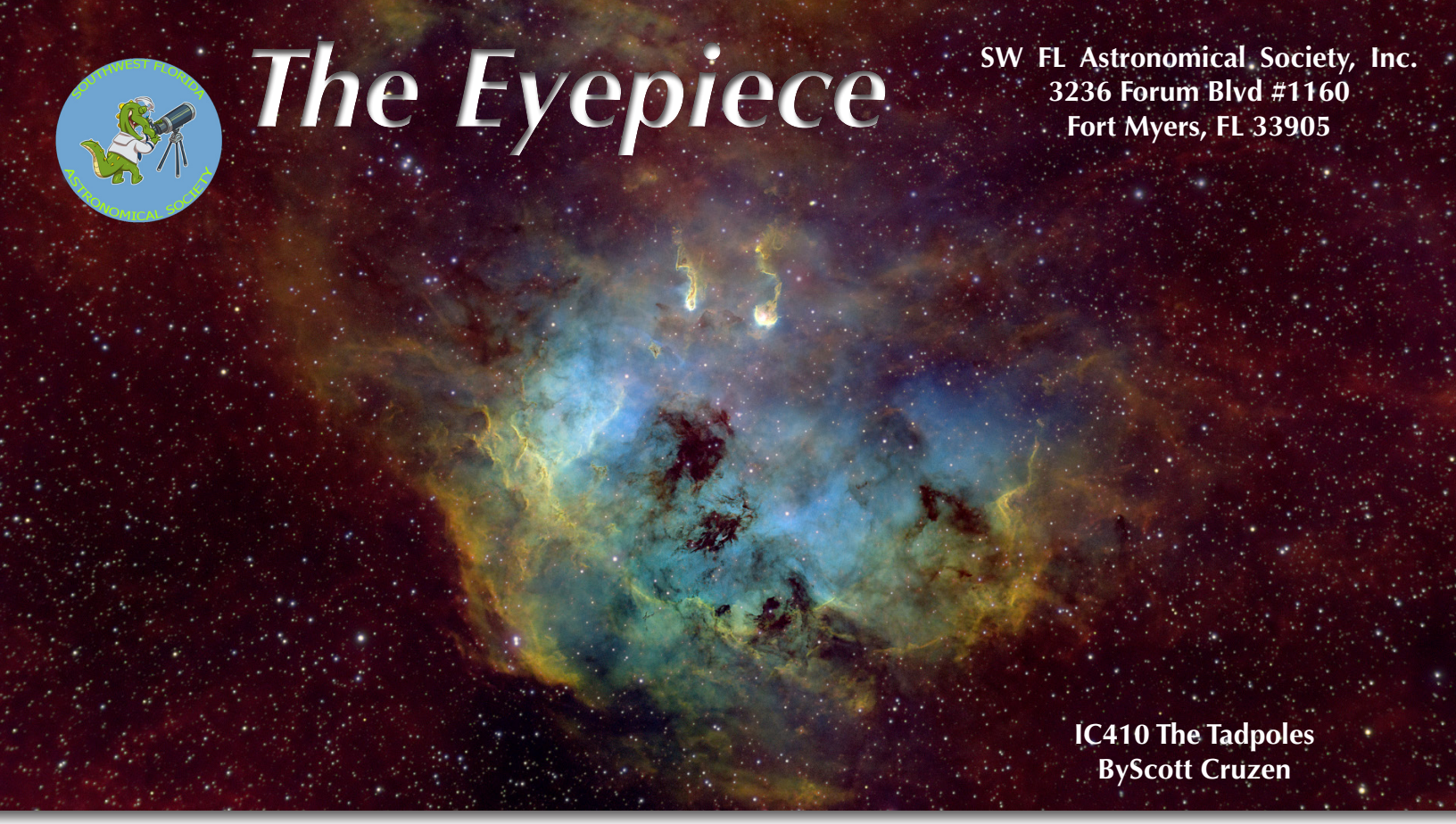
The Eyepiece

SW FL Astronomical Society, Inc.
3236 Forum Blvd #1160
Fort Myers, FL 33905



IC410 The Tadpoles
ByScott Cruzen

Editor - Mike Jensen

Please join me for a pre meeting dinner at:
Buffalo Wild Wings
5:15pm
The address is:
9390 Dynasty Drive, Suite 101,
Fort Myers, FL 33905

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Hi Everyone!

Well, we're completing another trip around our star. For me, it's been a very busy one, and another busy one coming up. For as long as I can remember, I've been a seeker of beauty in all forms and fashions on the land and in the skies. Almost everywhere I go I look up, to see what the skies look like where I'm at. In October I saw the Aurora for the first time in Maine! Wow. I'm going back to see it again in February in Northern Canada. I was also blessed to see the skies in the Antarctic this year. That experience has no comparisons. Next year we will be on photo & discovery trips to Iceland, Norway, Greenland as well as New Zeeland and Austrailia, whew! Everywhere I go, I will look for somethign in the sky to show you, in case you haven't been there.

Here at home, we're blessed to have a good team to operated and guide the club. Your board is chugging along but we could use your help. We need some of you to point us in the direction of some more speakers. If you see someone, or read about someone, reach out please. Let us know, or reach out yourself. I think we can all agree that the speakers program has been a key core component for the club. John MacLean has done an exemplary job, but he needs some more of his time and we need to step in and step up to keep this program going. Thanks for your support.

Monthly Meetings

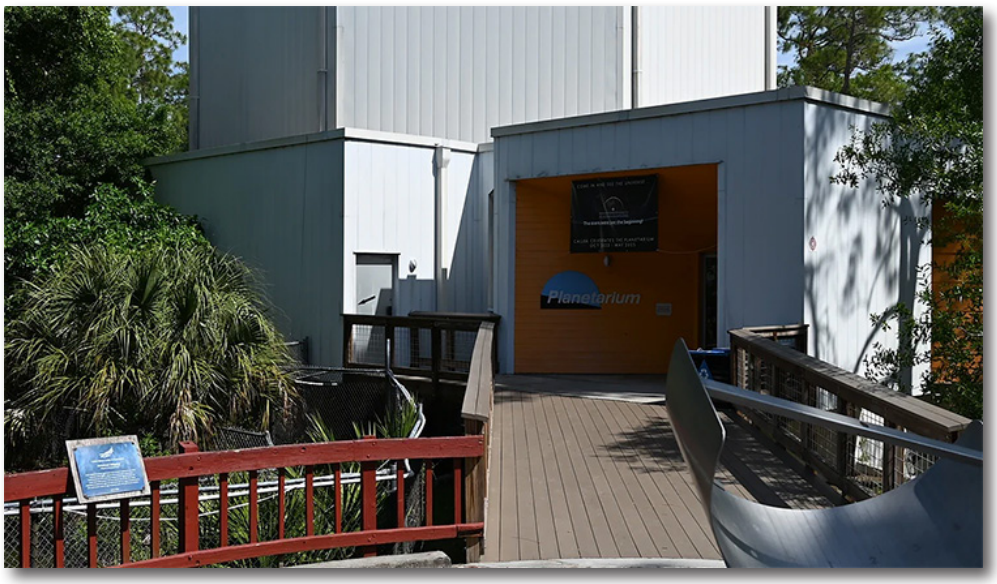
Our monthly meetings are held on the **first Thursday of each month**. **The meetings begin at 7:00pm**.

Here is the Zoom link:

https://zoom.us/j/97435302223?pwd=Y3A2dlk2Q3M2eG1ENTJuOXp4TEZEQT09

Passcode: 874185

Each meeting is usually a combined live and Zoom meeting.



The in person meeting is held at:
Calusa Nature Center/Planetarium
3450 Ortiz Ave,
Fort Myers, FL 33905

Below are the dates for the meetings of 2024:
Dec. 5, 2024
Jan. 2, 2025

Astro Sig Schedule 2024/25

All Meetings at 7:00pm

Dec. 17th
Jan. 21st

ASTRO SIG MEETING ZOOM LINK
NEW LINK

https://us06web.zoom.us/j/7900508233?pwd=enVNcFMxUi9KZ1dlOHBLSUpkNWk5UT09

Meeting ID: 790 050 8233
Passcode: 2Rp0wp

24/25 Observatory & Solar Dates

Below are the new schedules for the FSW Observatory and the Solar Observing events for the coming school year. Note that the observatory events will be the fourth Friday of each month, and the Solar observing events will be the second Saturday of each month at the indicated parks in Charlotte County.

FSW Observatory	Solar Observing	Park
Dec 27, 2024	Dec 14, 2024	Ponce deLeon
Jan 24, 2025	Jan 11, 2025	Bayshore Live Oak
Feb 28, 2025	Feb 8, 2025	Gilchrist
Mar 28, 2025	Mar 8, 2025	Ponce deLeon
Apr 25, 2025	Apr 12, 2025	Bayshore Live Oak
May 23, 2025	May 10, 2025	Gilchrist

President's Message

Brian Risley

Wow, Another year has gone by!

For December Meeting speaker we have Gregory T. Shanos The Smart Scope Revolution- Introducing the Seestar S50

A smart scope combines a telescope, camera, tracking mount and computer into a compact portable imaging system.

This will be a presentation in the planetarium.

Mike is planning a dinner before the meeting if interested. Join Mike at Buffalo Wild Wings at 5:15pm. The address is:
9390 Dynasty Drive, Suite 101, Fort Myers, FL 33905

On Saturday the 7th we will have a star party at Seahawk Park in North Cape Coral.

It's Dues time again. You can pay online at https://theeyepiece.org/membership/

Dues are $30/yr. The site has both electronic payment information as well as info if you want to mail a check.

December's cosmic calendar:
Jupiter shines bright as Geminids sparkle

Dec. 7: Jupiter opposition
The biggest planet in the solar system will be on display in the December sky as it shines brighter than it has all year.

Dec. 12-13: Geminid meteor shower
One of the best meteor showers of the year is about to peak, sparking shooting stars into the chilly December sky.

Dec. 14-15: Final full moon of 2024
Just two nights after the Geminids, the last full moon of 2024 will rise.

Dec. 21-22: Meteor shower on 1st night of winter
The December solstice marks the official start of astronomical winter in the Northern Hemisphere, taking place this year on Saturday, Dec. 21, at 4:20 a.m. EST. This is different than meteorological winter, which starts on Dec. 1.

Club Officers & Positions

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Calusa Nature Center Planetarium Director Heather Preston
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239-275-3435

GUEST SPEAKER PRESENTATIONS SERIES

Here's our lineup for the "SWFAS Guest Speaker Presentations" series of talks. These will cover astronomical science and space exploration along with practical astronomy and astrophotography talks by various subject matter experts. We are lining up prominent scientists and researchers to explain the science and technology behind the exciting discoveries being made in recent years in astronomy.

The following presentations are already scheduled and we will be firming up talks in 2024 on a month-to-month basis.:

December - The Smart Scope Revolution presented by Dr. Gregory T. Shanos
January - Light Pollution presented by our own Dr. Mario Motta

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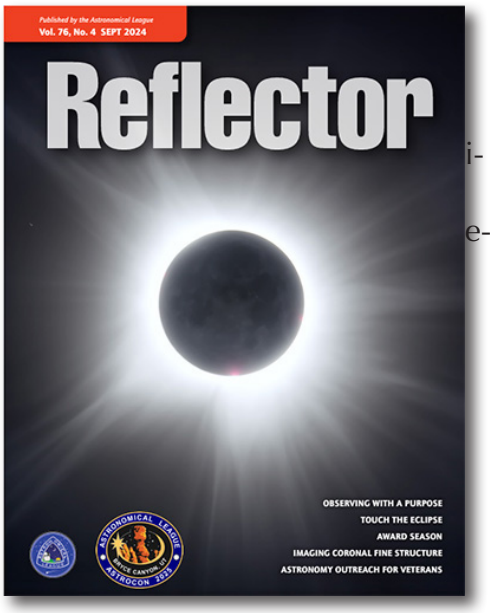
December 5, 2024 - The Smart Scope Revolution: Introducing the Seestar S50 by Gregory T. Shanos RPh, PharmD ALPO member & NASA/JPL Solar System Ambassador

January 2, 2025 Light Pollution presented by our own Dr. Mario Motta.

Mario is one of our members as well as a well known speaker and expert on many things concerning astronomy. Recently Dr. Motta spoke with NPR about Light Pollution. Click here to see/listen to the interview.

Dr. Motta has given many lectures and written many articles about light pollution and its impact on our vision, the circadian rhythm and the starry skies. Read more about this on his website here: https://www.mariomottamd.com/street-lighting/

The Astronomical League



As a member of the Southwest Florida Astronomical Society you are automatically also a member of the Astronomical League, a nationwide affiliation of astronomy clubs. Membership in the AL provides a number of benefits for you including receipt of The Reflector, the AL's quarterly newsletter, use of the Book Service, through which you can buy astronomy related books at a 10% discount. You can also participate in the Astronomical League's Observing Clubs. The Observing Clubs offer encouragement and certificates of accomplishment for demonstrating observing skills with a variety of instruments and objects. These include the Messier Club, Binocular Messier Club, the Herschel 400 Club, the Deep Sky Binocular Club, and many others. To learn more about the Astronomical League and its benefit s for you, visit http://www.astroleague.org

Reflector Magazine

The latest Sept. 2024 copy of the Reflector magazine has been emailed.. It is also available via the web at https://www.astroleague.org/reflector

What's up with the Astronomical League – November 2024

Monthly highlight of the Astronomical League Observing Programs
(Article prepared by SWFAS Astronomical League Coordinator John MacLean)

Last month we covered the Carbon Star and Double Stars observing programs which are both reasonably suited to back-yard observing in light polluted areas. This month we'll cover the two Lunar Observing Programs for which typical light pollution presents no problems at all.

Lunar Observing Program

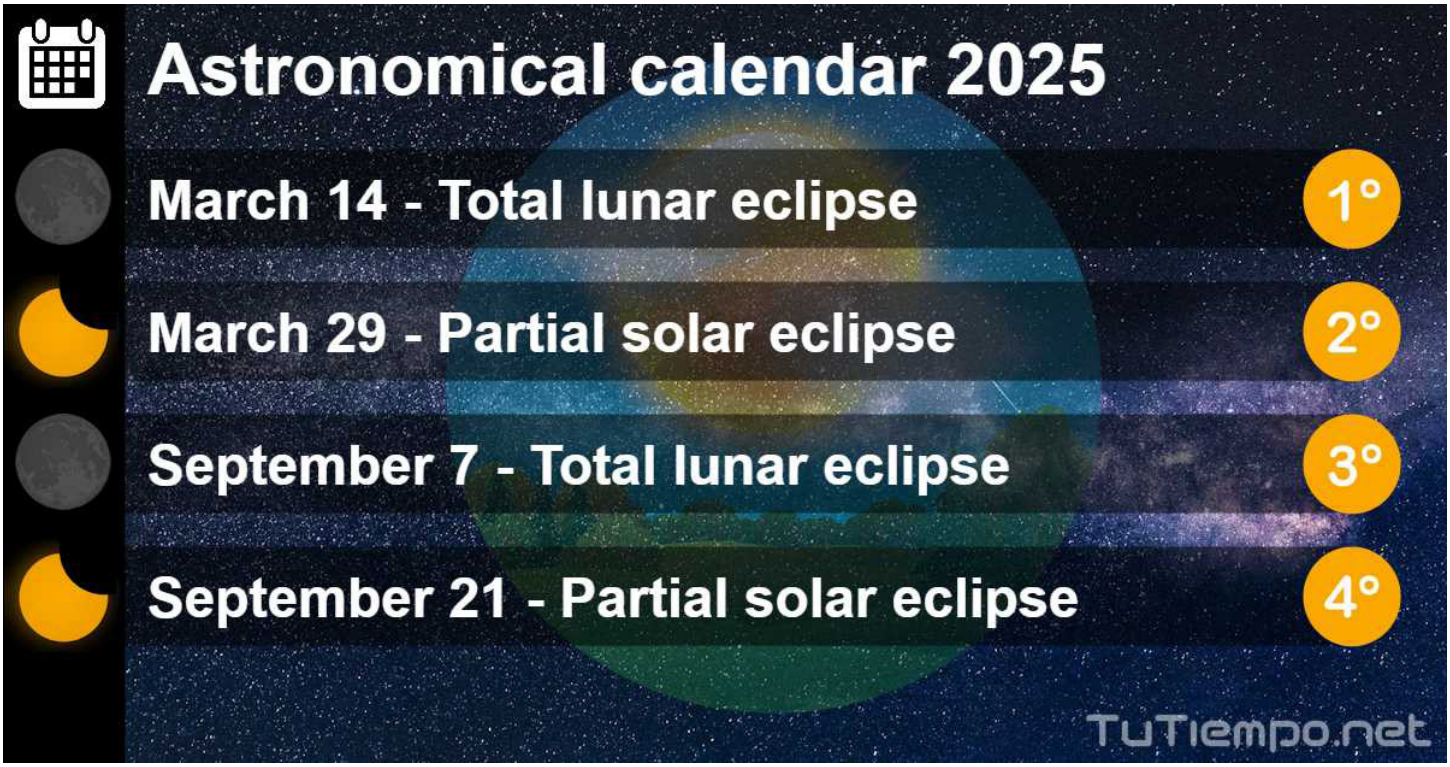
This is the introductory program suited to newcomers, both young and old. The 100 lunar features selected are broken down into 18 naked-eye (e.g. Maria), 46 binocular, and 36 telescopic targets. Small aperture equipment is entirely appropriate and the listing was validated by the Astronomical League using 7 X 35 binoculars and a 60mm refractor. A tripod is highly recommended for binocular use. The binocular targets include 39 of the most prominent craters. The telescopic targets include craters, mountains, valleys, walls, and various other lunar features. A convenient check list is provided to facilitate recording the observations. Binoculars may be used for any of the naked eye targets and a telescope may be substituted for all binocular targets. The laminated Moon Map by Sky Publishing is recommended as a low cost, good lunar map. This is available for various telescope orientations.

Lunar II Observing Program
This program builds on the Lunar Observing Program and is designed for the more experienced observer. The observations are designed to help members improve their observing skills and expand their knowledge of the visible lunar surface. Again, a minimum of 100 observations are required. 67 targets must be observed and described with the additional targets requiring sketches as well. Some observations require the same feature being observed under different lighting conditions. In addition to standard lunar features, various landing sites for Apollo and Luna missions are included. Often times viewers at star parties ask about whether lunar landing sites can be pointed out and having a knowledge of the general areas where various missions took place can certainly be helpful in this regard. Finally, observations of lunar eclipses and occultations are also included. In order to obtain a certificate and pin, successful completion of the Lunar Observing Program is a prerequisite.

The late Patrick Moore was a confirmed "lunatic". Completing the two Lunar Observing programs will help anyone to begin following in Patrick's footsteps and gain thorough familiarity with the Moon's topography.

Lunar Observing Resources.
The Astronomical League does not provide specific reading recommendations but the following two books provide very good information on the Moon including descriptions of the features covered by the two lunar observing programs:

Patrick Moore on the Moon — Cassell Illustrated, 2001
The Moon in Close-up, John Wilkinson — Patrick Moore's Practical Astronomy Series, 2010



The Star of Bethlehem

The Star of Bethlehem: Can science explain what it really was?

From Astronomy.com

For centuries, scholars have suggested the Star of Bethlehem may have actually been a "great conjunction" of bright planets.

Jupiter and Saturn came together in a "Great Conjunction" in 2020 that was unlike any seen in nearly 800 years. The two planets appeared so close together in Earth's night sky on the winter solstice they looked almost like a single object. That prompted some to dub the sight a "Christmas Star," and others to wonder about a similar-sounding celestial event that coincided with the biblical first Christmas: the Star of Bethlehem.

But did such a cosmic sight ever really exist? And if so, what does astronomical science tell us about what could have caused it?

Interestingly, there's some evidence that a pair of planetary conjunctions — not unlike the Great Conjunction — happened around the historically accepted time frame for the birth of Christ. That could potentially explain the Star of Bethlehem. But, of course, not everyone agrees with the idea.

The Star of Bethlehem

The story of the Star of Bethlehem appears only in the Book of Matthew. The gospel tells us that a bright star appeared in the eastern sky when Jesus was born, famously seen by a group of wise men. These biblical "Magi," sometimes called kings, now adorn nativity scenes around the world.

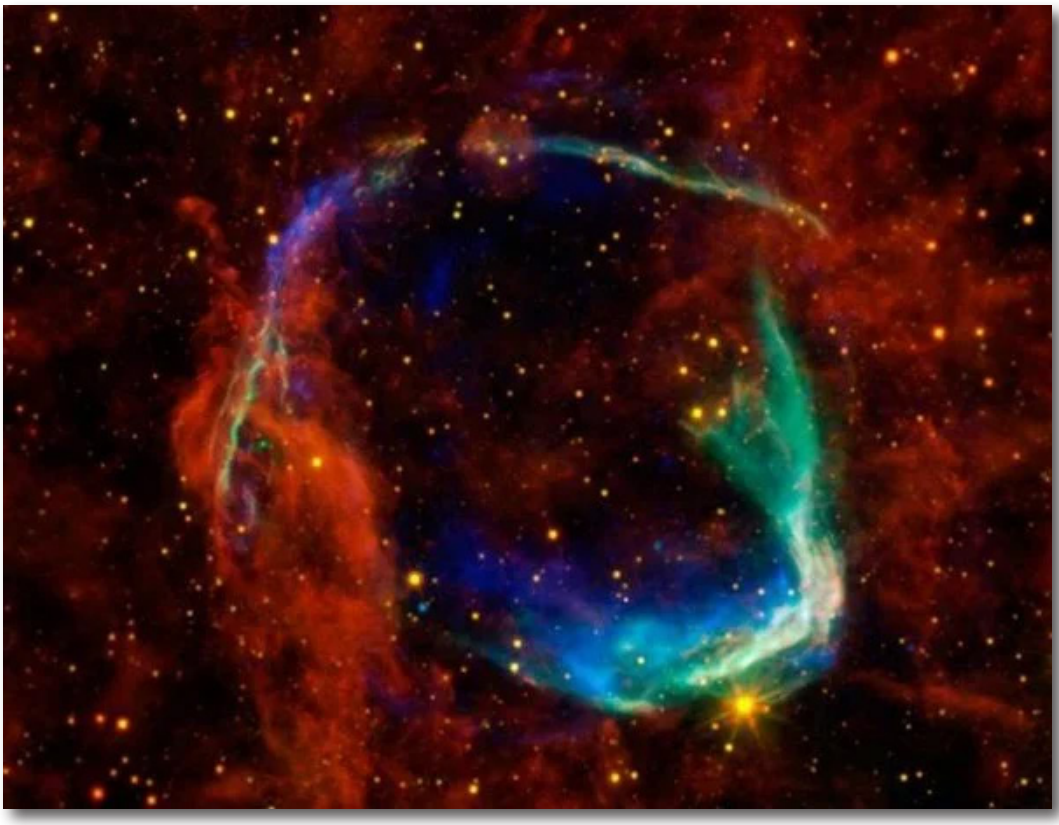
The Bible describes how these three wise men saw the new star as a sign of the birth of the King of the Jews, so they set out for Jerusalem to worship him. Once they arrive, they inquire about baby Jesus with Herod, the region's ruler appointed by Rome. "Where is the child who has been born king of the Jews? For we observed his star at its rising, and have come to pay him homage," Matthew tells us.

But Herod is worried by the idea. He and his own wise men supposedly seek to discover Jesus' birthplace. Eventually, they call on the three wise men to ask when the star appeared. And thanks to Micah's prophesy that the messiah would be born in Bethlehem, Herod sends the trio to Bethlehem to search for Jesus. (Supposedly, Herod also ultimately kills the infants of Bethlehem in an attempt to snuff out Jesus.)

According to Matthew, "When they had heard the king, they departed; and, lo, the star, which they saw in the east, went before them, till it came and stood over where the young child was. When they saw the star, they rejoiced with exceeding great joy."

Evidence for the Star of Bethlehem

For centuries, astronomers have looked to the historical record in search of evidence for what could explain this Star of Bethlehem. Scholars have been discussing potential causes since at least the 13th century. Perhaps it was a supernova, a comet, a solar flare or an alignment of planets. Or, alternatively, maybe it never happened at all. The truth is, science will likely never know the truth.



Supernova RCW 86, the oldest known supernova in recorded history, was seen by Chinese astronomers in 185 A.D. Credit: X-ray: NASA/CXC/SAO & ESA; Infared: NASA/ JPL-Caltech/B. Williams (NCSU)

But let's entertain the idea that it was a real celestial event. What are some science-backed explanations that could explain the Star of Bethlehem?

Well, the story is relatively vague, but it does give us some clues.

Some things are easily ruled out. For example, the Star of Bethlehem couldn't have been a meteor — a chunk of space rock that brightly burns up in Earth's atmosphere — which would've appeared and faded in an instant. There's no way three wise men could have tracked a meteor for weeks.

It's also unlikely that a supernova — the explosive death of a star, which drastically increases its brightness for days, weeks or months — could explain the Star of Bethlehem. Supernovae, or "guest stars" have been consistently witnessed and recorded going back thousands of years. So if one had happened, other cultures likely would have taken note.

And even if it somehow escaped the written historical record, astronomers have observed remnants of many other ancient supernovae. And by estimating their peak brightness, researchers have even tied some remnants to events seen on Earth in the past. Yet telescopes haven't found any evidence for a supernova remnant that sync up with the timing of the Star of Bethlehem. In fact, the only supernova that was visible from Earth around the time of Christ's birth actually happened in the year 185 A.D. and was recorded by Chinese astronomers.

A Christmas Comet?

In the past, some interested astronomers have also suggested the Star of Bethlehem was a comet passing near Earth. These icy bodies from the distant solar system often shine quite brightly when they venture into the inner solar system and are heated by the Sun. They're also known for sometimes visibly lingering in the sky for weeks or months at a time. And like supernovae, we also have historical records from other cultures regarding comets.

Sure enough, in the year 5 B.C., Chinese astronomers noted the appearance of a "Broom Star" that many researchers have interpreted as a comet. Like supernovae, Chinese scholars noted many historic comets, and even recorded a number of times that meteor impacts killed people.

In the 1970s, researchers caught onto the timing coincidence of this Chinese "Broom Star," and a string of papers started popping up in scientific journals debating the idea, among other inspirations. All the back and forth culminated in a 1977 story in The New York Times written by legendary science journalist Walter Sullivan that suggested it could have been a comet, conjunction, nova or simply myth. Clearly, no consensus opinion has emerged in the decades since, either.

So, could a comet have been the Star of Bethlehem? There's no way to rule it out, but there is one obvious reason to doubt it.

Keep in mind that people in the ancient world typically saw comets as symbols of pending doom — an evil omen of bad things about to happen. So, if a comet suddenly started shining brightly in the night sky, it's hard to imagine three wise menwould interpret it as a sign that their savior had finally been born.

Ancient great conjunction

What about a mash-up of planets like the Great Conjunction of 2020? Could that explain the Star of Bethlehem?

When you rewind the motion of the planets — something that's easy to do with observing software these days — you can see that several interesting conjunctions played out in the years around the life of Jesus. (A planetary conjunction happens when two planets make a close approach to each other in Earth's night sky. The two objects aren't actually near each other, though, they just look that way from our vantage point.)

In the year 7 B.C., Jupiter and Saturn had three conjunctions in the same constellation, Pisces. Because the planets move in their orbits at different speeds, and are located at different distances, sometimes they appear to pass one another in the night sky. They can also appear to hold still or move backward in the sky, which astronomers call retrograde motion. This trick is like passing a slower car on the highway. As you get close to the other vehicle, it seems to hold still beside you. Then, as you pull away, it drops backward. The same thing happens as Earth zips around the Sun much faster than the outer planets.

However, Jupiter is closer to the Sun than Saturn, so it also appears to move faster in our night sky.

So, if Jupiter and Saturn had three close conjunctions in a relatively brief period of time, it's easy to imagine that ancient astronomers — really, astrologers — would have taken note. And they also likely would have ascribed some meaning to the event.

These same astrologers wouldn't have had to wait long for an even more striking planetary encounter. Four years later, in the summer of 3 B.C., Jupiter and Venus met in an event that would have looked much like the "Christmas Star," also referred to as the Great Conjunction of December 2020.

On the morning of August 12 in 3 B.C., Jupiter and Venus would've sat just 1/10th a degree apart in the dawn sky. That's one-fifth the diameter of the Full Moon. (The December 2020 conjunction between Jupiter and Saturn had an identical separation, albeit in the evening sky.) That wasn't the end of the show, either. Venus and Jupiter continued their dance over most of the next year before finally appearing to merge into a single star in June.

The idea that a conjunction between bright planets could explain the Star of Bethlehem isn't new. A note in the Annals of the Abbey of Worcester from 1285 A.D. points out an alignment of Jupiter and Saturn that happened at the time of Jesus' birth. And Johannes Kepler himself touched on the idea in the 17th century.

Myth or reality?
Since then, many enthusiastic astronomers — and eager amateurs — have also pointed to other celestial positions playing out around the same time as further evidence that ancient astrologers would've found meaning in these events. Bright stars and planets were moving through important constellations. Still others have suggested that the Star of Bethlehem might not have been one celestial event at all. Instead, taken together, the combined effect of years of these astronomical events may have led the Magi to see signs a new king had been born.

But could any of these things have really caused the Star of Bethlehem?

The truth is, none of these events match up perfectly with the description of how things played out in the Book of Matthew. The context is also off. Ancient people knew their planets well, so it would be weird to call a conjunction of multiple planets a "star."

Furthermore, it's hard to imagine how Herod could be surprised by three wise men telling him about a new star; he surely would've seen any such bright or obvious object himself. According to the Bible, astrology is also heretical, which makes the idea of reading into the meaning of the stars a bit suspect in the first place.

In the end, we'll likely never know what really inspired the biblical story of the Star of Bethlehem. We can all decide for ourselves what it means to us. And, heresy aside, we all hope it brings good tidings for peace, joy, and love. Lord knows we need them right now.

NGC 2264 - The Cone Nebula & Christmas Tree Cluster
By Mike Jensen

Is The Capture of the Starship Booster the Technology Event of 2024?

SpaceX recently completed its fifth & sixth Starship test flights in recent months, returning the rocket's massive first-stage booster safely to its launch pad in Texas.

This monumental feat was achieved using the giant mechanical arms dubbed "chopsticks" on the "Mechazilla" launch tower which 'caught' the booster as it came in on approach. Once again SpaceX has pushed the boundaries of engineering in its unrelenting push to build a reusable Moon and Mars-capable rocket.

What the mission success means

With the successful tests of Starship and Super Heavy, SpaceX can now move forward with plans and begin the fine-tuning processes to ensure reliability in future tests. Once fully operational, Starship aims to accomplish several key objectives that could shift the space industry as a whole.

One of its primary goals is the facilitation of space travel to Mars, aligning with SpaceX's long-term vision of establishing a human presence on the planet. Starship is designed to be fully reusable, lowering the cost of space travel considerably. This reusability alongside the large payload capabilities of Starship could make interplanetary travel feasible for not just astronauts, but eventually civilians, enabling the colonisation of Mars, which SpaceX Founder Elon Musk has cited as a necessary step for humanity's survival in the event of Earth-bound catastrophes.

Another critical aspect of the Starship mission is its ability to support large-scale cargo missions, including the construction of infrastructure on the Moon and Mars. NASA has partnered with SpaceX for its Artemis programme, which seeks to return humans to the Moon by 2025. Starship is expected to serve as a key vehicle for transporting both astronauts and essential equipment for lunar exploration and habitation. In this regard, Starship would be the older brother to the popular and widely successful Falcon 9 which has seen some rockets reused upwards of 20 times!

Click on image above to view video of booster landing.

Starship is also expected to enhance commercial space activities, with the ability to deploy large constellations of satellites in a single trip. This could improve global communications networks and expand Internet access in remote areas. Additionally, the spacecraft is planned to support space tourism, a growing industry that could open up space experiences to more

individuals.

Sixth Starship Launch Has Some Successes & Some Failures
Source - CNN

Click on image, or here to view video of launch and landing.

11/20/24 - In a launch test attended by President Elect Trump, SpaceX aborted a highly anticipated booster catch attempt Tuesday during the sixth test of Starship — the most powerful rocket ever built — just weeks after acing the stunning feat on the first try. But the mission went on to soar through **new milestones** during a roughly hour-long flight.

The nearly 400-foot-tall (121-meter) Starship system, which features the Starship spacecraft stacked atop the Super Heavy booster, lifted off around 5 p.m. ET from the company's Starbase facility near Brownsville, Texas. President-elect Donald Trump was in attendance, joining SpaceX CEO Elon Musk for the event in another example of Musk's increasing role in Trump's orbit.

After firing up its 33 powerful Raptor engines and propelling the Starship spacecraft toward space, the Super Heavy booster separated from the spacecraft, reversed course and steered itself back toward the launch site. SpaceX planned to attempt a precision landing of the booster into the arms, or "chopsticks," of the launch and landing structure — nicknamed "Mechazilla" by Musk — at the company's Starbase facility. The company first pulled off the unprecedented maneuver during the fifth Starship test flight last month.

However, this time ***"automated health checks of critical hardware on the launch and catch tower triggered an abort of the catch attempt,"*** SpaceX said in a statement Tuesday. "The booster then executed a pre-planned divert maneuver, performing a landing burn and soft splashdown in the Gulf of Mexico."

The Starship spacecraft, meanwhile, fired up its own six engines before entering a coasting phase as it soared through space. The capsule briefly reignited an engine about half an hour later before bracing for reentry — the process by which it veers back into the thickest part of Earth's atmosphere — and executing a daring landing.

Starship hits new milestones
It's the first time Starship, a vehicle intended to eventually carry humans to the moon and Mars, has successfully ignited one of its Raptor engines while in space, according to SpaceX.

That's a big deal, explained Garret Reisman, a former NASA astronaut who now advises for SpaceX.

"They're finicky little beasts — (the Starship rocket engines) — and it's not so easy to light them up and shut them down and light them up again," Reisman told CNN.

Starship then aimed to test its limits as it headed toward splashdown in the Indian Ocean.

Launch 6 lands in the Gulf of Mexico

"We're going to fly the ship at an aggressive angle of attack once it's moving slower than the speed of sound," SpaceX engineer Jessie Anderson said on the company's livestream. "This means we'll be flying nose down instead of our usual belly flop orientation during final descent. This will — no doubt — stress the limits of the flaps' ability to maintain control, but it will be a chance to get real flight data on what our limits actually are."

The "flaps" are small wings attached to the side of the Starship vehicle meant to brace the winds of reentry and help slow the vehicle down.

The company had also removed some protective shielding off the vehicle to see whether the Starship could survive without it.

Starship made a safe landing in the Indian Ocean and remained intact despite the rough landing trajectory.

"Turns out the vehicle had more capability than our calculations predicted, and that is why we test like we fly," SpaceX engineer Kate Tice said on the livestream for the event.

Developing Starship, a reusable launch system
This uncrewed trial marked the fastest turnaround time yet in SpaceX's test campaign for Starship, which will play a key role in NASA's cornerstone Artemis program. Aiming to put boots on the moon as soon as 2026, the space agency plans to use the rocket's upper stage, the Starship spacecraft, as a lunar lander ferrying astronauts to the moon's surface.

NASA Administrator Bill Nelson referenced Starship's significance to the Artemis program when congratulating the company on Tuesday's test flight.

“Congrats to @SpaceX on Starship’s sixth test flight. Exciting to see the Raptor engine restart in space — major progress towards orbital flight. Starship’s success is #Artemis’ success. Together, we will return humanity to the Moon & set our sights on Mars,” Nelson posted on X after Starship’s splashdown.

The goal of these test flights is to hash out how SpaceX might one day recover and rapidly refly Super Heavy boosters and Starship spacecraft for future missions. Quickly reusing rocket parts is considered essential to drastically reducing the time and cost of getting cargo — or ships of people — to space.

The Federal Aviation Administration, which licenses commercial rocket launches, said it did not have to undertake the lengthy process of reviewing a launch license alteration because the flight path of this week’s flight was expected to closely mimic an earlier test.

“The FAA determined SpaceX met all safety, environmental and other licensing requirements for the suborbital test flight,” the agency said in a statement. “The FAA determined the changes requested by SpaceX for (Tuesday’s test flight) are within the scope of what has been previously analyzed.”

The fifth integrated test flight of Starship launched on October 13, garnering international attention with SpaceX’s ambitious attempt to maneuver the 232-foot-tall (71-meter) Super Heavy back to a gargantuan Mechazilla landing structure.

“Starship’s fifth flight test was a seminal moment in iterating towards a fully and rapidly reusable launch system,” the company said in a statement.

Starship is considered crucial to SpaceX’s founding mission of eventually carrying humans to Mars for the first time.

For NASA’s Artemis program, SpaceX has government contracts worth up to nearly $4 billion to complete the task of developing a cost-effective space transportation system.

Starship’s progress and path forward
Greg Autry, the associate provost for space commercialization and strategy at the University of Central Florida, said Starship operations Tuesday evening “looked really good.”

Autry said SpaceX might have opted for a sea landing of the booster out of an “abundance of caution,” with Trump and Musk in attendance.

“I don’t know what the decision-making process was yet of the failure mode or maybe they just want to be careful not to kill the president-elect of the United States by any chance,” he told CNN.

Autry is a rumored candidate for Trump’s NASA administrator pick. In a statement to CNN on Tuesday, the Trump campaign said, “President-Elect Trump is making decisions on who will serve in his second Administration. Those decisions will continue to be announced by him when they are made.”

Webb Confirms Galaxy Model

Webb Confirms a Longstanding Galaxy Model

Perhaps the greatest tool astronomers have is the ability to look backward in time. Since starlight takes time to reach us, astronomers can observe the history of the cosmos by capturing the light of distant galaxies. This is why observatories such as the James Webb Space Telescope (JWST) are so useful. With it, we can study in detail how galaxies formed and evolved. We are now at the point where our observations allow us to confirm long-standing galactic models, as a recent study shows.

This particular model concerns how galaxies become chemically enriched. In the early universe, there was mostly just hydrogen and helium, so the first stars were massive creatures with no planets. They died quickly and spewed heavier elements, from which more complex stars and planets could form. Each generation adds more elements to the mix. But as a galaxy nurtures a menagerie of stars from blue supergiants to red dwarfs, which stars play the greatest role in chemical enrichment? One model argues that it is the most massive stars. This makes sense because giant stars explode as supernovae when they die. They toss their enriched outer layers deep into space, allowing the material to mix within great molecular clouds from which new stars can form. But about 20 years ago, another model argued that smaller, more sunlike stars played a greater role.

Stars like the Sun don't die in powerful explosions. Billions of years from now, the Sun will swell into a red giant star. In a desperate attempt to keep burning, the core of a sun-like star heats up significantly to fuse helium, and its diffuse outer layers swell. On the Hertzsprung-Russell diagram, they are known as asymptotic giant branch (AGB) stars. While each AGB star might toss less material into interstellar space, they are far more common than giant stars. So, the model argues, AGB stars play a greater role in the enrichment of galaxies.

The Cat's Eye nebula is a remnant of an AGB star. Credit: ESA, NASA, HEIC and the Hubble Heritage Team, STScI/AURA

Both models have their strengths, but proving the AGB model over the giant star model would prove difficult. It's easy to observe supernovae in galaxies billions of light years away. Not so much with AGB stars. Thanks to the JWST, we can now test the AGB model.Using JWST the study looked at the spectra of three young galaxies. Since the Webb's NIRSpec camera can capture high-resolution infrared spectra, the team could see not just the presence of certain elements but their relative abundance. They found a strong presence of carbon and oxygen bands, which is common for AGB remnants, but also the presence of more rare elements such as vanadium and zirconium. Taken altogether, this points to a type of AGB star known as thermally pulsing AGBs, or TP-AGBs. Many red giant stars enter a pulsing phase at the end of their lives. The hot core swells the outer layers, things cool down a bit, and gravity compresses the star a bit, which heats the core, and the whole process starts over. This study indicates that TP-AGBs are particularly efficient at enriching galaxies, thus confirming the 20-year-old model.

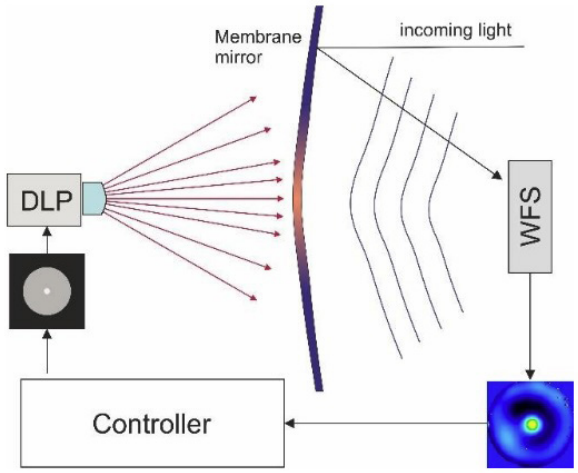
Future Space Telescopes

Future Space Telescopes Could be Made From Thin Membranes, Unrolled in Space to Enormous Size
Space-based telescopes are remarkable. Their view isn't obscured by the weather in our atmosphere, and so they can capture incredibly detailed images of the heavens. Unfortunately, they are quite limited in mirror size. As amazing as the James Webb Space Telescope is, its primary mirror is only 6.5 meters in diameter. Even then, the mirror had to have foldable components to fit into the launch rocket. In contrast, the Extremely Large Telescope currently under construction in northern Chile will have a mirror more than 39 meters across. If only we could launch such a large mirror into space! A new study looks at how that might be done.

As the study points out, when it comes to telescope mirrors, all you really need is a reflective surface. It doesn't need to be coated onto a thick piece of glass, nor does it need a big, rigid support structure. All that is just needed to hold the shape of the mirror against its own weight. As far as starlight is concerned, the shiny surface is all that matters. So why not just use a thin sheet of reflective material? You could just roll it up and put it in your launch vehicle. We could, for example, easily launch a 40-meter roll of aluminum foil into space.

Of course, things aren't quite that simple. You would still need to unroll your membrane telescope back into its proper shape. You would also need a detector to focus the image upon, and you'd need a way to keep that detector in the correct alignment with the broadsheet mirror. In principle, you could do that with a thin support structure, which wouldn't add an excessive bulk to your telescope. But even if we assume all of those engineering problems could be solved, you'd still have a problem. Even in the vacuum of space, the shape of such a thin mirror would deform over time. Solving this problem is the main focus of this new paper.

Once launched into space and unfurled, the membrane mirror wouldn't deform significantly. But to capture sharp images, the mirror would have to maintain focus on the order of visible light. When the Hubble was launched, its mirror shape was off by less than the thickness of a human hair, and it took correcting lenses and an entire shuttle mission to fix. Any shifts on that scale would render our membrane telescope useless. So the authors look to a well-used trick of astronomers known as adaptive optics.



How radiative adaptive optics might work. Credit: Rabien, et al

Adaptive optics is used on large ground-based telescopes as a way to correct for atmospheric distortion. Actuators behind the mirror distort the mirror's shape in real time to counteract the twinkles of the atmosphere. Essentially, it makes the shape of the mirror imperfect to account for our imperfect view of the sky. A similar trick could be used for a membrane telescope, but if we had to launch a complex actuator system for the mirror, we might as well go back to launching rigid telescopes. But what if we simply use laser projection instead?

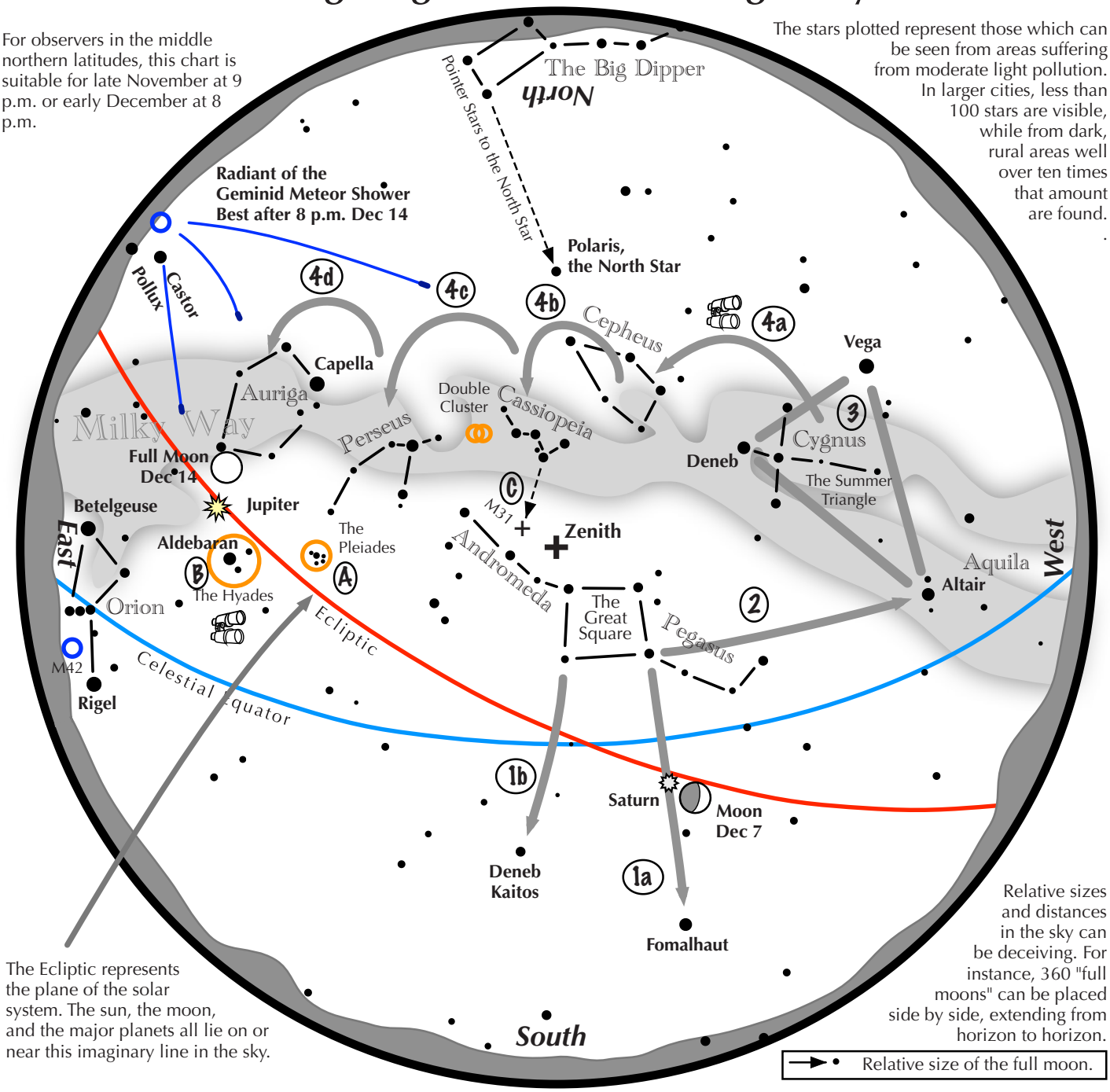
By shining a laser projection onto the mirror, we could alter its shape through radiative recoil. Since it is simply a thin membrane, the shape would be significant enough to create optical corrections, and it could be modified in real time to maintain the mirror's focus. The authors call this technique radiative adaptive optics, and through a series of lab experiments have demonstrated that it could work.

Doing this in deep space is much more complicated than doing it in the lab, but the work shows the approach is worth exploring. Perhaps in the coming decades we might build an entire array of such telescopes, which would allow us to see details in the distant heavens we can now only imagine.

Navigating the December Night Sky

For observers in the middle northern latitudes, this chart is suitable for late November at 9 p.m. or early December at 8 p.m.

The stars plotted represent those which can be seen from areas suffering from moderate light pollution. In larger cities, less than 100 stars are visible, while from dark, rural areas well over ten times that amount are found.



The Ecliptic represents the plane of the solar system. The sun, the moon, and the major planets all lie on or near this imaginary line in the sky.

Relative sizes and distances in the sky can be deceiving. For instance, 360 "full moons" can be placed side by side, extending from horizon to horizon.

Relative size of the full moon.

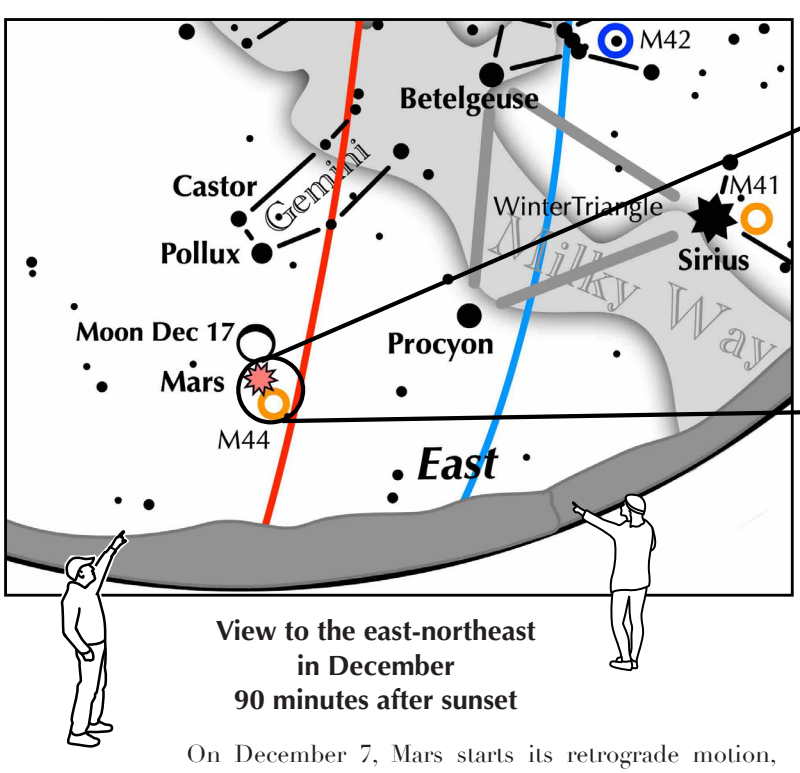
Navigating the December night sky: Simply start with what you know or with what you can easily find.

1. Face south. Almost overhead is the "Great Square" with four stars about the same brightness as those of the Big Dipper. Extend an imaginary line southward following the Square's two westernmost stars. The line strikes Fomalhaut, the brightest star in the southwest. A line extending southward from the two easternmost stars, passes Deneb Kaitos, the second bright star in the south.
2. Draw another line, this time westward following the southern edge of the Square. It strikes Altair, part of the "Summer Triangle."
3. Locate Vega and Deneb, the other two stars of the "Summer Triangle. Vega is its brightest member while Deneb sits in the middle of the Milky Way.
4. Jump along the Milky Way from Deneb to Cepheus, which resembles the outline of a house. Continue jumping to the "W" of Cassiopeia, to Perseus, and finally to Auriga with its bright star Capella.

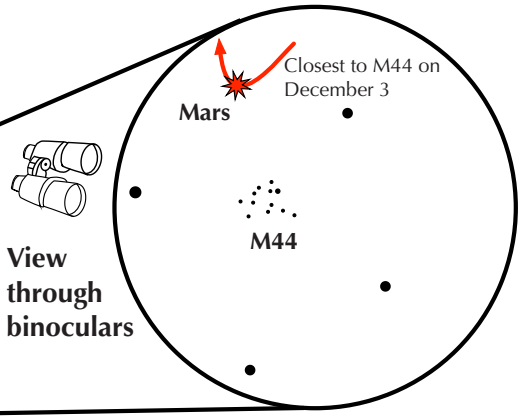
Binocular Highlights

A and B: Examine the stars of the Pleiades and Hyades, two naked eye star clusters.
C: The three westernmost stars of Cassiopeia's "W" point south to M31, the Andromeda Galaxy, a "fuzzy" oval.
D: Sweep along the Milky Way from Altair, past Deneb, through Cepheus, Cassiopeia and Perseus, then to Auriga for many intriguing star clusters and nebulous areas.

On a moonless evening in December, try this challenge:



View to the east-northeast in December 90 minutes after sunset



View through binoculars

Mars approaches the Beehive

On evenings in December, the Red Planet flies near the Beehive star cluster. On the night of December 3, it is closest.

Be sure to use binoculars to spot the many stellar bees of M44. The cluster has over 1000 stars, but only two dozen or so will be picked out with binoculars.

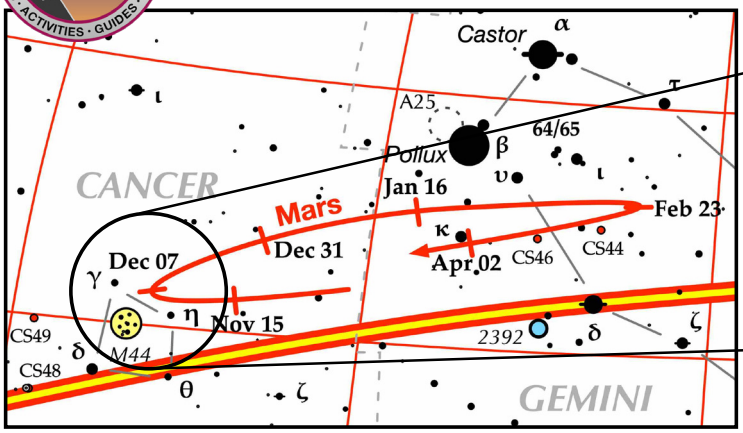
On December 7, Mars starts its retrograde motion, moving slightly each evening westward until February.

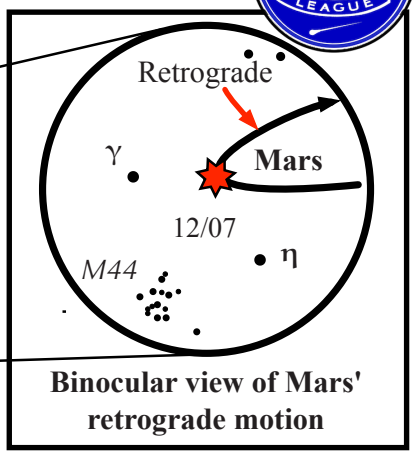
Even though Mars and M44 lie near each other in binoculars, they are nowhere near each other in three-dimensional space. M44 is 50 million times farther than the Mars!

It has taken the light from M44's stars over 575 years to reach your eyes!

Observing Project: Retrograde Motion of Mars

See this for yourself!





Binocular view of Mars' retrograde motion

Over the next four months, observe Mars using binoculars on every clear night, then plot its changing position among the background stars.

Mars nears M44, the Beehive star cluster, in central Cancer in early December. It reaches its closest point to it on December 7, after which it enters retrograde motion, inching westward each evening until February 23, 2025. Mars then lies in central Gemini.

Mars will also be growing in angular size as Earth slowly overtakes it on January 16, 2025. (Actually, the two planets are closest on January 11. The discrepancy is due to Mars' elliptical orbit.) At this time, it shows it largest angular size – 15 arc seconds – until April 2031. By February 23, the Red Planet ceases moving westward nightly, shifting its direction eastward (called prograde motion).

Relative apparent size of Mars

94% illuminated

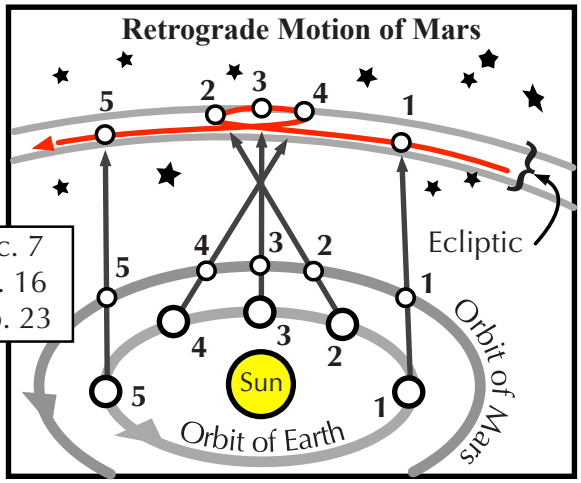
Dec. 7, 2024
Magnitude: -0.6
Diameter: 12 seconds
Distance: 71 million miles

100% illuminated

Opposition
Jan. 16, 2025
Magnitude: -1.4
Diameter: 15 seconds
Distance: 60 million miles

94% illuminated

Feb. 23, 2025
Magnitude: -0.4
Diameter: 11 seconds
Distance: 76 million miles



Mars at its brightest, largest & closest:
Jan. 11, 2025
-1.4 mag., 15 arc seconds, 59.8 million miles
It won't come any closer until Apr 11, 2031.

Why do this activity? This planetary dance can only be explained if both Earth and Mars orbit our sun following definable elliptical paths. Our view from Earth clearly shows this to those people who take the time to look carefully enough.

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What's Going On in the SIG Group?

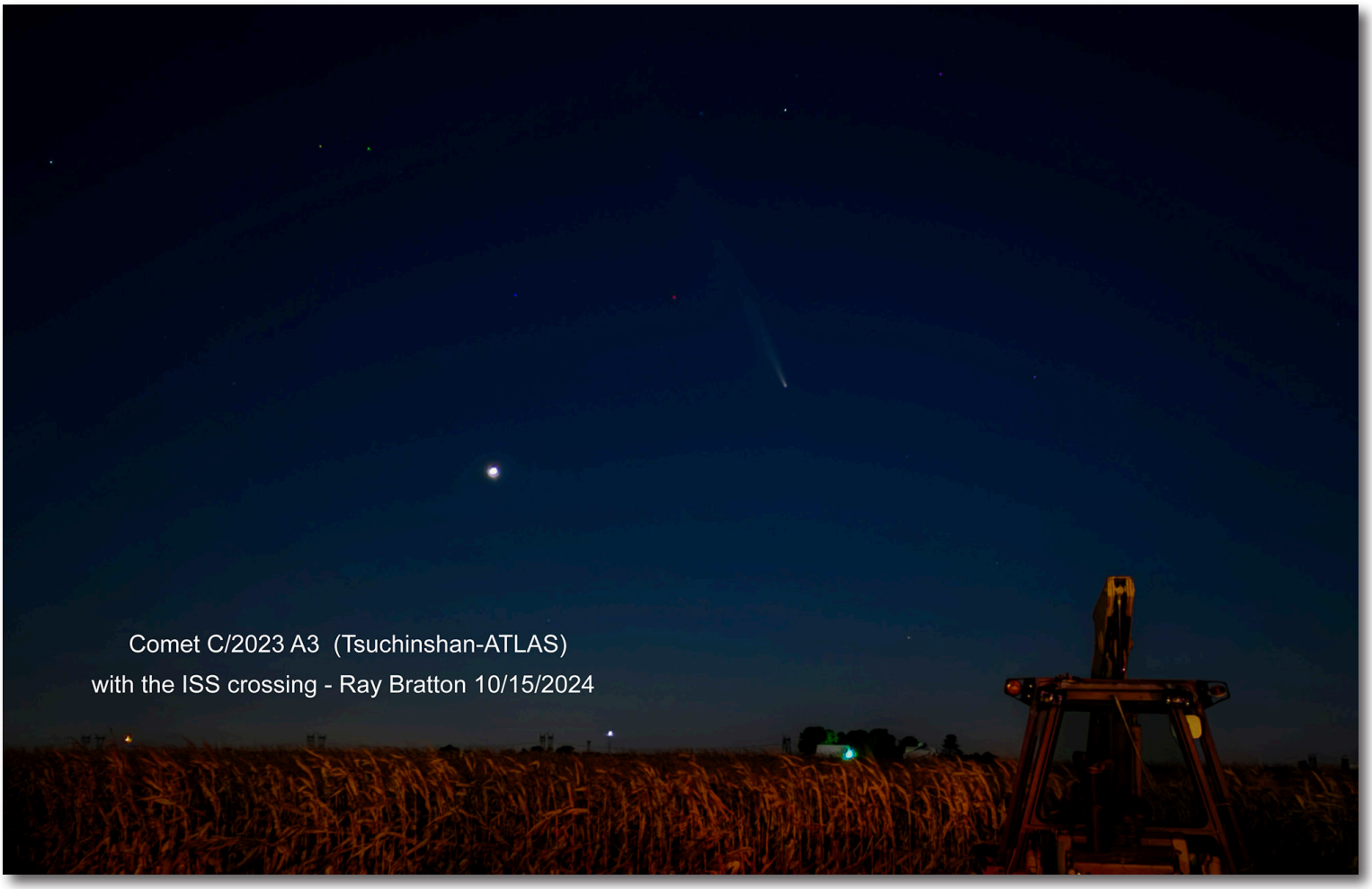
By Mike Jensen,
SIG Founder/Leader

Every month we get together on a Zoom call with a pretty loose agenda and manage to have an absolute blast talking about Astrophotography. I hope you'll join us if you're interested in Astrophotography.

There are many who are on the SIG email list but many fewer who actually join the meeting. We'd love to have you join us, and at some point I will begin removing non-participating members from the email list to protect our participating members who send out their images for critique and feedback.

Astro SIG Images

Comet C/2023 A3 (Tsuchinshan-ATLAS) with ISS about to cross the comet's tail by Ray Bratton
Brand/Type of Telescope/Lens: Canon EOS Ra, 100mm, f5.6, 0.9sec, ISO 6400
Mount: Gitzo tripod no tracking
Single exposure, Processing Software: Photoshop RAW
Here's the story:
Several minutes after shooting 450 1 second exposures of the comet to stack, I realized the ISS was about to cross the comet's tail. I hurried to get a shot since I was not expecting this. I got this one with the Canon camera before it crossed the tail.



Comet C/2023 A3 (Tsuchinshan-ATLAS)
with the ISS crossing - Ray Bratton 10/15/2024

47 Tucana by Mario E MOTTA
Brand/Type of Telescope/Lens: 12 inch F5 telescope
Mount: Not sure
Exposures:150 subs of 60 sec exposures

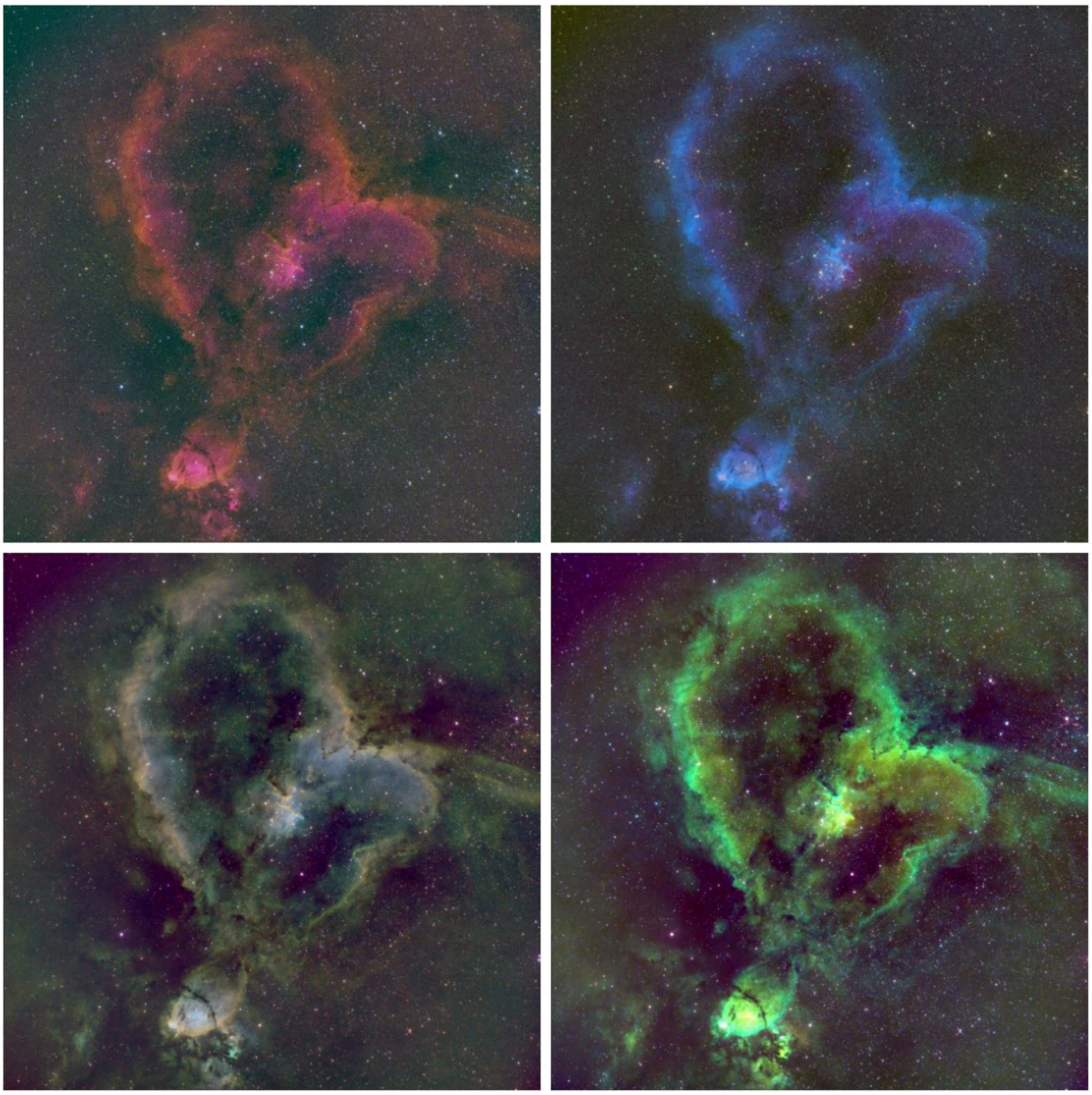
Processing Software: Pixinsight
Here's the story: I was the keynote speaker in New Zealand for the "starlight conference" on light pollution, and.. got to do some observing, as well as "borrowing" these subs from an imager down there (Adrien Barrajon)

Robin's Egg Nebula, NGC 1360 by Dick Cogswell
Brand/Type of Telescope/Lens: C-14 Edge
Mount: AP 1100
Exposures: 92 4-minute exposures in RGBSO
Processing Software: APP, BX, PS
Here's the story: This is a planetary nebula 1500 light years away in the constellation Fornax. It spans about 3 light years, and is about 1/3 the size of the full moon in the sky. It represents a brief and final phase in the evolution of an aging star. Visible at the center of the nebula, the central star of NGC 1360 is known to be a binary star system likely consisting of two evolved white dwarf stars, less massive but much hotter than the Sun. Their intense and otherwise invisible ultraviolet radiation has stripped away electrons from the atoms in their mutually surrounding gaseous shroud. The predominant blue-green hue of NGC 1360 seen here is the strong emission produced as electrons recombine with ionized oxygen atoms. In the center one can see reddish hydrogen.

Tumalo Falls In December by Mike Jensen

This is an image taken under a partially moonlight sky in a Bortle 1.5 location outside of Bend, Or. The falls are 97 feet in height and frequently freeze in winter. This is a 15 sec exposure taken in 2013. Temp was -5. I snowshoed in 2.5 miles to get the shot.

Heart Nebula by Jim Vaughan



Brand/Type of Telescope/ Lens: WO Redcat-51 / ASi533MM-Pro / 250mm (f/4.9)
Mount: ZWO AM5
Exposures:

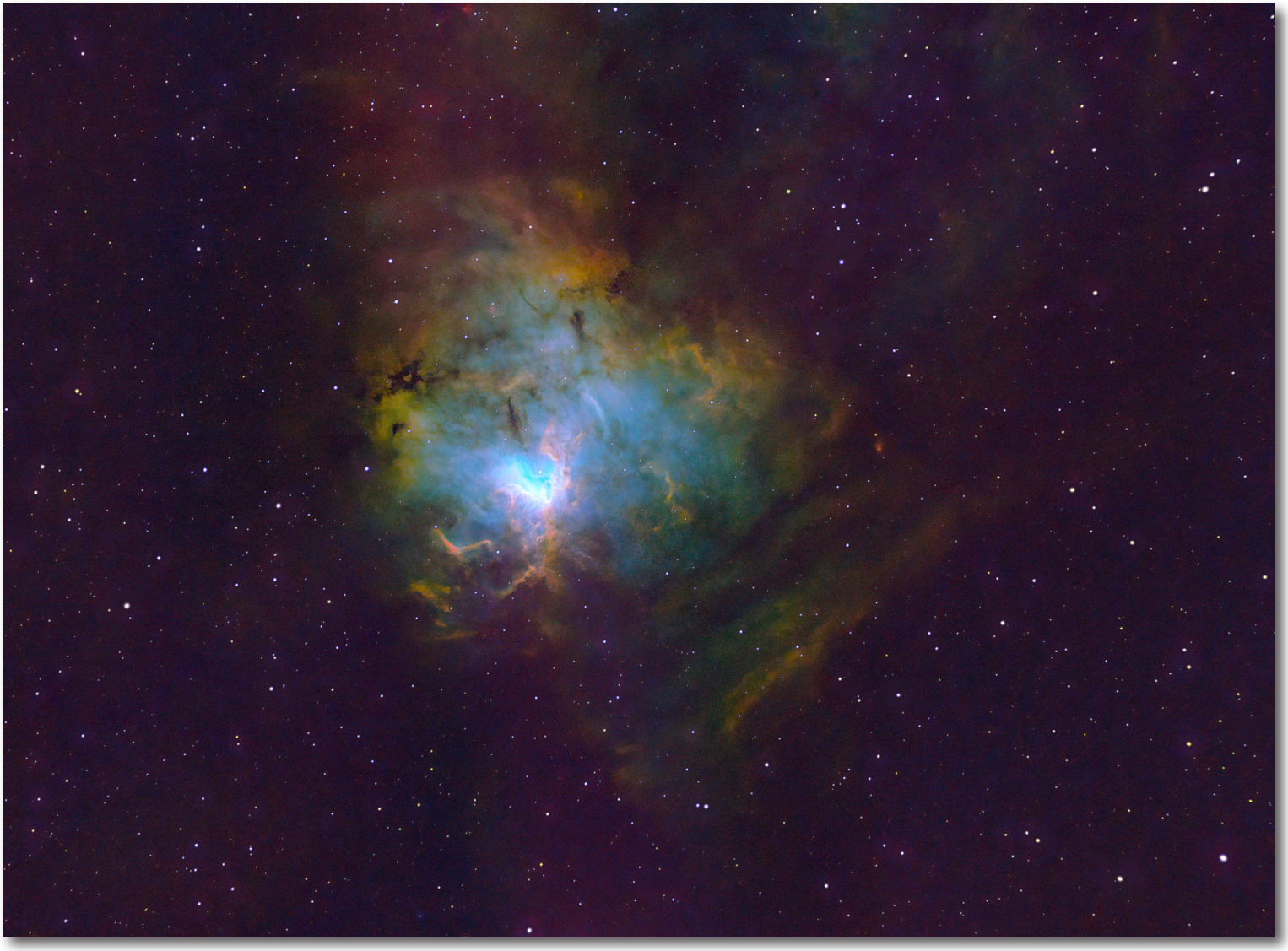
Exposures: Ha: 40 @ 180 sec, OIII: 40 @ 180 sec, SII: 37 @ 180 sec
Total time: 5h 51m

Processing Software: Pixinsight

Here's the story:

Heart Nebula
This is one of the first targets I shot when I set up my new RedCat-51 system back in Winter of 2023. My first foray into narrowband.
I was able to get a lot of data but wasn't too sure how to process the narrowband images that I did have. I tried SHO, HOO, and pretty much every other combination of the three. While certainly not achieving a Hubble-type likenesses I was amazed at the variety of hues and details I could get with switching around the Ha, OIII and SII bands.
But, trying to decide which one should be the finished product was my problem.
So, it being Christmas-time, and having a nice red and green pair already, I printed and framed each one of the four shown here separately. And gave one to each of my four children for Christmas. Telling them that they would have my heart forever, no matter where they were.
Merry Christmas.

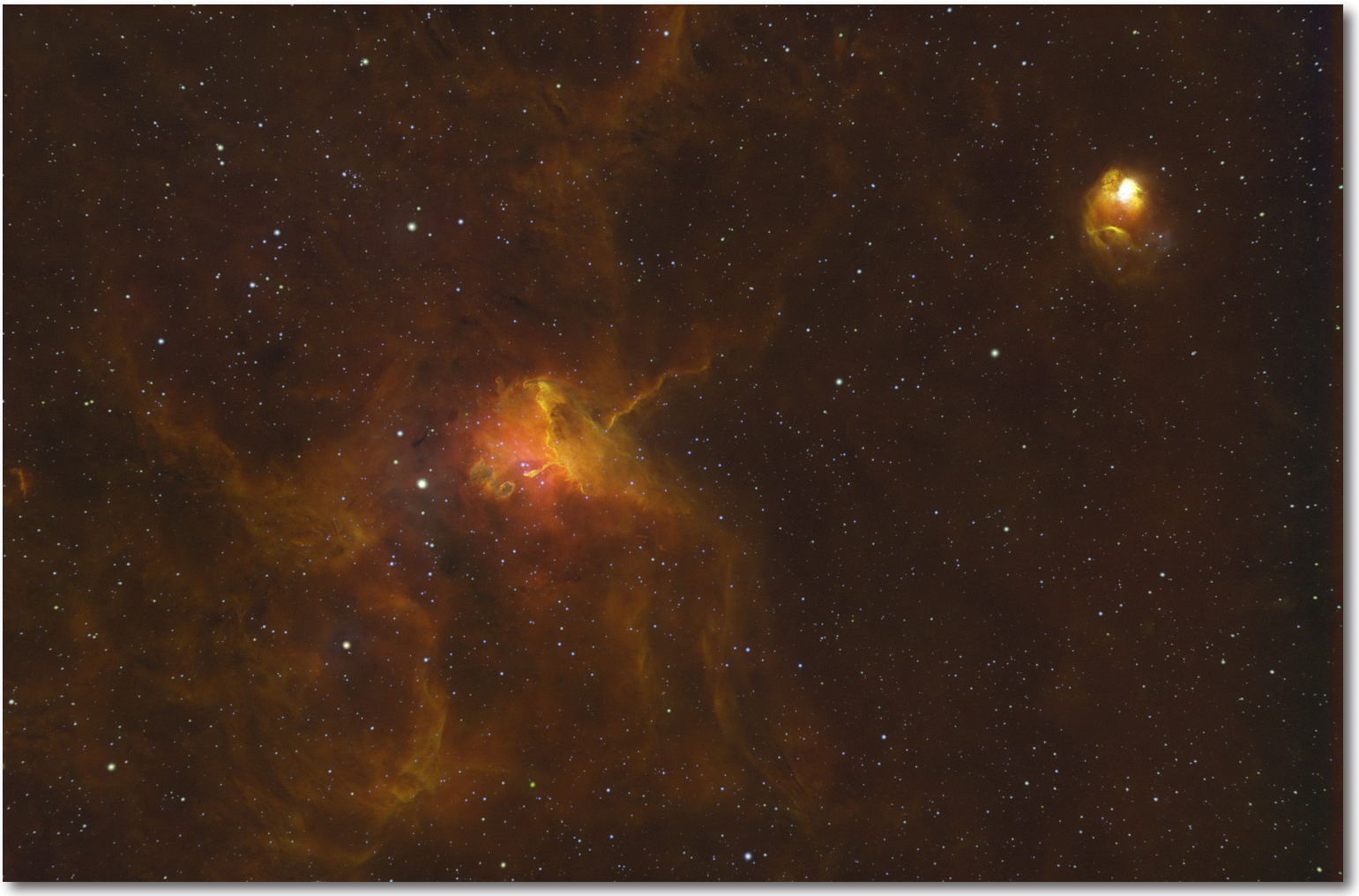
PS – I'd like to say that I got off with a cheap gift. But I think we all know better than that.



NGC 1491 The Fossil Footprint Nebula by Scott Cruzen
Brand/Type of Telescope/Lens: Astro-Tech 130mm F7 EDT APO Triplet Refractor 910mm FL
Mount: Skywatcher EQ6-R Pro, ASIAir Plus

Exposures:
94 x 240sec SII
115 x 240sec Ha
122 x 240sec OIII
Processing Software: SiriL/SiriLic, GIMP, DarkTable, Topaz

Here's the story: NGC 1491 is an emission nebula about 10,000 light years away in the constellation Perseus. Ultraviolet radiation from the large bright stars imbedded in the nebula illuminate it by ionizing the surrounding hydrogen gas. The curtain effect seen in the nebula results from a high speed wavefront where expanding ionized hydrogen gas meets slower-moving unionized hydrogen. I was not familiar with this oddly named nebula and decided to image it mostly because is was in the right place in the sky to allow for a full night's worth of exposures, and is the right apparent size to suit the FOV of my scope and camera combination.



IC417 and NGC1931 The Spider and Fly Nebulae by Scott Cruzen
Brand/Type of Telescope/Lens: Astro-Tech 130mm F7 EDT APO Triplet Refractor 910mm FL
Mount: Skywatcher EQ6-R Pro, ASIAir Plus
Exposures:

149 x 240sec SII
153 x 240sec Ha
151 x 240sec OIII
ASI2600MM Pro camera

Processing Software: SiriL/SiriLic, GIMP, DarkTable, Topaz

Here's the story: I was looking for a target that was in the right spot to allow me to image all night from dusk to dawn and IC417/NGC1931 in the constellation Auriga happened to be just the right size and in the right location. The spider (IC417) is about 10,000 light year away and The Fly (NGC1931) is about 7,000 light years distant. The bright star at the center of the image is Phi Aurigae, and it is not associated with the nebulae at all, as it is only 450 light years from Earth. I originally tried to process this image SHO, but there is very little OIII to provide the blue color, so I switched the processing the HSO to get better detail and that is why it has a predominantly red and yellow coloration.

IC 1805 The Heart Nebula by Scott Cruzen
Brand/Type of Telescope/Lens: Astro-Tech 130mm F7 EDT APO Triplet Refractor 910mm FL
Mount: Skywatcher EQ6-R Pro, ASIAir Plus
Exposures:

ASI2600MM Pro Camera
45 x 240sec SII
68 x 240sec Ha
94 x 240sec OIII
Processing Software: SiriL/SiriLic, GIMP, DarkTable, Topaz

Here's the story: The Heart Nebula (aka the Running Dog Nebula - believe it or not) is located about 7,500 light years away in the constellation Cassiopeia. IC1805 is often imaged along with the adjacent nebula IC 1848, the Soul Nebula, as a pair. The Heart Nebula comprises large quantities of ionized oxygen and sulfur gases, which provide the blue and orange colors in this narrowband SHO image. This image includes only a portion of the entire Heart Nebula since the complete nebula would not fit in the FOV with my scope/camera combination.

IC410 The Tadpole Nebula in SHORGB by Scott Cruzen
Brand/Type of Telescope/Lens: Astro-Tech 130mm F7 EDT APO Triplet Refractor 910mm FL
Mount: Skywatcher EQ6-R Pro, ASIAir Plus
Exposures:

ASI2600MM Pro Camera
93 x 240sec SII
82 x 240sec Ha
86 x 240sec OIII
39 x 240sec R
41 x 240sec G
41 x 240 sec B
RGB stars

Processing Software: SiriL/SiriLic, GIMP, DarkTable, Topaz
Here's the story:

IC 410 is located about 12,000 lightyears from Earth in the constellation Auriga. Its name comes from the pollywog-shaped areas of ionized gas and dust that appear to be swimming in the nebula. IC410 is over 100 light years across and is energized by streams of charged particles that emanate from the very young embedded star cluster NGC1893. I shot this image over 3 nights in late November and processed it in SHORGB, and processed the starfield separately in RGB.

M 42 Orion Nebula by Reggie Blackmon
Brand/Type of Telescope/Lens: Zwo/ Seestar S50 /50mm/250mm
Mount: Alt-Az
Exposures:

59 10 second exposures, OIII 30nm/ Ha filter

Processing Software: Siril, Gimp, Aiarty
Here's the story:

THE OBJECT:

The Orion Nebula (also known as Messier 42, M42, or NGC 1976) is a diffuse nebula situated in the Milky Way, being south of Orion's Belt in the constellation of Orion,[b] and is known as the middle "star" in the "sword" of Orion. It is one of the brightest nebulae and is visible to the naked eye in the night sky with an apparent magnitude of 4.0. It is 1,344 ± 20 light-years (412.1 ± 6.1 pc) away[3][6] and is the closest region of massive star formation to Earth.

[3] Reid, M. J.; et al. (2009). "Trigonometric Parallaxes of Massive Star Forming Regions: VI. Galactic Structure, Fundamental Parameters and Non-Circular Motions". Astrophysical Journal. 700 (1): 137–148.

[6]Hirota, Tomoya; et al. (2007). "Distance to Orion KL Measured with VERA". Publications of the Astronomical Society of Japan. 59 (5): 897–903.

A STORY OF FIRSTS:

M42 represents a story of firsts for me. It was the first deep sky object I learned about as a kid. It was the first DSO I observed with a telescope. It was the first DSO I observed with my wife. In October 2024, it became my first DSO astro-photo.

Membership Meeting Minutes

Southwest Florida Astronomical Society November 7, 2024

President Risley opened the meeting at 7:04 PM, thanking all 32 (16 in person, 16 zoom) attendees and Tom Klein for his computer assistance. Brian then introduced speaker Christopher
C. Stark, PHD, NASA Postdoctoral Program Fellow, NASA Goddard.
Program: "NASA's search for life on exoplanets including Hubble and Webb" " Are we alone"! Beginning with Democritus in the 5th century BC followed by Epicurus in the 4th century BC advancing the theory of other planets having life. Doctor Stark illustrated how a paint fleck caused blurred photos resulting in a "Phase retrieval" to diagnose the problem. STS-61 was the mission to save Hubble, which succeeded. He showed the first exoplanet of 51 Peg b further illustrating that other exoplanets have been discovered. What is a spectrum defined, explaining radial velocity method, stellar activity, the Kepler Mission, and the probability of earth-like planets. He then presented the value of the James Webb Space Telescope (JWST), by measuring an exoplanet's temperature, directly imaging, high contrast coronagraph technology, the Roman Space Telescope, HWO enabling transformative astrophysics, and the search for life. His talked ended on a book titled De Rerum Natura (On the Nature of Things) illustrating the facts regarding his presentation.

Offcer Elections and Budget Approval: President Risley advised that the budget must be reviewed and processed and that the President and Treasurer will serve for one year and that the Vice President and Secretary will serve for two years, and that such vote will take place in the December membership meeting. Anyone wanting to run for any position, to get with him.
Past Events

North Fort Myers/Lee County Parks and Recreation Fall Festival on October 18th was cancelled.
Seahawk meeting was cancelled.
Upcoming Events:
Charlotte County: Tom Segur advised that the monthly solar observing on November 9, 2024 will take place at Harold Avenue Park as the other 3 parks are closed due to 2024 Hurricane damage. Tom further advised that the November 22, 2024 will take place at the FSW Moore Observatory.
Lee County: President Risley advised that the Seahawk star party will take place at dusk on December 7, 2024.

Offcer and Committee Reports:
President: Brian Risley stated that there are free T-shirts and hats in the lobby on a first come first serve basis. Brian also stated that Phil has some astronomy equipment that he is giving to members on a first come first serve basis for items also in the lobby.
Vice President: Mike Jensen advised that he is retired and traveling a lot, but that he will get the newsletter completed monthly asking the members to send him any photos or issues. Mike said that the November Astrophotography meeting will take place at 7PM on November 19th.
Secretary: Dan Dannenhauer thanked John MacLean for taking the minutes of last month's meeting in Dan's absence. Dan asked for a motion of approval ….so moved by Tony Buscemi seconded by Sean Dey, passed without objection.

Treasurer: John MacLean was absent so President Risley advised that he will make certain the budget data is sent to members prior to the December 5, 2024 meeting.
Program Committee Coordinator: John MacLean was not available so Dan Dannenhauer advised that the December 5th speaker will be Greg Shanos speaking on the changing telescope technologies, illustrating in depth SeeStar Telescope advantages and disadvantages.
All other committees had no reports.
Adjournment: So moved by Don Bishop and seconded by Tom Klein, passed unanimously at 8:42PM