

# Lewes Astronomical Society

Newsletter - February 2023

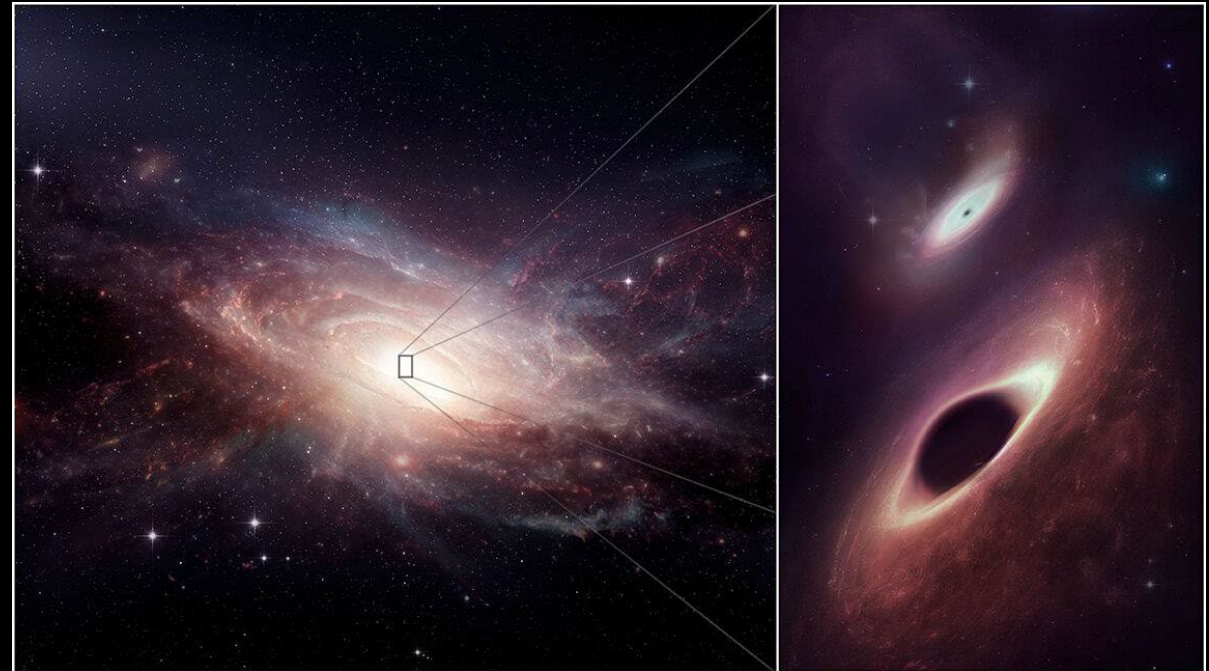
**Lewes Astronomical Society**

**Astronomy & Space News**

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## Merging Galaxy with 2 Black Holes

- ALMA (the Atacama Large Millimeter / Submillimeter Array) has discovered two supermassive black holes at the heart of newly merged galaxy UGC 4211
- The 2 black holes are actively feeding on gas and dust disrupted by gravity from the merger. They are separated by only 750 light years
- In a few hundred million years they will merge causing gravitational waves
- Watch the video at:  
<https://youtu.be/50eVUy3xZ-A>

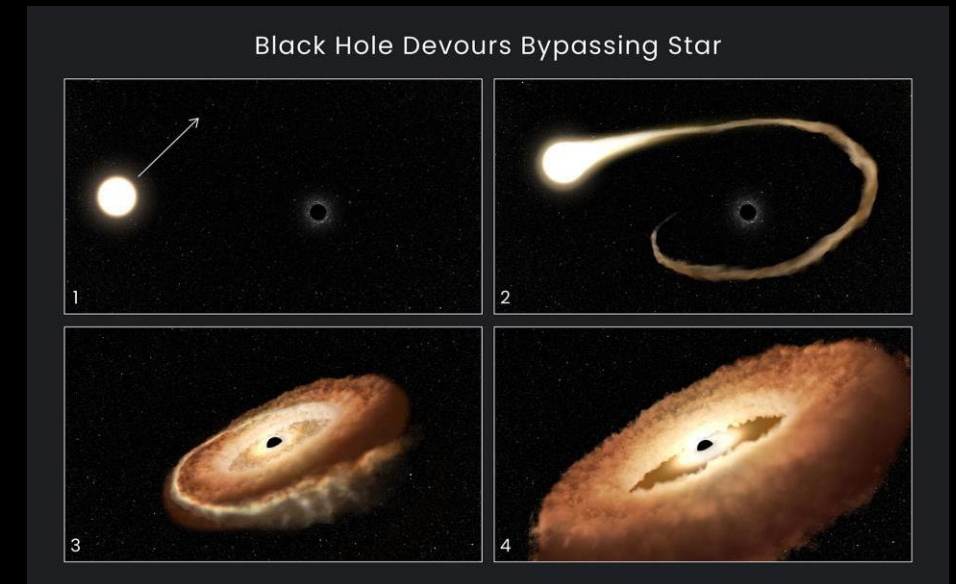
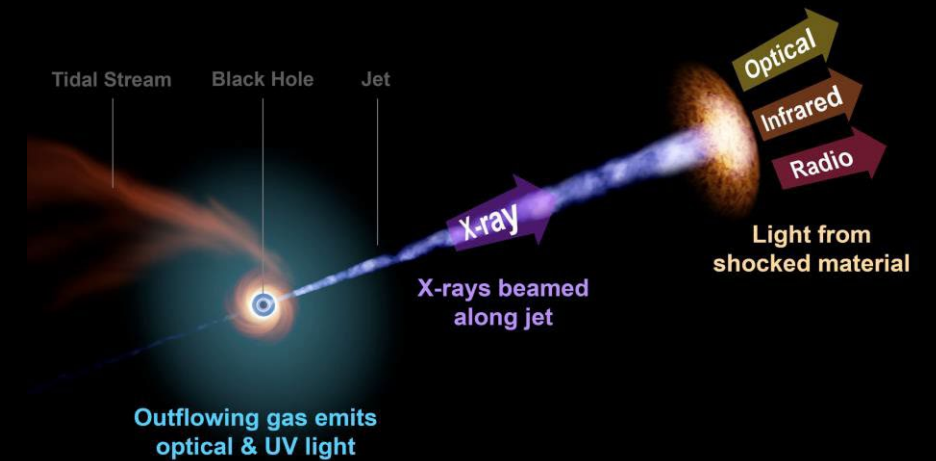


Credit: ALMA (ESO/NAOJ/NRAO); M. Weiss (NRAO/AUI/NSF)

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## Further from last month – Partial TDEs (1)

- In the Universe most things spin – they have Angular Momentum
- Black Holes are no different and they spin too!
- When a star gets too close, it is ripped apart by gravitational forces – a Tidal Disruption Event
- The star's material spins around in an accretion disk heated to million of degrees by friction before falling into the black hole
- But black holes are messy feeders and a huge amount of material (high energy X-rays) is beamed out from the poles

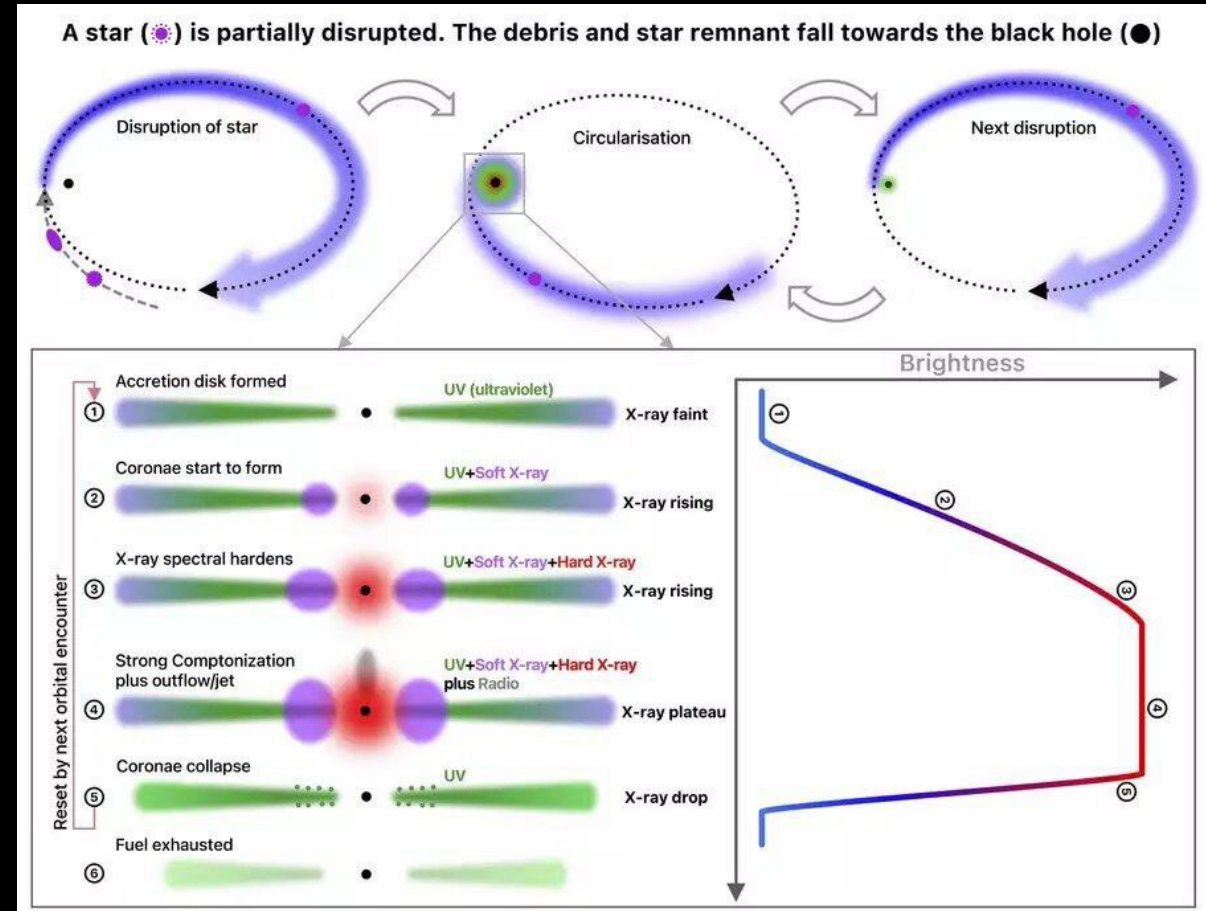


Credit (top image): Zwicky Transient Facility/R. Hunt (Caltech/IPAC)  
(bottom image): NASA, ESA, Leah Hustak (STScI)

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## Further from last month – Partial TDEs (2)

- Two new studies have looked at Partial TDEs where the star survives the encounter initially but is repeatedly stripped of material as it orbits the black hole
- The black hole is only able to feed when the star is closest and being stripped of gas
- Watch the video of partial TDEs at:
  - [https://youtu.be/\\_TRtPDbaQ2k](https://youtu.be/_TRtPDbaQ2k)
- Watch the video of a local TDE at:
  - <https://youtu.be/Q6gYWFgaI8k>



Credit: Max Planck Institute for Extraterrestrial Physics

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## The early universe – more diverse galaxies

- New research shows that there are many more galaxies formed in the early universe and that they were far more complicated and diverse
- JWST, in a survey of a very small area, finds 87 new galaxies with a redshift of 11 or more (13.4+ billion years ago)
- JWST surveying 850 other galaxies identified by Hubble with redshift of 3 to 9, finds detailed structures similar to much more recent and evolved galaxies

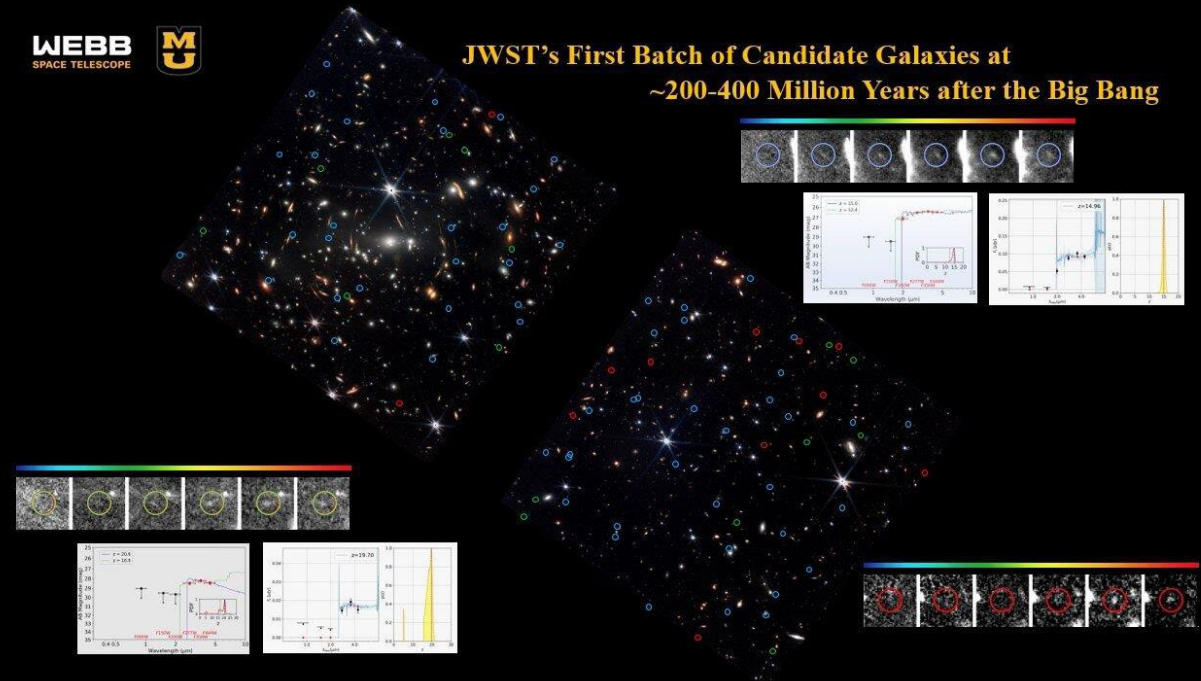


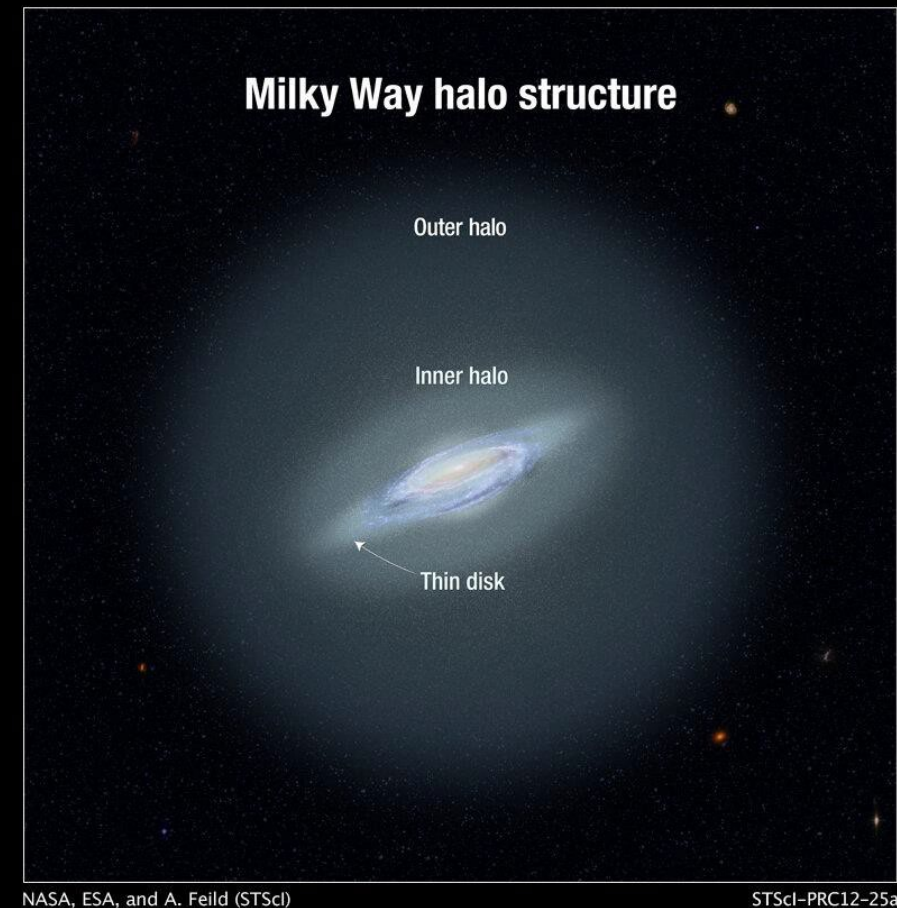
Image composite of galaxy cluster SMAC 0723-27. Candidate galaxies with large redshifts are coloured in blue, very large redshifts in green, and extremely large redshifts in red

Photos courtesy of: NASA, ESA, CSA, STScI  
Credit: University of Missouri  
Graphics: Haojing Yan and Bangzheng Sun, University of Missouri

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## Just how big is the Milky Way?

- The Canada-France-Hawaii Telescope has been carrying out the Next Generation Virgo Cluster Survey (NGVS) studying the galaxies which revolve around the large elliptical galaxy M87
- As part of the survey foreground stars were also included
- Amongst these were 208 RR Lyrae variable stars (which are “standard candles”) in the extended halo surrounding the Milky Way
- Measurements of the distances to these RR Lyrae stars indicate they are between 20 and 320kpc
- This means the outer halo extends at least 1 million light years – halfway to Andromeda!



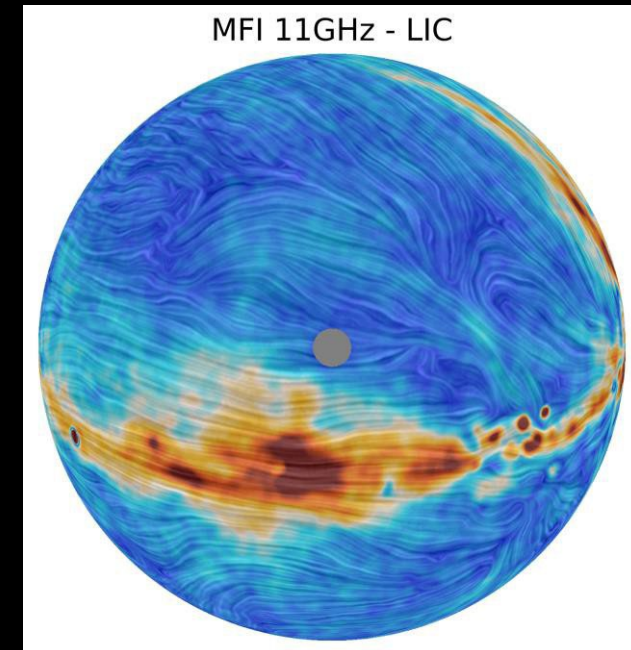
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## The Milky Way – as you have never seen it before!

- For the past ten years researchers working at the Teide Observatory using the twin 2.5m telescopes have built a microwave map of the Milky Way
- The Quijote (Q-U-I Joint Tenerife) Collaboration have successfully mapped the polarized emissions at microwave wavelengths
- The map will be useful in studying the early Universe by eliminating the Milky Way's own background emission and in the excess emission at the centre of the galaxy thought to be caused by the decay of dark matter particles



Credit: Teide Observatory - Daniel López/IAC (above)  
Microwave Map Quijote Collaboration (below)

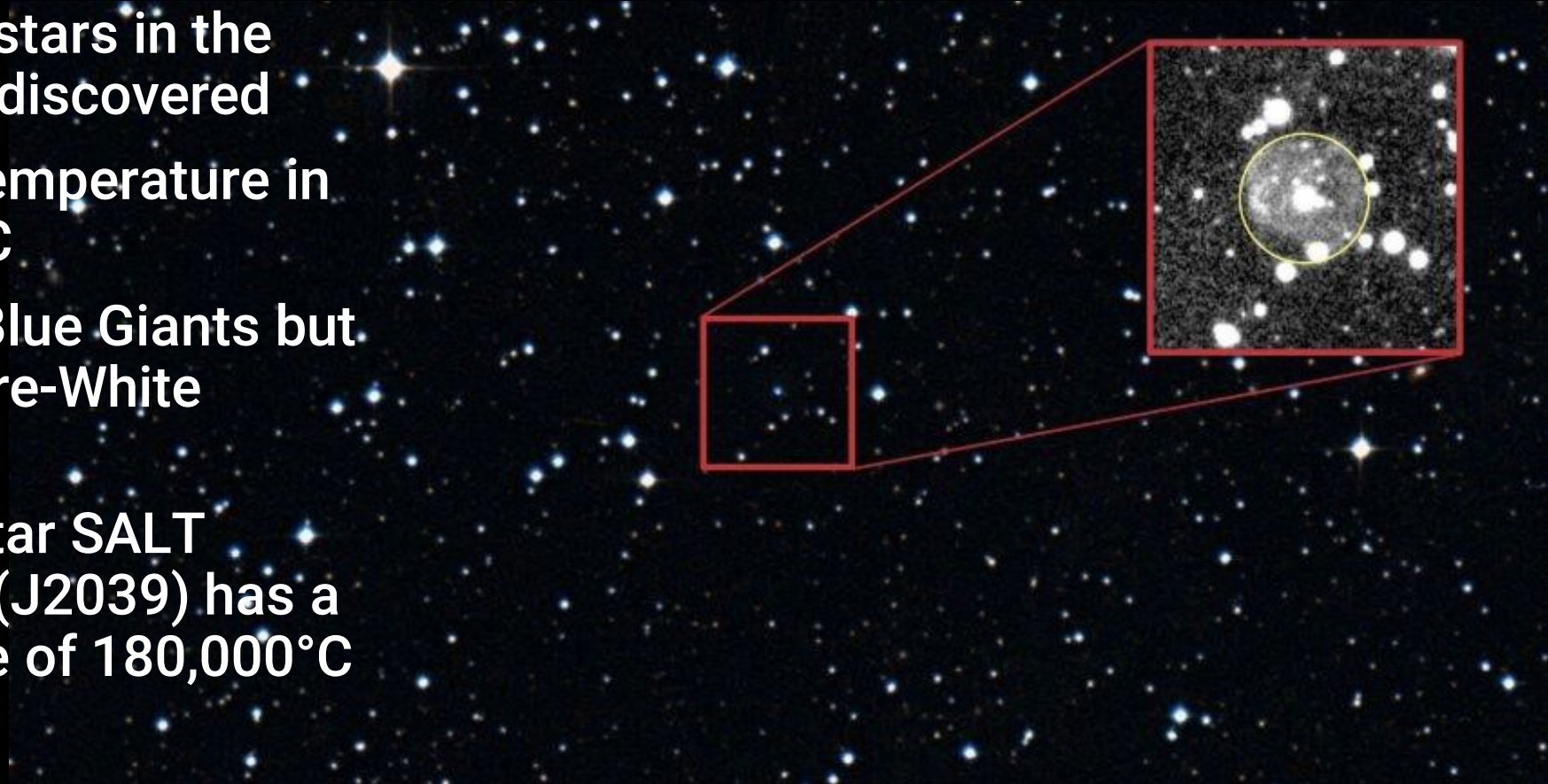




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## Super-hot White Dwarfs

- Eight of the hottest stars in the universe have been discovered
- All have a surface temperature in excess of  $100,000^{\circ}\text{C}$
- Not Supermassive Blue Giants but White Dwarfs and Pre-White Dwarfs!
- The hottest, O (H) star SALT J203959.5-034117 (J2039) has a surface temperature of  $180,000^{\circ}\text{C}$



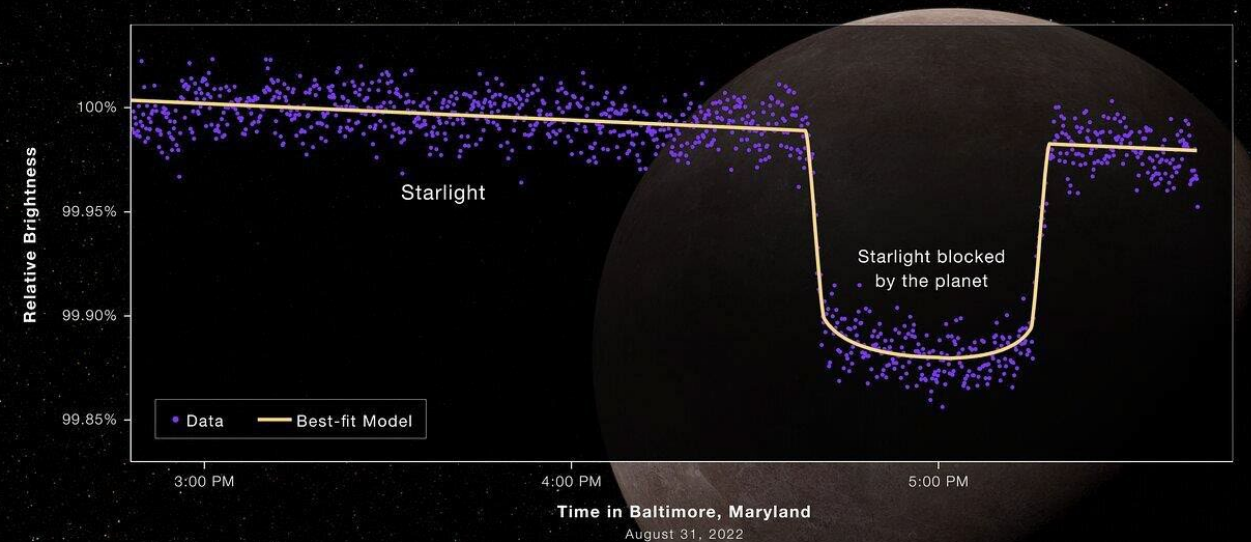
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## JWST finds its first exoplanet

- LHS 475b is an Earth-sized (99%) rocky planet orbiting a red dwarf 41 light years away in the constellation Octans
- It is very close to its star and completes an orbit in 2 days
- JWST found it following up on data from TESS
- Whether the exoplanet has an atmosphere has yet to be determined

### ROCKY EXOPLANET LHS 475 b TRANSIT LIGHT CURVE

NIRSpec | Bright Object Time-Series Spectroscopy



**WEBB**  
SPACE TELESCOPE

Credit: NASA, ESA, CSA, L. Hustak (STScI), K. Stevenson, J. Lustig-Yaeger, E. May (Johns Hopkins University Applied Physics Laboratory), G. Fu (Johns Hopkins University), and S. Moran (University of Arizona)

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## The mystery of Blue Stragglers

- Once stars start fusing hydrogen they follow a well-defined path, the Main Sequence on the Hertzsprung-Russell Diagram
- But Blue Stragglers are the exceptions
- Found in clusters they are brighter, hotter and bluer than expected
- They should have already died out
- Are they mergers or cannibalisation?
- Watch the video of how giant stars form at: <https://youtu.be/5IDFthGmBvE>

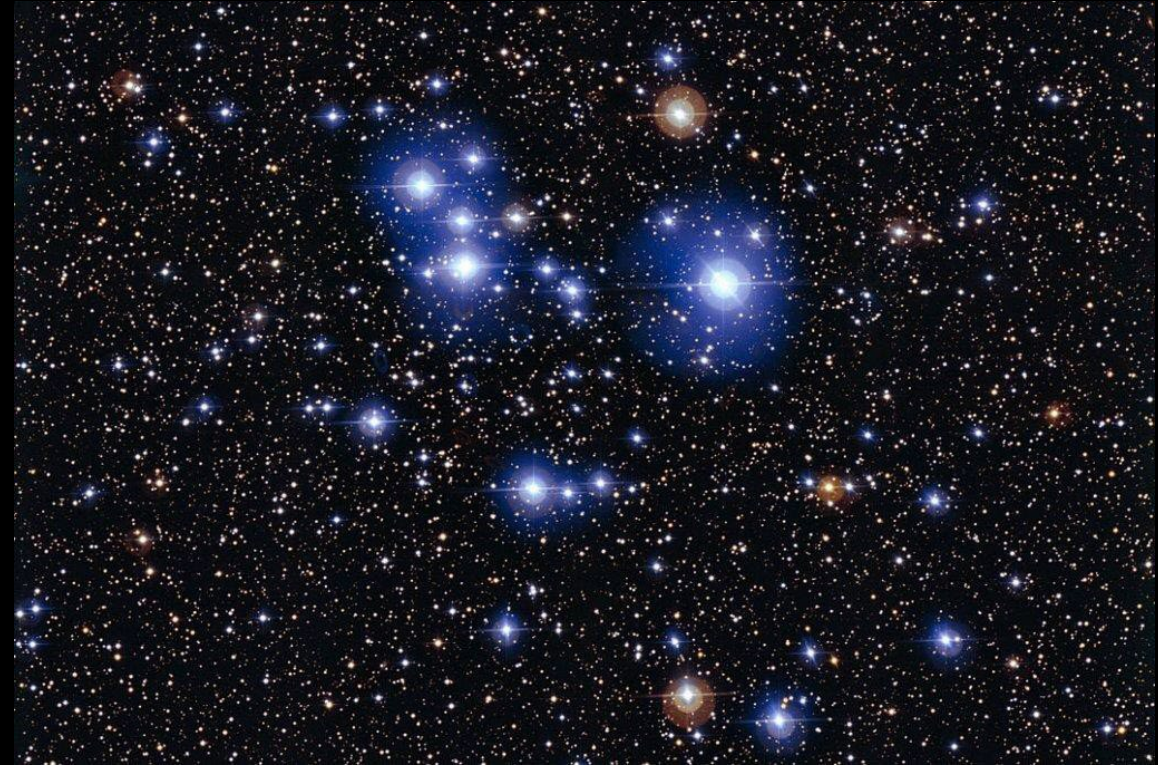


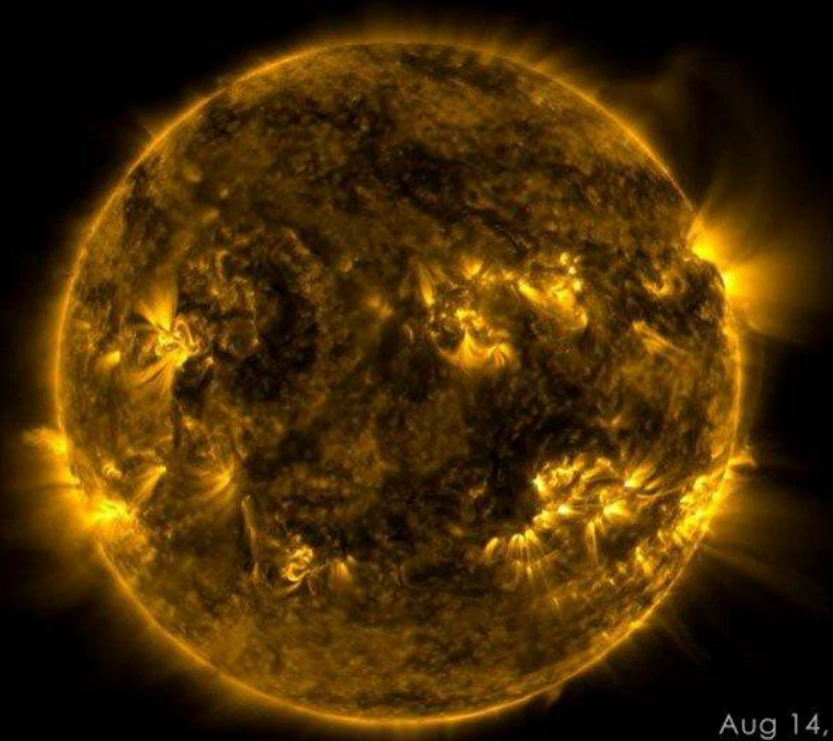
Image taken of Messier 47 taken by the 2.2m MPG/ESO telescope at the La Silla Observatory, Chile

Credit: ESO

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## 133 days in the life of the Sun

- A video has been made of the Sun covering 133 days (from August 12<sup>th</sup> to December 22<sup>nd</sup> 2022)
- The images come from the Solar Dynamics Observatory (SDO) and were taken 108 seconds apart condensing the 133 days into 59 minutes
- There are a few dark frames caused by eclipses and instrumentation downtime
- Watch the video at:  
<https://youtu.be/Sv3eXRN7hLo>



Aug 14, 2022

Credit: NASA's Goddard Space Flight Center (as at August 14 2022)

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## Walter Cunningham 1932–2023

- (Ronnie) Walter Cunningham, the last surviving member of the Apollo 7 crew, has died
- Former fighter pilot, he was, like Neil Armstrong, a private individual when he joined NASA
- Selected as the Lunar Module Pilot for the Apollo 7 mission (the first crewed Apollo mission following the fatal Apollo 1 fire)
- Launched October 11<sup>th</sup> 1968 the mission was successful but a bit of a PR disaster due to Wally Schirra's fractious mood and heavy colds
- None ever flew on another mission



Walter Cunningham 16/03/1932 – 03/01/2023

Apollo 7 crew members: Donn F Eisele, Walter M Schirra, and Walter Cunningham  
Credit: NASA

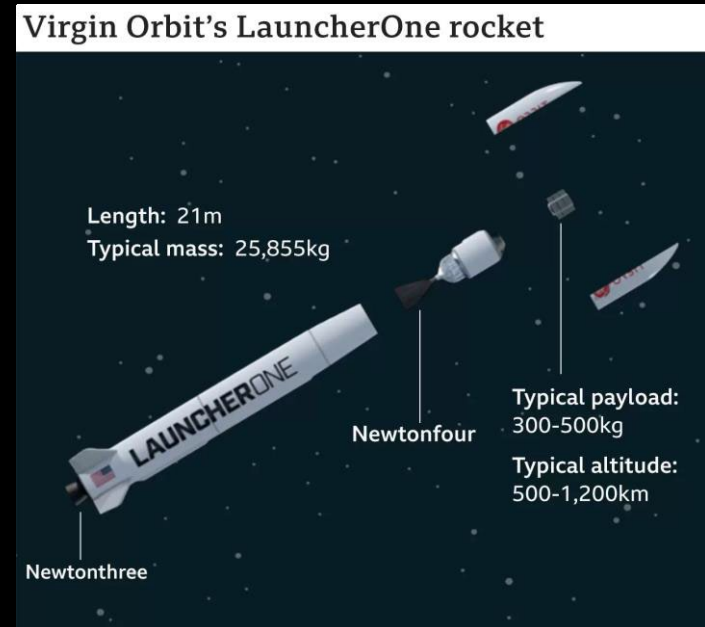
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## Finally (1) – Virgin Orbit rocket UK launch failure

- The first launch of Virgin Orbit's rocket from the UK on Monday 9<sup>th</sup> January ended in failure when the upper stage prematurely shut down at an altitude of 180km, short of orbit. The rocket and nine satellites were lost over the sea
- The rocket was successfully released at 35,000 feet being dropped from a modified Virgin Atlantic 747, named 'Cosmic Girl' off the southern coast of Ireland and the initial burn went according to plan
- Investigations are on-going as to the cause
- Over the past year the rocket has been launched successfully from California four times



Credit: Ben Birchall/PA via AP (above)  
Virgin Orbit (below)



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## Finally (2) – Soyuz spacecraft coolant leak

Credit: NASA TV

- A Soyuz (or SpaceX Dragon) spacecraft is always attached to the ISS ready to ferry the crew home
- On December 15<sup>th</sup> the external radiator of the Soyuz MS22 spacecraft was hit by a millimetre wide micrometeoroid causing coolant to escape from the supply tube
- Engineers determined that the Soyuz spacecraft could not be used and a replacement will be launched in February



- The crew, 2 Russian cosmonauts and an American astronaut are in no danger but are now likely to have to remain on the ISS until September

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## JWST and Hubble latest photos 1

- JWST has imaged barred spiral galaxies, similar in structure to the Milky Way which date back between 8.4 and 11 billion years
- These bars stretch from the centre to the outer edge of the galaxies. Bars in galaxies help with star formation and with the growth of supermassive black hole
- Previous images by Hubble couldn't distinguish any detail and failed to detect any bars in early galaxies

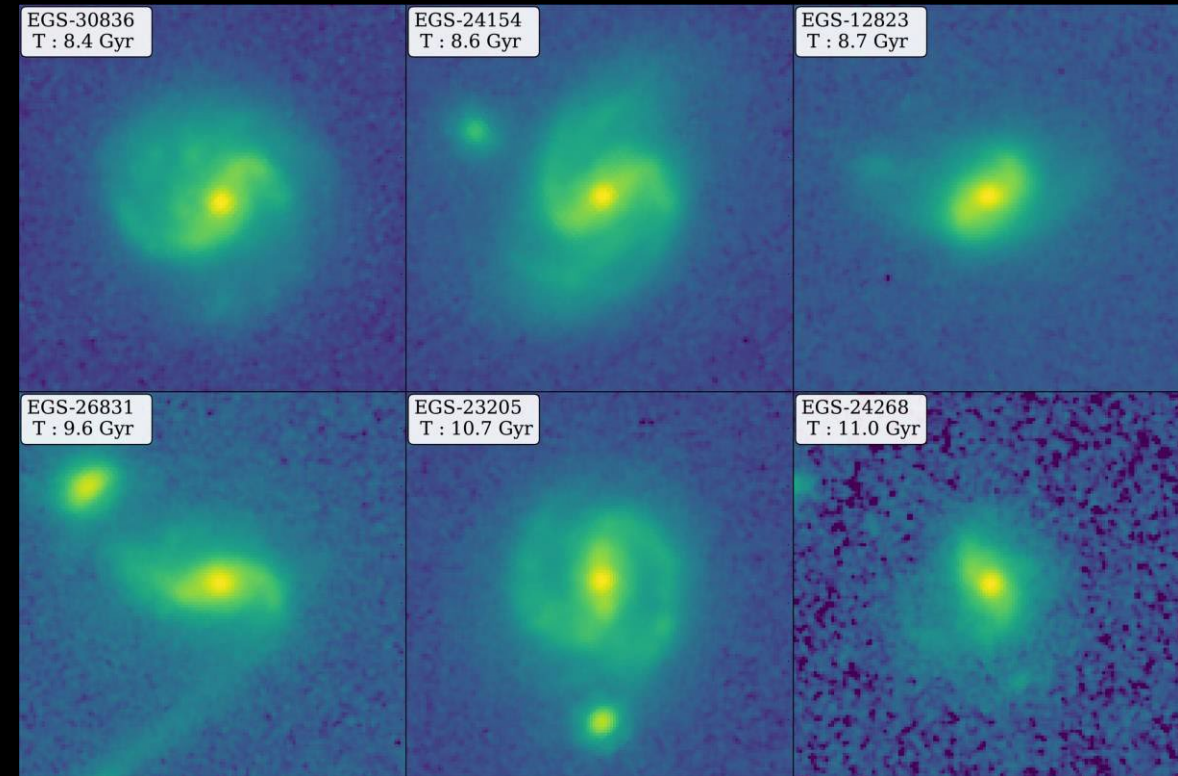


Image of 6 barred spiral galaxies which date back to between 20 and 40% of the present age of the universe

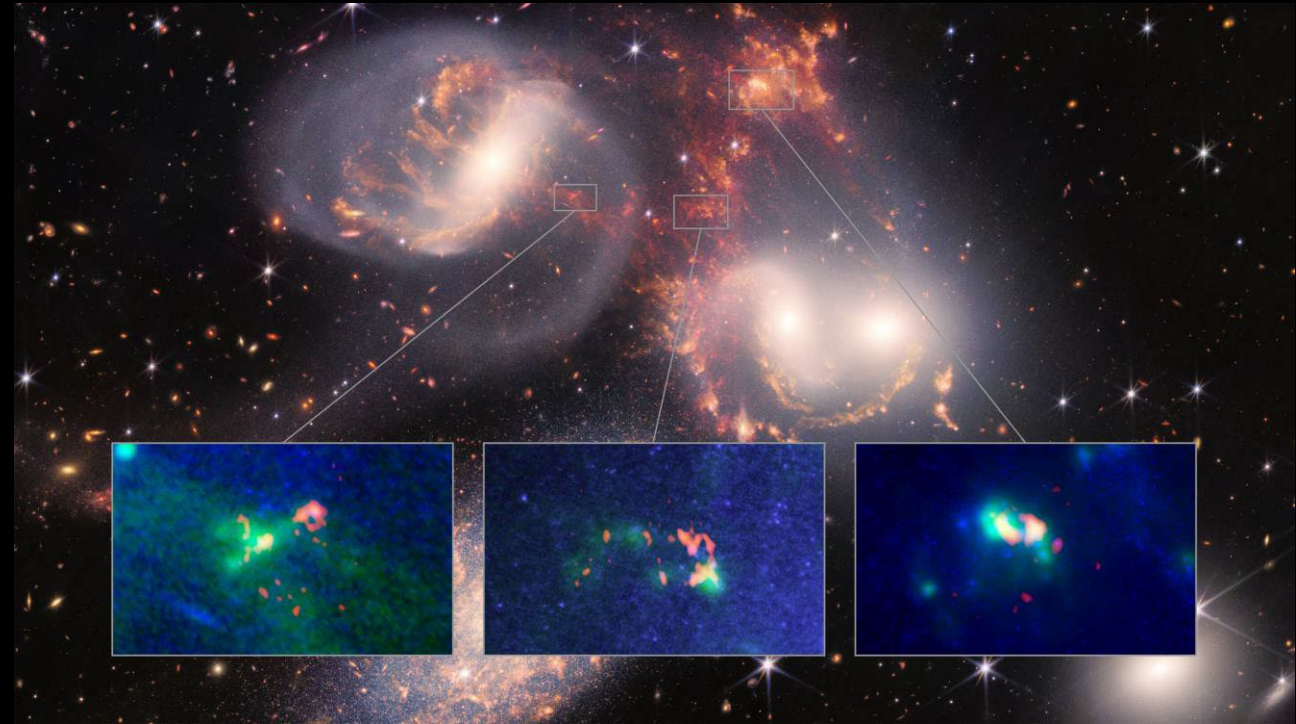
Credit: NASA/CEERS/University of Texas at Austin



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## JWST and Hubble latest photos 2

- Astronomers using ALMA and JWST have identified a recycling centre for cold and warm molecular hydrogen gas in Stephan's Quintet
- A sonic boom several times the size of the Milky Way is causing the recycling. The shockwave comes from an intruder galaxy (NGC 7318b) crashing into the clouds of gas at over 800km/sec
- Watch the YouTube video at: <https://youtu.be/mRTmAmdd8oI>



Credit: ALMA (ESO/NAOJ/NRAO)/JWST/ P. Appleton (Caltech), B.Saxton (NRAO/AUI/NSF)

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## JWST and Hubble latest photos 3

- **NGC 6355 is a globular cluster in The Milky Way about 50,000 light years away in the constellation Ophiuchus**
- **Globular clusters are groups of tens of thousands/millions of stars bound together by gravity into a roughly spherical shape. Hubble is able to resolve individual stars**

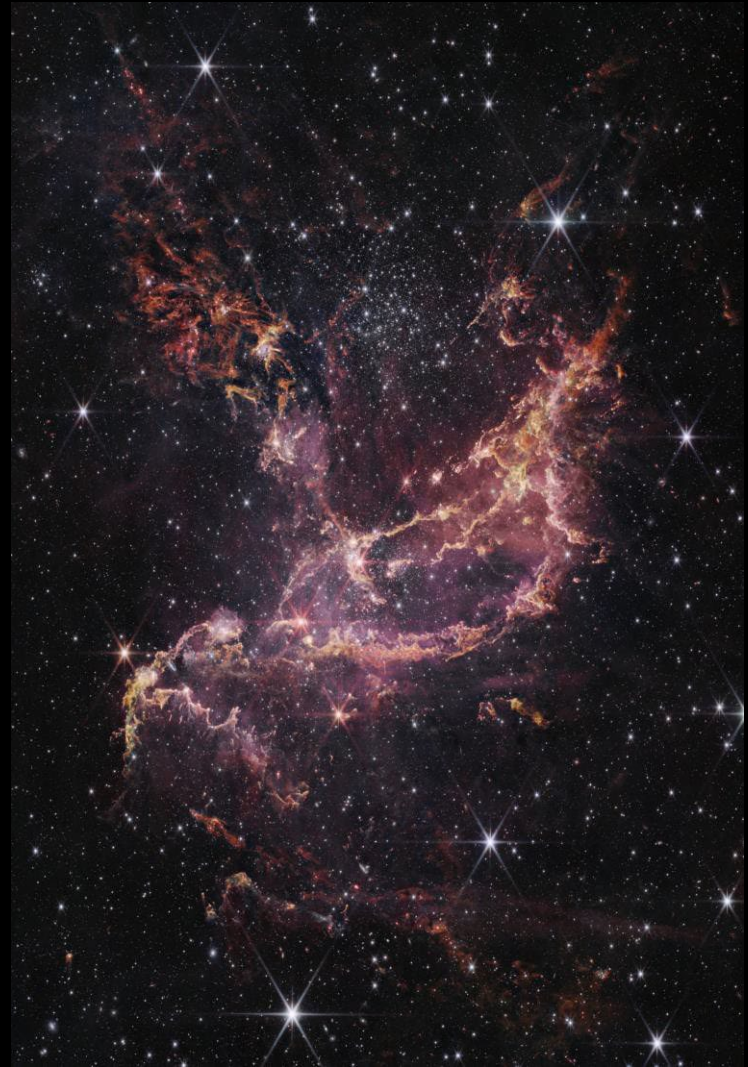


Credit: ESA/Hubble & NASA, E. Noyola, R. Cohen

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## JWST and Hubble latest photos 4

- NGC 346 is one of the main star-forming regions in the Small Magellanic Cloud
- As the SMC is relatively metal poor it was expected that this star-forming region would be similar but JWST has found the opposite
- Three YouTube videos help explain what is going on:
  - <https://youtu.be/LKvv787-WXE> (NGC 346)
  - [https://youtu.be/U7L\\_ml90w3A](https://youtu.be/U7L_ml90w3A) (Hubble/JWST)
  - <https://youtu.be/msg13IHhbAI> (Journey through NGC346 with JWST)

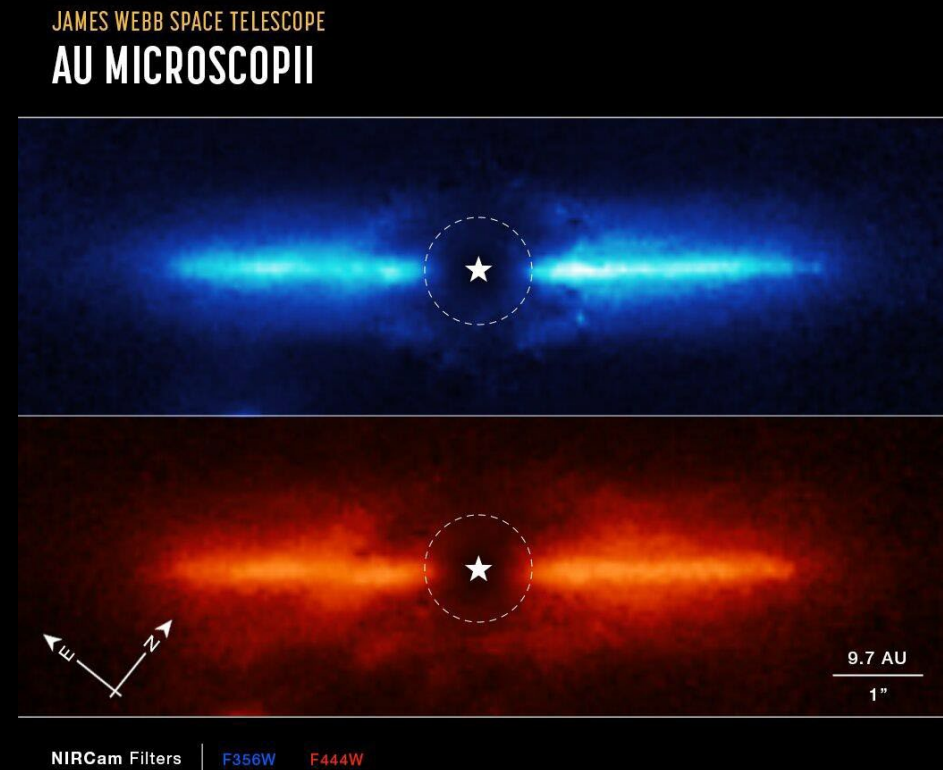


Credit: ESA/Hubble & NASA, E. Noyola, R. Cohen

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## JWST and Hubble latest photos 5

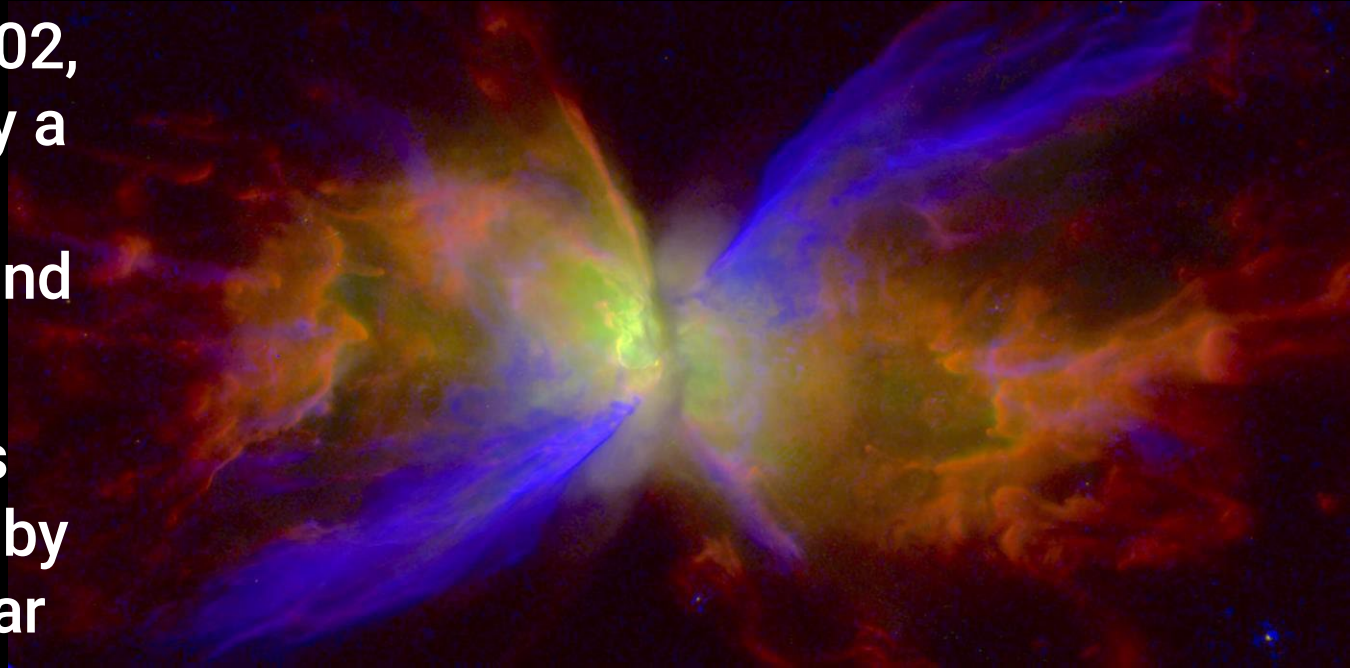
- JWST has imaged AU Microscopii, a red dwarf star 32 light years away in the southern constellation, Microscopium
- The star is about 23 million years old which is old enough for planet formation to have been completed; two exoplanets have been discovered by other telescopes
- JWST has been able to observe the dusty accretion disk to as close as 5 AU to the star



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## JWST and Hubble latest photos 6

- Planetary Nebulae, such as NGC 6302, the “Butterfly Nebula” are caused by a red giant star shedding off its outer layers as it runs out of helium fuel and collapses into a white dwarf
- Nebulae can be spherical but others like NGC 6302 are probably shaped by the interaction with a companion star
- The overall shape should remain the same as it expands but Hubble has shown this to be untrue



Credit: Bruce Balick/University of Washington/Joel Kastner/Paula Baez Moraga/Rochester Institute of Technology/Space Telescope Science Institute

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## JWST and Hubble latest photos 7

- Hubble has imaged LEDA 48062, a sparse amorphous galaxy 30 million light years away in the constellation Perseus. It is on the right of the image (UGC 8603 is the lenticular galaxy on the left)
- This is part of the “Every Known Nearby Galaxy” campaign to image all galaxies within 10 megaparsecs (33 million light years) of The Milky Way. This will help map out the local structure of the Universe



Credit: ESA/Hubble & NASA, R. Tully

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# **Observational Highlights**

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## February 2023 dates

- 1<sup>st</sup> February – Comet C/2022 E3 (ZTF) at perigee and brightest, 75° north (21:35), mag +5.4 in constellation Camelopardalis
- 4<sup>th</sup> February – Moon at apogee (08:54), 406,000km from Earth
- 7<sup>th</sup> February – Moon at aphelion (08:59), 0.9862 AU from The Sun
- 16<sup>th</sup> February – Saturn at solar conjunction (16:38), separation of 1°15'. Also at greatest distance from Earth (10.81 AU)
- 18<sup>th</sup> February – Comet C/2022 A2 (PANSTARRS) at perihelion, 39° north-east (05:39), mag +9.6 in constellation Cygnus
- 19<sup>th</sup> February – Moon at perigee (09:05), 358,000km from Earth
- 22<sup>nd</sup> February – Venus and Jupiter split by young crescent Moon



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## Naked eye Comet?

- Comet C/2022 E3 (ZTF) orbits the Sun once every 50,000 years
- Although small (approximately 1km) it will pass quite close to Earth and could be visible to the naked eye (and easy to see with binoculars)
- It will be closest on February 1<sup>st</sup> (0.28 AU) but the Full Moon will make it difficult to see. However, on February 10<sup>th</sup> it will pass close to Mars
- It should have a greenish tint due to presence of diatomic carbon and cyanogen interacting with UV light



Credit: José J. Chambó ([www.cometografia.es](http://www.cometografia.es))

- Best viewed near Polaris after midnight once the Moon has set

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## Winter Clusters

- Three open clusters are at their best in the late winter skies:
  - The Hyades – Taurus
  - The Pleiades – Taurus
  - The Beehive Cluster – Cancer



Credit:

Left – The Beehive Cluster  
(Drew Evans/NASA)

Top Right – The Hyades  
(Greg Parker/Astronomy Now)

Bottom Right – The Pleiades  
(John Haggart/EarthSky)



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## Planets (@ 01-02-2023)

(data supplied courtesy of In the Sky)

<u>Planet</u>	<u>Rises</u>	<u>Sets</u>	<u>Highest</u>	<u>Direction</u>	<u>Altitude</u>	<u>Magnitude</u>	<u>Visible?</u>
Mercury	06:19	14:34	10:26		4°	-0.16	NO
Venus	08:37	18:56	13:47	South-West	13° **	-3.93	YES
Mars	11:23	04:06	19:45	South	63°	-0.26	YES
Jupiter	09:27	21:46	15:37	South-West	36° **	-2.21	YES
Saturn	08:15	17:59	13:07		2°	+0.82	NO
Uranus	10:37	01:28	18:03	South	55°	+5.75	YES
Neptune	09:06	20:36	14:51		20°	+7.94	NO

\* = Highest point at Dawn (06:13 - last visible sighting)    \*\* = Highest point at Dusk (18:11 - first visible sighting)

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## Deep Sky Objects 1 (@ 01-02-2023)

[\*\*\* = circumpolar]

<u>Object</u>	<u>Name</u>	<u>Type</u>	<u>Rises</u>	<u>Sets</u>	<u>Highest</u>	<u>Direction</u>	<u>Alt</u>	<u>Mag</u>
Cr50	The Hyades (Taurus)	Open Cluster	12:14	03:06	19:40	South	65°	+0.5
M45	The Pleiades (Taurus)	Open Cluster	10:43	03:19	19:01	South	63°	+1.3
M44	The Beehive Cluster (Cancer)	Open Cluster	16:04	07:41	23:53	South	58°	+3.1
M31	Andromeda Galaxy (Andromeda)	Galaxy	***	***	15:56**	West	64°	+3.4
C14	Double Cluster (Perseus)	Open Cluster	***	***	17:33**	North	81°	+3.7
M42	The Orion Nebula (Orion)	Open Cluster	15:11	02:25	20:48	South	33°	+4.0
NGC2232	Open Cluster (Monoceros)	Open Cluster	16:01	03:20	21:41	South	34°	+4.2
IC4665	Open Cluster (Ophiuchus)	Open Cluster	02:30	15:33	09:01*	South-East	32°	+4.2
M47	Open Cluster (Puppis)	Open Cluster	17:59	03:39	22:49	South	24°	+4.4
NGC6633	Open Cluster (Ophiuchus)	Open Cluster	03:06	16:18	09:42*	South-East	28°	+4.6
IC4756	Graff's Cluster (Serpens)	Open Cluster	03:23	16:24	09:54*	South-East	25°	+4.6
M5	Globular Cluster (Serpens)	Globular Cluster	00:20	12:48	06:34	South	41°	+5.7
M33	Triangulum Galaxy (Triangulum)	Galaxy	07:34	02:00	16:47**	South	64°	+5.8
M13	Great Globular Cluster (Hercules)	Globular Cluster	21:25	18:28	07:57*	South-East	66°	+5.8
M12	Globular Cluster (Ophiuchus)	Globular Cluster	02:08	13:56	08:02*	South-East	32°	+6.1
M3	Globular Cluster (Canes Venatici)	Globular Cluster	20:06	13:49	04:58	South	67°	+6.3

\* = Highest point at Dawn (06:13 - last visible sighting)    \*\* = Highest point at Dusk (18:11 - first visible sighting)

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## Deep Sky Objects 2 (@ 01-02-2023)

[\*\*\* = circumpolar]

Object	Name	Type	Rises	Sets	Highest	Direction	Alt	Mag
M92	Globular Cluster (Hercules)	Globular Cluster	***	***	08:32*	East	65	+6.5
M10	Globular Cluster (Ophiuchus)	Globular Cluster	02:29	13:56	08:12*	South-East	ne	+6.6
M81	Bode's Galaxy (Ursa Major)	Galaxy	***	***	01:12	North	ar	+6.9
M101	Pinwheel Galaxy (Ursa Major)	Galaxy	***	***	05:19	North	Pol	+7.9
M110	'Satellite' Galaxy - 1 (Andromeda)	Galaxy	***	***	17:56	West	ari	+8.1
M94	'Spiral' Galaxy (Canes Venatici)	Galaxy	***	***	04:06	South	s	+8.2
M1	The Crab Nebula (Taurus)	S'nova Remnant	17:42	04:36	23:09	South	29°	+8.4
M51	Whirlpool Galaxy (Canes Venatici)	Galaxy	***	***	04:45	South-East	73°	+8.4
M104	Sombrero Galaxy (Virgo)	Galaxy	22:50	09:01	03:56	South	86°	+8.6
M57	The Ring Nebula (Lyra)	Planetary Nebula	17:32	21:09	17:32**	East	64°	+8.8
NGC2403	'Spiral' Galaxy (Camelopardalis)	Galaxy	***	***	22:49	North	80°	+8.9

61°

Twilight	Civil	Nautical	Astronomical		Rises	Sets
Morning (begins)	06:59	06:20	05:41	Sun	07:35	16:50
Evening (ends)	17:26	18:06	18:44	Moon	12:19	06:11

\* = Highest point at Dawn (06:13 - last visible sighting)    \*\* = Highest point at Dusk (18:11 - first visible sighting)

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## Phases of the Moon



**Brown Lunation Number: 1238 & 1239** (numbered from first New Moon in 1923)

**Full Moon**                      **5<sup>th</sup> February**                      **18:28 (1238)**

**Last Quarter**                      **13<sup>th</sup> February**                      **16:00 (1238)**

**New Moon**                      **20<sup>th</sup> February**                      **07:05 (1239)**

**First Quarter**                      **27<sup>th</sup> February**                      **08:05 (1239)**

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## University of Sussex

- The Sussex Universe lecture series returns on 2<sup>nd</sup> February with a talk by astronomer Dr Paul Giles on “*Cosmology in crisis: galaxy clusters to the rescue*”
- Talks are free to attend and take place at 6pm in the Fulton A lecture theatre and live online
- For more information see [www.sussexuniverse.org](http://www.sussexuniverse.org)

**SUSSEX UNIVERSE**  
Thursday 2nd February - 6pm Fulton A

**Dr Paul Giles**  
School of Mathematical and Physical Sciences  
*Cosmology in crisis: galaxy clusters to the rescue*

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**SUSSEX UNIVERSE**  
SUSSEXUNIVERSE.ORG | UNIVERSE@SUSSEX.AC.UK

Thursday 2nd February - 6pm Fulton A  
**Dr Paul Giles** | School of Mathematical and Physical Sciences  
*Cosmology in crisis: galaxy clusters to the rescue*

Thursday 16th February - 6pm Fulton A  
**Prof. Peter Giesl** | School of Mathematical and Physical Sciences  
*Dynamical Systems: attractivity, chaos and predicting the future*

Thursday 2nd March - 6pm Fulton A  
**Dr Simon Mitchell** | Brighton and Sussex Medical School  
*Will virtual patients help us choose the right treatments?*

Thursday 16th March - 6pm Fulton A  
**Dr Kate Shaw** | School of Mathematical and Physical Sciences  
*Bringing Large Hadron Collider data to the World*

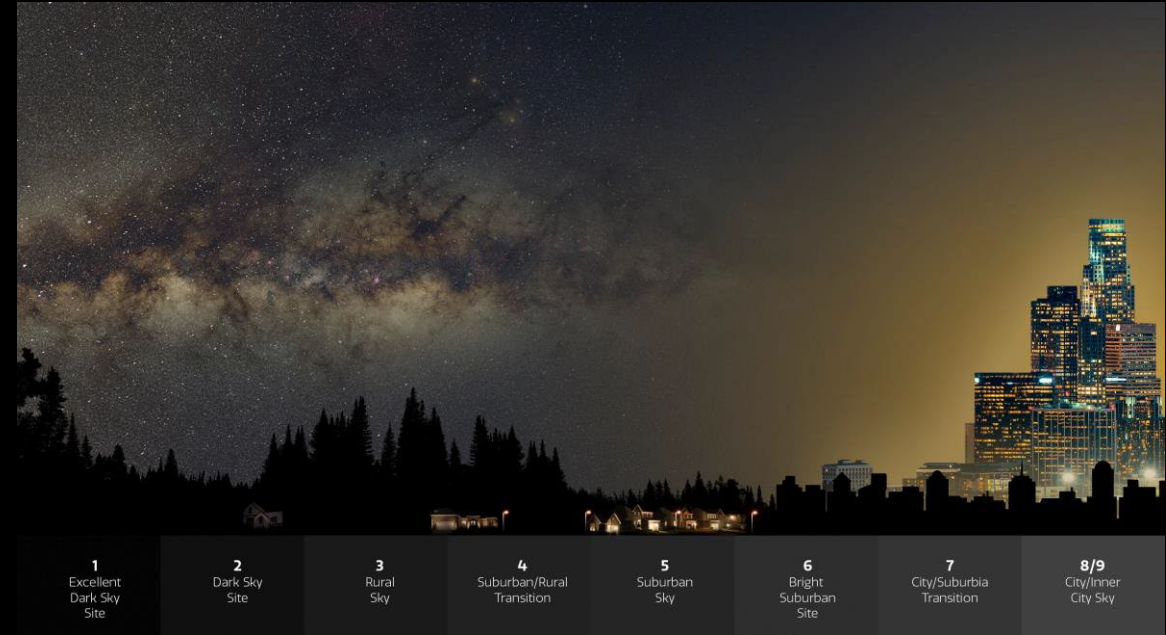
Thursday 30th March - 6pm Fulton A  
**Prof. Hazel Cox** | School of Life Sciences  
*Quantum Chemistry: Two's company three's a crowd*

**US**  
UNIVERSITY OF SUSSEX

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## Light Pollution and Dark Skies

- The problem of vanishing stars has been on the national news over the past few weeks
- New research suggests that the sky is brightening by 7% and 10% each year
- At the current rate a child born in a place where 250 stars are visible would only be able to see 100 on their 18<sup>th</sup> birthday
- Watch the '*Globe at Night*' Citizen Science video at:  
<https://youtu.be/boc20oqC3rU>



Impact of Light Pollution

Credit: NOIRLab/NSF/AURA, P. Marenfeld



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## CPRE Star Count 17<sup>th</sup> -24<sup>th</sup> February

- CPRE is the Countryside Charity
- Star count is an annual event supported by the British Astronomical Association
- Any clear night from 17<sup>th</sup> to 24<sup>th</sup> February
- Count the stars you can see inside the rectangle formed by the four corner stars of the Orion constellation
- Don't count the four corner stars!
- Submit your result on the CPRE website
- For more information see [www.cpre.org.uk](http://www.cpre.org.uk)



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**Wednesday 1<sup>st</sup> March 2023**

*"The rise and fall of an observatory at Herstmonceux"*

Keith Brackenborough, Lewes town hall, guests welcome

**Friday 10<sup>th</sup> March 2023**

*"An Introduction to Astrophotography"*

Arlington village hall, @ 8pm - strictly members only (courtesy of EAS)

**Wednesday 5<sup>th</sup> April 2023**

*"Astro-archaeology: how the people of the past used the sky to navigate their lives and deaths"*

Carina Garland, Lewes town hall, guests welcome