ASTRONOMY CLUB OF TULSA

OBSERVER

JUNE 2021

Bringing Stars to the eyes of Tulsa since 1937

Editor – John Land

The globular star cluster M13 in Hercules

M13 visible in small telescopes is a popular sky gem. This densely packed sphere contains several hundred thousand stars spanning a region 145 light years across at a distance of 25,100 light years. Its age is estimated at 12 billion years, nearly as old as our galaxy, as is easily seen by its many reddish iron poor first generation stars

Daniel Smith shared this image on our club Facebook page. Check out Daniel's new YouTube series of **Astro Photography** "**How To**" Video's at **https://www.youtube.com/c/zoliroastro**

Imaging telescope Celestron C9.25 Imaging camera: ZWO ASI533MC Pro

Mount: Sky-Watcher EQ6-R Pro

Contents:

Astronomy Club Events

Check our website AstroTulsa.com events section for updates
Observatory ONLY OPEN for SCHEDULED EVENTS. **Click for Observatory Map**
CAUTION: **DO NOT use GPS** it will likely send you on some nearly impassible back roads

For June we are still conducting Members ONLY Events observing nights
However we are working of plans for limited attendace
non-member nights later this summer

READ OUR NEW OBSERVING NIGHT GUIDELINES

Now that many of our members are vaccinated and the CDC guidelines have eased We are modifying Guidelines for Members' ONLY Observatory Nights as well.

The goal is to ensure enjoyment of our hobby while keeping each other safe and well.

Read all the details in the President's message

Friday, June 4, 8:15 PM		**Friday, June 11, 8:15 PM**	
Friday, July 2, 8:30 PM		**Friday, July 9, 8:30 PM**	

Weather Backup observing nights on Saturday

NOTE: If weather conditions are unfavorable or hazardous forecasts predictions our events may be postponed or cancelled. Please check our website before heading out.

ALCON 2021 Thurs Aug 19 thru Sat Aug 21

Register Free at https://www.alconvirtual.org/

The National Astronomical League will be conducting its 2021 Conference in a Virtual format this year using the League's YouTube channel. This will give you a great opportunity to hear top notch speakers and presentations from the comfort of your home. Registered participants will be eligible for some great **DOOR PRIZES** donated by astronomy clubs throughout the country.

A Stellar group of guest speakers are already lined up for your enjoyment. Speakers include:

David Levy - famed comet hunter - discovered 22 comets & authored 34 books.

Jocelyn Bell Burnell - discovered pulsars as a graduate student in radio astronomy in Cambridge, opening up a new branch of astrophysics.

David Eicher is an American editor, writer, and popularizer of astronomy and space. He has been editor-in-chief of Astronomy magazine since 2002.

Conal Richards an impressive up and coming astronomy youth. Founder and president of the Abingdon Heights High School Astronomy Club in Pennsylvania

J. Richard Gott is professor emeritus of Astrophysics at Princeton, known for his work in general relativity and cosmology. In 1991 he discovered an exact solution to Einstein's field equations of general relativity for the geometry around two moving cosmic strings.

Dr. Caitlin Ahrens - Dr. Ahrens gave an inspiring talk at or 2018 Midstate's convention telling of her work with data from the New Horizon's spacecraft and laboratory studies of ices on Pluto. She is now turning her interest toward ices on the moon.

Mark your calendars http://www.okie-tex.com/
Friday Oct 1st to Saturday Oct 9th
Registration Now OPEN - Sign Up Early

The 38th Annual Okie-Tex Star Party is held each year at the far western tip of the Oklahoma panhandle. Astronomy enthusiasts are drawn from all over the nation to revel in some of the darkest sky on the planet. Rated at Bortle 1 - the Milky Way looks like a river of starlight and the Zodiacal light is easily seen.
Check out the details on their website.

Happy Birthday to the BORTLE DARK SKY SCALE 2001 - 2021

The Bortle Scale for rating based on 50 years of observing experience gives astronomers and objective way to measure the sky's darkness.

Bortle 1 - 3 Dark rural skies. Magnitude 6.5 to 7.5 or darker
Bortle 4 - 6 Suburban skies Magnitude 6 to 4.5 or darker
Bortle 7 - 9 Urban Skies less than Magnitude 4.0

Great explanation of the c and star charts to measure your own skies.
https://www.handprint.com/ASTRO/bortle.html

Find your site on a Global Dark sky map then click to get a Bortle estimate.

PRESIDENT'S MESSAGE

BY TAMARA GREEN

Hey Y'all!

It looks like the pandemic is slowly getting under control. More and more of us are getting fully vaccinated. Mask mandates are being lifted. And **Summer is almost here!**

Guidelines for Members' ONLY Observatory Nights have changed as well.
The goal here is to ensure enjoyment of our hobby while keeping each other safe and well.

New Observing Night Guidelines for our members observing nights.

We are still limiting attendance to our membership however you may bring family or a couple of guests with you. - No large groups please.

Masks will not be required when you are outside. However, when you are INSIDE the classroom or viewing in our dome telescope, we request those who are not fully vaccinated to respect others health by wearing a mask. This mask guideline does not apply to younger children. We will leave that to their parent's discretion.

If you decide to join other members at their telescope, we would still advise that you ask their permission. Our Rest Room and Classroom areas are Open.
Please exercise proper hand washing and other common health hygiene practices.

Dress for weather conditions. This is a rural setting so closed toed shoes are recommended. Temperatures in on our hilltop observing grounds are cooler than city forecasts. Jackets may be useful. Please do not spray insect repellents around our telescopes. Do that at your car.

Be sure to review the map directions carefully. When arriving or departing be aware of people or telescopes on the field. _____

We are also going to try to have a Summer Members and family picnic in July or August.
More details will be forthcoming as plans get underway. We also hope to resume our **in Person General Meetings at the Jenks Planetarium again!** Of course, that will depend on policies of the Jenks school system as well. Please be patient with as we evaluation the changing situation.

If Covid restrictions continue to improve we hope to have a few public observing events.
Perhaps a night at the observatory with a cap on attendance numbers. By fall hopefully we can resume our Sidewalk Astronomy. Of course, these plans all depend of CDC health recommendations and everyone doing their part to do the things necessary to keep this Covid crisis under control.

VOLUNTEERS - are needed this summer to help open or close for our members observatory nights. We will need even more of you to help if we are going to be successful with beginning public events again.

The Okie-Tex 2021 Star Party, in far western Oklahoma, is October 1-9 this year. Okie-Tex begins on a Friday this year and runs to the following Saturday morning.
Registration is now open at http://www.okie-tex.com/ Over 100 people have already signed up. Registrations need to be in by Sept 11 **(do yours EARLY)** Also you have to **MAIL IN your Meal reservations** by Sept 11. (the nearest town is 35 miles away !) So read the Okie-Tex page well.

Clear Skies Hope to see you soon

Tamara Green - President

2021 Zoom Meeting Recordings online

May 25 - Preparing for Artemis:
Understanding the Moon's most important resource
Link to YouTube recording https://youtu.be/zfmOcvbLJFg
By 2024, the Artemis program's goal is to land the first woman and next man on the Moon, using innovative technologies to explore more of the lunar surface than ever before. **Dr. Casey Honniball** is a lunar scientist at NASA's Goddard Space Flight Center. Recently her team announced the direct detection of water molecules on a sunlit portion of the moon. You may watch the main program At **https://www.youtube.com/watch?v=BEUok-WqZR8&ab_channel=NASANightSkyNetwork**

April 20 - James Webb Infrared Space Telescope
https://www.youtube.com/watch?v=g7nwFC-xYS8
Introduction sections include an **Update on the Ash dome project**
Tour of useful observing links on our **webiste OBSERVE page**
The main feature is an update by Dr. Kelly Lepo giving the latest on the James Webb Space Telescope
The NASA Night Sky Network Webinar YouTube recording is separate from the club zoom.
https://www.youtube.com/watch?v=pU224REaSEU&ab_channel=NASANightSkyNetwork

March 23 - Amateur Astronomer Searching for Exoplanets
https://youtu.be/iwpIvh_zdsM
Amateur astronomer and retired teacher **Philip Scott** shares his successful quest to search for and discovery of an Exoplanet candidate planet orbiting a red dwarf star. Phillip discusses the history of planet discovery, what it takes to detect new planets and how he got involved with a worldwide network of amateur astronomers looking for nearby habitable planets.

February 16 Undersanding & Observing Stellar Spectra at **https://youtu.be/2F-HjCNiefw**
Tom Field of **www.RSpec-astro.com** gave an entertaining and informative presentation about how astronomers and chemists have learned to read the composition stars by examining the spectrum of starlight. Also tells how amateurs can imagine and examine these spectra.

A YouTube of our January 19 Zoom meeting is now available online
Featured short talks Stacking Digital Photos, Books for Novice astronomers, Meteorites samples. Main program - NASA's Search for Meteorites in Antarctica

Click on these images to links on the Internet

See our website observing page for a collection of Interactive Sky Watching Tools
Moon phases - Sun rise & Set - Make your own custom interactive sky chart and more

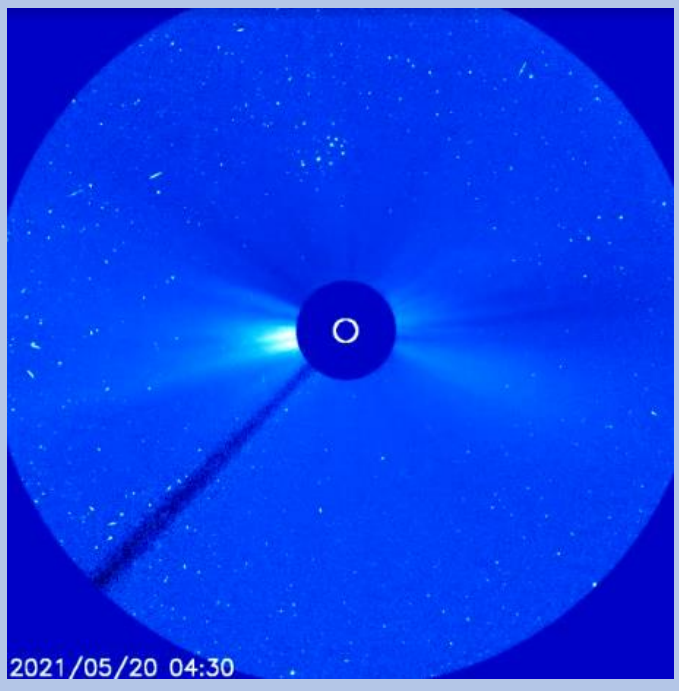
June Skies - Summer Solstice is June 21st. The nights are short - Sunset is after 8:40 PM and Sunrise by 6:07 AM. Star watching must wait until 9:15 PM and the sky is too bright by 5:30 AM. If we were still on Standard Time - Dawn would arrive by 4:30 AM ! *(However for the uninformed politicians and news media that always suggest we stay on Daylight time ALL year.)* Remind them they would be sending their kids off to school **1.5 hours BEFORE sunrise at 8: 26 AM CDT** ! It's even later in the cold northern states There are reasons Ben Franklin suggested the Daylight Time.

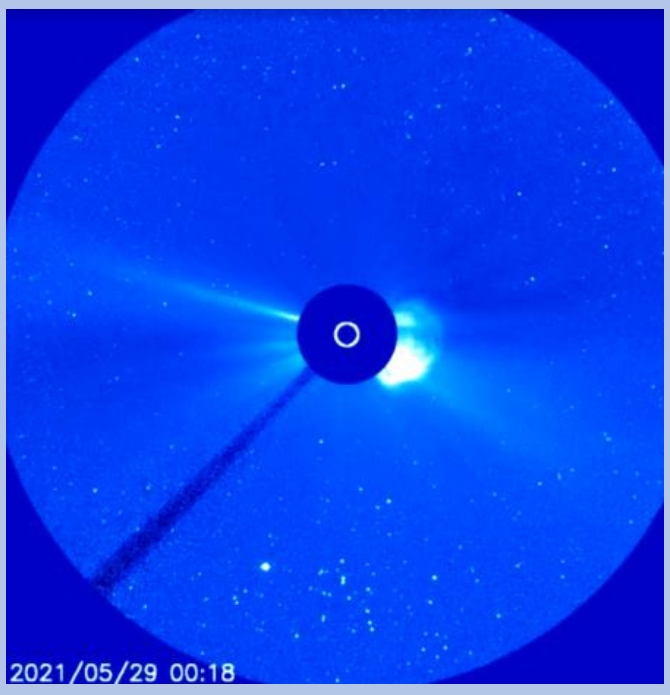
Our Winter sky of Orion and friends is gone, and the Spring sky of Leo and Virgo is sliding toward the west. Arcturus is high overhead as it becomes dark. Vega and companions of the summer triangle are visible in the eastern sky by 10:00 PM. You still must stay out until midnight to see the Milky Way well as it rises in the east. Look out for Ophiuchus and his **Snake Serpens** rising in the SE and a flock of **Quacking Ducks in the M 11**

June Evening Planets -
Venus is beginning its months long reign as our evening "star". Slipping through Gemini on its way to a July conjunction with Mars July 11-13th.
Mars at a much dimmer magnitude 1.8, is still hanging low in the western sky as it passes through Cancer. Mark your observing calendars to watch it move through the Beehive star cluster M44 on the nights of June 22-24. So watch **for Bees Bees Bees flying high**, A thin waxing crescent moon can be seen passing between the pair of planets in the early evening of June 11, 12 & 13.

June Morning Planets
Saturn rises about midnight and is well placed for the early riser's pleasure.
Jupiter follows close behind rising at 12:40 AM Now separated 18 degrees from their close conjunction in December 2020. A bright waning gibbous moon joins the pair on the mornings of June 27-29.
Mercury has left its May evening perch, having passed inferior conjunction on June 10th. It will quickly emerge near the eastern horizon by the last week of June and reaches is greatest morning elongation on July 10th
Neptune, passing from Aquarius into Pisces rises about 1:40 AM.
Uranus in Aries rises at 3:45 AM Neither planet is well placed for observing before dawn.
Wait until Autumn to search out these distant planets.

Our **Astrology friends** say that your destiny is determined by your Birth sign based on where the Sun was on your birthdate. The horoscope says that people born April 20 to May 20 are the sign of Taurus. In the Solar Heliospheric Observatory images below if you look closely, you can see the Pleiades above the Sun on May 20 and Aldebaran in the Hyades below on May 29. Both well **WITHIN** Taurus





TEXAS STAR PARTY 2021

Don Bradford

The “official” Texas Star Party (May 2 through 9) was actually cancelled this year due to Covid 19 issues and the sponsoring club’s inability to get liability insurance. However, the Prude Ranch, which hosts the annual event, decided to offer the same accommodations this year as the “West Texas Star Party” — but without the typical professional lectures, vendor presentations, prizes, etc. Even without the frills and crowds, the access to dark skies was enjoyed by about 80 people (compared to the usual over 300).

The Prude Ranch is located in the beautiful Davis Mountains, five miles from historic Ft. Davis, in far southwest Texas. This was my first trip to the Davis Mountains, and even though the trip from Tulsa is just over a grueling 700 miles, driving through the mountains for the first time makes the trip worthwhile. At 5,000 feet elevation, the view of the varied landscapes and unusual geological outcroppings are spectacular. (See: **Davis Mountains**)

The Prude Ranch has been a working cattle ranch for over 100 years and a guest ranch for over 80 years, offering horseback riding, swimming, hiking, and day trips to historical Ft. Davis and the McDonald Observatory. The Texas Star Party has been held there since 1982. The ranch offers multiple accommodations from primitive camping to fully equipped cabins, including catered meals. Although I first planned to camp and cook my own meals, after arriving exhausted from a two-day trip dealing with a soft, strapped-down roof top carrier, I opted for the bunk house and full meal plan - a choice I highly recommend. The chance to dine and chat with fellow observing enthusiasts was an additional treat.

And of course, the main attraction - the fantastic dark skies - also made the trip worthwhile. Seeing Omega Centauri, the brightest globular cluster in the sky, at a reasonable declination (not possible in Tulsa) was enough reason to make the long trip. It was easily visible naked eye and was so bright in any scope with any eyepiece that it resembled a roaring furnace with uncountable stars. At first, I thought either my eyes or my scope were playing tricks on me, but others verified the phenomenal view.

As with my first trip to Okie-Tex, I found myself spending a lot of time sitting in a chair taking in the entire night sky in one glance, and marveling at the sight. Unfortunately, the Milky Way was not fully visible until about 2:00 am, but as it rose, I first thought clouds were developing. It was indeed the bright Milky Way in all its glory.

As usual, viewing the dark sky was only a part of the attraction of a good star party. Meeting other astronomy enthusiasts and seeing their equipment was a big treat, especially for me being fairly new to the hobby. Virtually every level of observer was there, from newbies like me with a 102mm refractor with simple Alt-Az mount and 12” Dob to very sophisticated imaging equipment.

I met a fellow named Russel who showed me his solid-tube Newtonian reflector on his homemade equatorial mount with a tracking mechanism he claims is more accurate than any marketed mount. He is shown in the following photograph I took at 8:00 am the second day I was there. He was just putting his equipment away for the day after staying up all night imaging, including the early morning moon rise.

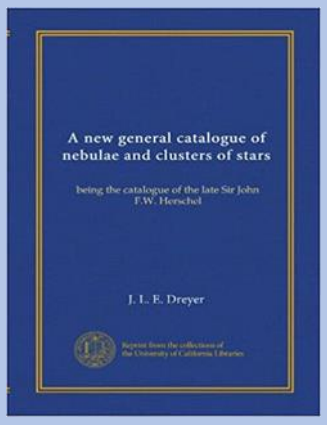
I also met a fellow named Dave, from San Antonio, who was seven objects away from completing the Herschel 400 observing program with his 25" Obsession truss-tube Dobsonian. His photographs follow. Dave had the trailer in the background modified to accommodate the telescope while traveling and to convert to his sleeping quarters while the telescope is deployed.

Although a long trip (arguably too long), the experience at this year's TSP were definitely worth the effort. I am now looking forward to Okie-Tex and considering starting the Herschel 400 observing program or perhaps the "Two in One" program. I completed the Messier Observing Program in late 2019. These observing programs are among the many programs offered by the Astronomical League (free as part of club membership) , and offer a great learning experience as well as motivation and discipline to expand one's observing skills.

You can find a listing of all the Astronomical League Observing programs at
https://www.astroleague.org/al/obsclubs/AlphabeticObservingClubs.html

The New General Catalogue

Lifetime Achievement Award for Amateur Observers



Many amateur astronomers are familiar with the NGC - the New General Catalog. It is a comprehensive list of deep sky objects that was compiled by John Louis Emil Dreyer in 1888, before the widespread use of astrophotography. For many people, it represents a daunting challenge for optical observing, both due to the sheer number of objects involved, and the fact that it extends through both hemispheres of the sky. However, for those who choose to take it on, it can provide a penultimate optical observing challenge and many nights of observing joy along the way.

I first began to consider observing all the NGC objects as I was finishing up all the Herschel objects in 2016. I had already optically observed quite a few of them by that point, and naively assumed it would just be another level of commitment. Having had the chance to go to the southern hemisphere before, I had even knocked off quite a few objects down there, including all of the Caldwells, several showpiece items and both Magellanic Clouds. So, what could it hurt? I might as well go ahead and finish what I started.

My first thought was to do a survey level imaging run of all the NGC objects I hadn't already visually sketched. I typically sketch all objects that I see through the telescope, so going back through nearly 100 volumes of records, I was able to determine which ones I needed to image. This was made much easier by access to remote telescopes, especially the one in Perth Australia. When I refer to survey level of quality, the intent was more to support how to approach viewing them than to provide good images of the objects. I'm not a good imager and was really more interested in figuring out which objects are realistically available to what size instrument and whether they were objects that I might have seen before, adjacent to sketched targets.

< My image of NGC 4169, 4173, 4174, 4175 (“The Box”)

That part of the project only took a little more than a year and lulled me into a sense of complacency. After all, if I can image it, I can see it, right? So, armed with my 22" Obsession, and my own obsessive personality, I began my journey into the rest of the catalog visually.

As with any observing program, planning is essential, especially when taking on over 7,000 objects. Since I wasn't sure when I would get back to the southern hemisphere, I began by limiting myself to everything above -30° declination. Since I live at 36° North, and all of my observing sites are near that latitude, this seemed like a reasonable cut off point.

Next came the seasonal adjustments both for location in the sky and my availability for observing. Spring is particularly bad in Oklahoma, which doesn't flange up well with the fact that there are so many NGC objects in the spring sky. I knew that would always be a pinch point and determined that every single clear night not overwhelmed by the moon would need to include observing. Then, in the fall, at the Okie-Tex Star Party, I would have a famously ink black sky to check off the other items as best I could in one week a year.

Part of the plan was trying to figure out how long this might take. Based on an aggressive estimate of about 20 objects a night, tempered by the fact that three or four months of the year I wouldn't be able to observe it all, I figured I could do something like 20 nights a year or 400 objects a year. Since I started off with 3,764 objects to go, I assumed I could finish in about 10 years. I added a few years due to the vagaries of weather and my advancing age (I started at age 52).

As for the status update and lessons learned so far, I am 64% through the list at this point:

	OVERALL	FROM START
Total Objects Cataloged	7840	
Non-Existent	494	
Total Existent	**7348**	
Sketched	**4704**	3584
Remaining Objects	**2644**	3764
Progress	**64%**	30%

However, as many of you know, NGC objects tend to be a lot of galaxies, and these are often found in clusters. With such a daunting task in front of me I took advantage of that fact and finished quite a few on the list via observing galaxy groups. Coupled with the fact that my early emphasis was on southern objects, since these present the least availability for me in the northern hemisphere, there are still an awful lot of objects all over the sky and the ones that are left tend to be the faintest and most remote.

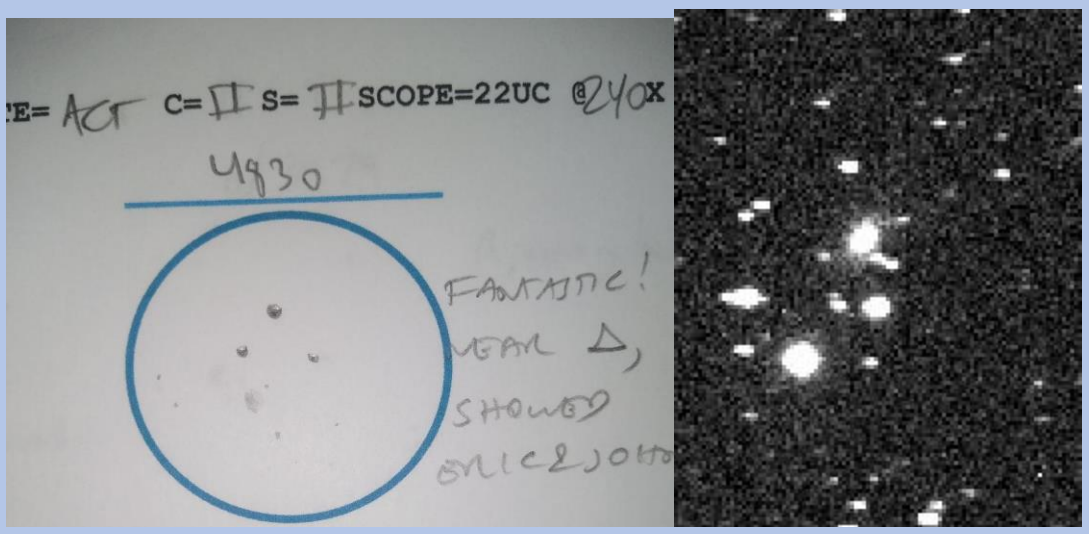
As far as the lessons learned so far, these have been legion. For one, much like galaxy clusters, observing nights tend to come in clusters and so I have learned not to canvas one area of the sky so that the next few available nights there's "nothing up there to see." I've also resisted the temptation to look at Index Catalog (IC) objects along the way; if for some odd reason I am able to finish the NGC list I'll go back and look at those. They cause quite a distraction if you allow them.

I would be doing the reader a disservice if I didn't mention to crucial decision of what list to use. The new general catalog is famous for its imperfections. The original NGC contained 7,840 objects. Many of these were later found to be duplicates, non-existent, or just stars. There is a good account of all the different attempts to reconcile the catalog from Astronomy Magazine: NGC Primer The gist of it is that when I started my journey, I used the SEDS list as published by the Saguaro Astronomical Society back in 2016.

However, after reading the article I decided to go back and revisit the list I was using against the recently published NGC 2000. This turned out to be a real bear of an exercise. Not only was it hard to reconcile everything, again mainly due to the sheer volume involved, but it began to erode my confidence.

I finally decided on using the SEDS list as is. A spot check seemed to indicate that they were the same. But beware, if you intend on attacking this observing challenge, make sure you compile your list with a trusted source and don't try to change things midstream. It is confusion.

But by far the most interesting lesson I've learned is that even though these objects do tend to be "end of season sale" faint galaxies for the most part, there are quite a few that have been surprisingly bright or interesting. One that comes to mind from a recent night was NGC 4830 in Virgo. I was trying to show a visitor something through my telescope but didn't want to get up on a ladder or sit down and look at anything low. My first try I had nothing to show him that I thought he would be able to see.



NGC 4830 (sketch and my image, neither does it justice)

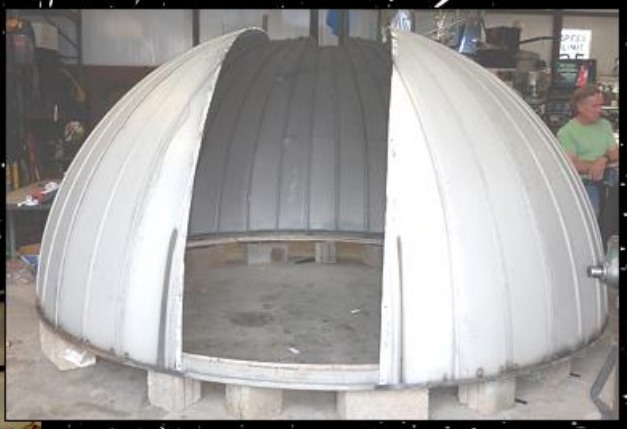
Later I happened upon this object a nice little galaxy near a triangle field stars, and perfectly place for both of us to stand at the eyepiece and look at it. Still, I was concerned about its brightness and wondered if he would enjoy it at all. He was delighted, in fact both of us and another observer were pleasantly surprised this unknown NGC object was such a nice view. So don't give up on the NGC objects if you start them and find several of them to be quite faint and boring. There are still a few gems left in the tailings pile and you may happen upon one yourself one night.

I would appreciate any feedback from those who have completed the list visually, or anyone else currently attempting this challenge.

For selected sketches, images, discussion, and updates, please see my **webpage**.

Progress is going well assembling the refurbished Ash Dome in James Taggart's workshop.

Skip Whitehurst, Don Bradford, Larry Smith, Jack Reeder and Ken Weikel have all been helping.



A few more days of work are ahead. Next will be drawing up architectural plans for the building it is to set on.

Watch a video of the Dome rotating

This article is distributed by NASA Night Sky Network May 2021

The Night Sky Network program supports astronomy clubs across the USA dedicated to astronomy outreach. Visit nightsky.jpl.nasa.gov to find local clubs, events, and more!

Astrophotography With Your Smartphone

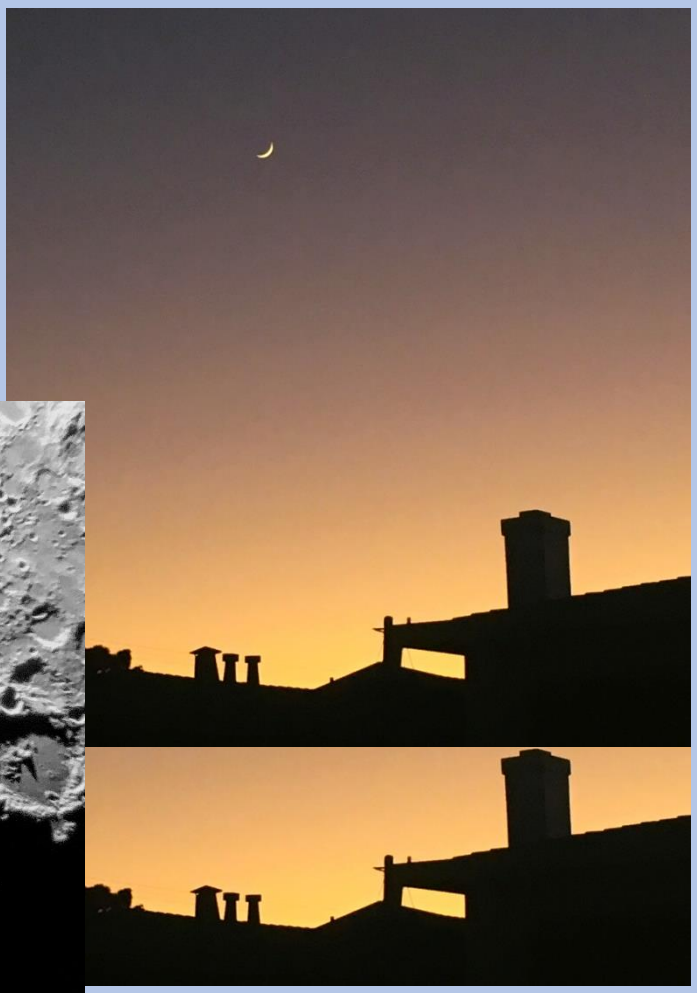
David Prosper

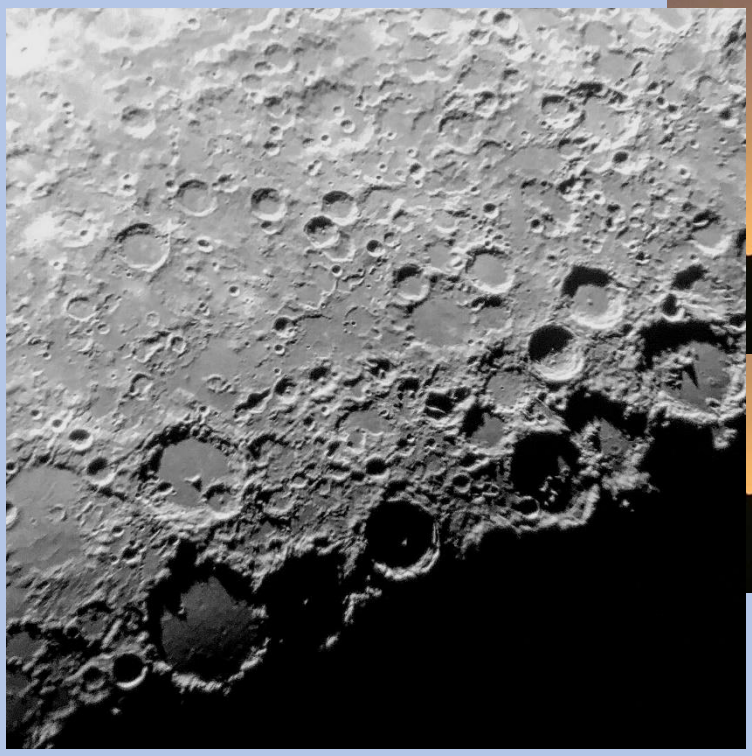
Have you ever wanted to take night time photos like you've seen online, with the Milky Way stretched across the sky, a blood-red Moon during a total eclipse, or a colorful nebula? Many astrophotos take hours of time, expensive equipment, and travel, which can intimidate beginners to astrophotography. However, anyone with a camera can take astrophotos; even if you have a just smartphone, you can do astrophotography. Seriously!

Don't expect Hubble-level images starting out! However, you can take surprisingly impressive shots by practicing several basic techniques: steadiness, locked focus, long exposure, and processing. First, steady your smartphone to keep your subjects sharp. This is especially important in low light conditions. A small tripod is ideal, but an improvised stand, like a rock or block of wood, works in a pinch. Most camera apps offer timer options to delay taking a photo by a few seconds, which reduces the vibration of your fingers when taking a shot. Next, lock your focus. Smartphones use autofocus, which is not ideal for low-light photos, especially if the camera readjusts focus mid-session. Tap the phone's screen to focus on a distant bright star or streetlight, then check for options to fine-tune and lock it. Adjusting your camera's exposure time is also essential. The longer your camera is open, the more light it gathers - essential for low-light astrophotography. Start by setting your exposure time to a few seconds. With those options set, take a test photo of your target! If your phone's camera app doesn't offer these options, you can download apps that do. While some phones offer an "astrophotography" setting, this is still rare as of 2021. Finally, process your photos using an app on your phone or computer to bring out additional detail! Post-processing is the secret of all astrophotography.

You now have your own first astrophotos! Wondering what you can do next? Practice: take lots of photos using different settings, especially before deciding on any equipment upgrades. Luckily, there are many amazing resources for budding astrophotographers. NASA has a free eBook with extensive tips for smartphone astrophotography at **bit.ly/smartastrophoto**, and you can also join the Smartphone Astrophotography project at **bit.ly/smartphoneastroproject**. Members of astronomy clubs often offer tips or even lessons on astrophotography; you can find a club near you by searching the "Clubs and Events" map on the Night Sky Network's website at **nightsky.jpl.nasa.gov.** May you have clear skies!

A small tripod for a smartphone. They are relatively inexpensive – the author found this at a local dollar store!





The Moon is large and bright, making it a great target for beginners. The author took both of these photos using an iPhone 6s. The crescent moon at sunset (left) was taken with a phone propped on the roof rack of a car; the closeup shot of lunar craters (right) was taken through the eyepiece of a friend's Celestron C8 telescope.

Note: A great Astrophotography App for iPhones is called NightCap Camera .

It uses AI programing to stack multiple images. Also has settings for Meteor showers and ISS flyovers.

TREASURER'S and MEMBERSHIP Report

BY JOHN NEWTON

As of May 26, we had **219 members**. We welcome this month our newest members **Jesus Frias**, **Joseph 'Joe' Lederer, Scott Foster, Lauren Reeble, Lisa Hoag, Travis Dailey, Brett Bell, Aimee Abdo, Denny Mishler** (returning member), and **Susan Oliver**. Hello and welcome to ACT!

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

Accounts as of May 25, 2021

Checking: $ 5,421.36
Savings: $ 13,785.96
Investments: $ 30,696.80 (Value tends to fluctuate with markets).

The club now has PayPal available for you to start or renew memberships and subscriptions using your credit or debit cards. Fill out the registration form at https://astrotulsa.com/page.aspx?pageid=16
Click Submit and you will be given the choice of either **mailing in your dues** with a check **or using PayPal** which accepts most major credit cards. A modest processing fee is added to PayPal transactions.
You may also renew your membership or join at one of our club events using your credit card by seeing one of our officers. We can take payments with the Square card reader. A small fee is also added on to these transactions.
ALSO NOTE: For our current members who are renewing their memberships, you can now go to a new link on the website to start your renewal process. On the home page, hover over the "Member" tab on the ribbon menu near the top of the page. Then select the "Membership Renewal" link and this will take to a page to fill out your information. Fill this out, submit it, then pay your dues by the method you choose.

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

Membership rates for **2021** are as follows:
Adults: $ 45 per year, includes Astronomical League Membership.
Sr. Adult: $ 35 per year for those 65 or older, includes Astro League Membership.
Students: $ 30 with League membership; Students: $ 25 without League membership.
Additional Family membership: $ 20 with voting rights and League membership.
$ 15 with voting rights but without League Membership.
The regular membership allows all members in the family to participate in club events but only ONE Voting Membership and one Astronomical League membership.

Join Online – Add or renew magazine subscriptions. https://www.astrotulsa.com/page.aspx?pageid=16

Magazine Subscriptions: If your magazines are coming up for renewal, try to save the mailing label or renewal form you get in the mail. Forms are available on the club website. Both magazine now include online access with paid subscription.
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Sky & Telescope is $ 33 per year https://skyandtelescope.org/
Sky & Telescope also offers a 10% discount on their products.
You may renew Sky & Telescope subscriptions directly by calling their number -**be sure to ask for the club rate**

ASTRONOMY CLUB OFFICERS:

PRESIDENT – TAMARA GREEN
astrotulsa.pres@gmail.com

VICE PRESIDENT – DANIEL SMITH
astrotulsa.vp@gmail.com

SECRETARY – RICHARD BRADY
astrotulsa.secy@gmail.com

TREASURER – JOHN NEWTON
astrotulsa.tres@gmail.com

BOARD MEMBERS-AT-LARGE:

MIKE BLAYLOCK
DON BRADFORD
JERRY CASSITY
JIM DANFORTH
ADAM KOLOFF
BRYAN KYLE
JOHN LAND
JAMES TAGGART
SKIP WHITEHURST

STAFF:

FACILITIES MANAGER –
JAMES TAGGART
astrotulsa.obs@gmail.com

EDITOR - JOHN LAND
tulsaastrobiz@gmail.com

PROGRAM CHAIR - JOHN LAND
tulsaastrobiz@gmail.com

Public FaceBook Page Coordinator
Adam Koloff
akoloffuso@gmail.com

OBSERIVING CHAIRS
OWEN AND TAMARA GREEN
darthnewo@yahoo.com
astrotulsa.pres@gmail.com

SIDEWALK ASTRONOMY –
OWEN GREEN darthnewo@yahoo.com

PR AND OUTREACH –

GROUP DIRECTOR – Open Position
Astrotulsa.outreach@gmail.com

NIGHT SKY NETWORK –
Open Position

WEBMASTER JENNIFER JONES

John Blaesi -
BAS -Bartlesville Club

I spy with my little eye,
With binoculars to the sky.
Bees Bees Bees flying high,
Looking for home me oh my.

Then I look then I shake,
What do I see
But a snake.

Near that snake, is a cluster.
Quack, Quack, Quack, makes a fusster.

What am I seeing?
Not this week,
clouds aren't fleeing.

If you read the newsletter, you'll find the answer to this month's riddle.

Answer to May " I Spy "
This alignment of three celestial bodies
is called a **SyZyGy**.
Examples are Eclipses or Occultations

A great word for the kid's game of Hangman

Do you have ideas for our club 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
Tulsaastrobiz@gmail.com