

# STRATFORD ASTRONOMY GROUP

DECEMBER 3<sup>RD</sup>, 2024



# AGENDA

- Meet and Greet
- Club NEWS and Activities
- Club Q & A
- Equipment Lessons
- Software and Imaging Information
- Latest Astronomy NEWS
- What's UP this Month
- Show and Tell
- Astronomy Lessons / Talks
- Cosmology Lessons
- Conclusion

# MEET AND GREET

**Welcome**  
New Visitors

**Regrets**

# UPCOMING MEETINGS

## NEXT MEETING DATES

Date	Room	Location
<del>Sept 17<sup>th</sup>, 2024</del>	<del>104</del>	<del>St. Michael's</del>
<del>Oct 1<sup>st</sup>, 2024</del>	<del>104</del>	<del>St. Michael's</del>
<del>Nov 5<sup>th</sup>, 2024</del>	<del>104</del>	<del>St. Michael's</del>
<del>Dec 3<sup>rd</sup>, 2024</del>	<del>104</del>	<del>St. Michael's</del>
Jan 7 <sup>th</sup> , 2025	104	St. Michael's
Feb 4 <sup>th</sup> , 2025	104	St. Michael's
March 4 <sup>th</sup> , 2025	104	St. Michael's
April 1 <sup>st</sup> , 2025	104	St. Michael's
May 6 <sup>th</sup> , 2025	104	St. Michael's
June 3 <sup>rd</sup> , 2025	104	St. Michael's

## CLUB NEWS AND ACTIVITIES

Group Funds

**Total = \$808.30**

- If you would like to contribute to the group, then please e-transfer Tim at:

[timannemariepauli@gmail.com](mailto:timannemariepauli@gmail.com)

or by cheques:

Tim Pauli  
96 Front Street  
Stratford, ON  
N5A4H2

# CLUB NEWS AND ACTIVITIES

## EQUIPMENT:

### STRATFORD ASTRONOMY CLUB EQUIPMENT

#### CLUB EQUIPMENT LOCATION:

Paul Bartlett is now storing all the group's equipment. If you wish to borrow an item, then please contact him at:

[1948paul.bartlett@gmail.com](mailto:1948paul.bartlett@gmail.com)

519-274-2010

**New Equipment Donation: Tim**

# CLUB NEWS AND ACTIVITIES

- **New Web site:** (<https://stratfordastronomy.com/>)
  - Tim Pauli - Owner/Administrator
  - Ken Roberts - technical contact
  - Tom Kimber - Administrator/Editor
  - Doug Fyfe - Administrator
  - Michael Burns- Administrator
  - Tom will build it on WordPress.



## CLUB Q & A





# WHAT'S UP

## STRATFORD ASTRONOMY GROUP

### WHAT'S UP FOR DECEMBER



<< November

December 2024

January >>

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
1  <b>New</b> Visible: 1% ↑ Age: 0.22 days	2  <b>New</b> Visible: 2% ↑ Age: 1.17 days	3  <b>Waxing crescent</b> Visible: 6% ↑ Age: 2.14 days	4  <b>Waxing crescent</b> Visible: 11% ↑ Age: 3.12 days	5  <b>Waxing crescent</b> Visible: 19% ↑ Age: 4.13 days	6  <b>Waxing crescent</b> Visible: 28% ↑ Age: 5.15 days	7  <b>First quarter</b> Visible: 38% ↑ Age: 6.18 days
8  <b>First quarter</b> Visible: 49% ↑ Age: 7.23 days	9  <b>First quarter</b> Visible: 60% ↑ Age: 8.30 days	10  <b>Waxing gibbous</b> Visible: 71% ↑ Age: 9.39 days	11  <b>Waxing gibbous</b> Visible: 81% ↑ Age: 10.48 days	12  <b>Waxing gibbous</b> Visible: 90% ↑ Age: 11.60 days	13  <b>Waxing gibbous</b> Visible: 96% ↑ Age: 12.71 days	14  <b>Full moon</b> Visible: 99% ↑ Age: 13.82 days
15  <b>Full moon</b> Visible: 100% Age: 14.91 days	16  <b>Full moon</b> Visible: 99% ↓ Age: 15.98 days	17  <b>Waning gibbous</b> Visible: 95% ↓ Age: 17.01 days	18  <b>Waning gibbous</b> Visible: 89% ↓ Age: 18.02 days	19  <b>Waning gibbous</b> Visible: 82% ↓ Age: 18.99 days	20  <b>Waning gibbous</b> Visible: 73% ↓ Age: 19.94 days	21  <b>Last quarter</b> Visible: 64% ↓ Age: 20.85 days
22  <b>Last quarter</b> Visible: 55% ↓ Age: 21.75 days	23  <b>Last quarter</b> Visible: 45% ↓ Age: 22.64 days	24  <b>Last quarter</b> Visible: 36% ↓ Age: 23.53 days	25  <b>Waning crescent</b> Visible: 27% ↓ Age: 24.42 days	26  <b>Waning crescent</b> Visible: 19% ↓ Age: 25.31 days	27  <b>Waning crescent</b> Visible: 12% ↓ Age: 26.23 days	28  <b>Waning crescent</b> Visible: 7% ↓ Age: 27.16 days
29  <b>New</b> Visible: 3% ↓ Age: 28.11 days	30  <b>New</b> Visible: 1% ↓ Age: 29.08 days	31  <b>New</b> Visible: 1% ↑ Age: 0.55 days	1 	2 	3 	4 

# HEY, THERE BE A MOON OVERHEAD

MOON PHASES FOR THE MONTH  
OF DECEMBER  
THE MOON KEEPS RUNNING INTO  
CELESTIAL OBJECTS THIS MONTH

# « DECEMBER 2024 (LET'S USE THE MOON) »

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
<b>1</b> <a href="#">New Moon</a>	<b>2</b> <a href="#">Pheonid meteor shower 2024</a> <a href="#">The Moon at perihelion</a>	<b>3</b>	<b>4</b> <a href="#">Conjunction of the Moon and Venus</a> <a href="#">Close approach of the Moon and Venus</a>	<b>5</b> <a href="#">Conjunction of Ceres and Pluto</a> <a href="#">December <math>\phi</math>-Cassiopeid meteor shower 2024</a> <a href="#">Mercury at inferior solar conjunction</a>	<b>6</b> <a href="#">Jupiter at perigee</a> <a href="#">Mercury at perihelion</a> <a href="#">Puppis-Velid meteor shower 2024</a> <a href="#">Mars enters retrograde motion</a>	<b>7</b> <a href="#">Conjunction of Venus and Pluto</a> <a href="#">Jupiter at opposition</a> <a href="#">Neptune ends retrograde motion</a>
<b>8</b> <a href="#">Close approach of the Moon and Saturn</a> <a href="#">Lunar occultation of Saturn</a> <a href="#">Conjunction of the Moon and Saturn</a> <a href="#">Conjunction of Venus and Ceres</a> <a href="#">Moon at First Quarter</a> <a href="#">Monocerotid meteor shower 2024</a>	<b>9</b> <a href="#">Lunar occultation of Neptune</a>	<b>10</b>	<b>11</b> <a href="#"><math>\sigma</math>-Hydrid meteor shower 2024</a>	<b>12</b> <a href="#">The Moon at perigee</a> <a href="#">The Large Magellanic Cloud is well placed</a>	<b>13</b> <a href="#">Close approach of the Moon and M45</a>	<b>14</b> <a href="#">Geminid meteor shower 2024</a> <a href="#">The Moon at aphelion</a> <a href="#">Close approach of the Moon and Jupiter</a> <a href="#">Conjunction of the Moon and Jupiter</a> <a href="#">Asteroid 15 Eunomia at opposition</a> <a href="#">The Running Man cluster is well placed</a> <a href="#">The Orion Nebula is well placed</a>
<b>15</b> <a href="#">Lunar occultation of Beta Tauri</a> <a href="#">Full Moon</a> <a href="#">Comae Berenicid meteor shower 2024</a>	<b>16</b>	<b>17</b>	<b>18</b> <a href="#">Conjunction of the Moon and Mars</a> <a href="#">Close approach of the Moon and Mars</a> <a href="#">Lunar occultation of Mars</a>	<b>19</b> <a href="#">December Leonis Minorid meteor shower 2024</a>	<b>20</b> <a href="#">Mercury at dichotomy</a>	<b>21</b> <a href="#">Mercury at highest altitude in morning sky</a> <a href="#">December solstice</a>
<b>22</b> <a href="#">Ursid meteor shower 2024</a> <a href="#">Moon at Last Quarter</a>	<b>23</b>	<b>24</b> <a href="#">The Moon at apogee</a> <a href="#">Lunar occultation of Spica</a>	<b>25</b> <a href="#">Mercury at greatest elongation west</a>	<b>26</b>	<b>27</b>	<b>28</b> <a href="#">Lunar occultation of Antares</a> <a href="#">The cluster NGC 2232 is well placed</a> <a href="#">Conjunction of the Moon and Mercury</a>
<b>29</b> <a href="#">The Rosette Nebula is well placed</a>	<b>30</b> <a href="#">The Moon at perihelion</a> <a href="#">New Moon</a>	<b>31</b>				

# Conjunction of the Moon and Venus

WED, 04 DEC 2024 AT 17:41 EST (22:41 UTC)



The Moon and Venus will share the same right ascension, with the Moon passing 2°15' to the south of Venus. The Moon will be 3 days old.



At around the same time, the two objects will also make a close approach, technically called an appulse.



From Stratford, the pair will become visible at around 17:07 (EST), 19° above your south-western horizon, as dusk fades to darkness. They will then sink towards the horizon, setting 3 hours and 6 minutes after the Sun at 19:53.




The Moon will be at mag -10.5, and Venus at mag -4.2, both in the constellation Sagittarius.



The pair will be too widely separated to fit within the field of view of a telescope but will be visible to the naked eye or through a pair of binoculars.



THE SKY ON 4 DECEMBER 2024		
Sunrise	07:37	 Waxing Crescent 17% 3 days old
Sunset	16:47	
Twilight ends	18:30	
Twilight begins	05:55	
		Planets
		Rise Culm. Set
		Mercury 07:52 12:27 17:02
		Venus 10:55 15:24 19:52
		Moon 11:07 15:19 19:37
		Mars 20:33 04:04 11:35
		Jupiter 16:56 00:30 08:04
		Saturn 12:56 18:25 23:55
All times shown in EST.		

# Conjunction of Venus and Pluto

SAT, 07 DEC 2024 AT 13:13 EST (18:13 UTC)



Venus and Pluto will share the same right ascension, with Venus passing 53' to the north of Pluto.



From Stratford however, the pair will not be observable – they will reach their highest point in the sky during daytime and will be no higher than 14° above the horizon at dusk.



Venus will be at mag -4.2, and Pluto at mag 15.2, both in the constellation Capricornus.



The pair will be a little too widely separated to fit comfortably within the field of view of a telescope, but will be visible through a pair of binoculars.




THE SKY ON 7 DECEMBER 2024																														
Sunrise	07:40	 Waxing Crescent 45% 6 days old																												
Sunset	16:47																													
Twilight ends	18:30																													
Twilight begins	05:57																													
		Planets																												
		<table border="1"><thead><tr><th></th><th>Rise</th><th>Culm.</th><th>Set</th></tr></thead><tbody><tr><td>Mercury</td><td>07:17</td><td>11:58</td><td>16:40</td></tr><tr><td>Venus</td><td>10:55</td><td>15:27</td><td>19:58</td></tr><tr><td>Moon</td><td>12:36</td><td>17:53</td><td>23:21</td></tr><tr><td>Mars</td><td>20:21</td><td>03:53</td><td>11:24</td></tr><tr><td>Jupiter</td><td>16:43</td><td>00:17</td><td>07:50</td></tr><tr><td>Saturn</td><td>12:44</td><td>18:14</td><td>23:44</td></tr></tbody></table>		Rise	Culm.	Set	Mercury	07:17	11:58	16:40	Venus	10:55	15:27	19:58	Moon	12:36	17:53	23:21	Mars	20:21	03:53	11:24	Jupiter	16:43	00:17	07:50	Saturn	12:44	18:14	23:44
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Jupiter	16:43	00:17	07:50																											
Saturn	12:44	18:14	23:44																											
All times shown in EST.																														

## CLOSE APPROACH OF THE MOON AND SATURN

THIS EVENT IS EASILY VISIBLE THROUGH NAKED EYE FROM STRATFORD.

SUN, 08 DEC 2024 AT 03:41 EST (08:41 UTC)

- The Moon and Saturn will make a close approach, passing within a mere 16.3 arcminutes of each other. From some parts of the world, the Moon will pass in front of Saturn, creating a lunar occultation. The Moon will be 7 days old.
- From Stratford, the pair will be visible in the evening sky, becoming accessible around 17:29 (EST), 37° above your southern horizon, as dusk fades to darkness. They will then reach their highest point in the sky at 18:10, 37° above your southern horizon. They will continue to be observable until around 22:30, when they sink below 11° above your south-western horizon.
- The Moon will be at mag -11.9; and Saturn will be at mag 0.8. Both objects will lie in the constellation Aquarius.
- They will be close enough to fit within the field of view of a telescope, but will also be visible to the naked eye or through a pair of binoculars.
- At around the same time, the pair will also share the same right ascension – called a conjunction.

THE SKY ON 8 DECEMBER 2024		
Sunrise	 Waxing Gibbous 52% 7 days old	<b>Planets</b>
07:41		Rise Culm. Set
Sunset		Mercury 07:06 11:49 16:32
16:47		Venus 10:54 15:27 20:00
Twilight ends		Moon 12:57 18:41 00:36
18:30		Mars 20:17 03:49 11:20
Twilight begins		Jupiter 16:39 00:12 07:46
05:58		Saturn 12:40 18:10 23:41
		All times shown in EST.



# Close approach of the Moon and M45

THIS EVENT IS EASILY VISIBLE THROUGH NAKED EYE FROM STRATFORD.

FRI, 13 DEC 2024 AT 12:54 EST (17:54 UTC)

The Moon and M45 will make a close approach, passing within a mere 9.8 arcminutes of each other. The Moon will be 12 days old.

From Stratford, the pair will be visible in the evening sky, becoming accessible around 17:36 (EST), 26° above your eastern horizon, as dusk fades to darkness. They will then reach their highest point in the sky at 22:38, 70° above your southern horizon. They will continue to be observable until around 04:59, when they sink below 12° above your western horizon.

The Moon will be at mag -12.7; and M45 will be at mag 1.3. Both objects will lie in the constellation Taurus.

They will be close enough to fit within the field of view of a telescope, but will also be visible to the naked eye or through a pair of binoculars.

THE SKY ON 13 DECEMBER 2024						
Sunrise	 Waxing Gibbous 98% 12 days old	Planets				
07:45			Rise	Culm.	Set	
Sunset			Mercury	06:23	11:12	16:02
16:47			Venus	10:52	15:31	20:11
		Moon	15:08	23:03	07:10	
Twilight ends		Mars	19:55	03:28	11:01	
18:31		Jupiter	16:12	23:46	07:19	
Twilight begins		Saturn	12:21	17:51	23:22	
06:02		All times shown in EST.				



LATEST ASTRONOMY NEWS

NOVEMBER





## Hubble and Webb are the dream team—don't break them up, researchers say - Nov 5th

Many people think of the James Webb Space Telescope as a sort of Hubble 2. They understand that the Hubble Space Telescope (HST) has served us well but is now old and overdue for replacement. NASA seems to agree, as they have not sent a maintenance mission in over 15 years and are already preparing to wind down operations.

But a recent [paper](#) posted to the *arXiv* preprint server argues that this is a mistake. Despite its age, HST still performs extremely well and continues to produce an avalanche of valuable scientific results. And given that JWST was never designed as a replacement for HST—it is an infrared (IR) telescope—we would best be served by operating both telescopes in tandem, to maximize coverage of all observations.

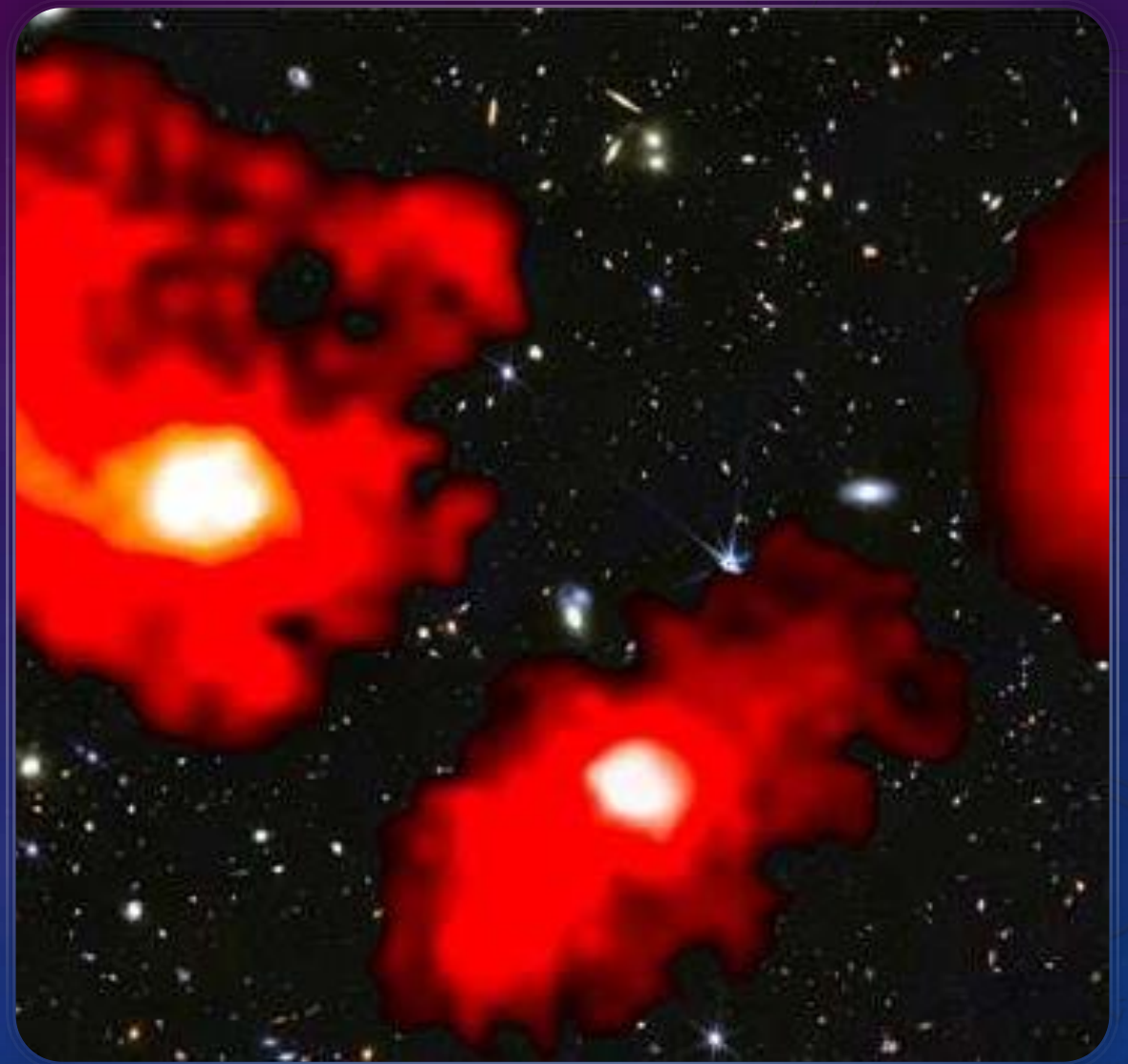
HST, however, is in Low Earth Orbit (LEO), and suffers very slight amounts of drag from the faint outer reaches of the atmosphere. Over time it will gradually lose speed, drifting downwards until it enters the atmosphere proper and crashes to Earth. Because of its size, it will not burn up completely, and large chunks will smash into the surface.

The current plan is to send up an uncrewed rocket which will dock with the telescope (a special attachment was installed on the final servicing mission for this purpose) and deorbit it in a controlled way to ensure that its pieces land safely in the ocean.



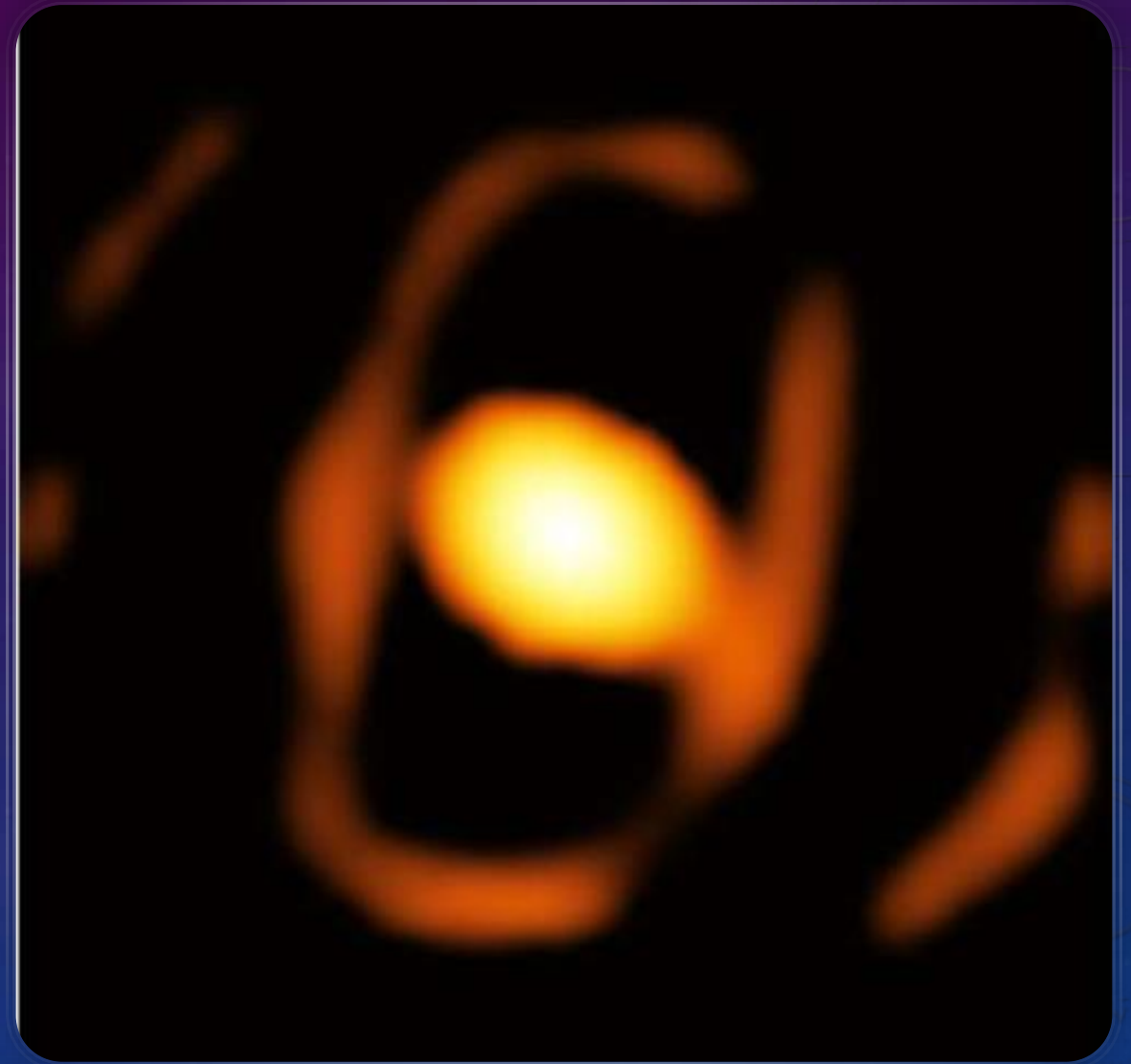
## DISCOVERY OF THREE GALACTIC 'RED MONSTERS' IN EARLY UNIVERSE CHALLENGES CURRENT MODELS OF GALAXY FORMATION – NOV 13TH

- An international team led by the University of Geneva (UNIGE) has identified three ultra-massive galaxies—nearly as massive as the Milky Way—already in place within the first billion years after the Big Bang.
- This surprising discovery was made possible by the James Webb Space Telescope's FRESCO program, which uses the NIRCam/grism spectrograph to measure accurate distances and stellar masses of galaxies. The results indicate that the formation of stars in the early universe was far more efficient than previously thought, challenging existing galaxy formation models.
- In the theoretical model favored by scientists, galaxies form gradually within large halos of dark matter. Dark matter halos capture gas (atoms and molecules) into gravitationally bound structures. Typically, only about 20% of this gas at most is converted into stars in galaxies.
- However, new findings challenge this view. The researchers reveal that massive galaxies in the early universe may have been much more efficient in building stars than their later counterparts, growing much more rapidly than previously thought.



# ASTRONOMERS TAKE FIRST CLOSE-UP PICTURE OF A STAR OUTSIDE OUR GALAXY— NOV 21

- Located a staggering 160,000 light-years from us, the star WOH G64 was imaged thanks to the impressive sharpness offered by the European Southern Observatory's Very Large Telescope Interferometer (ESO's VLTI). The new observations reveal a star puffing out gas and dust in the last stages before it becomes a supernova.
- "For the first time, we have succeeded in taking a zoomed-in image of a dying star in a galaxy outside our own Milky Way," says Keiichi Ohnaka, an astrophysicist from Universidad Andrés Bello in Chile.
- "We discovered an egg-shaped cocoon closely surrounding the star," says Ohnaka, the lead author of a study reporting the observations published today in *Astronomy & Astrophysics*. "We are excited because this may be related to the drastic ejection of material from the dying star before a supernova explosion."
- The newly imaged star, WOH G64, lies within the Large Magellanic Cloud, one of the small galaxies that orbits the Milky Way.



# COSMOLOGICAL MODEL PROPOSES DARK MATTER PRODUCTION DURING PRE-BIG BANG INFLATION – NOV 30

As physicists continue their struggle to find and explain the origin of dark matter, the approximately 80% - 85% of the matter in the universe that we can't see and so far haven't been able to detect, researchers have now proposed a model where it is produced before the Big Bang.

Their idea is that dark matter would be produced during a infinitesimally short inflationary phase when the size of the universe quickly expanded exponentially. The new model was published in *Physical Review Letters* by three scientists from Texas in the US.

Though it sounds unusual, these cosmologists now think that inflation happened before the Big Bang, since the existence of a Big Bang singularity with infinite density and infinite spacetime curvature seems unrealistic.

Instead, the universe would have some small size after inflation, roughly 10<sup>-26</sup> meters in diameter, and from there the standard steps of radiation and particle production would occur, then nucleosynthesis would take place to populate the universe.



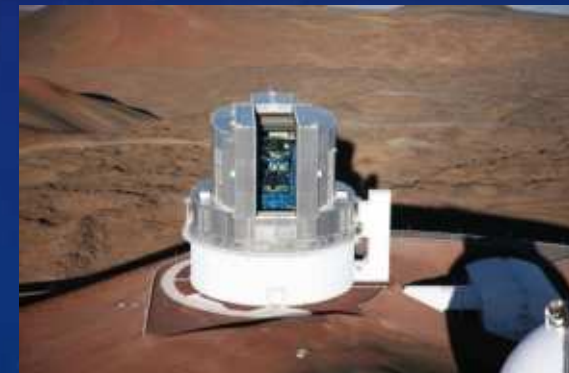
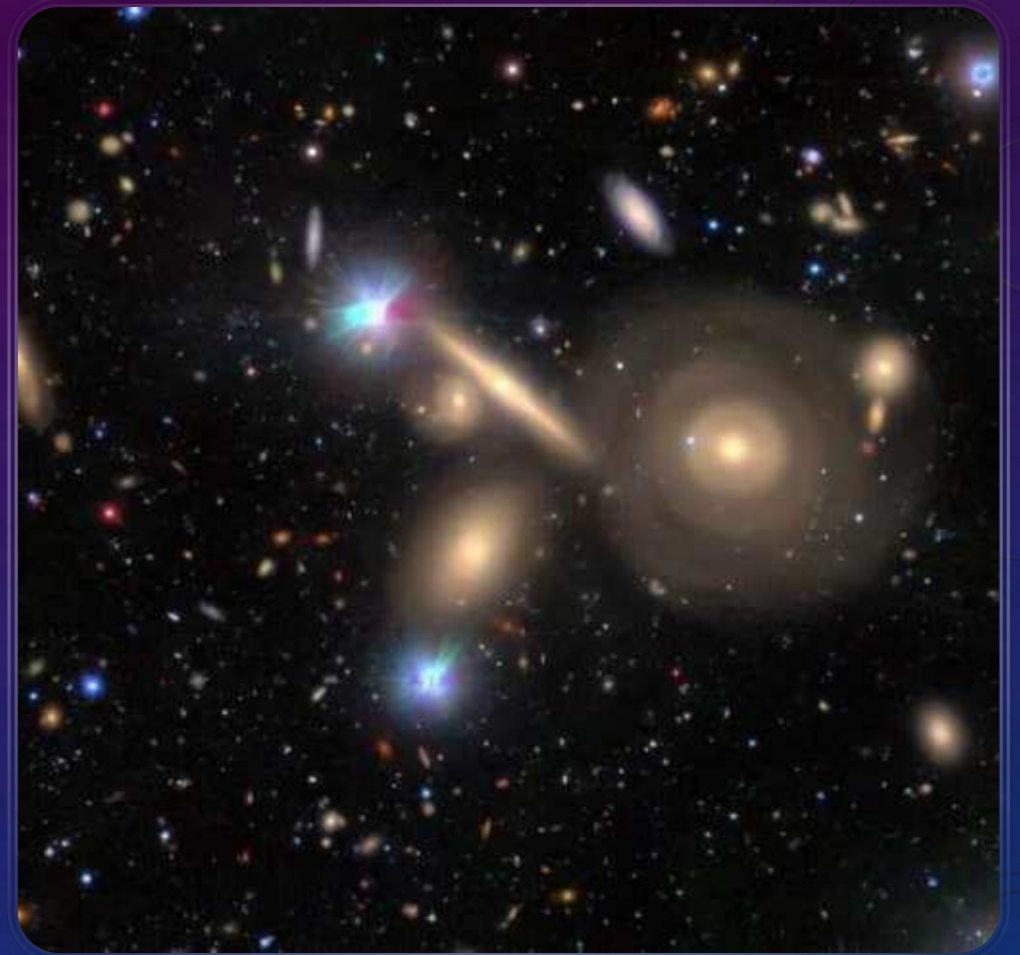


LATEST WEBB/HUBBLE  
IMAGES



# SUBARO CAPTURES EXCEPTIONALLY RARE TRIPLE RING GALAXY – NOV 7TH

- The Hubble Classification, also known as the Hubble Sequence, is a widely recognized method for systematically categorizing galaxy morphology. Galaxies are classified into elliptical, lenticular, and spiral (or barred spiral) galaxies.
- Galaxies with irregular shapes that do not fit into any categories are classified as irregular galaxies. While this classification can be used for most galaxies, some do not fit into any category, though they have regular shapes.
- A ring galaxy is one of these. There are various theories about their origin, but one leading hypothesis asserts that ring galaxies originate from galactic interactions and mergers. The citizen science project GALAXY CRUISE, using vast cosmic images captured by the Subaru Telescope, regards ring galaxies as interacting.
- Ring galaxies are rare and difficult to find. This galaxy features three rings, which is exceptionally rare and valuable to scientific research.

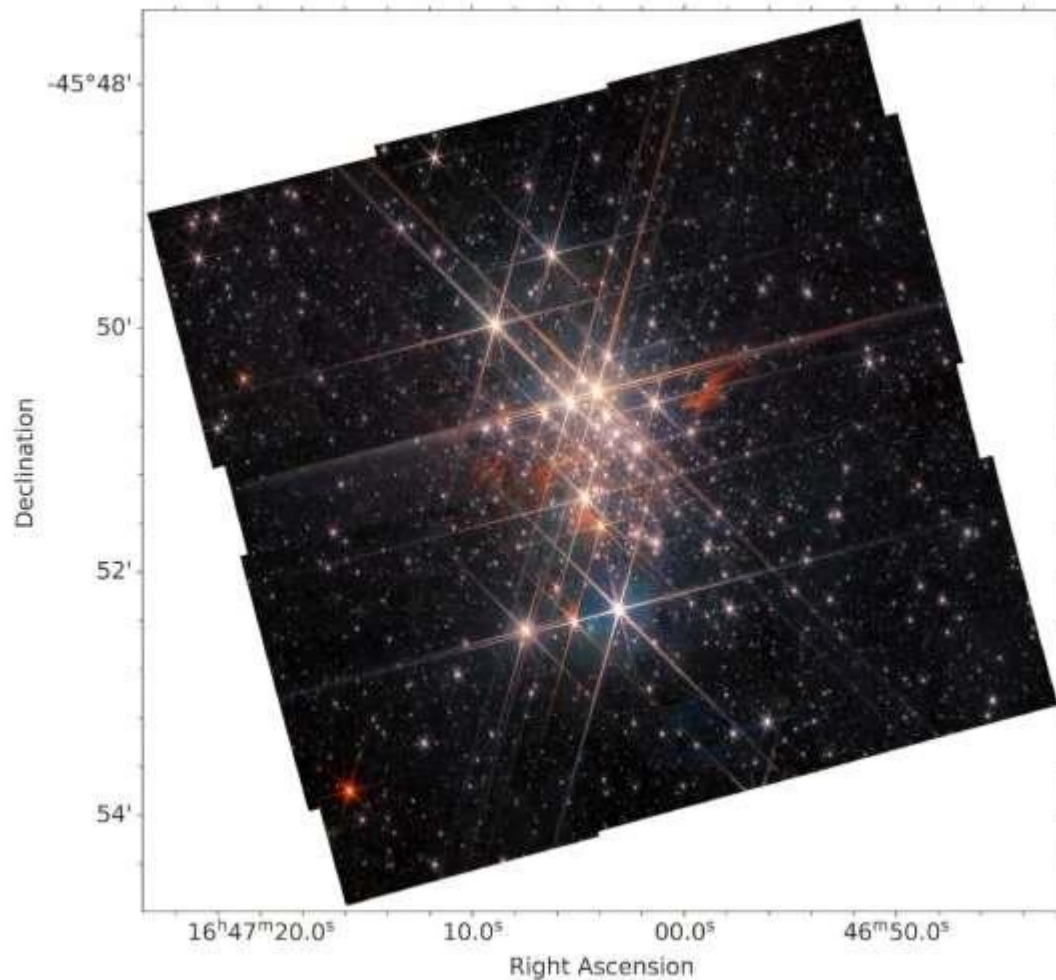


## HUBBLE CAPTURES BARRED SPIRAL GALAXY NGC 1672 – NOV 16



- This NASA/ESA Hubble Space Telescope image features NGC 1672, a barred spiral galaxy located 49 million light-years from Earth in the constellation Dorado. This galaxy is a multi-talented light show, showing off an impressive array of different celestial lights.

# WEBB OBSERVATIONS EXPLORE THE WESTERLUND 1 STAR CLUSTER – NOV 27TH

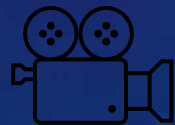


- An international team of astronomers has employed the James Webb Space Telescope (JWST) to observe a supermassive Galactic open cluster known as Westerlund 1. Results of the observational campaign, presented in a paper [published](#) Nov. 20 on the *arXiv* preprint server, yield important insights about the structure and properties of this cluster.



# SOMBRERO GALAXY DAZZLES IN NEW WEBB IMAGES AND VIDEO – NOV 25

A new mid-infrared image from the NASA/ESA/CSA James Webb Space Telescope features the Sombrero galaxy, also known as Messier 104 (M104). The signature, glowing core seen in visible-light images does not shine, and instead a smooth inner disk is revealed. The sharp resolution of Webb's MIRI (Mid-Infrared Instrument) also brings into focus details of the galaxy's outer ring, providing insights into how the dust, an essential building block for astronomical objects in the universe, is distributed. The galaxy's outer ring shows intricate clumps in the infrared for the first time.



AN ANNIVERSARY OF GALACTIC IMPORTANCE

On November 16th, 1974, the Arecibo Radio Telescope in Puerto Rico sent out the strongest signal ever sent into space. The broadcast's goal was to showcase humanity's technical advancement. Renowned SETI researcher **Frank Drake** and famous scientific communicator **Carl Sagan** created it. The Arecibo Message has remained the most widely publicized effort to contact extraterrestrial intelligence in the forty-eight years since its transmission.



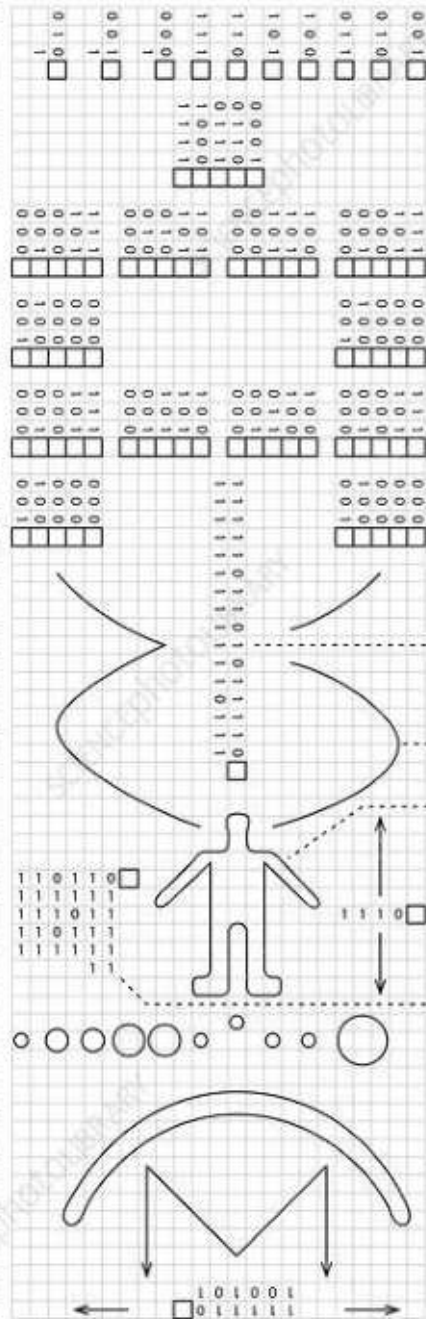
ACTUAL 1974  
RECORDING OF  
MESSAGE FROM  
WITHIN FACILITY.











NUMBERS 10 - 1

NUMBER LABELS

ATOMIC NUMBERS FOR ELEMENTS  
(L-R) PHOSPHORUS, OXYGEN,  
NITROGEN, CARBON, HYDROGEN

FORMULAS FOR THE  
SUGARS AND BASES IN  
NUCLEOTIDES OF DNA

NUMBER OF  
NUCLEOTIDES  
IN DNA

DOUBLE HELIX  
STRUCTURE  
OF DNA

SHAPE OF A HUMAN BEING

HEIGHT OF A HUMAN BEING

HUMAN POPULATION OF EARTH

SUN (R) AND PLANETS OF THE SOLAR SYSTEM  
WITH EARTH DISPLACED TOWARD HUMAN FIGURE

DISH OF ARECIBO TELESCOPE  
TRANSMITTING MESSAGE

DIAMETER OF TELESCOPE



# SHOW AND TELL

# COSMOLOGY TALK