ASTRONOMY CLUB OF TULSA

OBSERVER

DECEMBER 2024

Bringing Stars to the eyes of Tulsa since 1937

Editor – John Land

Our annual astronomy club members dinner was held on Saturday Nov 10, 2024. We enjoyed food from Las Cabos and visiting with other members and their families.

Our President Jonathan Fussell spoke to us about his vision for the club in the coming year and introduced us to a fun computer astronomy topic quiz game. We also had drawings for several nice door prizes.

JENKS PLANETARIUM

Saturday Dec 7 -- 1:00 PM *Holiday Under the Stars*

Back by popular demand! Join in celebrating the season with fun activities for the kids, a planetarium show, and a Special Visit from a Beloved Seasonal Guest !.
Reserve your tickets at https://jenks.ce.eleyo.com/Planetarium

Digital Puzzles of the Stars

Many of us enjoy looking at the amazing images and information on the **Astronomy Picture of the Day** They have been posting images every day since July 1995 ! You can simply type APOD in your browser and it will likely take you to the site. There you will find the current days image with some interesting information and links related to the subject. It also has a searchable index of the 1000s of images.

NOW there is an Astronomy Puzzle of the Day featuring digital puzzles of selected APOD images. You can choose from four different difficulty levels and manipulate the pieces on your computer or device to solve the puzzle. (Caution: It can be additive 😊)
https://www.scigames.org/apps/webjigsaw2/index.php

Stay starstruck this December with the **Princeton University Press spell-binding collection of books** on astronomy, including the brand-new **Hidden in the Heavens,** a NASA insider's account of the Kepler mission and its bewildering discoveries. Take some time to learn from women who broke down barriers and changed the face of modern astronomy in **The Sky Is for Everyone.** Then it's time to pack your bags to go **Back to the Moon**, one scientist's inspiring vision, and onward to explore the real science behind interstellar expeditions in **A Traveler's Guide to the Stars.** Your holiday gift list won't be complete without touring the most spectacular sights in astronomy as observed in **Welcome to the Universe in 3D**, the *New York Times* bestseller from Neil deGrasse Tyson, Michael A. Strauss, J. Richard Gott, and Robert J. Vanderbei. Princeton titles make stellar choices for holiday or donor gifts, book clubs, and to share with members of your astronomy club, professional organization, or academic department.

To learn more or ask about our substantial bulk discounts
Email **Barbara_Tonetti@press.princeton.edu** for details!

Stargazing Nights and Observatory Nights

Our GUESTS & Members nights are open to anyone. We do ask guests to try to RSVP.
Large groups need to make separate arrangements.

Members Only Nights are Open to members and their family
Details, Times and Direction Maps are posted on our Website
https://www.astrotulsa.com/events

Guest and member Observatory nights

Come enjoy an evening of star gazing at our observatory
located in dark rural skies SW of Tulsa
See details and directions on our Website Events Page
Guests are requested to RSVP

Saturday Dec 21 - 4:30 PM Guest & Members Observatory Night

Saturday Jan 18 - 5:00 PM Guest & Members Observatory Night

Astronomy Club Members Nights

Our members are invited to come work on their observing goals, do some Astro imaging and share ideas.

Friday Dec 27 - 4:45 PM Members Observatory Night

Friday Jan 24 - 5:15 PM Members Observatory Night

If a Friday event must be cancelled due to weather, we will try again on Saturday 30 minutes before sunset
- Always check the website for event updates

In Town Astronomy Club meetings at Jenks High School planetarium

Open to Guests and Members

Friday Dec 13 – 7:00 PM Jenks High School Planetarium

Friday Jan 17 – 7:00 PM Jenks High School Planetarium

Located at 105 East B St, Jenks, OK

Hunter Park Public Telescope Night

Friday Dec. 6 - 5:00 PM to 8:00 PM
This is a Come & Go event

The entrance to Hunter Park is located off 91st Street between Yale and Sheridan. **(5804 E 91st ST)**

See details at
https://www.astrotulsa.com/event/2024-12-6-Hunter-Park

Check our website possible weather rescheduling.

President's Message
Jonathan Fussell

Hello Astronomy Club Members,

As we leave the latter months of 2024 behind and embrace the chill of December, I'd like to reflect on the first few steps of my presidency. November marked a memorable milestone with our annual club dinner, where both new and long-term members came together to celebrate. We also had the opportunity to thank Don Bradford for his dedicated leadership as last year's president.

Looking ahead, I'd like to outline a vision for the club with short-term, long-term, and even far-reaching goals. My priority is to build a roadmap that ensures the Astronomy Club of Tulsa thrives well into the future. This includes fostering open discussions about our direction so that every member feels informed and involved.

One of my first goals—expanding our outreach efforts—is already taking shape. I'm excited to share that we have a Public Outreach Night scheduled for December 6th at Hunter Park (located on 91st Street between Yale and Sheridan). This event is another testament to Don Bradford's passion for connecting with the community and sharing the wonders of astronomy.

I'm also looking forward to our December 13th meeting at the Jenks High School Planetarium and to the observing nights at the observatory as we close out the year. It has been an extraordinary year, filled with stories of chasing the 2024 North American Eclipse and the unforgettable experiences at Okie-Tex. My hope is that as we move into 2025, these good times will continue.

But these moments of joy and discovery don't happen on their own—they happen because of your support! This is your club, and your involvement is the key to our success. Whether it's participating in events, volunteering, or simply sharing your enthusiasm for astronomy, you make all the difference. Together, I know we can achieve incredible things.

Thank you for giving me the opportunity to serve you and this remarkable club.

Clear Skies,

Astronomy Club of Tulsa

"Bringing Stars to the Eyes of Tulsa since 1937"

Jonathan Fussell - President

Click on these images to links on the Internet

***** The NEW CLEAR OUTSIDE icon above is a link to an extensive site showing cloud cover %, Seeing, Transparency, Moon Phase, Temp in ^{O} C and many other useful tools**

GOT A NEW TELESCOPE? Here are some sites to help you get started with you telescope.

Getting Started with Your New Telescope
https://skyandtelescope.org/astronomy-news/getting-started-with-your-new-telescope-2/

Astronomy for Beginners | Night Sky Facts, FAQs & Resources
https://skyandtelescope.org/astronomy-information/

What to Know Before Buying a Telescope
https://skyandtelescope.org/astronomy-news/what-to-know-before-buying-a-telescope/

See Website Observation Station for a collection of Interactive Sky Watching Tools
Moon phases - Sun rise & Set - Make your own custom interactive sky chart and more
Great website for printable Finder Charts of Solar System objects https://in-the-sky.org/

October - Moon Phases - -
1st Q Sun Dec 8 - - Full Sun Dec 15 - - 3rd Q - - Mon Dec 22 - - New Mon Dec 30

Lunar conjunctions – Venus Dec. 4, Saturn Dec 7, Neptune Dec 8, Jupiter Dec 13, Mars Dec 18 < 4:00 AM

OBSERVING THIS MONTH by Brad Young

As mentioned at our last club meeting, I plan to have a look ahead to next month in both the newsletter and at each meeting at Jenks. For December 2024, here's a rundown on observing you might try, starting with the planets.

MERCURY will be passing through inferior conjunction in early December 7th, so by the end of the month you may be able to spot it low in twilight before dawn, in the southeast down near Antares. I always like to try to catch Antares' helical rising right around Christmas anyway. **Venus** is becoming brighter and higher each month and makes a magnificent Christmas Star this year. It shines in the dusk in Capricornus and will reach greatest eastern elongation in the evening sky on January 10th.

After having only Saturn in the evening sky for several months, we will begin to have three outer planets to join Venus. **MARS** rises mid evening and is quickly approaching its opposition on January 15th. Now's the time to start looking at it through the telescope as it won't be any nearer until April 2031. **JUPITER** reaches opposition on December 7th and is a glorious sight in Taurus all night. As mentioned, **SATURN** is high in the southwest in the evening and is still showing very thin rings. The rings will seem to disappear on about March 15th as Earth will view its rings edge on. Unfortunately it will be very close to the Sun in March. Fortunately, we get a second chance in early November.

The other two outer planets are also in the evening sky with **NEPTURE** a little east of Saturn, and **URANUS** a little west of Jupiter near the Pleiades. Both will require binoculars unless you're in a super dark sky, where you might just glimpse Uranus without them.

The moon has close conjunctions with all three bright planets starting with Saturn, Jupiter, and then Mars. Unfortunately, it is full as it passes Jupiter on the 13th, the night of the Geminid meteor shower. Things look much better for the Quadrantids meteor shower the first weekend of January.

The recent comet, **C/2023 A3 Tsuchinshan-ATLAS**, is still visible in the evenings sky although it is a telescopic object now. It is currently at about 9.7 magnitude in the constellation of Aquila which sets in the SW about 8:30 PM

Eunomia, the 15th asteroid discovered has a bright opposition in Auriga this month at 8th magnitude. It should be visible in binoculars the week of Dec 4 to 10 as it passes between the M36 and M38.

Last thing, my trip to Oz in March, the Total Solar Eclipse, and Okie-Tex were all clear and some of the best sights of my life. Enjoy Christmas and see you in 2025 !

Brad Young - Observing Chairman

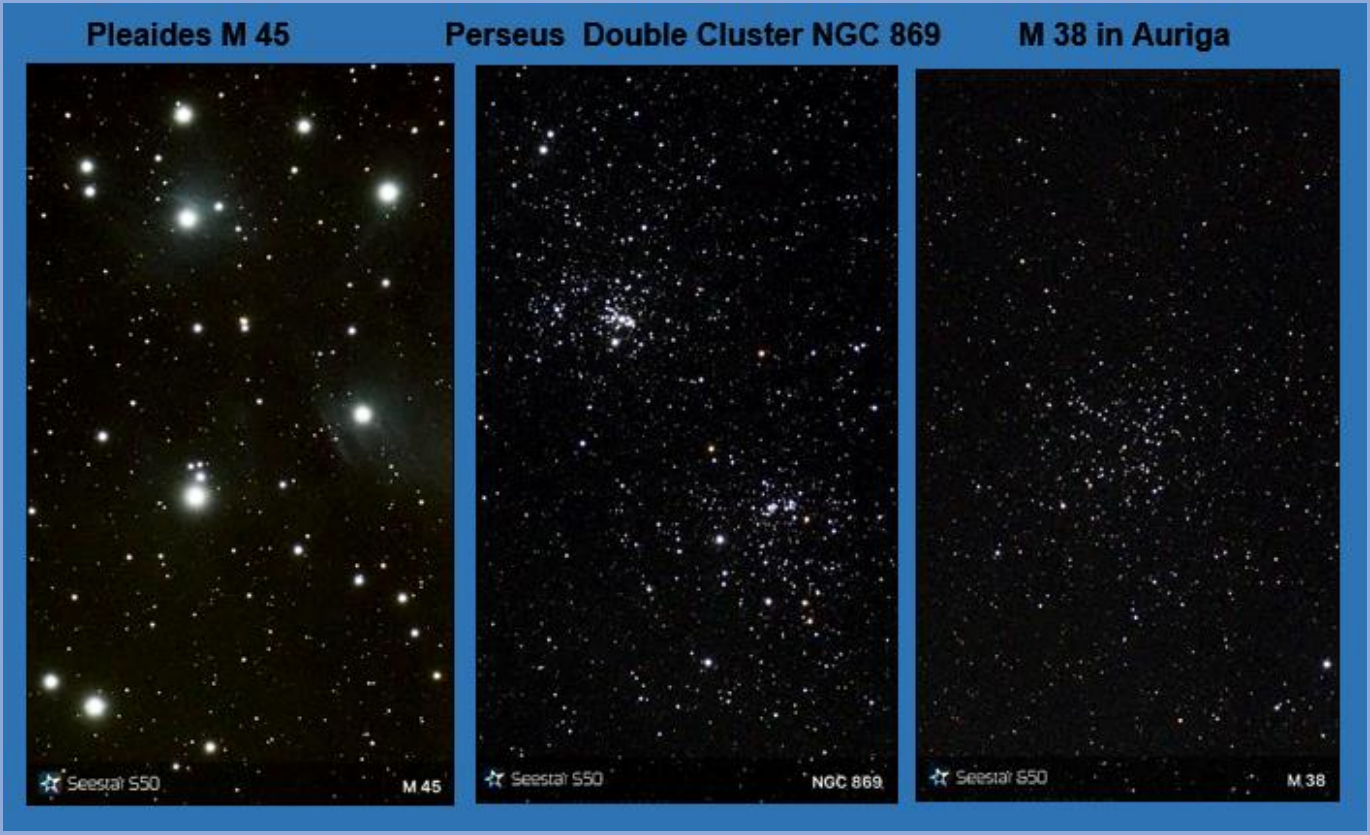
***Editor's note*:** Eunomia is the largest S-type stony asteroid measuring 300 km along it longest axis. (186 miles) It orbits the sun in 4.3 years with a semi-major axis of 2.64 AUs. It is the parent body of the Eunomia family of asteroids that make up about 5% of the main asteroid belt.

You can find Printable Finder Charts to all of the objects mentioned above at
In-The-Sky.org **https://in-the-sky.org/data/data.php**

Mars in Retrograde Project. – (See details page 11 in this Newsletter)
As the month opens Mars is near M 44 the Beehive Cluster in Cancer. On December 7 Mars begins it retrograde motion westward among the stars toward back toward Gemini. This is an excellent opportunity to observe and record its progress to learn firsthand how the planets move. Observe and Sketch or Photograph Mars position relative to surrounding stars about once a week over the next four months. Also watch as it grows brighter. As Brad mentioned above, this is the best time to observe Mars with your telescope. Its northern polar ice cap will be tilted toward us at this opposition. To best compare your observations over time, orient your drawing or images to line up with the Gemini stars of Pollux and Castor

Ancient sky watchers recognized that a few objects moved among the background of stars. The Greeks called these wandering stars *planetes* – Planets They recognized the five visible planets, Mercury, Venus, Mars, Jupiter, and Saturn but also included the Sun and Moon since they also moved among the stars. For millennia scholars tried to devise a system that could accurately predict where they would be at a future date or an important date in the past. The most perplexing aspect of their motion was that the planets would move along orderly eastward through the stars then pause and move backwards to the west for a few months. They also observed that the planet would grow brighter during this time. You can enjoy observing and recording this Retrograde Motion for yourself.

December Sky Treasures - **by John Land** **As a kid you likely enjoyed going on a "Treasure Hunt" The night sky contains many wonderful treasures for you to seek out in the canopy of the night sky. For December let's go "Treasure Hunting" for Open Star Clusters.**



Open Star clusters are loosely bound groups of a few tens to a few hundred stars. They are formed from the same giant molecular cloud and have roughly the same age. They are found in rich star formation regions of spiral or irregular galaxies. Our Milky Way galaxy has 1,100 identified open clusters.

Since they form from the same molecular cloud, they are about the same distance away. They also are traveling around the galaxy in a similar direction and velocity. (Space Velocity) Since the stars have similar chemical compositions and formed at roughly the same time, the difference in their appearance is primary a reflection of how much mass the star accredited as it was forming. Studying these differences helps astronomers learn about the life cycle of stars. Nuclear fusion in massive hot stars burns at much higher temperatures consuming its mass at a high rate and have a much shorter life span. Less massive stars burn at lower temperatures and take longer to consume their mass of nuclear fusion materials.
(An earthly analogy would be a roaring bonfire compared to the embers of a campfire)
https://esahubble.org/wordbank/open-cluster/ https://en.wikipedia.org/wiki/Open_cluster

Perhaps the best-known open cluster is the Pleiades cluster in Taurus M 45. This cluster is easily seen with the unaided eye. It has many names from different cultures. The Greeks saw it as "*Seven Sisters*", Japanese as "*Subaru*" and Persians as "*Soraya*". It is referenced in the Bible with its Hebrew name "*Kiymah*" in the books of Job and Amos. Many people commonly confuse it with the Little Dipper due to its cup shaped appearance.

To the naked eye 6 stars are easily identified. Binoculars will reveal dozens more. In a larger telescope under pristine skies over 100 stars can be seen. You'll need a wide field eyepiece of 1 degree or more to fit it all into a single view. Photographs show wispy clouds of nearby interstellar dust reflecting their star light. The Pleaides are located about 440 light years away and span a region of about 8 lights across. The cluster has 1,000 confirmed members with a mass of 800 suns. The cluster is thought to have formed about 100 million years ago. Its young age is revealed by its abundance of blue-white spectral class B giant stars which have a very short life span. Source: Sky Safari phone APP

Below the Pleiades you will find the "V" shaped Hyades cluster which spans a bit more than 5 degrees on the sky. Except for the bright star Aldebaran, the members of this cluster lie about 150 light years away. It spans a region of about 17 light years, but it looks much larger than the Pleiades since it is only about 1/3 the distance away.

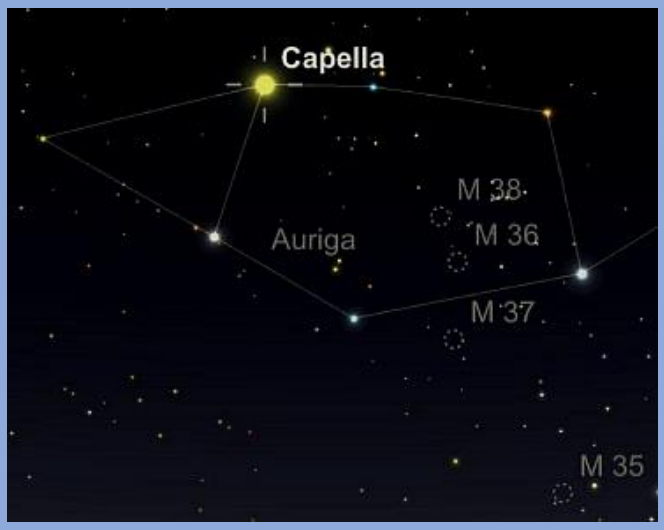
Look for the Pleiades and Hyades in the East soon after sunset. Later in the evening you will find them high overhead.

Next, we will move to a northern circumpolar constellation the "W" shaped Cassiopeia. Look M 103 about 2 degrees from Delta Cassiopia. See if you can identify a ruddy red super giant star among its members. One of my favorite clusters is NGC 457, the Owl Cluster, also called the ET cluster. It looks like a person with outstretched arms and two eyes looking back at you. Other more challenging clusters nearby are NGC 663 and NGC 559. (Not Labeled) In the upper portion near the star Caph you will find NGC 7789. Also, the sparsely scattered cluster M 52

About halfway between Cassiopeia and Perseus lies the densely packed double clusters of NGC 869 & 884. See if you can identify a tiny "parachute" pattern in one of the clusters. These are an easy target in binoculars. You can even make out their location naked eye under dark skies. It's a mystery to me why Messier did not include them in his famous catalogue. In the lower region of Perseus, you will find M 34.

NGC stands for the New General Catalog of Nebulae and Clusters of Stars. It is an astronomical catalogue of deep-sky objects compiled by John Louis Emil Dreyer in 1888. The NGC contains 7,840 objects, including galaxies, star clusters and emission nebulae.
https://en.wikipedia.org/wiki/New_General_Catalogue

Printable version of Article and Object chart at
https://www.astrotulsa.com/files/OBCrt-1-Star-Open-Clusters.sc7fr1z42q700hwr.pdf



Lastly, we'll move lower in the NE to find the bright star Capella in the constellation of Auriga the Charioteer. This yellow orange G type giant star is a bit cooler than our sun at 4800 Kelvins and 42.8 Light years away. Its first rising in the NE in late October is a good sign that frost is soon on the way.

Auriga contains three open clusters which are easily seen with small scopes.
M 38 the "Starfish cluster", M 36 the Pinwheel cluster and M 37 all make lovely views.

To round off your evening look for M 35 in the foot of the constellation Gemini. This star cluster lies near where the sun is located at the June summer solstice. As an extra challenge try to identify the small cluster NGC 2158 just beyond the edge of M 35

BEGIN YOUR DECEMBERSKY TREASURE HUNT CHALLENGE !

Observe at least 12 of these 16 Open Star Cluster during the month of December.
Record the - 1. Object Name 2. Date & Time 3 Instrument used 4. Make some notes
Optional: Make a sketch of your observation.

Submit a List of Objects Observed and Date along with your name, email and any comments you would like to share with our members to tulsaastrobiz@gmail.com
Please Submit your list by Jan 10, 2025 so that I can recognize you in our newsletter.

Record your observations using one of the observing log sheets listed on the next page or your own log sheets.

Your membership in our Tulsa Club allows you to participate in one of the many Observing Certificate Programs sponsored by the https://www.astroleague.org/
These programs are an excellent way to build your observing skills along with discovering many hidden treasures in the night sky.

You will need to read the rules and requirements for each program for completion.
The Messier Objects Certificate is a good starting certificate featuring 110 sights accessible to most telescopes. It has two levels of certificates and there is also a Binocular Messier Certificate and a new Imaging Messier Certificate.

Try the Open Cluster Observing Program for a deeper dive into the sky featuring 125 open clusters and how they are classified.

Printable Version of Chart and Article at
https://www.astrotulsa.com/files/OBCrt-1-Star-Open-Clusters.sc7fr1z42q700hwr.pdf

Winter Sky Open Cluster Challenge									
Messier	NGC	R.A.		Dec.		Mag.	Type	Con	Size
		Hrs	Mins	Hrs	Mins				arc min'
Pleiades	M 45	3	47	24	7	1.4	OCl	Tau	110.0′
Hyades	Mel 25	4	28	15	55	0.5	OCl	Tau	330'
52	7654	23	24.2	61	35	8	OCl	Cas	13.0′
103	581	1	33.2	60	42	7	OCl	Cas	6.0′
	NGC 457	1:19.1		+58:20		6.4	OCl	Cas	13
	NGC 663	1:46.0		+61:15		7.1	OCl	Cas	16
	NGC 559	1:29.5		+63:18		9.5	OCl	Cas	4
	NGC 7789	23:57.0		+54:20		6.7	OCl	Cas	16
	NGC 869	2:19.0		+57:09		5.3	OCl	Per	30
	NGC 884	2:22.4		+57:07		6.1	OCl	Per	30
34	1039	2	42	42	47	6	OCl	Per	35.0′
36	1960	5	36.1	34	8	6.5	OCl	Aur	12.0′
37	2099	5	52.4	32	33	6	OCl	Aur	24.0′
38	1912	5	28.7	35	50	7	OCl	Aur	21.0′
35	2168	6	8.9	24	20	5.5	OCl	Gem	28.0′
	NGC 2158	6:07.5		+24:06		8.6	OCl	Gem	5

Some printable observing forms
http://www.astromax.org/pdf/a4-obsfm.pdf Object list and comments
These include areas for sketching
https://www.astrotulsa.com/files/RSTool-1-Obs-Form.wlyit0s1gynl4jyq.pdf

https://tucsonastronomy.org/wp-content/uploads/2020/02/Log-generic-sketch.pdf

Seeing and Transparency guides
https://tucsonastronomy.org/wp-content/uploads/2020/02/Seeing-and-Transparency-Guide.pdf

How to Use a Star Chart with a Telescope
https://skyandtelescope.org/astronomy-resources/using-a-map-at-the-telescope/

You can **measure your eyepiece Field of View (FOV)** by pointing at a star in Orion's belt.
Turn off you telescope drive - Time how long it takes for the star to drift across the FOV.
Earth rotates 1 degree in 240 sec. Divide Time in seconds by 240 that will be FOV in degrees.

There are several phone apps that can assist you in locating objects
Find one that lets you set the time manually and zoom in to match your field of view.
I like **Sky Safari** - You don't need the top pro version unless you are going to control you telescope with the app. Often, they have sales during the holidays.

Celestron SkyPortal – is free and has many of the Sky Safari features.

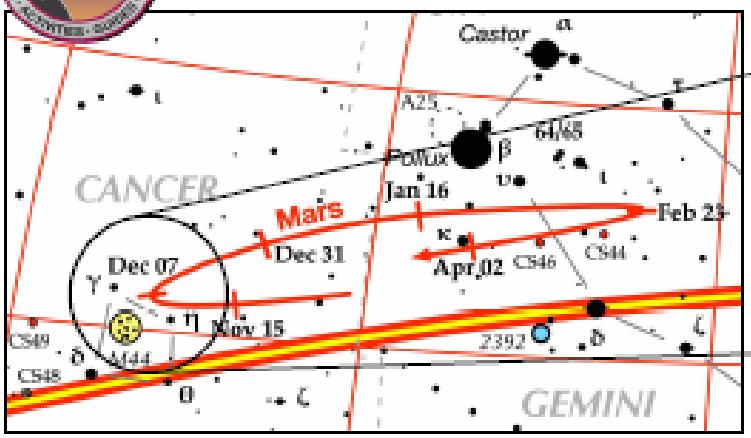
Go into the App settings and change the Constellations to "Modern Lines" and turn off Mythical lines Some apps let you set a FOV circle to let to match your scope.

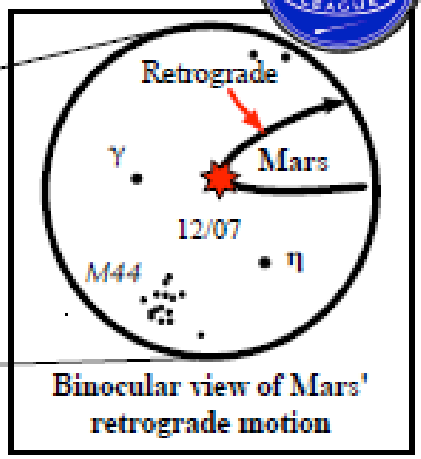
For Alto-Azimuth mounts and Dob Telescopes
Our April 2024 Newsletter has a review of AstroHopper app that acts as a "Push to" star finder

Our October 2024 Newsletter describes how to custom print Dobsonian Setting Circles

Observing Project: Retrograde Motion of Mars

See this for yourself!





Binocular view of Mars' retrograde 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

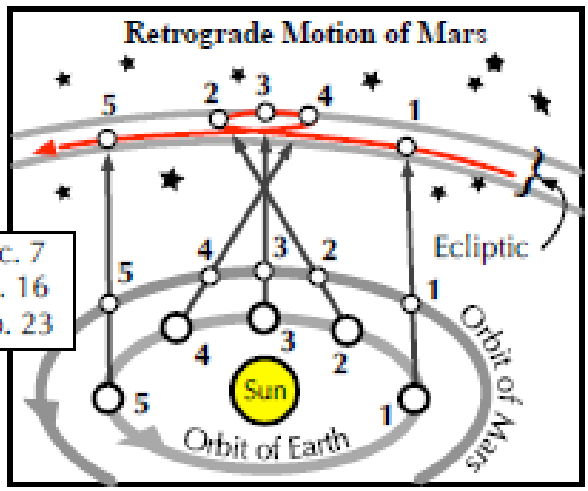
94% illuminated

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

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).



2: Dec. 7
3: Jan. 16
4: Feb. 23

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.

Degree in Observational Astronomy

A very long time ago I wrote up a curriculum for an imaginary bachelor's degree in Observational Astronomy. I found it the other day and reproduced and **posted it here** at my website. It has ideas for classes and labs, including the corresponding Astronomical League observing program and useful books. Note that some of the books were old even then, but later editions or similar texts should be available today. To be honest, for the basic stuff that doesn't become out of date, I prefer the older texts.

I know that there are plenty of colleges out there that have programs in astronomy, and here locally our community college offers a course in astronomy that has been taught by members of our astronomy club. However, they tend to be either introductory, without discussing observation methods, or are geared towards students destined to be professional astronomers. This imaginary curriculum was meant more to list all the subjects useful to the ambitious amateur. However, this discussion isn't about that curriculum, but more about the ideas and knowledge in it that can be used to improve your observational skills.

Choosing Improvement Instead of Derision

"Advice is like snow - the softer it falls, the longer it dwells upon, and the deeper it sinks into the mind." - Samuel Taylor Coleridge.

Right from the start, I want to clarify I don't intend to state that you're not a "real" amateur unless you know all these subjects and could do everything manually, which was a common theme when I was starting out as an amateur astronomer. Back then, if you didn't build your own scope, you weren't dedicated. And if you didn't eschew setting circles and star hop, some people didn't consider you a true amateur. Instead of adopting that attitude, I would like to look at things from a positive standpoint, i.e., the skills you can choose to learn that may help.

Many people today start out in amateur astronomy with computer-controlled imaging equipment and do not take the time to learn some of the basics of how the sky works and what you can do with your observations to improve your knowledge and possibly provide information used by professional astronomers. There is nothing wrong with this, but starting out letting the computer find everything, and not having basic skills may hinder your growth as an amateur.

Celestial Mechanics

"We see the sky turning around us every day, but we are the ones who are turning." — Carlo Rovelli, The Order of Time

If we look at the many subjects that most general astronomy classes cover, you would be introduced to celestial mechanics. Celestial mechanics is the study of how the sky moves and works, including the coordinate systems that are used to find the position of objects. This would certainly be worth the time and effort to learn no matter what your interest in astronomy may be. Knowing how the sky rotates each night, and changes with the seasons will help you determine what targets are available to you, how high in the sky they are, etc.

Learning the constellations will also help you while you're out under the stars and looking for the approximate location of your target. Knowing how the planets move along the ecliptic and when they are best to observe is also an important skill to have.
The coordinate systems include:

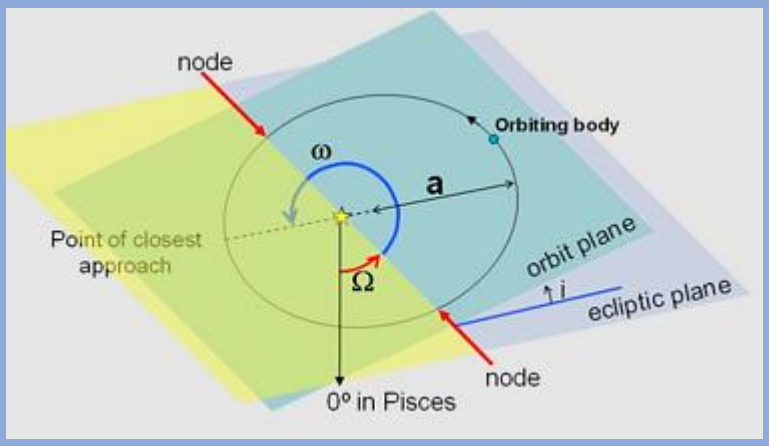
- right ascension and declination, the extension of longitude and latitude into the sky
- ecliptic latitude and longitude, based on the path of the sun and planets
- galactic latitude and longitude, based on the shape of the Milky Way

Most positions will be given in the first set using RA and declination, but it may help to know at least the basis for the other two in case you run across them.
Another subject in astronomy is orbital mechanics. Knowing a few fundamental values, the position of a planet, asteroid, or comet can be determined far into the future. In the reverse, with three good positions on a new comet or asteroid, the orbit can be determined and described by the same values. These are called the Keplerian elements (named for Johannes Kepler) and include:

- M = mean anomaly at the selected epoch, the average change in position during the interval from perihelion until the epoch date and time
- Ω = ascending node, the longitude where the object crosses the ecliptic going north
- ω = argument of perihelion, difference in longitude from Ω to perihelion
- ι = inclination, the maximum vertical deviation of the orbit from the ecliptic
- ε = eccentricity, the deviation of the elliptical orbit from a circle
- a = semi-major axis, the average distance from the sun

Note that perihelion is the point in the orbit closest to the sun, and epoch is a date selected for convenience and used for all objects that year.
For a comet, the time of perihelion T and the perihelion distance Q may replace M, epoch and a.
Seeing the situation in a diagram may help:

It's not critical that you know how to use these elements to calculate positions in the sky, but you may have to input these values or use them on occasion and its helps to know what they are and why they are used.



Other important things to know include atmospheric phenomenon and transient apparitions. The zodiacal light and gegenschein are among the effects that may interfere with observing or imaging but are also amazing to see visually. And you will be best served if you know when there will be a meteor shower and how comets appear in the sky, how they travel and what to expect when you observe them.

Equipment Selection and Methods

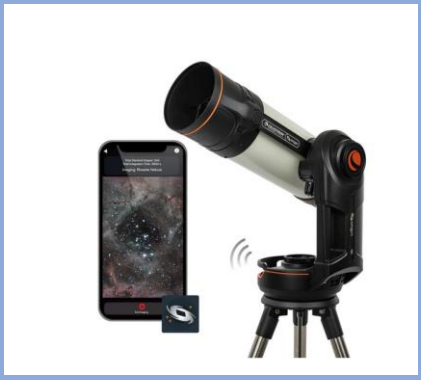
But choose wisely, for while the true [scope] will bring you [the sky], the false [scope] will take it from you. Grail Knight (sort of)

Of course, each type of optical and camera assembly will have individual requirements, but to determine the best setup for your interest, it would be good to know how all equipment works including the different types of telescopes, the different types of cameras and mounts, and how they all work together to provide images. Or, if you are staying with only visual observations, it will be critical for you to know how telescope operates and what eyepieces, filters, etc. are needed for best results.

Planetary, lunar, solar, and deep sky observing all have different requirements for equipment and you would be best off to know how these different targets respond to different equipment. There are also subtle differences in how you observe each type of object and having a better understanding of this will aid you in either imaging or visual observation.

In addition there are also highly specialized observing methods for occultations, photometry, astrometry, and spectroscopy. Additionally, some amateurs track satellites either visually or by radio, and radio astronomy can be done by amateurs to study all sorts of objects that have their best view in that part of the spectrum. Most of this equipment is at least moderately difficult to setup, much of it requiring the user to build or modify the standard equipment.

High End Equipment and No End Knowledge



Origins Observatory by Celestron

Recently, smart scopes like the Celestron Origins Observatory have been developed to rid the user of any need to know where they are, what time it is, and allow a minimal setup, running the scope from their smartphone. This makes observing automatic to the point of nearly point and click. Very useful, but it is easy to ignore learning all the basic knowledge I described earlier and just start cold.

Good Idea – But How Do I Learn?

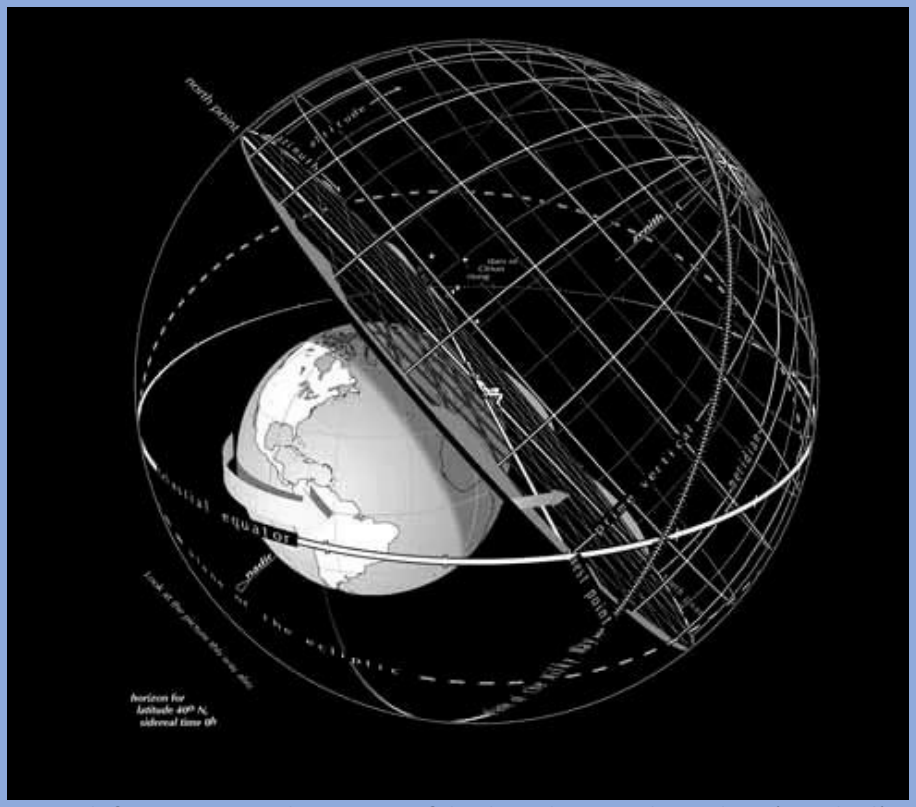
"I am always doing that which I cannot do, in order that I may learn how to do it." - Pablo Picasso

So, I have pushed you to learn about these subjects, especially the basic ones about how the sky works, the constellations, and the coordinate systems used. I believe this would be a huge help in whatever equipment and type of targets you choose. So, the question is, how are you supposed to learn these concepts?

Open universities provide free classes on many astronomy subjects. For instance, https://www.classcentral.com/subject/astronomy?free=true&free-certificate=true list free on-line classes, showing the provider, subject, and workload. Some even provide a certificate.

There are several websites that provide free projects and lessons for homeschoolers, such as https://skyandtelescope.org/homeschool-resources/. There is no reason why anyone else should know you are using these, and they do explain the concepts well, especially the items intended for high school students.

The curriculum posted to my website has books that I thought would be useful and probably still are. Some of them were published a while back so there may be later additions or more modern treatises on these things but many of the basics have not changed, such as constellations and the movements of the stars and planets.



Example from Astronomical Companion of sky above the person laying down (in Turkey?)

Newer ones that come to mind are Guy Ottewell's Astronomical Companion, and The Stars: A New Way to See Them, by H.A. Rey. When you start to view more challenging objects in the deep sky, David Levy has written several good guidebooks for specific types of objects, as has Steven O'Meara.

Close the Book and Laptop

Using these books and courses will help you start out, but when you have a chance, it is most useful to spend time under the sky. Even on nights that don't merit using the telescope, working out how these fundamental concepts of star rising and setting, the motion of the planets, or just the glow of the sunset all around the horizon is an investment in knowing the sky.

Observing with and talking to some of the other people in your club may help you to work through learning about these useful subjects. Don't be embarrassed to ask even the simplest questions; someone there will be willing and able to help or know who can.

Electronically aided astronomy (EAA) and the other devices that simplify seeing the universe are a wonderful leap in technology to jump start people into observing and imaging without much initial effort. But I tend to believe that putting in that effort to learn the basics has made me a better amateur astronomer. Learning the basics would probably be very useful to anyone using any technology to do amateur astronomy today. And I can assure you that it will make you enjoy the night even more.

Astronomy in the News

This is a selection of astronomy related news articles that come to my attention is recent weeks. I tried to select ones that seem credible but cannot vouch for complete accuracy.

Arecibo's Powerful Radar May Have Contributed to the Telescope's Demise
https://skyandtelescope.org/astronomy-news/arecibos-powerful-radar-may-have-contributed-to-the-telescopes-demise/

CHARA close-up observations of Polaris, the North Star | BBC Sky at Night Magazine
https://www.skyatnightmagazine.com/news/polaris-north-star-chara-observations

Event horizon telescope captures the highest-resolution black hole images from Earth
https://www.thebrighterside.news/post/event-horizon-telescope-captures-the-highest-resolution-black-hole-images-from-earth/

Astronomers discover one of the fastest-spinning stars in the universe
https://phys.org/news/2024-10-astronomers-fastest-stars-universe.html

One of humanity's best telescopes snapped a stunning image of deep space | Mashable
https://mashable.com/article/galaxies-space-telescope-images-gemini-observatory

Curiosity rover provides new insights into how Mars became uninhabitable
https://phys.org/news/2024-10-curiosity-rover-insights-mars-uninhabitable.html

A possible explanation of the double peaks in solar cycles | HMI Science Nuggets
http://hmi.stanford.edu/hminuggets/?p=2685

NASA's Hubble, Webb Probe Surprisingly Smooth Disk Around Vega - NASA Science
https://science.nasa.gov/missions/hubble/nasas-hubble-webb-probe-surprisingly-smooth-disk-around-vega/

Largest Commercial Satellites Unfurl, Outshining Most of the Night Sky
https://gizmodo.com/largest-commercial-satellites-unfurl-outshining-most-of-the-night-sky-2000516738

Treasurer Report
Cathy Grounds

As of Nov. 30th, 2024, we have 179 members with 49 new members so far this year! Please welcome our newest members Ethan Guenther and Tyler Tollette, Gary Gray, Chris Taylor

Accounts as of Nov. 15th, 2024:

Checking: $ 2,755.56
Savings: $ 5,440.15
Investments: $38,610.87 (fluctuates with markets).

Don't forget these EASY METHODS of Joining or Renewing your membership:

ONLINE - JOIN or RENEW memberships using ANY MAJOR CREDIT CARD
Transactions are processed through PayPal, but you DO NOT need a PayPal account.
A modest processing fee is added to online transactions.

MAIL IN a check or money order to Astronomy Club of Tulsa, PO Box 470611, Tulsa, OK 74147

PAY CASH at any club event or swipe a credit card (there is roughly a 3% card service charge).

To start click the JOIN / RENEW TAB -https://www.astrotulsa.com/join and fill out the registration forms. Submit them online, mail them in or bring them in person.

Membership rates are as follows: All memberships include Astronomical League Membership.

REGULAR: $ 50 per year
SENIOR: $ 40 per year - 65 or older
STUDENT: $ 40 per year
Additional Family membership $ 30 per year

See Full Description of Membership types at ACT Membership Bylaws

As always if you have any questions or concerns or if your contact information (Email, Phone or Postal address) has changed please email me: AstroTulsa.Tres@gmail.com

MAGAZINE SUBSCRIPTION RATES 2024 updates

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To learn about Astronomy magazine see their home page
Use this **Astronomy Subscription Link** **Digital $ 39.95 Print & Digital $ 49.95** no club discount

December - Skies to Stars -The Christmas Star

By Ed Downs – Ed Writes for a national magazine called "*In flight USA*"

The Holiday season offers a huge number of both aviation and astronomical topics to write about. **From the aviation standpoint, gift giving is made easy. Pilots will love anything that has to do with** their flying activities or cherished flying machine. We are an easy "gift buy" group. Astronomy also has a firm connection with the Christmas season, with the Star of Bethlehem (the Christmas Star) playing a major role in virtually every aspect of Holiday decorations, lore, and tradition. The biblical reference in Mathew 2:2 begins our tradition of "the Star in the East" and the holy journey of the three Magi, referred to as "The Three Kings" in late medieval times. It would be hard to imagine the Christmas tradition without this celestial miracle. A quick search in this writer's biblical concordance comes up with no less than 10 references to the stars. And it must be remembered that many biblical historians believe the Magi were astrologers, skilled in many arts and sciences, having familiarity with the prophecies of Daniel. While today astrology is considered as a completely different subject than astronomy, they were once one and the same, and perhaps the oldest of all scientific understandings by ancient civilizations. Indeed, the stars are an integral part of the Holiday season.

As an amateur astronomer, this writer recalled continuing work being done to try and verify, scientifically, that the Star of Bethlehem existed in a physical sense that can be verified through the science of astronomy and astrophysics. This writer is intrigued by such research and a great fan of biblical archeology, but my research disclosed that I was treading on disputed ground. To millions, the reality that the "Star" was a miracle contained in the Word is absolute proof of its existence. Elements of the Christian faith even disagree as to meaning of the "Star." To challenge faith-based views with physical evidence is, in fact, insulting and upsetting. It is not the intent of this writer to do either. But, as a Christian with a telescope, this writer cannot help but look to the heavens in admiration of a God that created everything in an instant. Astrophysicists know this as the "singularity" while we common folk think in terms of the "Big Bang."

Those who search for the Star of Bethlehem run into a variety of challenges. The calendar, as we know it, did not exist, and competing calendars flourished. The precise historical birthday of Jesus is not known. Our current celebration was established centuries after the Crucifixion. Astronomers (astrologers?) of the time did not have hard drives into which data could be stored, and scientific records that might have existed were destroyed when the remarkable documents contained in the Library of Alexandria were lost through a series of devastating wars covering a period of nearly 600 years. But today's computers can roll back time. We can see that the time of Christ's birth did contain some unusual conjunctions of planets, especially between Jupiter and Venus, meaning they were so close together that they may well have appeared as a single, new, bright "Star." This conjunction would have appeared in the constellation Leo, known as the "Lion of Judah," long associated with the coming of a King. A passing comet could certainly have been viewed as the "Star" and may have seemed to have stayed in one position, but comets were traditionally viewed during ancient times as "the coming of bad things" and not likely to be associated with such a holy event. Additionally, records that do exist make no mentions of a comet, something that would have "made the 10:00 news" of the day.

It is interesting to note that Chinese records (avid and skilled astronomers) of the time do speak of a sudden bright light in the sky that lasted for months. This could well have been a supernova, the sudden and explosive death of a star. A supernova occurs when a star's central thermonuclear core burns out or runs out of fuel. The core shuts down suddenly and the enormous mass of the star collapses in on itself. The unimaginable heat and energy caused by this collapse creates an enormous explosion that is billions of times brighter than our own sun. This would most certainly have been observed in all parts of the ancient world and recorded. But only Chinese accounts survive. One might think that the explosive death of a star is hardly a good omen for the birth of a Savior but think again. The death of a star is actually a birth! The heat and energy expelled by a single supernova causes massive molecular changes to occur within its own atomic structure, creating every known chemical element. These elements are cast out into the universe as building blocks for new stars, planets, and life forms, like us.

Speculation persists, but for this amateur astronomer, a look through my telescope is all that is needed to fire up the imagination. Imagine you are standing on the shore of the Sea of Galilee, looking into the night skies with a powerful telescope. Your view falls upon a beautiful open star cluster known as M22, 2000 light years from earth. With thousands of stars huddled together by gravity, it is now known that at least some of those stars will have planets, and one of those planets might have an advanced life form that is looking back at you at that very moment. But you would not see them looking back, because the light from that planet took 2000 years to reach you, so you would see their living history, in real time. And they would not see you but would see our planet's living history as it was 2000 years ago. Our M22 friends might see a big gathering on the shores of a lake, with a man in a robe serving fish and bread, followed by a speech from a mount. They would see this in real, living, time. And imagine, He was the only one in that crowd that knew we would be celebrating His birthday, over 2000 years later. ***Happy birthday, Jesus.***

Just a bit of added information to Ed's article *by John Land*

The Star of Bethlehem is a popular topic at planetarium shows this time of year. One to the better articles on the subject I have read is a Dec 1996 article from Hillsdale College newsletter Imprimis ***https://imprimis.hillsdale.edu/the-star-of-bethlehem/***

The depiction of the Christmas star as having a long tail does perhaps have an astronomical link. Early Italian Renaissance painter Giotto di Bondone. in his painting Adoration of the Magi. Painted the star of his nativity scene with a long-tailed comet. He had observed Halley's Comet in 1301 and was inspired to depict it as the star of Bethlehem. The European spacecraft Giotto flew within 370 miles of Comet Halley's nucleus in March 1986 ***http://en.wikipedia.org/wiki/Giotto_(spacecraft)***

Some interesting planetary alignments as seen from Jerusalem
On the evening of June 17, 2 BC Venus and Jupiter were within 9 arcsecs (1/400) of a degree apart. So, close it would have been impossible to tell them apart without a telescope. And firmly in the center of Leo – a constellation associated with royalty. There are several biblical references to The Lion of Judah. They returned to a close conjunction on Oct 14 in the morning sky about 1.5 degrees apart. Followed by another even closer conjunction on evenings of Aug 20 and 21, 1 BC ½ degree each other. During the day on the on Aug 20 they passed within 1/10 of a degree of each other.

Jupiter and the star Regulus in Leo went through a series of 3 conjunctions.
On Sept 14, 3 BC Jup. & Reg. at dawn. Feb 17, 2 BC Jup – Reg – Full moon within 1.5 deg at dawn and May 9, 2 BC Jup – Reg – Crescent moon Evening. *(**Note**: Dates are in our present calendar system. The Julian Calendar used at the time is 13 days off from our present Gregorian Calendar)*

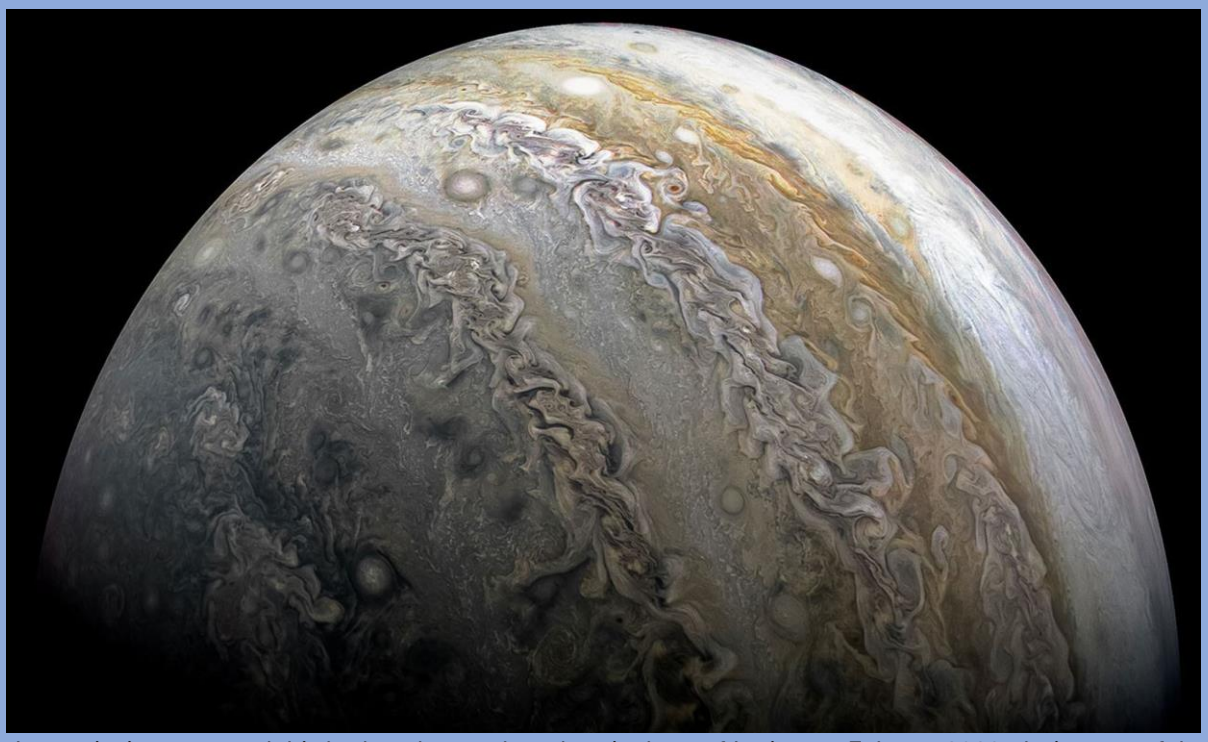
Personally, I don't think a planetary alignment explains what the "Wisemen" saw. The planets were well known by many cultures including Jewish. The Jewish faith does not worship the celestial objects such as the sun or stars as was common in some other cultures. Therefore, the Bible has only a few celestial references to constellations of Orion, Pleiades, Bear and Twins. Whatever they saw it was likely something that a person well versed on the night sky might have seen as significant. Much like many discoveries of Nova and Comets are made by vigilant observers today.

By John Land

December's Night Sky Notes: Spot the King of Planets

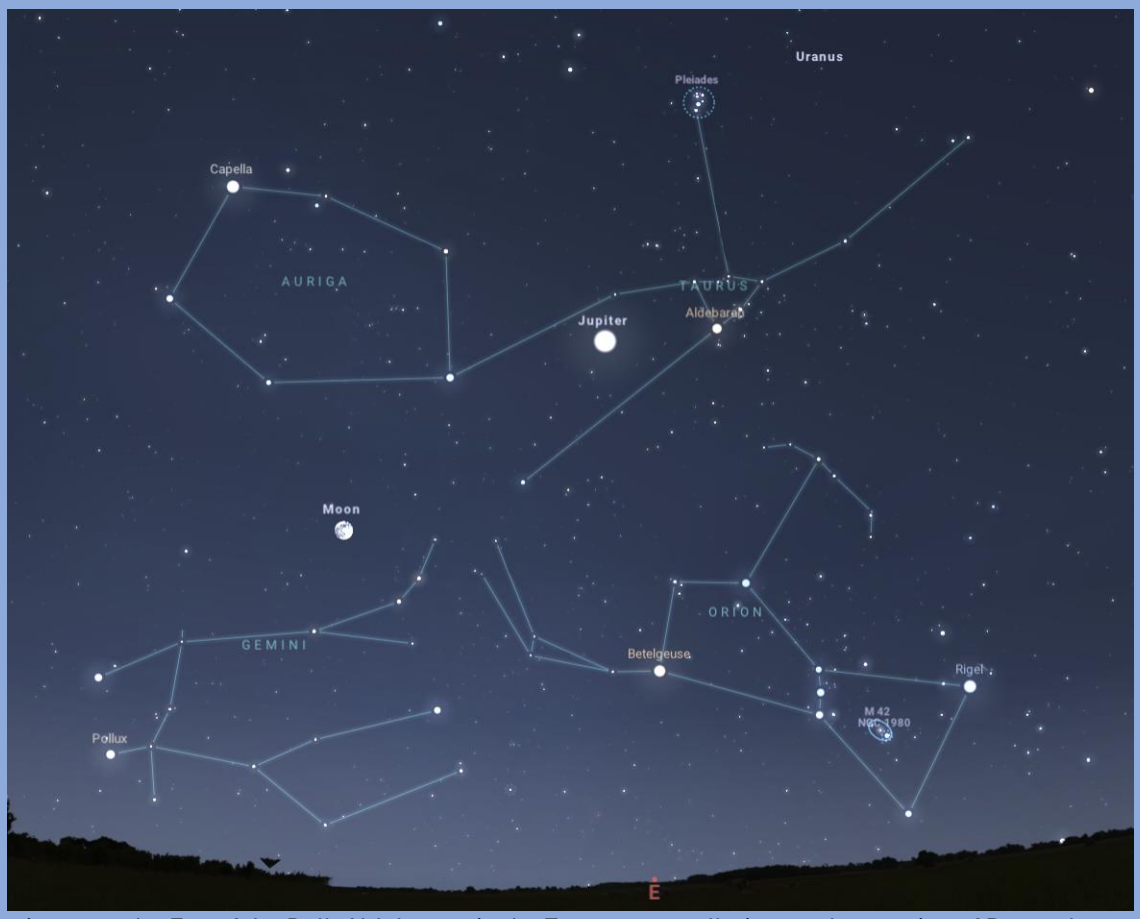
By Dave Prosper Updated by Kat Troche

Jupiter is our solar system's undisputed king of the planets! Jupiter is bright and easy to spot from our vantage point on Earth, helped by its massive size and banded, reflective cloud tops. Jupiter even possesses moons the size of planets: Ganymede, its largest, is bigger than the planet Mercury. What's more, you can easily observe Jupiter and its moons with a modest instrument, just like Galileo did over 400 years ago.



NASA's Juno mission captured this look at the southern hemisphere of Jupiter on Feb. 17, 2020, during one of the spacecraft's close approaches to the giant planet. This high-resolution view is a composite of four images captured by the JunoCam imager and assembled by citizen scientist Kevin M. Gill. Credit: NASA, JPL-Caltech, SwRI, MSSS | Image processing by Kevin M. Gill, © CC BY

Jupiter's position as our solar system's largest planet is truly earned; you could fit 11 Earths along Jupiter's diameter, and in case you were looking to fill up Jupiter with some Earth-size marbles, you would need over 1300 Earths to fill it up – and that would still not be quite enough! However, despite its formidable size, Jupiter's true rule over the outer solar system comes from its enormous mass. If you took all of the planets in our solar system and put them together, they would still only be half as massive as Jupiter all by itself. Jupiter's mighty mass has shaped the orbits of countless comets and asteroids. Its gravity can fling these tiny objects towards our inner solar system and also draw them into itself, as famously observed in 1994 when Comet Shoemaker-Levy 9, drawn towards Jupiter in previous orbits, smashed into the gas giant's atmosphere. Its multiple fragments slammed into Jupiter's cloud tops with such violence that the fireballs and dark impact spots were not only seen by NASA's orbiting Galileo probe but also by observers back on Earth!



Look for Jupiter near the Eye of the Bull, Aldebaran, in the Taurus constellation on the evening of December 15, 2024. Binoculars may help you spot Jupiter's moons as small bright star-like objects on either side of the planet. A small telescope will show them easily, along with Jupiter's famed cloud bands. How many can you count? Credit: Stellarium Web

Jupiter is easy to observe at night with our unaided eyes, as well-documented by the ancient astronomers who carefully recorded its slow movements from night to night. It can be one of the brightest objects in our nighttime skies, bested only by the Moon, Venus, and occasionally Mars, when the red planet is at opposition. That's impressive for a planet that, at its closest to Earth, is still over 365 million miles (587 million km) away. It's even more impressive that the giant world remains very bright to Earthbound observers at its furthest distance: 600 million miles (968 million km)! While the King of Planets has a coterie of 95 known moons, only the four large moons that Galileo originally observed in 1610 – Io, Europa, Ganymede, and Calisto – can be easily observed by Earth-based observers with very modest equipment. These are called, appropriately enough, the Galilean moons. Most telescopes will show the moons as faint star-like objects neatly lined up close to bright Jupiter. Most binoculars will show at least one or two moons orbiting the planet. Small telescopes will show all four of the Galilean moons if they are all visible, but sometimes they can pass behind or in front of Jupiter or even each other. Telescopes will also show details like Jupiter's cloud bands and, if powerful enough, large storms like its famous Great Red Spot, and the shadows of the Galilean moons passing between the Sun and Jupiter. Sketching the positions of Jupiter's moons during the course of an evening – and night to night – can be a rewarding project! You can download an activity guide from the Astronomical Society of the Pacific at bit.ly/drawjupitermoons

Now in its eighth year, NASA's Juno mission is one of just nine spacecraft to have visited this impressive world. Juno entered Jupiter's orbit in 2016 to begin its initial mission to study this giant world's mysterious interior. The years have proven Juno's mission a success, with data from the probe revolutionizing our understanding of this gassy world's guts. Juno's mission has since been extended to include the study of its large moons, and since 2021 the plucky probe, increasingly battered by Jupiter's powerful radiation belts, has made close flybys of the icy moons Ganymede and Europa, along with volcanic Io. What else will we potentially learn in 2030 with the Europa Clipper mission?

Find the latest discoveries from Juno and NASA's missions to Jupiter at science.nasa.gov/jupiter/

Originally posted by Dave Prosper: February 2023
Last Updated by Kat Troche: November 2024

News Update
November 21, 2024

Straight out of science fiction: NASA's Juno spacecraft captures image of a dolphin on Jupiter's surface

See Article at
Dolphin Image on Jupiter

You are invited to come join us to learn more about
Astronomy and view the wonderful sights in the night sky.
Check the EVENTS section at https://www.astrotulsa.com/

During the school year our club holds a
Monthly General Club meetings at
Jenks Public Schools Planetarium
105 East B St, Jenks, OK
Located North of the intersection of
1st and B St

Meetings begin at 7:00 PM

When you enter the building lobby,
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Click for Google Map Link

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Features: classroom, restroom, dome with 14-inch telescope and an acre to set up your telescopes.

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***** Groups need to make separate arrangements.

MEMBERS OBSERVING NIGHT usually on a Friday near new moon
Reserved for club members and their families to allow them to pursue observing projects.
The Observatory is ONLY OPEN for SCHEDULED EVENTS.

Check the EVENTS section at https://www.astrotulsa.com/
Follow our map directions DO NOT USE GPS

Two Options for travel to the observatory

MOSTLY PAVED ROADS – Hwy 75 to 201st St S – through Mounds OK

Most DIRECT ROUTE – Hwy 75 to 241st St S – some coarse gravel & dirt roads

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