



OBSERVER

DECEMBER 2020

Bringing Stars to the eyes of Tulsa since 1937

Editor – John Land



NGC 1975 the “Running Man” nebula

Robbin Jones took this image of the “The Running Man” nebula in Orion Oct 17 with his [MallinCam DS10cTEC](#) color CMOS camera on a Celestron 8" SCT XLT scope. Image was made using an Orion Skyglow imaging filter with 30 15 second exposures live stacked at 3 different histogram white points of 255, 200 and 150. Most of us are familiar with M 42 the great Orion Nebula but we often overlook other nearby treasures. NGC 1975 sets just above the famous nebula. Its composed of a cloud of interstellar dust superimposed on a background area of reflection nebulae. It is part of a larger region composed of NGC 1973, 1975 and 1977 lying about 1,500 light years away in Orion.

See more at <https://apod.nasa.gov/apod/ap141219.html>

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Astronomy Club Events

Check our website www.AstroTulsa.com events section for updates

**Members ONLY Events continue
with Social Distancing Guidelines in Effect**

We are limiting our Observatory nights to our MEMBERS ONLY. Please observe Social Distancing and we strongly recommend wearing a mask when around other people. PLEASE WEAR a MASK when in the heated CLASSROOM. Please keep minor family members within your observing area.

With the return to Central Standard Time, Sunset is very early in winter months. We have CHANGED the START TIME to 6:30 making our opening time AFTER DARK. Be sure to review the map directions carefully. When you arrive be aware of people on the field and telescopes set up. If a backup date on Saturday is used due to weather cancellation, the Start Time will move closer to sunset. Check website for changes.

Friday, Dec 11, 6:30 PM
Saturday, Dec 5, 4:50 PM (backup)

Friday, Dec 18, 6:30 PM
Saturday, Dec 19, 4:50 PM (backup)
Note: Date was changed from Dec 4th

Friday, Jan 8, 6:30 PM
Saturday, Jan 9, 5:00 PM (backup)

Friday, Jan 15, 6:30 PM
Saturday, Jan 16, 5:00 PM (backup)

Check our website www.AstroTulsa.com events section for updates

Observatory ONLY OPEN for SCHEDULED EVENTS. [Click for Observatory Map](#)

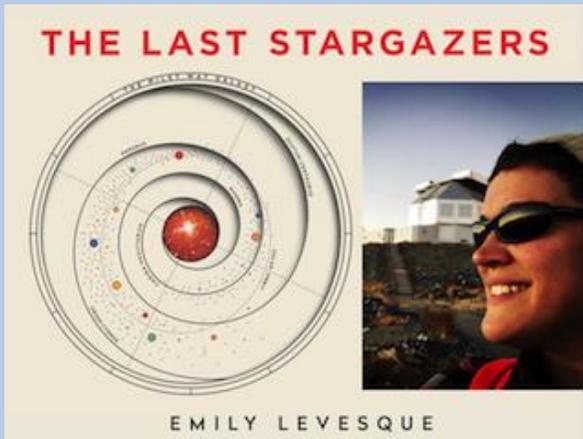
CAUTION: **DO NOT use GPS** it will likely send you on some nearly impassible back roads.

Guidelines for Members Only Observing Night

No guests – other than immediate family – no large family groups.

Additional details will be sent via membership emails

These guidelines are in place to protect our members while also enjoying observing



Tuesday Dec. 8th @ 7:00 PM

Our Tulsa Club ZOOM meeting will feature a captivating talk by Dr. Emily Levesque. Her talk is a prerecorded presentation courtesy of the Night Sky Network of which our club is a member. Zoom links will be sent to member's email nearer the date.

Dr. Emily Levesque shares what it's like to be a professional astronomer from her own experiences at some of the premiere telescopes of the world. She

also gives tantalizing excerpts from her new book "*The Last Stargazers*" with tales of adventures of other astronomers.

Dr. Levesque is an astronomy professor at the University of Washington. Her research is focused on understanding how the most massive stars in the universe evolve and die. She has observed for upward of fifty nights on many of the planet's largest telescopes and flown over the Antarctic stratosphere in an experimental aircraft for her research. Her academic accolades include the 2014 Annie Jump Cannon Award, a 2017 Alfred P. Sloan fellowship, a 2019 Cottrell Scholar award, and the 2020 Newton Lacy Pierce Prize. She earned a bachelor's degree in physics from MIT and a PhD in astronomy from the University of Hawaii where she observed on Mauna Kea observatory.

In her book *The Last Stargazers*, Levesque takes readers inside the most powerful telescopes in the world and introduces them to the people who run them. She also explores the future of one of the most ancient and inspiring scientific disciplines as we gain the ability to see farther beyond our planet than ever before while relying increasingly on code and computers to study the stars.

<https://thelaststargazers.com/>

If you missed our Monthly Zoom meetings you can watch the recordings of them

Sept 22 - [Electronically Assisted Astronomy](#) - Presenter – Robbin Jones

Oct 26 - [Understanding the Active Sun through satellite observations](#)

Presenter – Dr. Aaron Coyner

Nov 12 - [Ocean Worlds: NASA's Europa Clipper Mission](#) & the Search for Habitability Beyond Earth

Presenter - Dr. Tracy Becker – this was an invitation meeting from Dr. Coyner

Dec 8 – 7:00 PM – Next Zoom meeting "The Last Stargazers" with Dr. Emily Levesque.



2021 is the 75th Anniversary of the formation of the Astronomy League composed of many local clubs like Tulsa's across our nation. In celebration of this the League has put together monthly interest themes. The 2021 calendar contains numerous trivia tidbits about the history of the league as well as astronomical events for the year.

Calendars are \$ 13 each and can be ordered from the League Sales store at <https://store.astroleague.org/> or obtained locally by contacting BASidewalkAstro@yahoo.com

PRESIDENT'S MESSAGE

BY TAMARA GREEN



Hey Y'all !!

I wish you and yours a very happy Thanksgiving and Holiday Season! Have fun and stay safe!

So far, our General Meetings via Zoom have worked out nicely. We are going to try to have some really interesting speakers next year, especially since if we continue having our meetings via Zoom, there will be no need for travel expenses! But, I still hope that one day in the not-so-distant future we can meet in person at the planetarium again!

As of right now, we are still not holding any public or guest events. We do not want anyone becoming ill, especially with the scary number of new cases each day! I really hope that this upcoming new year will see this stupid pandemic finally get at least somewhat under control and that we can start having normal activities again. I miss Sidewalk at Bass Pro and Public Nights at the Observatory! I will keep all of you posted as far as updates and developments go.

Well, this is all I have for now. Hope to see all of you soon!

Clear Skies, Tamara Green

On Nov 21 we had our first meeting with our new board. We discussed several ideas which included scheduling events for the coming year. New board member Jim Danforth is Fire chief for Mounds OK and has recommended we do a controlled burn of our surrounding property in their ongoing efforts to reduce risk of wildfires common in the dry months. He will arrange the details. Skip Whitehurst and James Taggart are working on improvements at the observatory.

I am pleased to announce our new **Astronomy Club Facebook** coordinator **Adam Koloff** ! Adam has already jumped in and started lots of new postings on our Public Facebook site. He has posted some great astronomy photos. Also he and Daniel Smith made a video describing the various types of telescopes and good information how they work.

You can help by LIKE US at <https://www.facebook.com/AstronomyClubofTulsa>



Texas Star Party

MAY 2- 9 in far SW Texas near Fort Davis, TX

Registration is now open for the 42nd annual Texas Star Party. Attendance will be limited to 300 people so you must

PRE-REGISTER EARLY in order to be entered into a DRAWING for an attendance slot. Due to the Pandemic uncertainty plans have been made to allow observers to enjoy the pristine dark skies of SW Texas while doing so in a health safety manner. Be sure to carefully read the Health Safety Guidelines specifying the regulations. [START REGISTRATION](#) [Corona Virus Policy](#) [Welcome Page](#)

Note: Oklahoma will host the [Okie-Tex Star party](#) Oct 1-9, 2021 at the far western end of the Oklahoma Panhandle in the fall next year. Several of our Tulsa members go each year.



Grand Conjunction of Jupiter and Saturn going on NOW in you evening skies ! !

As December opens the two planets appear 2 degrees apart about 25 degrees low in the SW after sunset. By Dec. 12 their separation shrinks to 1 degree allowing them both to fit in the same low power eyepiece view. **On the night of the winter solstice Dec 21st they are separated by a mere 1/10 degree!** You'll need a good clear view low to the SW to see

them just 15 degrees up as dusk falls. Plan to observe them often as the next Grand Conjunction won't come until June 15, 2041 and will be 4 degrees apart in the predawn hours.

These two gas giant planets only pass each other once about every 20 years. The last conjunction was May 28, 2000 but the two planets were very close to the sun shortly before dawn. The last easily observable conjunction was a months long planet dance **40 years ago** as a triple conjunction in Virgo. Jupiter passed Saturn first on December 31, 1980 then backed up in retrograde motion and passed again on March 5, 1981 and lastly on July 23, 1981. At the time I was a fairly new novice at astronomy and took several images on slide film. Unfortunately, these are long gone in various moves.

Grand Conjunctions in History - The conjunction of Jupiter and Saturn figures highly in our knowledge of astronomy. Our curiosity about the heavens predates even written history. Humans had learned they could measure the seasons by the position of the sun throughout the year. They had identified and named various patterns of stars in the sky. Some even figured in religious practices. But our place in the universe remained a concept of great debate. The prevailing view was that the Earth remained motionless and the stars moved around us in the heavens, the Geocentric model. Some great thinkers had suggested we moved around the sun, the Heliocentric model. Most recently Copernicus in 1542. To further confused the situation there were seven objects that moved among the stars called Planets. (the Sun and Moon considered planets) They lacked evidence and more importantly measurements that could convincingly decide between the two models.



Enter an eccentric **Danish astronomer Tycho Brahe** (1546-1601). When he was 14 years there was a great debate about SYZYGYY – (an alignment of three celestial objects). In this case, **When** and **Where** would Jupiter and Saturn align. Astrology, not astronomy, was in the forefront at the time and as such just where the planets aligned would influence the future for the next 20 years. Neither the Geocentric or Heliocentric models of the time even got close to the date and location of the actual event. Tycho is said to have sneaked out at night to watch the stars. What an amazing time that must have been in August of 1563 as the planets drew closer and closer together. On the nights of Aug 11 & 12 Venus passed within half a degree from the two planets. Then they skimmed by each other on Aug 25, 1563 only one tenth of a degree apart.

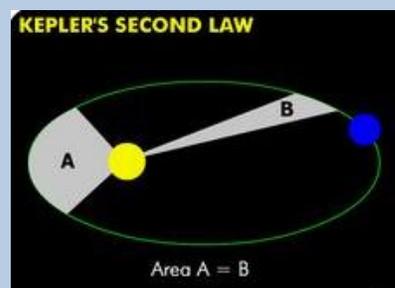
Tycho decided **HE** would master the motions of the Universe ! My mother made me an embroidery image of Orion that hangs on my wall with a quote from Tycho Brahe saying “**Those who study the stars, have God for a Teacher**” In 1572 Tycho noticed a new bright star in the region of Cassiopeia. It was a naked eye Super Nova star. He carefully compared it position to those of other observers and wrote a book **De Nova Stella** proving that it lay far out among the stars. He went on to study astronomy in Paris and then returned to his native land where he set up an observatory to make continuous and accurate measurements of the planets. This was 37 years before the invention of the telescope! Using giant protractor like instruments (Quadrants), he was able to make measurements as accurate as 8 arc minutes (8/60 degree) That’s better than 1/4 degree. This was done night after night, month after month for years. Tycho struggled to come up with a mathematical model to predict planet motions that would match his observations. Partly because his measurements showed no shift in the positions of the stars throughout the year (Parallax); he therefore concluded the Earth could not be moving.



Around 1600 he began corresponding with the brilliant younger German mathematician Johannes Kepler (1571-1630) who was also trying to understand the workings of the universe. The pious religious Kepler sought to “**Read the mind of God, Mathematician**”) Kepler kept trying to make his model fit together by nesting perfect solid geometrical shapes to support the planets. The two men quarreled and distrusted each other. However, both could not achieve their goals without the help of the other. After Brahe’s untimely death in 1601 Kepler worked another seven years to decipher the motions of Mars. The accuracy of Tycho’s measurements forced him to give up his notions of heavenly perfection. Finally, he discovered that the mathematical formulas

for an **ELLIPSE** fit the motions of the planets. This led to his first two laws of planet motion.

1. Planets orbit the Sun in an ellipse with the Sun at one focus.
2. Planets travel faster when they are closer to the Sun and slower when they are farther from the Sun but sweep out equal areas of the ellipse in equal times
3. Later he formed the third law that a planet’s orbit squared is equal to its average distance from the sun (A) cubed $P^2 = A^3$



Well I seemed to have rambled on and on (a teeny bit 😊) **Bottom**

line- had it not been for the Grand Conjunction of Jupiter and Saturn in 1563 that stimulated Tycho Brahe to study the stars, it may have been decades more before the scientific foundations of planet motion were discovered. Cosmic Ramblings by editor John Land

What’s Going on in the Night Sky this month? By John Land



Below is great resource night to night things to see and even a video link.
<https://www.beckstromobservatory.com/whats-up-in-tonights-sky-2/>

Also Sky and Telescope has an audio podcast you can listen to while under the night sky.
<https://skyandtelescope.org/observing/sky-tour-astronomy-podcast/>

Both websites renew information each month

Mars still shines at **O** mag in the high in the evening skies but continues to fade and shrink in size.

Uranus is nearby in Pisces **Neptune** is still visible in Aquarius til about 23:00 [See charts in Oct. News](#)

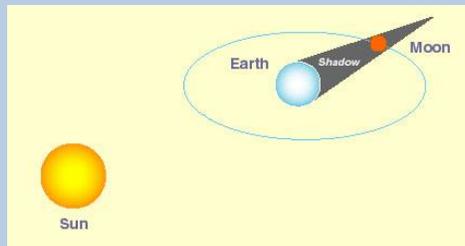
Venus still shines bright in the predawn sky. Check the links above for other sky events.

Throwing Shade

by Brad Young

The Earth is a large object. That's probably not news to you, but it might surprise you how large its shadow is. Using a little bit of math, you will find that on average the shadow thrown by the Earth is about 1.4 million km (870,000 miles) long, and encompasses a volume of almost 6×10^{13} cubic km (1.43×10^{13} cubic miles). The shadow of the Earth as shown below is called the umbra. This shadow is so long is because we are so far from the sun.

NOT TO SCALE:



TO SCALE (Earth in blue, Moon in yellow):



Notice that even 400,000 miles out (the end of the diagram), the umbra is just starting to shrink in width. It would take another diagram, a little longer, to follow the shadow to its end.

It would be great to observe an object so large. The fact is, at sunset* you can see the Earth's shadow plainly, using just your eyes.

**NOTE: all phenomena in this article also occur, in reverse, from break of day until sunrise.*

At the moment of sunset, our sky would go completely dark if we did not have an atmosphere. If that were true, we would never be able to see the Earth's shadow on a consistent basis like we can now. (We also wouldn't be alive but that's a story for another venue).

As the sun goes down the next clear night with no bright moon, look directly opposite of it in the east. From near the horizon to low (about 20 degrees or less) above it, you may see a beautiful band of pinkish glow that will begin to get a little darker in hue and rise up off the horizon over the first 10 minutes after sunset or so. Underneath it, you might see a dark blue band that extends down to the horizon and begins to get larger as twilight deepens into night. Somewhere between 15 and 25 minutes after sunset, the pinkish glow will give way completely to the dark blue or deep violet glow, and then even that band will disappear as the sky becomes completely dark.



Image by Brad Young

The pinkish glow is called the Belt of Venus, as in the Roman goddess of love. This portion of the Earth's shadow is made more beautiful and easily visible, by refraction of the last bit of sunlight in the Earth's atmosphere. This is the reason that the pinkish glow is much more prevalent and easier to see directly opposite of the sun. Backscattering (aka Rayleigh scatter) of sunlight by particles in the upper atmosphere preferentially reflect longer, redder light waves.

Meanwhile, the blue to dark violet portion (the lower band) is our view of the umbra (complete shadow) cast by the Earth. It is also known as the "shadow wedge" although it may appear more oval than sharply edged in definition.

Another way to see the Earth's shadow is a lunar eclipse. Occasionally there are partial or total eclipses of the moon. During these eclipses, we are seeing the umbra projected onto part or all of the Moon's surface. We have a partial lunar eclipse coming up November 18-19, 2021. At that time, you can see the shadow of the earth extended about 384,000 km (240,000 miles) and showing very obviously on the surface of the moon.



View of the partial phases of a lunar eclipse

See animated Link at https://en.wikipedia.org/wiki/File:Eclipse_lunar_2019.gif

NOTE: We have a penumbral lunar eclipse coming up on November 29-30. The penumbra is the effect of the Earth partially blocking sunlight. So, during penumbral eclipses, the Moon is not actually passing through the fully dark umbral shadow cone. Therefore, it is difficult to see the slight shading on the Full Moon.

So, during the course of each night, there is a huge dark cone of shadow, cast by the Earth, that extends more than three times the Moon's distance into space. You can visualize it as you watch twilight descend, or once a year or so, watch a lunar eclipse. But even when you can't see it, it's there. It extends out and up into the sky, rotating from east to west just like the stars every night. It's fascinating to see it in action, each night presenting a new chance to watch the Earth throw shade.

RESOURCES:

A really cool panoramic view of the Belt of Venus is at:

https://lunaproductions.com/wp-content/uploads/2016/04/757_CloudsRest_dusk_v6j_q8.jpg

All images, unless noted, from Wikipedia



Editor Note: Yet another way to witness Earth's Shadow is to watch the ISS Space Station when it flies over. As it moves eastward near the end of its pass it will dim and fade out as it goes into Earth's shadow. Nov 18th my daughter and I watched a long pass just after dusk. The ISS actually turned orange and then reddish as it slipped into the shadow from the light of sunsets more than 400 miles farther west. You can find ISS predictions from several free Apps. I use one called *ISS Spotter*.

By editor - John Land

Ancient Egyptian temple reveals previously unknown star constellations

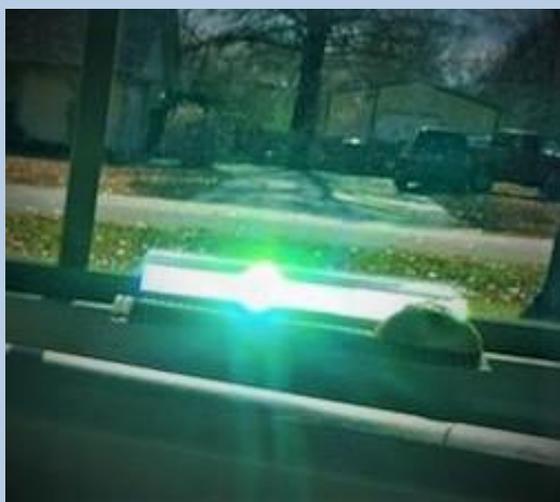
Member **Ron Coates** passed on this link to an article about [Egyptian Constellations](#)



Here is the ancient Egyptian depiction of the Big Dipper, seen here in the shape of a bull's leg. It includes seven stars and is tied to a stake by a goddess in hippo form (right). The Big Dipper is considered the manifestation of the evil god Seth, who murdered his brother Osiris. The goddess prevents Seth from reaching Osiris in the underworld — a myth made possible because the constellation never dips below the horizon. (Image: © Ahmed Amin)

The restoration of a soot-filled ancient Egyptian temple has revealed the previously unknown names of ancient Egyptian constellations and also uncovered the gorgeous original colors the ancient Egyptians painted the 2,000-year-old temple. See Link above for full story.

Making a Rainbow Sundial by John Land



For a few years I have enjoyed watching a rainbow crawl across our kitchen wallpaper border for an hour or so near solar noon each day. I have placed a simple glass prism on the lip of my south facing window so that it catches the sunlight. It then splits the light into its spectrum and projects the colored spectrum into the rooms. As the noon hour approaches the rainbow projects through our kitchen doorway the the wall near the ceiling about 35 feet away. Its fun to watch it move steadily across the wallpaper for an hour or so. We also can observe when it is exactly in the middle making Solar Noon. (which is not 12:00 on the clock) Solar Noon is around 12:08 in mid-November and as late as 12:37 in mid-February in Broken Arrow. So I get to observe a bit of science during a mid-day snack. See [Analemma](#) for details.

My sundial only works well from November through February when the Sun is low enough in the sky to come into the window and the trees have lost thier leaves. You have to place the prism Point End Down and adjust its angle a bit once in awhile to cast the light where you want it. I used a piece of rubbery shelf liner to keep it from slipping and a small sea shell to prop it up at the desired angle. You might try it in an east or west window to catch the moring or evening sun and see how it changes with the seasons.

John Blaes from the Bartlesville Astronomical Society

Created this Celestial Word Search

You can print this page to find them all

STARS AND CONSTELLATIONS

ACRUX	CANCER	HADAR	PROXIMA CENTAURI
ALDEBARAN	CANOPUS	HERCULES	REGULUS
ALPHA CENTAURI	CAPELLA	HYDRA	SAGITTARIUS
ALTAIR	CAPRICORNUS	LALANDE	SCORPIUS
ANDROMEDA	CASSIOPEIA	LEO	SIRIUS
ANTARES	CEPHEUS	LIBRA	SPICA
AQUARIUS	CORONA BOREALIS	ORION	TAURUS
ARCTURUS	CYGNUS	PERSEUS	URSA MAJOR
ARIES	EPSILON ERIDANI	PISCES	URSA MINOR
BARNARDS STAR	EPSILON INDI	POLLUX	VEGA
BETELGEUSE	GEMINI	PROCYON	VIRGO



Crossword Provided By John Blaes

TREASURER'S and MEMBERSHIP Report

BY JOHN NEWTON



As of November 20, we had **193** members. **79 new members for the year a net gain of 33.** We welcome this month our newest member **Elli Hanvey** Hello and welcome to ACT!

In addition, we want to recognize our long-term prominent and well-respected members who continue to renew their memberships with the club, even during these restricted times. We look forward to seeing you all at meetings, even if virtual by Zoom, and at club events throughout the year when possible.

Accounts as of November 20, 2020

Checking: \$ 4,568.28 < \$ 3,000 moved t from checking to savings

Savings: \$ 10,784.91

Investments: \$ 26,416.13 (Value tends to fluctuate with markets).

The club now has PayPal available for you to start or renew memberships and subscriptions using your credit or debit cards. Fill out the registration form at <https://astrotulsa.com/page.aspx?pageid=16>

Click Submit and you will be given the choice of either **mailing in your dues** with a check **or using PayPal** which accepts most major credit cards. A modest processing fee is added to PayPal transactions.

You may also renew your membership or join at one of our club events using your credit card by seeing one of our officers. We can take payments with the Square card reader. A small fee is also added on to these transactions.

ALSO NOTE: For our current members who are renewing their memberships, you can now go to a new link on the website to start your renewal process. On the home page, hover over the "Member" tab on the ribbon menu near the top of the page. Then select the "Membership Renewal" link and this will take to a page to fill out your information. Fill this out, submit it, then pay your dues by the method you choose.

NEWS NOTE: Both Sky & Telescope and Astronomy have free Digital subscriptions available with print subscriptions, or Digital subscriptions may be purchased separately. Details - Contact their websites

Membership rates for **2020** are as follows:

Adults: \$ 45 per year, includes Astronomical League Membership.

Sr. Adult: \$ 35 per year for those 65 or older, includes Astro League Membership.

Students: \$ 30 with League membership; Students: \$ 25 without League membership.

Additional Family membership: \$ 20 with voting rights and League membership.

\$ 15 with voting rights but without League Membership.

The regular membership allows all members in the family to participate in club events but only ONE Voting Membership and one Astronomical League membership.

Join Online – Add or renew magazine subscriptions.

<https://www.astrotulsa.com/page.aspx?pageid=16>

Magazine Subscriptions: If your magazines are coming up for renewal, try to save the mailing label or renewal form you get in the mail. Forms are available on the club website.

Astronomy is \$ 34 for 1 year, or \$ 60 for 2 years. www.astronomy.com

To get the club discount you must go through the club group rate.

Sky & Telescope is \$ 33 per year <https://skyandtelescope.org/>

Sky & Telescope also offers a 10% discount on their products.

You may renew Sky & Telescope subscriptions directly by calling their number **-be sure to ask for the club rate**

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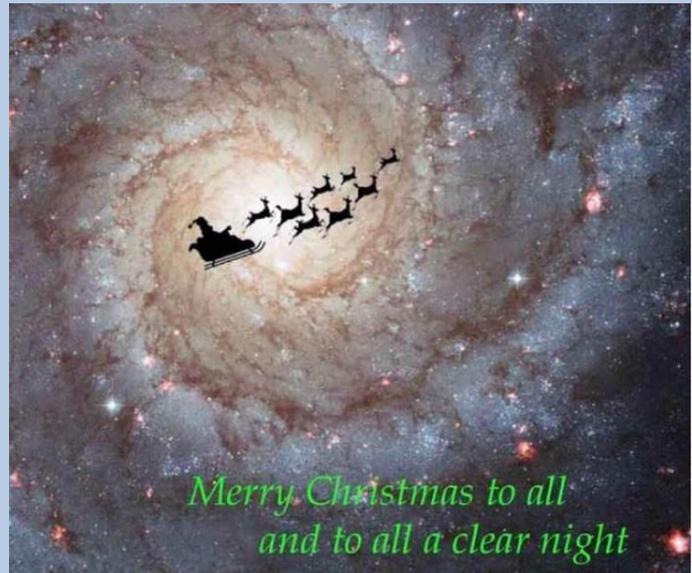
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WEBMASTER JENNIFER JONES



Do you have ideas for our club ZOOM Meetings?
Know someone who willing to be a Guest presenter?

We would also welcome YOU to do a short 5-10
minute section of interest or new equipment you'd
like to review.

Create a Cartoon on a Space Theme

Contact our Editor John Land
Tulsaastrobiz@gmail.com

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