



OBSERVER

February 2023

Bringing Stars to the eyes of Tulsa
since 1937 Editor - John Land



Images of Comet C/ 2022 E3 ZTF

Top: Justin Faulk – Ninety 30 second subs with a Skywatcher 72ED, field flattener and Pentax K-1

Bottom Left: Don Bradford Fifty 5 second exposures, live stacked (50 images)
by ASIAir Pro software with his ZWO ASI294MM camera using a 102mm refractor

Bottom Right: Don Sailing – “got 112, 30 second exposures of which my software would only accept 38 for a total expose time of 19 minutes. PixInsight’s Comet Alignment”

Photos taken on Jan 27. At the time of the photo the comet’s head was facing Earth with the tail fanned out behind it so that we are seeing it mostly edge on. See <https://apod.nasa.gov/apod/ap230127> .html for explanation of the comet orbit plane crossing.

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Astronomy Club Events Check our website AstroTulsa.com events section for updates

Astronomy Club Meeting - Friday Feb 3 - 7:00 PM - IN PERSON club meetings.

At Jenks High School planetarium 105 E B Jenks OK - Guests Welcome



Our main program will feature a Zoom presentation with Richard Stember founder of [Science Heads Inc.](http://ScienceHeadsInc.com) in California.

Their goal is to Support STEM Education and Raise Science Literacy.

Science Heads Inc. is currently building a Mobile OBSERVATORY (MOBS) here in Tulsa - similar to the one that they built for southern California. When completed this spring the organization plans to take the Tulsa MOBS to local schools, libraries, museums, and other public venues with the goal to inspire local students and generally raise science literacy in the community. It will feature an 11-inch Celestron main telescope along with a Coronado MAX 2 H-alpha scope for safely observing the sun. He will be sharing how you can volunteer to be part of this effort.

Observing Chairman Brad Young plans to demonstrate how to set up a telescope in preparation to help people at our upcoming Telescope Workshop Feb 25

Observatory Stargazing Nights

Saturday Feb 11 5:30 to 10:00 PM **Guest and Members Night** -
Guest requested to RSVP - Gates Open near sunset

Friday Feb 17 6:00 PM **Members Only night** * Gate opens after sunset
Open to members and their immediate family

Astronomy Club Meeting - Friday March 3 - 7:00 PM - IN PERSON club meetings.

At Jenks High School planetarium 105 E B Jenks OK - Guests Welcome

Saturday Mar 11 6:00 to 10:00 PM **Guest and Members Night** -
Guest requested to RSVP - Gates Open near sunset

☹ **Sunday March 12 Daylight Savings Time Begins** ☹

Friday Mar 17 7:00 PM **Members Only night** * Gate opens after sunset
Open to members and their immediate family

Saturday Mar 18 Tentative Date for club Messier Marathon
Open to our members Details to follow later.



Saturday Feb 25th TELESCOPE 101 WORKSHOP 10:30 AM to 1:30 PM
at Tulsa Air & Space Museum [See Registration Details](#)

We are planning a Workshop for New Telescope owners or those who have one gathering dust and want to know how to use it. You can sign up to bring your telescope for a 30 minute session with one of our experienced Astronomers helping you understand the basics so you can get out and enjoy the stars. Please register no later than Feb 23^d



See our new [Telescopes & Astro Equipment Sale](#) Page

Our club frequently gets inquires from members or the public who have astronomical equipment they would like to sell. I am trying an experiment to create a page that can be updated occasionally as new offers come in. If you have items to sell, send a picture, contact information and information to Tulsaastrobiz@gmail.com If you have a particular item you are looking for you might try our page. This page is intended for equipment that can be acquired in the Tulsa area.

President's Message John Land



I hope your new year has started off well and you have been able to take advantage of a few warmer January nights for observing. Comet 2022 E3 ZTF has given us some added incentive to get out binoculars or telescope for viewing. Its been a bit of a challenge from my house since I had to wait until after 2:00 AM for it to clear my tall tree. Several people came out to the observatory Jan 27th to get a chance to see it. See some images by our members on the cover page.

Our MidStates Convention planning team has been busy making plans for us to host regional clubs June 9-11 convention here in Tulsa. We have a Keynote speaker lined up from Univ of Arkansas to talk about his work with gravitational waves. We have been given access to make up our own website promoting the convention. After much searching we have found an affordable space to hold the main banquet and narrowed down options for catering services. We also worked on a general schedule concept for the flow of presentations.

There is much more to be done to prepare to show off our club to our sister clubs. The observatory will need some work days to get everything all *Spic-and-Span*. Our committee will be assembling welcome packets to introduce guest to attractions around Tulsa. Snacks and beverages displays will be needed. Decorations for our Keynote speaker banquet. Volunteers to help with registration and welcoming guests as they arrive. Setting up telescopes at the observatory on the opening night. Some I am asking all our members to consider how they can volunteer to make our 2023 Convention a most memorable event for our guests.

The February 25th annual Telescope Workshop at the Tulsa Air and Space Museum is only 4 weeks away. It is always fun to meet new telescope owners and show them a few tips for assembling and learning to observe with their telescope. We are hoping for at 50 or more guests eager to learn about their telescopes and hopefully more about our club.

Finally our Zoom speaker Richard Stember will be telling us about the Mobile Observatory project coming to Tulsa. He is looking for local volunteers to help with taking this wonderful STEM education exhibit to schools, parks and other places to share our enthusiasm for astronomy.

So you can see it is going to take many dedicated volunteers to pull all this together. To volunteer contact astrotulsa.pres@gmail.com

Let us continue our 85+ years of

"Bringing Stars to the Eyes of Tulsa since 1937"

John Land - President

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/>



Click on these images
to links on the Internet



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/>

February - Moon Phases -- Full Feb 5 -- 3rd Q Feb 13 -- New Feb 20 -- 1st Q Feb 27

February planets. Sadly, **Saturn** is no longer visible in our evening sky. I reached superior conjunction behind the Sun on Feb. 16th. **JUPITER** will remain visible in the SW sky for another couple of months before it too passes behind the Sun on April 11th. (See the NSN article later in the newsletter) You will have to rise early before dawn this summer to enjoy views of these gas giant planets. **VENUS** however will dominate as our bright evening star until its Inferior Conjunction between us and the Sun on August 11th. Venus is best observed in bright evening twilight due to its intense brightness. A lunar filter or such will help see it better. If you are new to planet observing, observe it making sketches of its shape at 80 to 100 X every couple of weeks. Then you also can affirm with Galileo that it surely must revolve around the Sun and not the Earth. **MERCURY** can be seen low in the SE sky just before dawn. You'll likely need to use binoculars to search for it. The MOON has a nice pairing with Jupiter and Venus on the evenings of Feb 21 & 22 then slip past Mars on Feb 27th. Jupiter and Venus have a close pairing with the moon the evening of March 2nd.



Comet ZTF (C/2022 E3) has been in the news and on the internet this past month. It made its closest approach to the Sun (perihelion) Jan 12. It made its closest approach to the on February 1, 2023, at a distance of 0.28 AU. Unfortunately, the first week of February is also Full moon week making the background sky bright. Observations reports from dark sites report it at about 5th magnitude. During the last week of January, it was circumpolar as it passed by the Little Dipper. From my location in east Broken Arrow, I could identify it rather easily in binoculars.

The cloud of luminous gases surrounding (its Coma) appears as a fairly large fuzzy disk of light. Not color or tail was visible in my 4th mag sky. In my 8" scope I could see a brighter central region of the Coma and maybe a hint of tail with averted vision. For a rough frame of reference, it appears about the same apparent size of the Orion nebula with binoculars.

Look for it within two degrees on the star Capella on Feb 5th, close to Mars Feb 10th and 11th and then Aldebaran in Taurus on Feb 14. Unless something spectacular happens, it will be 7th Mag in the middle of February and drop to 8.7 mag by the end of the month. Imagers may be able to follow it another month or so as it recedes to its distance home in the Oort cloud.



During winter months the Kalamazoo Astronomical Society puts on a Live Two-Hour Remote telescope viewing from its observatory in Sky Village Arizona. Using a Wide Field 5" Takahashi scope and a 20" Plane View RC scope. The host, Richard Bell, gives a delightful running commentary on the objects being view and other topics. (Times given are EST time zone)

To participate register in advance at Zoom link <https://www.kasonline.org/schedule.html>

Next Viewing Session Feb 11 Cloud out dates on Sunday

Editor Introduction: Many of you may remember a kid's TV show and video game called "**Where in the World is Carmen Sandiego**" The object of the game was to search out clues to discover what part of the world she was in. It was a great geography – culture education tool. I often enjoy looking a beautiful panoramic photos on Astronomy Picture of the Day [APOD](#) and try to identify stars and constellations in the images. Member Dana Swift has enjoys using computer software to discover the exact location of an object in the sky from astronomical images. This can be scientifically significant when tracking the motions of asteroids, comets and faint dwarf planets.

Plate Solvers By Dana Swift

What a plate solver does is attempt to identify the exact celestial source for an astro-photograph. This is also one branch of the science of "astrometry", or positional astronomy.

My first application was determining how my Canon DSLR camera was oriented with respect to the earth. The camera was mounted on a standard photographic tripod, not an astronomy mount. To do this I would take a short time exposure of the sky and then manually match the stars. Too much work! There had to be an easier way. The result I needed was: the pitch, roll, and heading of the camera, as well as the specific field of view. I wanted a program that met my specific needs.

The general approach: Separate stars from the image background, precisely get the image coordinates of each star and its total signal. Create a list of stars found in the image. Sort the list so the brightest stars are first in the list.

The geometry database

The biggest task in plate solving is not solving images, its creating the database of possible solutions to match them with. A small database for wide fields of view may take weeks to create with a computer running 24 hours a day and 7 days a week. Creating a large enough database to meet my needs was a real problem. My computers used so much electricity for so many months that I received notices saying I should consider adding insulation to my house! This is a problem for any plate solver. Generating the database was not free.

Hinted Solvers

A hinted solver must be given some estimate of the image field of view, and nominal location in the sky: look up the expected stars in the area. Correlate the brightest star in the image to the brightest star expected. For each fainter star, does the distance between stars match expectations? This is the general strategy used by most plate solving programs.

During the attempt to correlate a star to the catalog being used there may be no match, as the "star" in may be something else: an airplane, satellite, etc. Most images are simple and have no confusing content, however enough do- it must be handled in a reasonable way. Its also possible that atmospheric turbulence will make a star not show where it is expected, or much more faint.

This strategy usually goes fairly quickly, especially if the original estimate is close to the correct values. Iterate until a solution is found.

Blind Solvers

A blind plate solver receives an image with no idea of the image scale, orientation, or sky location. The solution must be found "blind".

How can that be done? The correct answer involves a great deal of math which I will not review, but the concept is quite simple: find a way to convert any pattern of stars to a simple number that will reliably find the same number for the same pattern without regard for rotation or scaling.

As an over-simplified approach to illustrate the concept: take the three brightest stars in the list and think of them as a triangle. Starting with the brightest star and make that the reference point for the triangle. Find the three angles from that triangle, these angles are the same without regard for rotation or scale, so the triangle method can meet the requirements. Take the angles from the two brightest stars and convert them to a number, one scheme could be: multiply the larger angle in whole degrees by 1000 then and add the second angle. With a triangle knowing two angles allows the third angle to be computed, so only two angles are needed. Now a consistent geometric property of the image has been reduced to a single number.

Given a database of all the geometry numbers for the stars that may be matched, look up the number computed from the image and get a list of possible locations where the image may have been taken. This may be millions of possible places for any triangle! Even though this has eliminated a huge number of possible source locations for the image it is still a daunting list to sort through. Each possibility has to be checked against the surrounding stars to eliminate all the places in the sky the image could not have come from.

If only one possible source remains, return the solution. Sometimes there is no solution.

An Improvement

The triangle approach matches so many places in the sky for any given geometry that a database search returns a long list of possibilities. A more efficient method is needed. The on-line plate solver at <https://nova.astrometry.net> uses the four brightest stars in the image to create a single number that can be matched against a database.

Using more than four stars to create a “geometric description number” bogs down if any of the four stars is actually an airplane, or some other non-stellar source. So four stars make a good compromise between the triangle and a five star approach.

The algorithm [astrometry.net](https://nova.astrometry.net) uses is clearly adequate, as the results are very reliable, although a bit slow. I chose to try a different method that makes a geometric description number that usually results in a single entry in the database, helping speed things up considerably. It is also possible there are no matches.

When one or more matches are found in the database, check the surrounding stars to verify a solution, or eliminate that match as being the solution. Repeat..

General summary

Remember my goal was to determine the precise mount for my camera on its tripod, so my program is able to give that result. Now it can do much more- compute exact focal lengths of the optics, generate the same numerical geometric description parameters used in professional astronomy, etc. This data is frequently found in FITS image files after plate solving.

My current plate solver works in two steps, first it loads a catalog of stars into memory, that process takes about three seconds. Then the list of images to be solved is processed in sequence. The solution time for any given image depends on the size of the image. Sometimes its faster to reduce the image size then solve the reduced image, my program allows either approach.

Given a list of images to solve, usually it can sustain solving ten to twenty images per second after the star catalog is loaded one time. So, supposing ten images are being solved, and including three seconds

to load the star catalog- at the end of four seconds ten images have been processed, averaging four tenths of a second each. That has been fast enough for my purposes.

Reliability, yes my program has sometimes given a solution that is wrong. A weakness in my program is when images are full of "speckle" which can be a very overexposed image, or noise. But my program sees these spots as stars possibly confirming the geometry and getting fooled. If the image was created by one of my programs, the overexposure problem is rare, so I have not bothered to strengthen the verification process.

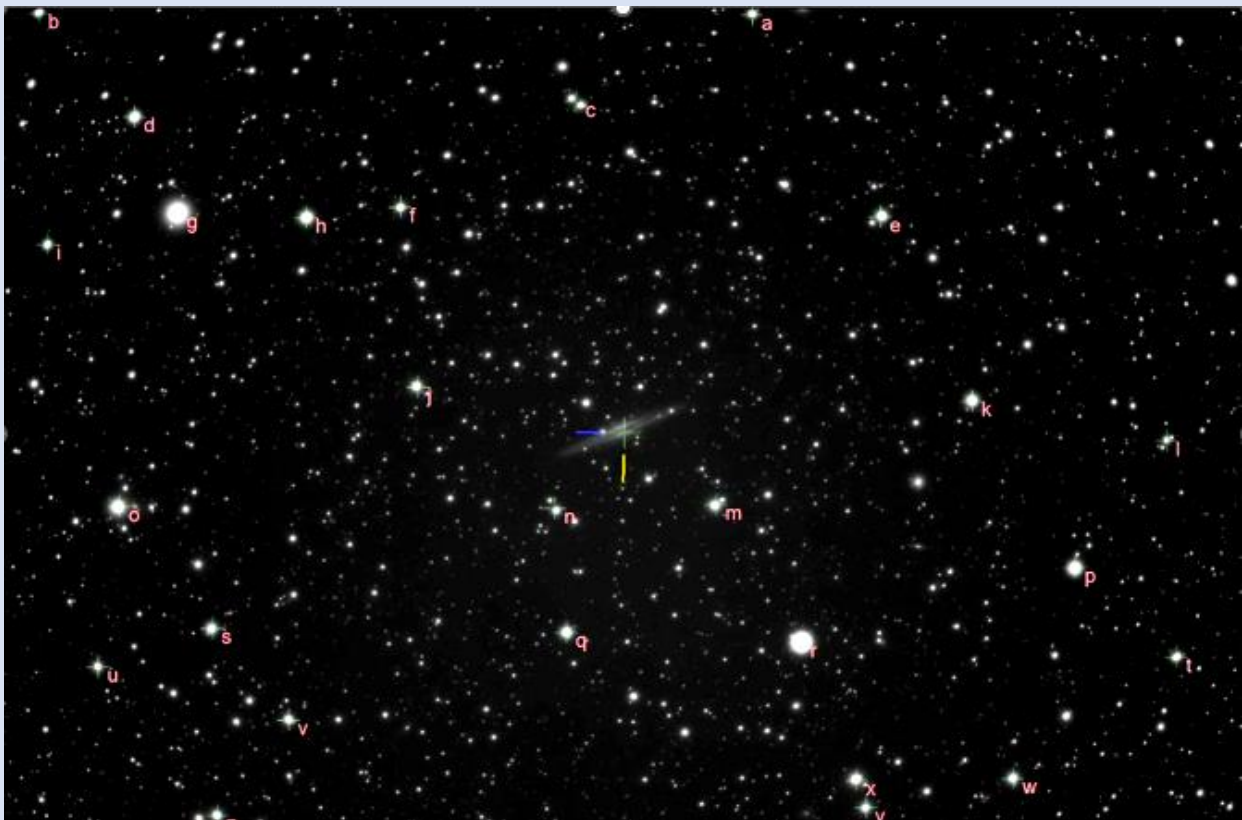
Very narrow fields of view are less likely to be found in the database, one solution is to create a larger database, and that may be a project for the future.

Try plate solving yourself

You can upload any image to the public plate solver provided by the National Academy of Science, it will do a blind or hinted solution. <https://nova.astrometry.net/>

There are several versions of this program that can be loaded onto your personal computer and used locally from SharpCap, which makes a entry point for most folks. This is not the one I wrote, but its free online. For a more extensive article including mathematics contact author [Dana Swift](#)

Give it a try! Dana Swift



The solver creates a table of each star with a letter identifier, correlating that star to its catalog ID number in the UCAC4 catalog, the celestial coordinates of the star and the exact location in the image where the star appeared. The "nPixels" indicates how many pixels were members of the stars image, the signal indicates the sum of all the A/D counts involved with the individual star image.

Note that none of these stars have official IAU names.

Note – Editor altered image contrast and saturation some to enhance letter identifications.

[Your Name Here]-1 by Brad Young

One of the joys of sweeping the night sky is the plethora of lines, figures and shapes seen in the star fields. Many groups of stars that you see aren't among the official constellations and are called asterisms. Some are large enough to be seen with the naked eye, and others show up best in a telescope. Quite a few are listed in books and other references, and you probably know many of them already. For instance, the Big Dipper is an asterism. It's part of the constellation Ursa Major but it's not actually a constellation itself. The shape we see as a dipper has been seen by many cultures over time, and given different names and mythology, but the constellation itself includes more stars, and even another asterism, [3 Leaps of the Gazelle](#).

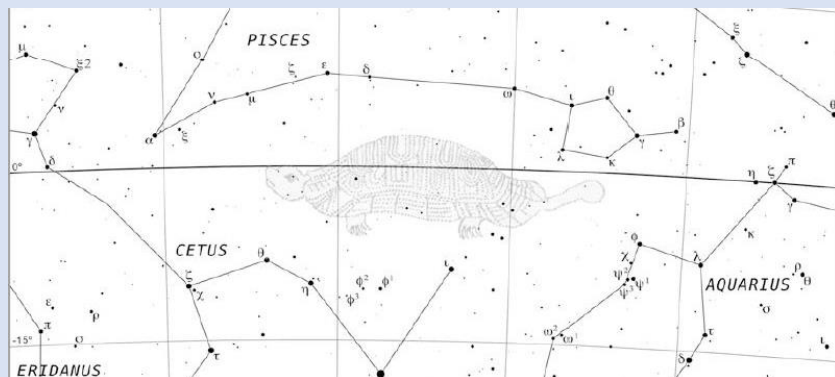
Of course, people see different groups in their own way even today. Asterisms may be generally known or published, part of an obsolete constellation, or unknown (except for in the eye of the beholder). The following examples might encourage you to look for these groups, or sweep along in the sky, making up your own as you see interesting shapes or beauty.

Little Box and Lawn Chair

Over the years, I have found dozens of beautiful little fields and groups and have a few favorites, many from satellite hunting. One is what I call the Little Box. This group of four stars first drew my attention because it is near the First Point of Aries, where the Sun is located at the Spring Equinox. Later, I learned it is also part of an extinct constellation called Testudo, which was shown on star atlases and maps in the West until it was removed with the [adoption of the 88 official constellations in 1930](#). Testudo the Turtle consisted of what I call the Little Box plus a few more stars to the east along the Pisces / Cetus border. The star at the southwest (bottom right) is 30 Pisces.



Little Box



Testudo the Turtle

The Little Box is especially useful to me because geosynchronous satellites flare up and become easy to see in autumn. For my latitude, they appear to pass right through the box during early October. I had noticed it long before my interest in satellites, but now I use it to find them every fall. Now that I know its history, I enjoy it all year long.

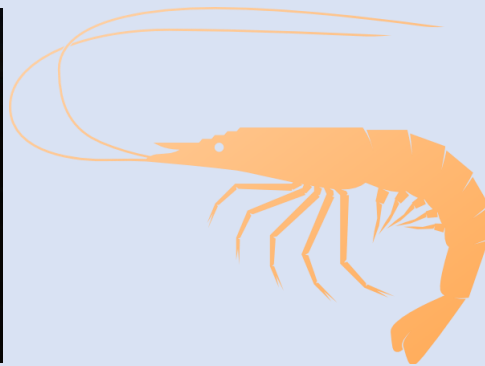
On the other side of the sky, there is a group of 7th magnitude stars at RA 10h 21m Dec -5° in Sextans that looks like a lawn chair, and I use it for the same purpose as the flaring satellites pass right through or right next to it. I like to think it is a stellar version of my lawn chair as I sit and look at it. As far as I can find, this is a “Brad” group – not published by others.



The Lawn Chair

Under the Sea (and Ground)

Other groups abound such as **67, k, u, and 72 Tauri** just above the Hyades. It's a group of four stars that look a bit like a shrimp. This winter, Mars has passed by this group three times during its opposition loop. John Chiravalle includes this as part of his asterism the Fishhook in “Pattern Asterisms”, but I see only this part, and as a shrimp. There are lots of asterisms and [former constellations](#) with this common shape, such as Gryphites (Shellfish), Hippocampus (Sea Horse), Hirudo (Leech), and Patella (Limpet) to name a few.



Shrimp

It also resembles the star cluster Melotte 31, also called the [Flying Minnow](#) that is near AE Auriga, a runaway star (a star with high proper motion) that lights the Flaming Star Nebula. The group is hard to miss on your way to that object. AE Aur is at the upper right, with its nebula, and the bright star at the south end of the Minnow is 16 Aurigae.



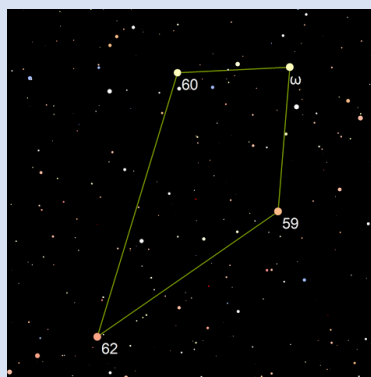
Flying Minnow

All of these resemble Delphinus, the Dolphin, an official constellation which includes its own asterism, [Job's Coffin](#). This asterism is the diamond shape formed by the four bright stars in the head of the Dolphin as shown below.



Snail and a Slice

[Terebellum](#) in southeastern Sagittarius is another group, named by Ptolemy, that is not a constellation itself. It consists of four stars (59, 60, 62, ω Sagittarii) and is near Messier 55. Named for a snail (I don't see it), the Chinese had another idea, and called it Dog Territory. It was included in their [wide collection](#) of groupings in modern Sagittarius.



Source: Wikipedia

Just north of the horns (γ and δ) of Capricornus, is a little group of four or five stars that looks a bit like a slice of pizza. This little group is made up of 42, 44, 45 Capricornus and three others. In 2022, Saturn was moving through it during its opposition. [Classic star charts](#) usually show only 42 plotted (as “d” in this case) and it does not appear to be a known group. And it must be plain cheese, as there are no stars inside the group for toppings.

Note – [some sources](#) list the Summer Triangle as the Pizza Slice, but the original name is well established.



Pizza Slice

There are uncounted other little groups all over the sky – it would be easy to find groups of your own that resemble a bird or a box or some other object that you can easily remember.

Alternate Views

Another way of viewing these groups is to see how other cultures have viewed them, in both location and time. The stars were a fundamental part of the mythology and philosophies of all countries, empires, and even prehistoric tribes. At my website, view information on the [Alternate Constellations Observing Program](#) and see the list of resources there on cultural astronomy. There are [also other programs](#) on Asterisms and the official Constellations to help you enjoy our sky more. You may find your favorite group there, as an obsolete constellation, or an ancient Akkadian warlord.

Build Your Own Catalog

Deep sky objects can hold the same type of individual objects that only you “know about”. One of my favorite sites to see is the dark nebula leading to the Cocoon Nebula in Cygnus. I start by viewing it naked eye (in a very dark sky) and follow with “zooming in” on the nebula itself with the telescope. I don’t know of an official name (“bradding?”) for this sort of observation, but gradually admiring an object’s surroundings with the eye, or binoculars, and then homing in with power and resolution is a great way to view many deep sky sights. And, in a way, that experience is your own, part of a personal catalog.



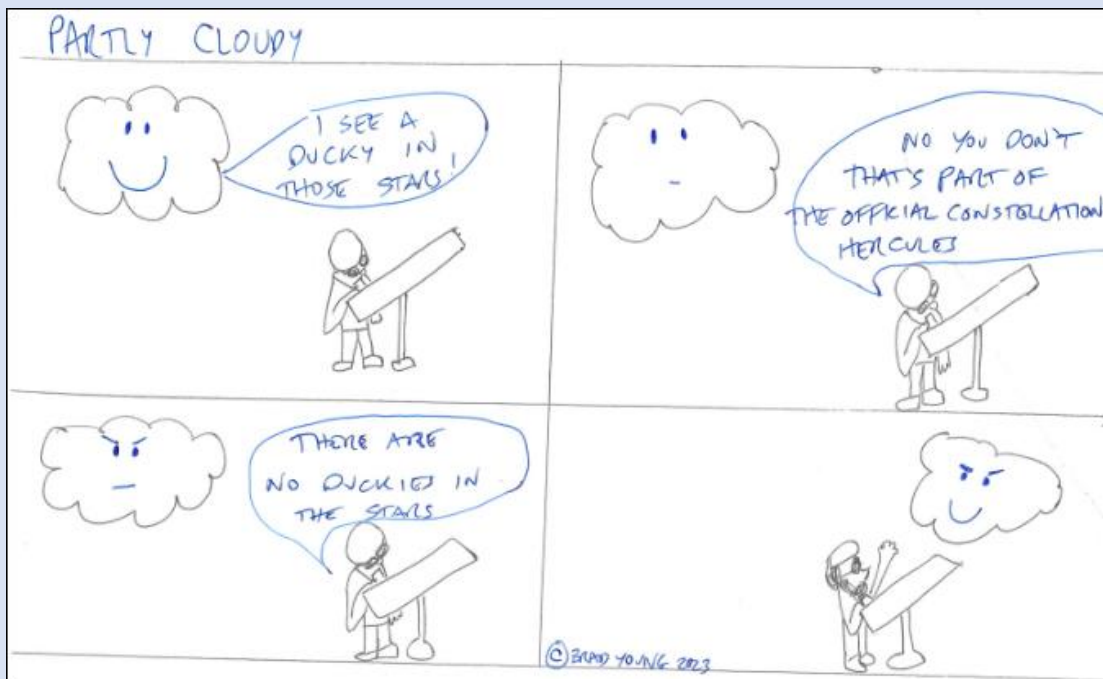
Cocoon Nebula (IC 5146), LDN 1042 and vdB147 in Cygnus
([by Johnathan MacCollum](#))

I learned about this method when I first began observing and discovered the field surrounding NGC 6871 and 6883 along with Biurakan1 and 2 in Cygnus. Although the area contains cataloged open clusters, back then I didn't have good charts (or computer). It seemed to me that the loop de loops, wide double stars, and connecting lines and whorls of stars between all of these objects was something that only I knew about. I returned to that field repeatedly to enjoy the interaction between the clusters and the Milky Way surrounding it.



Sweeping the sky and star fields surrounding a target object is often as rewarding as the target object. There's a lot of interesting stuff out there that may not be cataloged, but it's beautiful nonetheless and near objects that you're looking at anyway. The next time you're observing, look around your object and if there's not a neat clump of wide double stars or a line or circle of colorful field stars. If no one's looking, you can catalog them as **[Your Name Here]-1**.

Note: all sky images are screenshots from Aladin unless otherwise noted.



Resources:

A great source for the history of obsolete and forgotten Western constellations and asterisms is the set of two books by John Barentine listed in the references below. These groups were inserted by early uranographers to fill the “gaps” between the major constellations, and many have colorful histories and stories, as Barentine presents in an informative and entertaining way:

The Lost Constellations, John C. Barentine ISBN 978-3-319-22794-8

Uncharted Constellations, John C. Barentine ISBN 978-3-319-27618-2

<http://www.rocketmime.com/astronomy/fig/UrsaMajor.gif>

<https://en.wikipedia.org/wiki/Constellation>

https://en.wikipedia.org/wiki/AE_Aurigae

<https://www.astroshop.eu/magazine/practical-tips/observation/tours-with-binoculars/non-identical-triplets-and-a-flying-fish/i,1250>

Pattern Asterisms, John A. Chiravalle ISBN 978-1-84628-327-7, p.53

https://en.wikipedia.org/wiki/Omega_Sagittarii

<http://www.orrastrorrawing.com/NGC6871-6883-Biurakan1-Biurakan2.html>

<https://www.astroleague.org/al/obsclubs/AlphabeticObservingClubs.html>

<https://hafsnt.com/index.php/alternate-constellations/>

<https://astronomy.com/magazine/phil-harrington/2020/09/a-dolphins-tale>

[https://en.wikipedia.org/wiki/Dipper_\(Chinese_constellation\)](https://en.wikipedia.org/wiki/Dipper_(Chinese_constellation))

<https://twitter.com/astrogeo/status/1297682343939858432>

[https://www.darkflats.com/Deep-](https://www.darkflats.com/Deep-Sky/Cocoon/Cocoon%20OSC.L3.60x240s.Solved.DBE.BN.CC.NR.HSVR.ArcSin.MS.LHE.DeconStars.LSLHE.MMTNR.MTStars.NR.Draft2.png)

[Sky/Cocoon/Cocoon%20OSC.L3.60x240s.Solved.DBE.BN.CC.NR.HSVR.ArcSin.MS.LHE.DeconStars.LSLHE.MMTNR.MTStars.NR.Draft2.png](https://www.darkflats.com/Deep-Sky/Cocoon/Cocoon%20OSC.L3.60x240s.Solved.DBE.BN.CC.NR.HSVR.ArcSin.MS.LHE.DeconStars.LSLHE.MMTNR.MTStars.NR.Draft2.png)

Editor Note: The February 2023 Sky & Telescope magazine has a nicely illustrated article about constellations invented by Dutch astronomer Petrus Plancius. (1552 – 1622) Petrus created many of the constellations in the then unnamed areas of the southern sky as well as a few voids elsewhere. Sixteen of his constellation patterns have become part of the 88 official constellations adopted by the International Astronomical Union in 1930.

Associate Treasurer Report

Mike Blaylock



As January 23, we had 186 members 4 New members for 2023

We welcome this month's newest members – Ryan Clark, Glen Singer, David Ballard, and Victoria Morse. Hello and welcome to ACT !

Have you changed you Contact Information? Email, Phone, Postal Address ?

Please help us to maintain our records by sending an email to AstroTulsa.Tres@gmail.com

Accounts as of January 23, 2023

Checking: \$ 1,373.04 < * We paid off the \$ 3696 balance on the Observatory Dome project.

Savings: \$ 5,788.78

Investments: \$ 30,199.00 (Value tends to fluctuate with markets).

You can JOIN or RENEW memberships or magazine subscriptions ONLINE using ANY MAJOR CREDIT CARD.

The transactions are processed through PayPal but you Do Not need a PayPal account.

Fill out the registration form at <https://www.astrotulsa.com/join>

Click Submit and you will be given the choice of either MAILING in your dues with a check or paying online with most major credit cards. A modest processing fee is added to online transactions.

Membership rates for 2023 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/join>

MAGAZINE SUBSCRIPTION RATES and PROCESS has CHANGED !

You can get a discount rate as a Astronomy Club member. **However, you will need to do so directly using their discount rate web links.** Both Sky & Telescope and Astronomy have options for DIGITAL as well as PRINT subscriptions.

For club member's Discount subscription rates to [Sky and Telescope magazine](#) go to [this page](#)

For club member's Discount subscription rates to [Astronomy magazine](#) go to [this page](#)

Use the DISCOUNT RATE LINKS above instead of their regular subscription pages to MAKE or RENEW your subscription.

If you need assistance, contact our club treasurer at astrotulsa.tres@gmail.com



This article is distributed by NASA's Night Sky Network (NSN). The NSN program supports astronomy clubs across the USA dedicated to astronomy outreach. Visit nightsky.jpl.nasa.gov to find local clubs, events, and more!

Spot the King of Planets: Observe Jupiter

David Prosper

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.

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 awesome size, Jupiter's true rule over the outer solar system comes from its enormous mass. If you put all of the other planets in our solar system together, they would still only be half as massive as Jupiter. 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 observers back on Earth!

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 around 75 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

NASA's Juno mission currently orbits Jupiter, one of just nine spacecraft to have visited this awesome 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. In 2024 NASA will launch the Europa Clipper mission to study this world and its potential to host life inside its deep subsurface oceans in much more detail. Find the latest discoveries from Juno and NASA's missions at nasa.gov.

Look in the SW for Jupiter and Venus the evening of March 1, 2023 when the two brightest planets pass within 1 degree of each other.

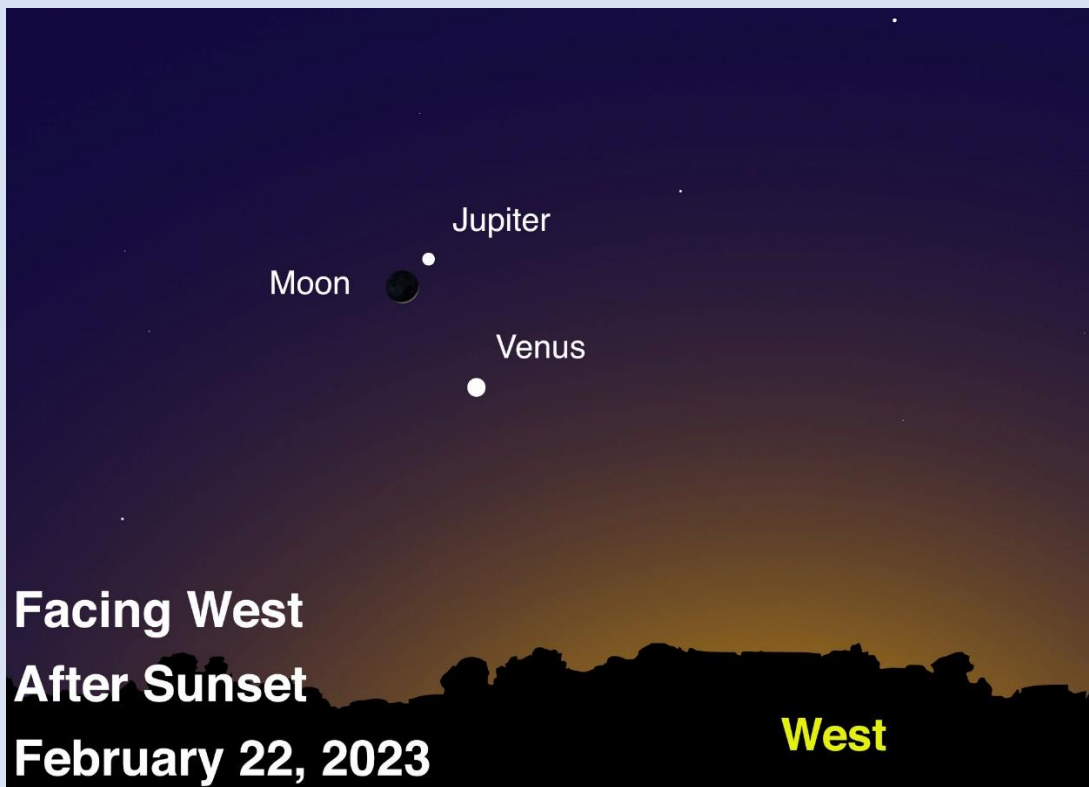




This stunning image of Jupiter's cloud tops was taken by NASA's Juno mission and processed by Kevin M. Gill. You too can create amazing images like this, all with publicly available data from Juno. Go to missionjuno.swri.edu/junocam to begin your image procession journey – and get creative!

Full Image Credit: NASA/JPL-Caltech/SwRI/MSSS; Processing: Kevin M. Gill, license: CC BY 2.0) <https://creativecommons.org/licenses/by/2.0/>

Source: <https://apod.nasa.gov/apod/ap201123.html>



Look for Jupiter as it forms one of the points of a celestial triangle, along with Venus and a very thin crescent Moon, the evening of February 22, 2023. This trio consists of the brightest objects in the sky – until the Sun rises! 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? Keep watching Jupiter and Venus as the two planets will continue to get closer together each night until they form a close conjunction the night of March 1. Image created with assistance from Stellarium.

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**
205 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, take the elevator to the 3rd floor.

[Click for Google Map Link](#)



ASTRONOMY CLUB OBSERVATORY

Located on a hilltop about 25 miles SW of Tulsa
Features: classroom, restroom, dome with 14-inch telescope and an acre to set up your telescopes.

Weather permitting, we host two types of observing nights.

GUEST OBSERVING NIGHT – RSVP requested

This event is open to our Guest – both individuals and families as well as our regular members.

Several of our club members set up telescope for public

viewing.

* 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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2023 [Go to Show Schedule](#)

Click the Date Column to sort them by show date

Most Shows take place on

Tuesday evenings from 7:00 PM to 8:00 PM
a few on Saturday

Do you have ideas for our club In Person or ZOOM Meetings?

Want to share an observing experience or astrophoto.
Know someone 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

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