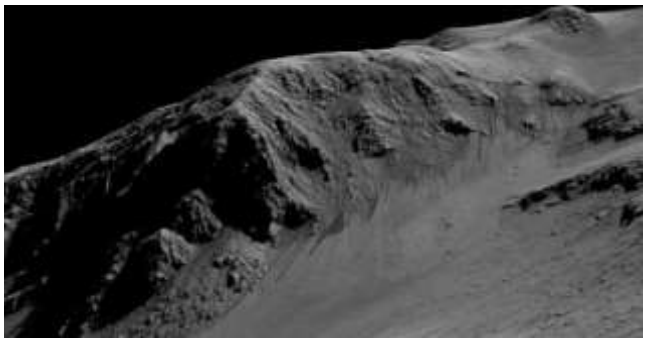
Distribution of brines on Mars, with colors showing the percent of the year a liquid can exist on the surface. Credit: Rivera-Valentín et al.

For the sake of their study, the team used laboratory measurements of Mars-relevant salts along with Martian climate information from both planetary models and spacecraft measurements. With the help of a scientist from the SwRI, whose research was funded by NASA through the Habitable Worlds program, they developed a model to predict where, when, and how long brines are stable on the surface (and shallow subsurface) of Mars.

From this, they sought to determine if salty pockets of water present on the Red Planet are capable of supporting life as we know it on Earth. Dr. Alejandro Soto, a senior research scientist at the SwRI and co-author of the study, was responsible for the climate model. As he said in a SwRI press release:

"Our team looked at specific regions on Mars — areas where liquid water temperature and accessibility limits could possibly allow known terrestrial organisms to replicate — to understand if they could be habitable. We used Martian climate information from both atmospheric models and spacecraft measurements. We developed a model to predict where, when and for how long brines are stable on the surface and shallow subsurface of Mars.

"Even extreme life on Earth has its limits, and we found that brine formation from some salts can lead to liquid water over 40% of the Martian surface but only seasonally, during 2% of the Martian year. This would preclude life as we know it."



Dark, narrow streaks on Mars at sites like the Horowitz Crater are inferred to be formed by seasonal flow of water on modern-day Mars. Credit: NASA/JPL-Caltech/ Univ. of Arizona

Brines have a lower freezing temperature than pure liquid water and are also subject to slower evaporation. But because Mars is hyper-arid, they would also need significantly lower temperatures than are required on Earth for water to condense in the atmosphere and remain stable. In other words, the air needs to be very cold to achieve high relative humidity.

In the end, the team determined that brines would experience a maximum temperature of -48 °C (-55° F). In addition, they found that certain salts could result in seasonal brines forming over 40% of the Martian surface – but only for 2% of the year. Not only is this temperature right at the lower boundary of what life-forms on Earth can theoretically tolerate, it also means that brines are very intermittent on Mars.

Dr. Edgard Rivera-Valentín, a planetary scientist and NASA Early Career Fellow with the LPI, was the lead author on the study. As he summarized in a recent USRA/LPI press release:

"In our work, we show that the highest temperature a stable brine will experience on Mars is -48°C (-55° F). This is well below the lowest temperature we know life can tolerate… We have shown that on a planetary scale the Martian surface and shallow subsurface would not be suitable for terrestrial organisms because liquids can only form at rare times, and even then, they form under harsh conditions. However, there might be unexplored life on Earth that would be happy under

these conditions."

Artist's impression of the Perseverance rover on Mars. Credit: NASA-JPL

These results are good news for future missions to Mars, especially where astronauts are concerned. For years, missions planners have been concerned that additional rovers, landers, and astronauts could pose a threat to any indigenous life forms. Knowing that Earth microbes could not survive in a Martian environment reduces the risk of possible contamination.

Studies of this kind are essential to future exploration efforts, especially missions that are searching for evidence of extra-terrestrial life. When missions to Europa, Ganymede, and other "ocean worlds" become common, preventing contamination will be of vital importance. After all, searching for evidence of life beyond Earth is pretty pointless if you destroy it in the process!

Further Reading: LPI, SwRI, Nature

NASA is Going to Try Manufacturing a Telescope Mirror in Space

Space telescopes are a pretty amazing thing. By deploying an observatory to orbit, astronomers are able to take pictures of the Universe unencumbered by atmospheric disturbance. At the same time, they are very expensive to build, maintain, and launch into space. As the case of Hubble's flawed mirror demonstrated, a space telescope also has to go through rigorous checks because of how difficult it becomes to service them after launch.

To address this, NASA is investigating the possibility of constructing future space telescopes in space. A key aspect of this involves a manufacturing technique known as Atomic Layer Deposition (ALD), a process where layers of material no thicker than an atom is deposited on a surface and then hardened in place. Now, a team of NASA-supported researchers has been given the chance to test ALD in a microgravity environment (i.e. space!)

E Mails Viewings Logs and Images from Members.

Hi Andy,
I hope you are well.
Here are my submissions for the WAS June 2020 Newsletter.
07/05/2020
Flower Full Moon

Canon SX50HS 1800mm (50x Optical and 25 x Digital), ISO 80, F6.5, 1/200 sec
100 images cropped in Pipp, stacked in Registax 6 and post processed in Affinity Photo
24/05/2020
Crescent Moon, Mercury and Venus

Canon 1100D, Sigma 17-70mm at 70mm (effective focal length 112mm)
Sunset image 3 images - F4, ISO 400, 1/100 sec, 1/125 sec, 1/80 sec – HDR merge HDR3
Twilight image 3 images - F4.5, ISO 800, 1 sec, 1.6 sec, 0.6 sec – HDR merge HDR3
28/05/2020
ISS UK 2109 UT (2209 BST) Flyby

The light trails are from tractors/trailers as the farmers were collecting cuttings for silage from their fields! I had expected it to be quiet at the lake but I did not have time to relocate to another place before the ISS flyby. I could have removed the light trails in post pro-

cessing but decided to leave them. I thought it made a more interesting picture with the ISS light trail and the vehicle light trails – high technology versus traditional activities on Earth.
89 images stacked in Starstax and post processed in Affinity Photo to remove star trails.
Canon 1100D, Rokinon 8mm (effective focal length 13mm)
ISO 200, F3.5, 3.2 sec.
Stay safe and well.
Clear skies,
John Dartnell

Viewing Log for 19th of May

With people now allowed to go out and do sun bathing (light from a star?), I thought I would do a twist on it and do my sun bathing from Arcturus (light from a star?). Anyway I went off to my usual viewing spot at Uffcott only to find 'road closed' signs up and access only, going pass the sign I managed to get to my usual layby and started setting up my Meade LX90 GOTO 8 inch (203 mm) telescope, while doing set up's two cars went past me (the only two I would see all evening J. The temperature was 13 ° and no wind, so should be pleasant conditions to view (not having any winter gear with me, I hope it would be okay?). I was set up and ready to start viewing at 21:43 (this is the trouble of

viewing in mid-May, late starts!).

First object of the evening was going to be Venus as it was fairly low and in twilight skies! I could make out a 7.3% lit crescent phase, once it got a bit darker I noticed Mercury below and to the west of Venus (first time I have caught the inner most planet in a while and could make a good photo in a few days' time, see picture elsewhere in magazine?). After doing the short planet tour I decided I would let the

hand controller decide what I would be looking at that night, there is a programme on it called 'Tonight's Best'. First object was the Double Cluster but that was in the hedge beside me (too low to view, currently), so on to next object which was the star Vega in Lyra, a nice brilliant white star. Arcturus in Bootes was the next object, a giant orange/red star which is the fourth brightest in the night sky. Spica (16th brightest) in Virgo was the next object, a white star to look at. On to Regulus in Leo, a brilliant white star followed by Albireo in Cygnus, probably the best double star to look at, but tonight it was not that good at it was low down? Finally onto deep sky objects and M 13, the great Globular Cluster (G C) in Hercules, this was good to look at and after a while I could make out a few stars in this cluster. Oh, back to stars again and Castor in Gemini a double star which can be spilt very easy with telescopes? According to the internet, this is a six body system but the other four must be fairly faint? Back to deep sky and M 44, the Beehive Cluster in Cancer, this Open Cluster (O C) is best viewed with the finder scope, too large for main scope? Off westward and to Auriga and M 37, this O C was hard to see (still some twilight skies in the west), M 38 was not much better, could make out a few stars and that was about it! M 36 was the best of the three Messier objects in this constellation, it looked very loose? Swing around to the eastern horizon and M 27, the Dumbbell Nebula being very low in the sky it was hard to make out. Back to stars again and Deneb, the brilliant blue/white star in Cygnus followed this up with Altair and that completed the 'Summer Triangle' of stars. Back to Hercules and M 92, this G C is often over looked by it more famous neighbour M 13, it had a bright core and a bit smaller than M 13? In to Ursa Major and M 82, this spiral galaxy was bright to look at? Next object I would guess would be M 81 right next door? Eh wrong, turned out to be M 5 in Serpens, this G C looked similar to M 13 but not as bright? In to Virgo and M 104, the Sombrero Galaxy, this is the usual Fuzzy Blob (F B) and spiral galaxies for me, no detail at all! M 57, the Ring Nebula was good to look at, the next object I had to use adverted vision to see it? M 68 was very low in the southern skies, I called it a faint fussy blob (F F B) for the evening. Back to the east again and M 52 in Cassiopeia, this is a loose O C, one less number but now nearly overhead (84 °) and M 51, the Whirlpool Galaxy, I could make out the arms of this galaxy? C 53, the Spindle Galaxy was an F F B to look at, being only 13 ° above the horizon did not help it out? That was the end of the evening tour from the hand controller, not sure the way it went around the sky, I thought it would start in the west and go eastwards? As I finished on a Caldwell object I thought I would try and see a few of the objects still on my list I have not seen namely C 52, 66, 67, 69 and 70? Started with C 52 with this in Virgo I could locate this Elliptical Galaxy, as usual it was an F F B to look at! C 66 I could not make out, thought I would go to High Precision mode on the telescope (when in this mode, the telescope goes off to a nearby bright star and I centre it manually and then press enter and it should find the required object?) turns out C 66 was only 12 ° above the horizon and another F F B being a G C the surface brightest is spread out? C 67 and 69 were still below the horizon so I will have to try them later in the year, not sure if I can see C 70 at its latitude is – 37 ° 41' from Uffcott? Scorpio was now clearing the south eastern horizon, started with M 4 (very close to Antares), this G C was an F B and only 7 ° above horizon. M 80, the other G C in Scorpio was a tight one? Final object for the evening was C 14 (Double Cluster) which had now cleared the nearby hedge, it was okay to look at and only being 19 ° high.

I started packing up at 23:39 and there was little dew on the equipment, it would still need to be dried out over the night? As for the road closed, that was only during the day while work men were doing something to the edge of the road?

Probably no more viewing sessions until early August when I can see the Milky Way high in the sky.

Clear skies and stay safe.

Peter Chappell

To: Andy

Mercury and Venus conjunction was I was out viewing.

Mercury and Venus (with Moon nearby) conjunction.

Two day old waxing crescent Moon.

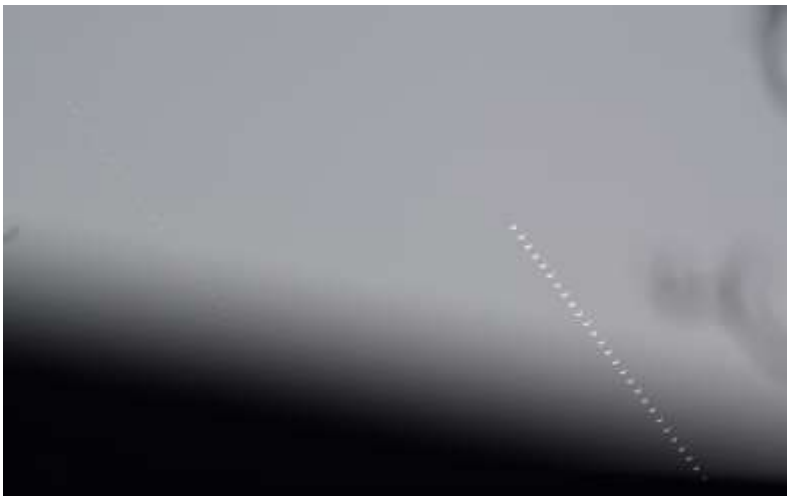
Peter

Hi Andy
Thought you might like this.
(I will ask Sam to get this on the web site and put it on Facebook)
It's the ISS transiting the moon last Thursday at around 10:11pm
1 video at 3 different speeds. ISS enters top right, exits lower left. Transit time is 0.97 seconds.

Rgds
Steve

(NOW posted on Facebook pages)

Some Images from the Chair...



Mercury (tiny to the left, and crescent Venus from their conjunction in May.

Venus as a tiny crescent phase on 29th May. USB DMK52au camera on telescope.

Here are some Globular clusters associated with the northern hemisphere of the Milky Way.

M13

M92

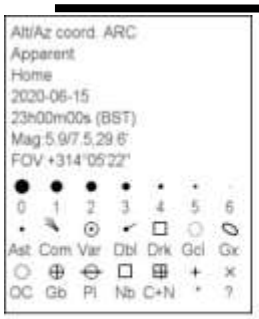
M5

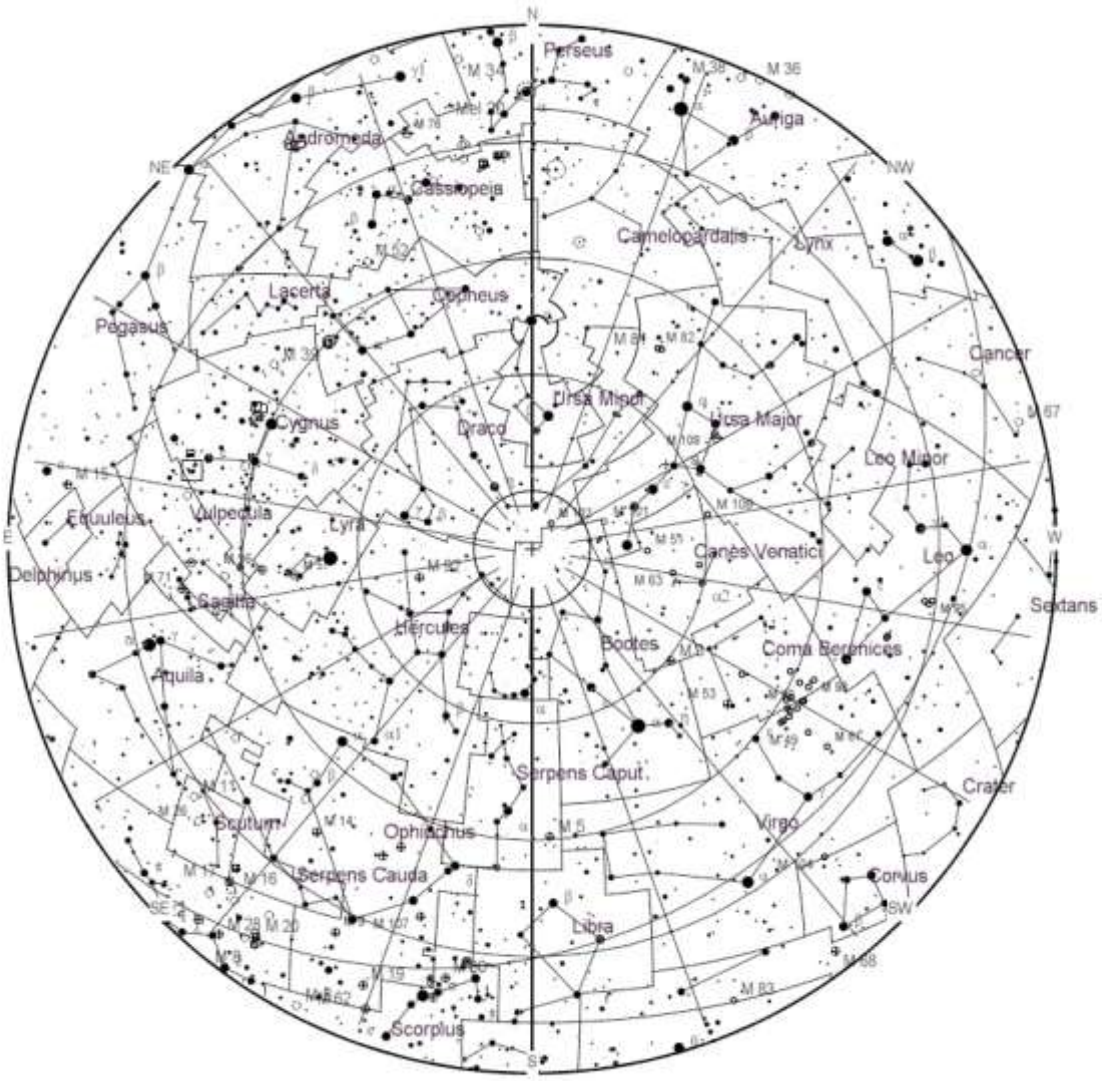
M3

M56

M12

WHATS UP, SUMMER 2020





June 5 - **Penumbral Lunar Eclipse.** A penumbral lunar eclipse occurs when the Moon passes through the Earth's partial shadow, or penumbra. During this type of eclipse the Moon will darken slightly but not completely. The eclipse will be visible throughout most of Europe, Africa, Asia, Australia, the Indian Ocean, and Australia.
June 21 - **New Moon.** The Moon will located on the same side of the Earth as the Sun and will not be visible in the night sky. This phase occurs at 06:42 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.

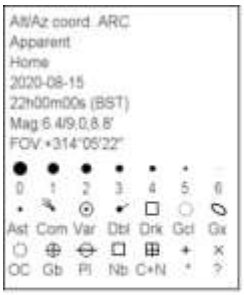
June 21 - **Annular Solar Eclipse.** An annular solar eclipse occurs when the Moon is too far away from the Earth to completely cover the Sun. This results in a ring of light around the darkened Moon. The Sun's corona is not visible during an annular eclipse. The path of the eclipse will begin in central Africa and travel through Saudi Arabia, northern India, and southern China before ending in the Pacific Ocean. A partial eclipse will be visible throughout most of eastern Africa, the Middle East, and southern Asia.

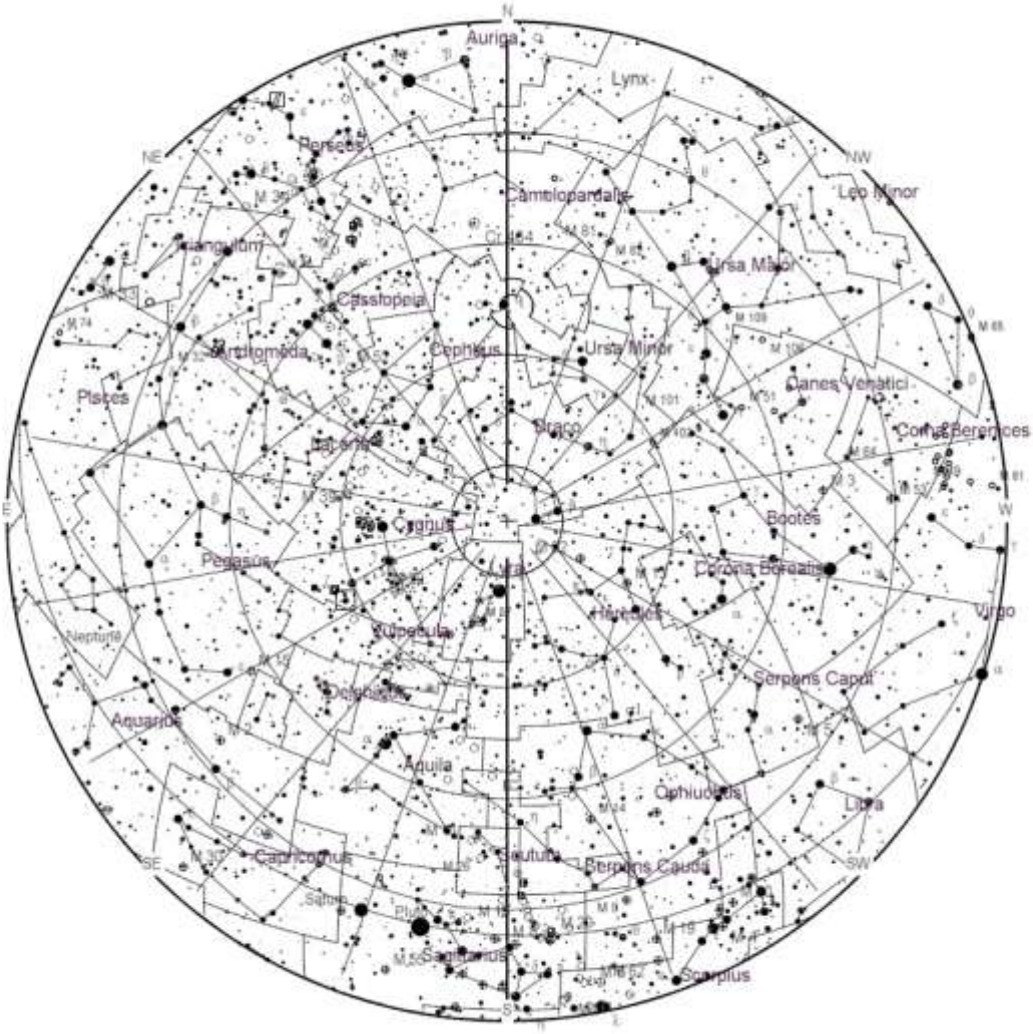
June 20 - **June Solstice.** The June solstice occurs at 21:43 UTC. The North Pole of the earth will be tilted toward the Sun, which will have reached its northernmost position in the sky and will be directly over the Tropic of Cancer at 23.44 degrees north latitude. This is the first day of summer (summer solstice) in the Northern Hemisphere and the first day of winter (winter solstice) in the Southern Hemisphere.

July 5 - **Full Moon.** The Moon will be located on the opposite side of the Earth as the Sun and its face will be will be fully illuminated. This phase occurs at 04:44 UTC. This full moon was known by early Native American tribes as the Buck Moon because the male buck deer would begin to grow their new antlers at this time of year. This moon has also been known as the Thunder Moon and the Hay Moon.

July 5 - **Penumbral Lunar Eclipse.** A penumbral lunar eclipse occurs when the Moon passes through the Earth's partial shadow, or penumbra. During this type of eclipse the Moon will darken slightly but not completely. The eclipse will be visible throughout most of North America, South America, the eastern Pacific Ocean, the western Atlantic Ocean, and extreme western Africa. (**NASA Map and Eclipse Information**)

July 14 - **Jupiter at Opposition.** The giant planet will be at its closest approach to Earth and its face will be fully illuminated by the Sun. It will be brighter than any other time of the year and will be visible all night long. This is the best time to view and photograph Jupiter and its moons. A medium-sized telescope should be able to show you some of the details in Jupiter's cloud bands. A good pair of binoculars should allow you to see Jupiter's





four largest moons, appearing as bright dots on either side of the planet.

July 20 - **New Moon.** The Moon will located on the same side of the Earth as the Sun and will not be visible in the night sky. This phase occurs at 17:33 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.

July 20 - **Saturn at Opposition.** The ringed planet will be at its closest approach to Earth and its face will be fully illuminated by the Sun. It will be brighter than any other time of the year and will be visible all night long. This is the best time to view and photograph Saturn and its moons. A medium-sized or larger telescope will allow you to see Saturn's rings and a few of its brightest moons.

July 22 - **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.

July 28, 29 - **Delta Aquarids Meteor Shower.** The Delta Aquarids is an average shower that can produce up to 20 meteors per hour at its peak. It is produced by debris left behind by comets Marsden and Kracht. The shower runs annually from July 12 to August 23. It peaks this year on the night of the 28th and morning of the 29th. The second quarter moon will block many of the fainter meteors this year. But if you are patient, you should still be able to catch a few of the brighter ones. Best viewing will be from a dark location after midnight. Meteors will radiate from the constellation Aquarius, but can appear anywhere in the sky.

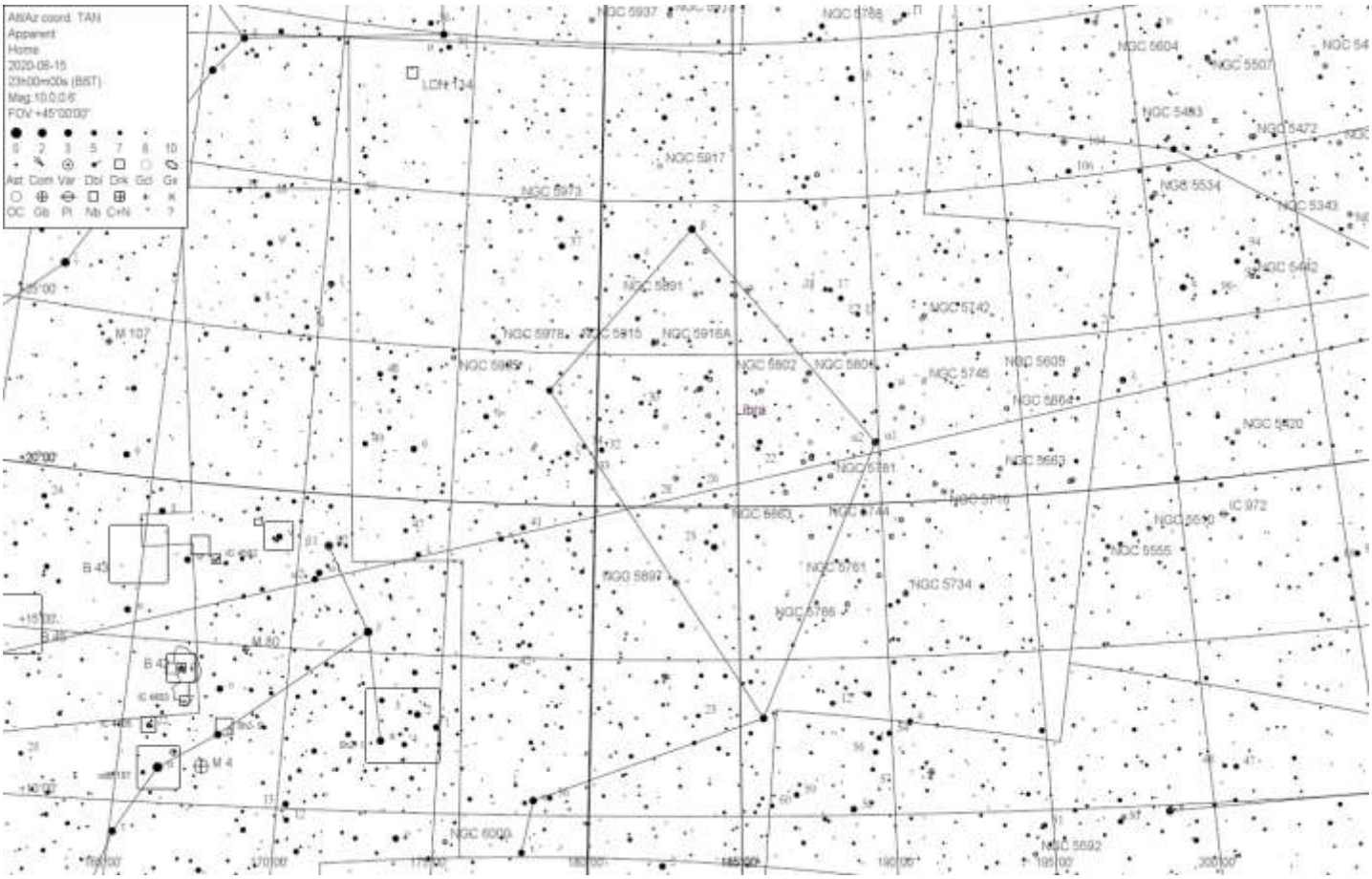
August 3 - **Full Moon.** The Moon will be located on the opposite side of the Earth as the Sun and its face will be will be fully illuminated. This phase occurs at 15:59 UTC. This full moon was known by early Native American tribes as the Sturgeon Moon because the large sturgeon fish of the Great Lakes and other major lakes were more easily caught at this time of year. This moon has also been known as the Green Corn Moon and the Grain Moon.

August 11, 12 - **Perseids Meteor Shower.** The Perseids is one of the best meteor showers to observe, producing up to 60 meteors per hour at its peak. It is produced by comet Swift-Tuttle, which was discovered in 1862. The Perseids are famous for producing a large number of bright meteors. The shower runs annually from July 17 to August 24. It peaks this year on the night of the 11th and morning of the 12th. The second quarter moon will block out some of the fainter meteors this year, but the Perseids are so bright and numerous that it should still be a good show. Best viewing will be from a dark location after midnight. Meteors will radiate from the constellation Perseus, but can appear anywhere in the sky.

August 13 - **Venus at Greatest Western Elongation.** The planet Venus reaches greatest western elongation of 45.8 degrees from the Sun. This is the best time to view Venus since it will be at its highest point above the horizon in the morning sky. Look for the bright planet in the eastern sky before sunrise.

August 19 - **New Moon.** The Moon will located on the same side of the Earth as the Sun and will not be visible in the night sky. This phase occurs at 02:42 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.

CONSTELLATIONS OF THE MONTH: LIBRA



Libra is a constellation of the zodiac, positioned on the ecliptic plane between Virgo to the west and Scorpius to the east. It is a faint group of stars and not easy to recognize. Its two major stars once represented the claws of Scorpius. How and when it came to be recognized by its present designation is unknown. Libra covers approximately 538 square degrees of sky and contains 6 stars in its asterism. There are 46 Bayer Flamsteed designated stars within Libra and it is bordered by Serpens Caput, Virgo, Hydra, Centaurus, Lupus, Scorpius and Ophiuchus. Libra can be seen by all observers at latitudes between +65° and ?90° and is best seen at culmination during the month of June.

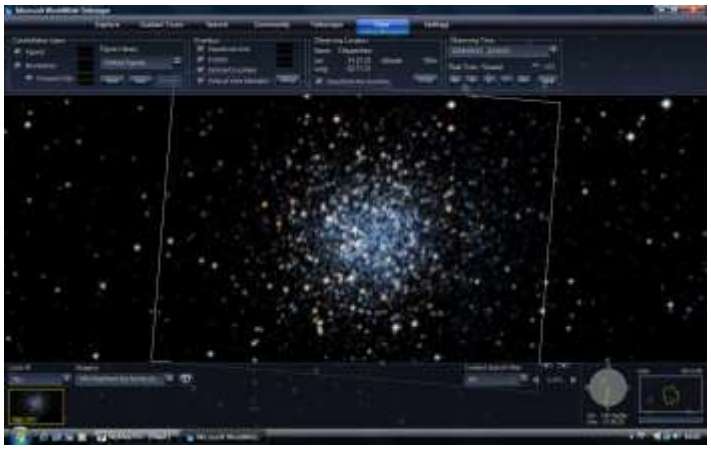
In mythology, the Alpha and Beta stars of Libra once represented *Chelae Scorpionis*, the northern and southern claws of the Scorpion. Who knows exactly where and when it became depicted as a set of scales, but the Romans identified it with the scales held by Astraea, the goddess of justice. They believed the Moon was in Libra when Rome was founded and the astrological sign represented balance because this is where the Sun was housed during autumnal equinox. Oddly enough, Libra is the only astrological symbol that doesn't depict some type of living creature.

Once you've located it, let's take a binocular tour of Libra, beginning with Alpha Librae – Zubenelgenubi – the "a" symbol on our map. Despite its alpha designation, it's not the brightest star here, but what you'll find here is a wonderful, visual double star. Alpha Librae "The Southern Claw" is located approximately 77 light years from the Sun, and the components are easily separated with even the slightest visual aid. Look for a beautiful yellow coloration to the spectral type A3 primary star and a slight blue tinge to the far fainter type F4 companion. Zubenelgenubi is close to the ecliptic so it can be easily occulted by the Moon!

Now, hop to Beta Librae – Zubeneschamali – the "B" symbol on our map. "The Northern Claw" is actually the brightest star in Libra and also one of the furthest away at about 160 light years from Earth. Beta Librae is a blue dwarf star of spectral type B8, what would appear to be a rather ordinary main sequence star – but take a really close look in binoculars. Does it appear a little green to you? Zubeneschamali is running a high temperature – more than twice that of our own Sun – produces light with a simple spectrum. This makes it a perfect candidate for examining interstellar gas and dust which lay between us and it – but its rapid hydrogen fusion also causes it to appear a little more green than other stars. A colour rarely seen in stars! What's more, Beta Librae spins about 100 times faster than our Sun and shines about 130 brighter. Not bad for a star that not even as evolved as Sirius!

Point your binoculars further south for Sigma Librae – the "O" symbol with the little flag on our map. Its traditional name is Zubenhakrabi – a cool class M (M3) rather-luminous red giant. Located approximately 292 light years from our solar system, Sigma is rather special – a prototype of its own group of ultra-small-amplitude variables which are called Sigma Librae variable stars. What are they? Pulsing red giants, of course! It doesn't change its brightness much, maybe only 0.16 magnitudes over a 20-day period, but knowing you're looking at dying solar mass star, with a dead helium core, fuelled by internal nuclear-burning shells of helium and hydrogen is still undeniably fascinating! What's

Zubenhakrabi future like? Chances are it will just eventually become a Mira-type variable star that will eventually shed its outer skin, leaving its now-content carbon-oxygen center to become just another of the white dwarf stars of the night!



Time to get out the telescope and head for NGC 5694 (RA 14:39:36.5 Dec -26:32:18). This 10th magnitude, irregularly shaped globular cluster was discovered by Sir William Herschel in 1784 and is one of the more remote globular clusters of the Milky Way Galaxy at a distance of about 113 thousand light years. If you find it difficult to resolve, you'd be right. Its brightest stars average about magnitude 16 and so far none of them have been discovered to be variable. Why bother if it is so dim? Because this globular cluster is a curiosity! It's moving… and it's moving fast. According to studies, NGC 5694 can either be a hyperbolic orbit or may be elevated into a higher energy orbit during its evolution. It is possible that NGC 5694 may have once belonged to the Magellanic Clouds. Thanks to work done by Lee (et al) who discovered one red giant star, we know that it has a "unique chemical abundance pattern" and an "an extragalactic origin". No wonder it's so faint….

Need a big telescope challenge? Then try NGC5792 (RA 14:58.4 Dec -01:05). At around magnitude 12, it's going to take some dark sky to catch this nearly edge-on spiral galaxy, but it is worth your time and trouble. As part of the Herschel catalogue, you'll find a distracting star on the western edge, but very pretty spiral galaxy structure with a bright nucleus await you. At 85 million light years away, it still shows some very nice form to large aperture.

Before you put away your telescope, try NGC 5903/5898 (RA 15:18.6 Dec -24:04). This binary el-

liptical galaxy pair is quite achievable in an 8″ telescope with dark skies and good seeing conditions. You'll find them about three degrees northeast of Sigma, and just north of a pair of 7th magnitude stars. While northernmost NGC 5903 seems to be nothing more than a faint elliptical with a brighter concentration toward the centre and an almost identical elliptical – NGC 5898 – to the southwest, you're probably asking yourself… Why the big deal over two small ellipticals? First off, NGC 5903 is Herschel III.139 and NGC 5898 is Herschel III.138…two more to add to your studies. And second? The Very Large Array has studied this galaxy pair in the spectral lines of neutral hydrogen. The brighter of the pair, NGC 5898, shows evidence of ionized gas which has been collected from outside its galactic realm – while NGC 5903 seems to be running streamers of material toward its neighbour. A double-galaxy, double-accretion event! But there's more… Look to the southeast and you'll double your pleasure and double your fun as you discover two double stars instead of just one! Sometimes we overlook field stars for reasons of study – but don't do it tonight. Even mid-sized telescopes can easily reveal this twin pair of galaxies sharing "their stuff," as well as a pair of double stars in the same low power field of view. (Psst… slim and dim MCG 043607 and quasar 1514-241 are also here!)

Tip the "scales" in your favour if you have a big telescope and get a good star chart. There's lots more in Libra than you think!

ISS PASSES For Summer 2020 From Heavens Above website maintained by Chris Peat

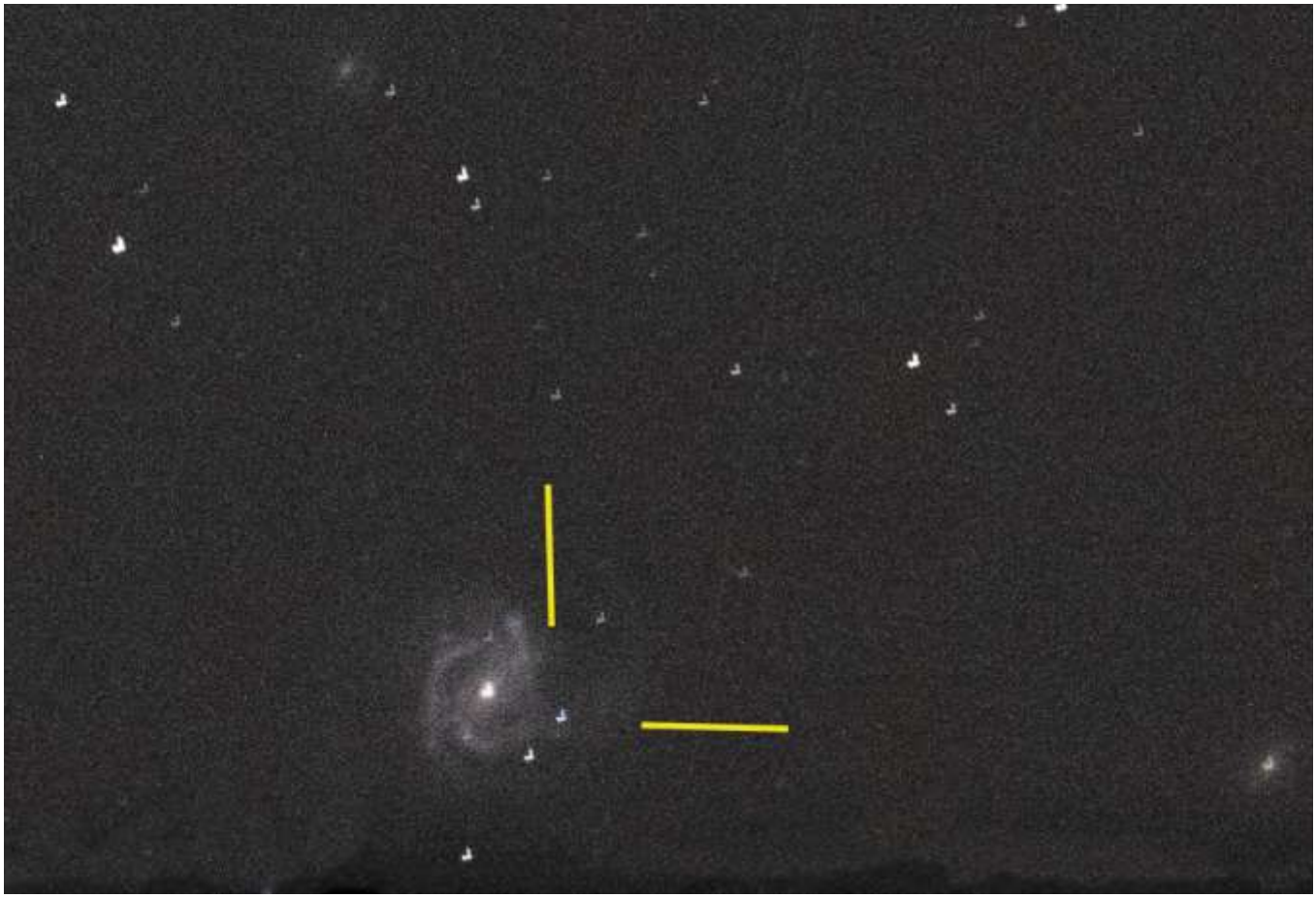
Date	Brightness	Start	Highest point	End						
	(mag)	Time	Alt.	Az.	Time	Alt.	Az.	Time	Alt.	Az.
02 Jul	-2.2	03:51:23	10°	SSW	03:54:09	24°	SSE	03:56:56	10°	E
03 Jul	-1.8	03:04:52	14°	S	03:06:10	17°	SE	03:08:26	10°	E
04 Jul	-1.4	02:18:19	12°	SE	02:18:19	12°	SE	02:19:25	10°	ESE
04 Jul	-3.2	03:51:13	11°	SW	03:54:20	44°	SSE	03:57:34	10°	E
05 Jul	-2.8	03:04:36	20°	SSW	03:06:15	32°	SSE	03:09:18	10°	E
06 Jul	-2.4	02:17:57	23°	SSE	02:18:12	23°	SE	02:20:55	10°	E
06 Jul	-3.8	03:51:16	10°	WSW	03:54:36	73°	SSE	03:57:58	10°	E
07 Jul	-1.6	01:31:14	14°	ESE	01:31:14	14°	ESE	01:32:22	10°	E
07 Jul	-3.7	03:04:07	18°	SW	03:06:26	57°	SSE	03:09:45	10°	E
08 Jul	-3.4	02:17:21	33°	SSW	02:18:17	43°	SSE	02:21:30	10°	E
08 Jul	-3.7	03:51:33	10°	W	03:54:55	88°	N	03:58:18	10°	E
09 Jul	-2.8	01:30:31	30°	SE	01:30:31	30°	SE	01:33:11	10°	E
09 Jul	-3.8	03:03:23	10°	WSW	03:06:41	84°	S	03:10:04	10°	E
10 Jul	-1.8	00:43:35	17°	ESE	00:43:35	17°	ESE	00:44:45	10°	E
10 Jul	-3.9	02:16:28	22°	WSW	02:18:27	71°	SSE	02:21:49	10°	E
10 Jul	-3.7	03:51:51	10°	W	03:55:14	87°	N	03:58:36	10°	E
11 Jul	-3.7	01:29:24	41°	SSW	01:30:14	56°	SSE	01:33:33	10°	E
11 Jul	-3.7	03:03:35	10°	W	03:06:58	85°	N	03:10:20	10°	E
12 Jul	-3.4	00:42:09	41°	SSE	00:42:09	41°	SSE	00:45:15	10°	E
12 Jul	-3.8	02:15:18	10°	W	02:18:41	88°	N	02:22:04	10°	E
12 Jul	-3.8	03:52:06	10°	W	03:55:28	75°	SSW	03:58:49	10°	ESE
12 Jul	-2.8	23:54:22	29°	SE	23:54:22	29°	SE	23:56:53	10°	E
13 Jul	-3.9	01:27:09	11°	WSW	01:30:24	83°	S	01:33:46	10°	E
13 Jul	-3.8	03:03:49	10°	W	03:07:11	87°	S	03:10:34	10°	E
13 Jul	-2.5	23:03:07	10°	SSW	23:05:45	22°	SE	23:08:24	10°	E
14 Jul	-3.9	00:38:47	10°	WSW	00:42:08	69°	SSE	00:45:29	10°	E
14 Jul	-3.8	02:15:31	10°	W	02:18:54	86°	N	02:22:16	10°	E
14 Jul	-3.5	03:52:19	10°	W	03:55:34	47°	SSW	03:58:48	10°	SE
14 Jul	-2.1	22:15:39	10°	S	22:17:39	15°	SE	22:19:40	10°	ESE
14 Jul	-3.7	23:50:35	10°	WSW	23:53:53	54°	SSE	23:57:10	10°	E
15 Jul	-3.8	01:27:13	10°	W	01:30:35	85°	N	01:33:57	10°	E
15 Jul	-3.8	03:03:59	10°	W	03:07:19	62°	SSW	03:10:39	10°	ESE
15 Jul	-3.4	23:02:28	10°	SW	23:05:39	40°	SSE	23:08:50	10°	E
16 Jul	-3.8	00:38:54	10°	W	00:42:16	89°	NNW	00:45:38	10°	E
16 Jul	-3.9	02:15:41	10°	W	02:19:03	77°	SSW	02:22:24	10°	ESE
16 Jul	-2.8	03:52:38	10°	W	03:55:30	26°	SSW	03:58:21	10°	SSE
16 Jul	-2.9	22:14:30	10°	SSW	22:17:27	29°	SSE	22:20:25	10°	E
16 Jul	-3.9	23:50:35	10°	WSW	23:53:57	81°	SSE	23:57:19	10°	E
17 Jul	-3.9	01:27:21	10°	W	01:30:44	88°	S	01:34:06	10°	E
17 Jul	-3.2	03:04:11	10°	W	03:07:18	36°	SSW	03:10:25	10°	SE
17 Jul	-3.9	23:02:18	10°	WSW	23:05:38	67°	SSE	23:08:59	10°	E
18 Jul	-3.8	00:39:01	10°	W	00:42:23	86°	N	00:45:46	10°	E
18 Jul	-3.6	02:15:48	10°	W	02:19:04	49°	SSW	02:20:48	24°	SE
18 Jul	-3.6	22:14:04	10°	SW	22:17:21	52°	SSE	22:20:38	10°	E
18 Jul	-3.8	23:50:40	10°	W	23:54:02	85°	N	23:57:25	10°	E
19 Jul	-3.9	01:27:27	10°	W	01:30:47	64°	SSW	01:31:21	52°	SSE

I have not missed June and August passes, there are no night time passes for either of those months apart from odd days at the end of the cycle.

Bytime the summer is over we will have another 360 Starlink satellites to deal with. They have already ruined many photo-graphs.

19 Jul	-3.8	23:02:18	10°	W	23:05:40	90°	NNW	23:09:03	10°	E
20 Jul	-3.9	00:39:05	10°	W	00:42:28	79°	S	00:43:41	36°	ESE
20 Jul	-1.4	02:16:01	10°	W	02:16:31	13°	W	02:16:31	13°	W
20 Jul	-3.8	22:13:57	10°	WSW	22:17:19	80°	SSE	22:20:41	10°	E
20 Jul	-3.9	23:50:43	10°	W	23:54:06	89°	S	23:56:22	19°	E
21 Jul	-2.2	01:27:32	10°	W	01:29:14	24°	WSW	01:29:14	24°	WSW
21 Jul	-3.8	23:02:21	10°	W	23:05:43	85°	N	23:09:05	10°	E
22 Jul	-3.5	00:39:07	10°	W	00:42:06	48°	SW	00:42:06	48°	SW
22 Jul	-3.7	22:13:57	10°	W	22:17:19	85°	N	22:20:42	10°	E
22 Jul	-3.8	23:50:43	10°	W	23:54:04	66°	SSW	23:55:03	40°	SE
23 Jul	-1.1	01:27:53	10°	W	01:27:55	10°	W	01:27:55	10°	W
23 Jul	-3.9	23:02:20	10°	W	23:05:42	80°	SSW	23:08:04	18°	ESE
24 Jul	-2.0	00:39:14	10°	W	00:40:55	22°	WSW	00:40:55	22°	WSW
24 Jul	-3.8	22:13:55	10°	W	22:17:18	90°	NE	22:20:40	10°	E
24 Jul	-3.2	23:50:43	10°	W	23:53:53	39°	SSW	23:53:58	39°	SSW
25 Jul	-3.5	23:02:16	10°	W	23:05:33	53°	SSW	23:07:03	28°	SE
26 Jul	-1.1	00:39:49	10°	WSW	00:39:55	10°	WSW	00:39:55	10°	WSW
26 Jul	-3.7	22:13:50	10°	W	22:17:11	68°	SSW	22:20:10	12°	ESE
26 Jul	-2.0	23:50:56	10°	W	23:53:02	20°	SW	23:53:02	20°	SW
27 Jul	-2.6	23:02:17	10°	W	23:05:16	29°	SSW	23:06:11	25°	S
28 Jul	-3.1	22:13:45	10°	W	22:16:56	41°	SSW	22:19:20	15°	SE
29 Jul	-1.7	23:02:42	10°	WSW	23:04:46	15°	SW	23:05:25	15°	SSW
30 Jul	-2.0	22:13:50	10°	W	22:16:30	22°	SW	22:18:39	13°	SSE
26 Aug	-1.0	05:14:02	10°	SSE	05:15:12	11°	SE	05:16:20	10°	ESE
28 Aug	-1.9	05:11:18	10°	SSW	05:13:59	23°	SE	05:16:41	10°	E
29 Aug	-1.6	04:24:22	14°	SSE	04:25:24	16°	SE	04:27:31	10°	ESE
30 Aug	-3.0	05:10:27	15°	SW	05:12:53	41°	SSE	05:16:05	10°	E
31 Aug	-2.6	04:23:36	28°	S	04:24:12	30°	SSE	04:27:11	10°	E
01 Sep	-1.5	03:36:43	18°	ESE	03:36:43	18°	ESE	03:38:10	10°	E
01 Sep	-3.7	05:09:35	19°	WSW	05:11:52	69°	SSE	05:15:13	10°	E
02 Sep	-3.5	04:22:41	48°	S	04:23:06	53°	SSE	04:26:23	10°	E
03 Sep	-1.9	03:35:44	25°	ESE	03:35:44	25°	ESE	03:37:30	10°	E
03 Sep	-3.8	05:08:37	19°	W	05:10:55	89°	NNE	05:14:17	10°	E
04 Sep	-3.9	04:21:41	66°	SW	04:22:04	80°	SSE	04:25:26	10°	E
05 Sep	-2.0	03:34:44	29°	E	03:34:44	29°	E	03:36:35	10°	E
05 Sep	-3.8	05:07:37	18°	W	05:09:57	85°	N	05:13:19	10°	E
06 Sep	-3.9	04:20:43	69°	W	04:21:04	85°	N	04:24:26	10°	E
06 Sep	-3.7	05:54:27	10°	W	05:57:47	66°	SSW	06:01:06	10°	ESE
07 Sep	-1.9	03:33:51	27°	E	03:33:51	27°	E	03:35:33	10°	E
07 Sep	-3.9	05:06:44	20°	W	05:08:56	81°	S	05:12:16	10°	ESE
08 Sep	-3.9	04:19:56	84°	WNW	04:20:02	89°	NNE	04:23:24	10°	E
08 Sep	-3.2	05:53:26	10°	W	05:56:36	39°	SSW	05:59:45	10°	SE

END IMAGES, OBSERVING AND OUTREACH



Supernova in M61 galaxy (part of the Virgo cluster)
Nikon D810a 120seconds on 120mm esprit telescope with field flattener.

June Observing Suggestion

Wiltshire Astronomical Society Observing Suggestion for June 2020 @ 23:00

We have updated the observation targets this month for those with binoculars or smaller wide field telescopes to have some search for.

And as we can no longer gather as one, for the time being, each month the WAS Observing Team will provide recommended observi you to do in isolation at home.
This will continue until we can start our group observing again (hopefully) in the new season.

Most target objects can be found around due south between 2300 and Midnight
Where To Look This Month: Ophiuchus

Just select 'What's Up' link below to get the PDF file.
Upload Link: WAS_June_2020.pdf

Also Wiltshire Astronomical Society will produce the monthly newsletter containing further information, which can be downloaded here: https://wasnet.org.uk/

OUTREACH

On hold during Isolation/Social Distencing