ASTRONOMY CLUB 85 Yrs OF TULSA

OBSERVER

June 2022

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

The Pinwheel Galaxy M 101 in Ursa Major

Image by Tim Gilliand at his Hardhat Observatory

Imaging Telescope Stellarvue SVX127D Imaging Camera SBIG ST8300M
20 Luminousity @ 900 sec each 20 RGB @ 225 sec each - binned 2x2

In this Issue

Astronomy Club Events

Check our website AstroTulsa.com events section for updates

Observatory ONLY OPEN for SCHEDULED EVENTS. **Click for Observatory Map**

Please use insect repellants at home or away from telescopes.

Now that Sunset is later OBSERVING NIGHTS will be scheduled on Friday with Saturday as a backup night for weather cancellations.

Friday June 17 8:00 PM Guest and Members Night - Guest requested to RSVP

Friday June 24 8:15 PM Members Only night - Weather back up night June 25
Open to members and their immediate family

MidStates Astronomy Convention June 3 - 4 - 5 in St Louis

Summer Solstice June 21 4:04 AM CDT RA 6hr 0' 00" Dec + 23^{O} 26' 9.3"
Sunrise 6:05 AM Sunset 20:42 PM 14 hours 37 mins of Daylight

Friday July 22 8:00 PM Guest and Members Night - Guest requested to RSVP

Friday July 29 8:15 PM Members Only night
Open to members and their immediate family

Saturday July 30 Annual Club Picnic - Details coming later

NOTE: Please check our website for Weather Cancellations before heading out.

OBSERVING NIGHT GUIDELINES

While Covid cases are down, and flu is still going strong. We want to keep our guests and members safe. We ask you to please be thoughtful of the health safety of others around you. If you or a person in your household is showing signs of illness, please postpone your visit for another date.

Personal Hygiene, Social Distancing and Mask wearing are effective means of preventing spread. Please respect each individual's choices about how they interact with others. Ask permission when approaching a person with a telescope if you want to share a view.

President's Message
John Land

Greetings to all our Astronomy Club of Tulsa Members and Guests.

Summer is beginning with all its busy activities. People often visit area lakes or parks and get a chance to finally get away from the urban skyglow and enjoy darker skies at night. Our Observatory Guest nights are often busy as families come out to enjoy seeing the stars. Members we can always use volunteers to help on our guest nights.

The nights are shorter but there are still grand sights to be seen. During the month of June all the all Five of the easily visible planets are can be viewed in the morning sky before dawn. It will be well worth your time get out early with you telescope and see them arrayed in a long arc across the sky. If you are planning family outings the 4th of July weekend, consider taking along binoculars or a small telescope and sharing the sky with family and friends.

We also look forward to seeing more of our members this summer as the club celebrates its 85th Anniversary since its founding in the summer of 1937. I am encouraged to see several younger people becoming active in the club helping to ensure a bright future for years to come. The Club is planning a picnic the end of July and we welcome ideas to make it a fun time.

I hope to see many of you at our Summer observing sessions.

Let us continue our 85 years of *"Bringing Stars to the Eyes of Tulsa since 1937"*

John Land - President

Links to YouTube recordings of our Zoom meetings

April 8 Meeting: https://youtu.be/FPSVks95Gtw
"EXOPLANETS, FINDING LIFE IN THE GALAXY"

May 13 Meeting: https://youtu.be/y-hByzWNeb8
Dragonfly: Robotic Mission to Titan

Some Summer Astronomy Conventions.
See more Complete details in our May 2022 Newsletter

2022 MidStates Regional Conference in St Louis

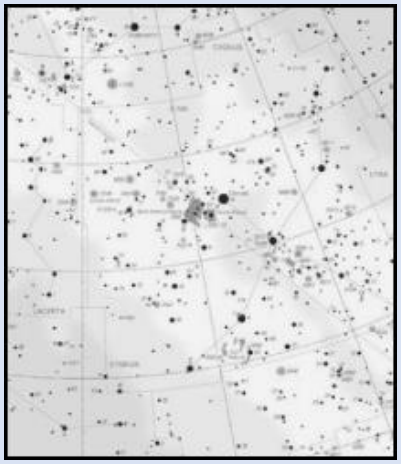
https://www.slasonline.org/images/MSRAL/MSRAL_2022R.pdf

DATES: FRIDAY, JUNE 3 to SUNDAY, JUNE 5

National Astronomical League convention will be held in Albuquerque, NM July 28 - 30

https://alcon2022.org/

Observing Chairman
Brad Young



First time telescope owners and novice stargazers are eager to learn about the night sky. They see many these pictures of the of things that can be seen in telescopes. But often get discouraged because they don't know where to find them. Summertime viewers want to see Orion but discover its not up until winter. Wintertime they look for the Big Dipper and its nowhere to be seen. Leaves you wondering

"Hey, What's the Deal ?"

At our June 17 Observatory night our Observing Chairman, Brad Young will be doing a lesson titled

"How the Sky Works"

The session will begin in the classroom about 8:30 where Brad will give a few basics. Then move outdoors for some "Hands-On" training while it is still twilight. Once it gets dark there is usually a short, guided tour of the Stars and Constellations visible that evening. Afterwards you can try your skills at locating objects yourself or enjoy views in the telescopes our members have set up.

Here are some links to preview. (Note: Some videos start with short Ads)

Eyes on the Sky Stargazing Basics Part 1

Eyes on the Sky Stargazing Basics Part 2

Eyes on the Sky Stargazing Basics Part 3

How to Use a Star Chart

Bring your star chart or planisphere if you like, and questions!
See Sky Chart at end of newsletter

More Questions - Contact

Brad Young, Observing Chair

Brad's Website

Click on these images to links on the Internet

Good To Stargaze ™

Tulsa National Weather Service

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. - Moon Phases - - 1st Q June 7 - - Full June 14 - - 3rd Q June 20 - - New June 28

Morning Planet Parade - the predawn sky during the month of June features ALL the Visible Planets arranged in about a 100-degree arc appearing in the same order that they orbit the sun. According to Sky & Telescope it's been about 100 years since this sequential alignment has occurred. Early in the month **Mercury** is close to the Sun but which improves as it reaches its Greatest Elongation from the Sun on June 16th rising at 4:55 AM. Look for it near the horizon in the NE. **Venus** rises at 4:15 AM. **Mars** at 2:30 AM. **Jupiter** at 2:05 AM and **Saturn** at just after midnight. The moon joins the parade passing Saturn June 18, Jupiter June 21, Mars June 22 and joining Venus the 26th and Mercury the 24th You'll have to get up earlier than 5:00 AM to catch them before the early morning twilight.
As an added bonus the telescopic planets **Uranus & Neptune** are both visible in the morning sky. **Uranus** is in Aries and sets about 1.5 degrees above Venus on the 11th. **Neptune** lies about 10 degrees to right of Jupiter in western Pisces. **See Page 17 for More Sky event news**.

Astronomical League Observing Challenge - Special Awards

The Springtime Challenge is to observe the **TWENTY BRIGHTEST GALAXIES**
It began March 1 and must be completed by June 30, 2022. Click the link above for details for to earn the award. Here is a PDF of the **LIST of GALAXIES** You will also want to review details about **Rating Seeing and Transparency**
Learn more about other **Astronomical League Observing Certificates** available

Jenks Public Schools PLANETARIUM

Tired of Cloudy nights? Enjoy the Stars Indoors by taking in a show at the spacious Jenks High School Planetarium. Most shows are on Tuesday evenings. Check the schedule of shows and make your reservation at https://www.jenkscommunityed.com/jenks-planetarium

JUNE

7	Tues	From Earth To Saturn	6:30pm
9	Thurs	Sistine Chapel	6:30pm
11	Sat	Earth, Moon & Sun	11am
11	Sat	The Spring Sky***	8:30pm
13	Mon	Passport To The Universe	6:30pm
15	Wed	Solar System Protection Agency	6:30pm

JULY

5	Tues	Moons: Worlds of Mystery**	6:30pm
7	Thurs	Animals of the Sky	6:30pm
9	Sat	Spacepark: Infinity*	11am
9	Sat	The Summer Sky***	8:30pm
11	Mon	My House Has Stars	6:30pm
13	Wed	Apollo 11	6:30pm

Parade of planets going on in the Pre-Dawn Sky in June - Image June 23

Evening Sky June 17 9:30 PM

The Objects That Changed Astronomy

By Brad Young

(And How to Observe Them)

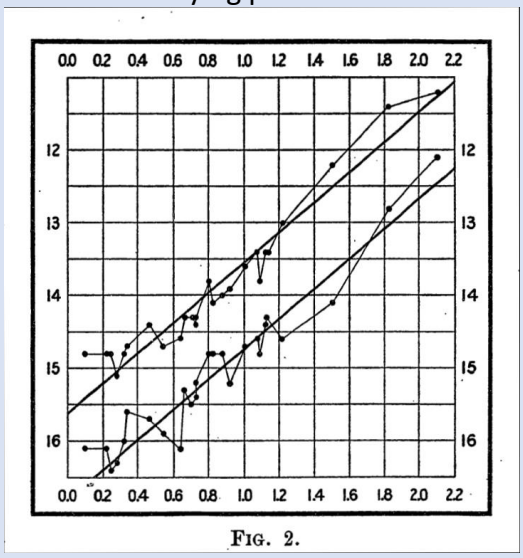
Part Three: Daguerre to Sputnik

The invention of photography (usually attributed to Daguerre) was not only a technological breakthrough for human civilization, but a powerful addition to the toolkit of astronomers. The human eye, though a miraculous organ, does not have the ability to gather photons over time like photography or imaging can. It also sees only a narrow band of the electromagnetic spectrum which we call visible light. Photography can integrate photons over time and "see" in different wavelengths above and below the frequencies available to our eyes.

New Tools Require New Thinking (Again)

"Young man, I am afraid you are wasting your time. If there were any more planets, they would have been found long before this" – as told to Clyde Tombaugh

The first astrophotograph was taken in 1840, of the moon. The usefulness of this method was seen immediately, but it took decades of improvements to the process to reach its full potential. Early adopters such as E.E. Barnard found the extent of known nebula (both bright and dark) throughout the sky increased dramatically using long exposures. Photographs also provided a record that could be checked against older images, leading to blinking methods for identifying planets and asteroids such as Pluto.



Brightness vs. Period Relationship

Photography also provided a much easier way of recording variable stars. The "standard candles" identified by Henrietta Leavitt (Cepheid variables) led to the *period-luminosity relationship* method of providing stellar and later galactic distances far beyond the reach of simple parallax.

Image by Author

Observing These Wonders

If you have imaging equipment or access to any of the remote imaging services, you can recreate the power that photography brought to astronomy. For instance, you may have struggled all your observing life to visually observe the Horsehead Nebula (Barnard 33) in Orion or spent hundreds on a H-beta filter. A 60 second exposure with no filter on a rental scope will give you an amazing view of the nebula to rival those seen in your astronomy books.

You can also use imaging to track variable stars, although many can also be tracked visually. There are many Cepheid variables that can be observed either way, and your observations used to calculate the distance to a star based on its period and apparent luminosity. Check the AAVSO website (American Association of Variable Star Observers) to understand how this is done.

Blinking images to search for asteroids or near-earth objects is still done via the various sky surveys such as Pan-STARRS and the Catalina Sky Survey. If you would like to be involved in this, you can request to be on a team via the IASC (International Asteroid Search Committee) and blink images provided to you by those surveys.

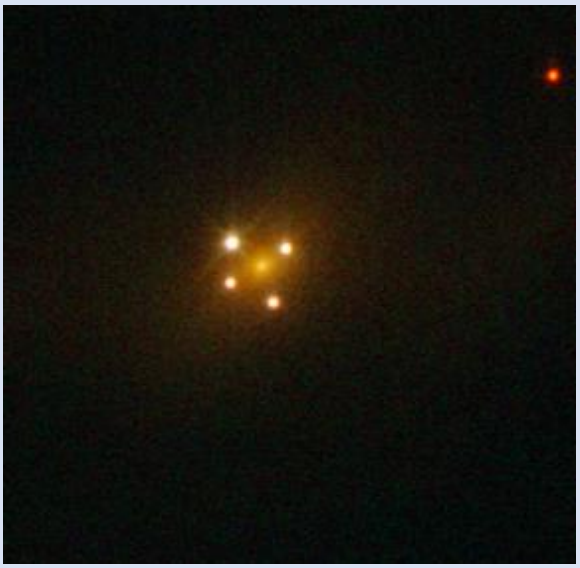
Imaging Relativity

"Spacetime tells matter how to move; matter tells spacetime how to curve." -John Archibald Wheeler

Another benefit of astrophotography was scale and adaptability. One of the effects of gravity predicted by Einstein's theory of relativity was that starlight passing near a massive object such as the sun would be bent by its gravity. This would seem to be a hard thing to prove, but at the 1919 solar eclipse, Sir Arthur Eddington took the famous photograph below that was used to prove the theory. Stars in the image (not visible at this scale) were compared to images of those same stars in Taurus without the sun in the field. The exact replication available using photography and very careful, precise measurement proved that the light from the stars near the sun had been displaced slightly by the gravity of the Sun during the eclipse.

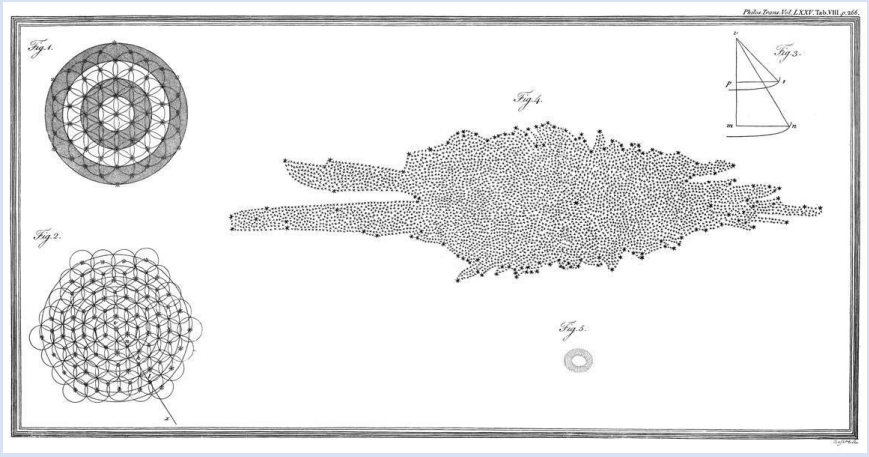
I'm not sure you're going to be able to replicate this famous use of imaging yourself, but it stands as one of the best early uses of photography to prove a fundamental theory about our universe. If you have a very large scope or highly sophisticated imaging setup, there are other examples, such as gravitational lensing. An Einstein Cross, such as Huchra's Lens, also pictured below (by Hubble Space Telescope), is a

famous example. Four images of the same distant quasar (plus one in the center, too dim to see) appear in the middle of the foreground galaxy due to strong gravitational lensing.



Island Universes

One thing you can admire every clear night are the galaxies in the universe, either the one that we inhabit or all the other ones in the sky. Before photography, these nebulous patches were thought to be clouds of gas within our own, singular Galaxy. William Herschel famously sketched our Milky Way as a flattened disc based on his visual observations:



In the 20th century, Hubble, Friedmann, and Lemaitre used general relativity and spectrography to show that these nebulae were other galaxies and were receding away from us in all directions. The spectrum of all but the nearest galaxies shifted to the red end of the spectrum, an example of the Doppler effect. This was a fundamental change in the way the universe was understood; we were no longer alone as a single galaxy, but one in a universe of millions of galaxies, all racing away from each other. These discoveries led to the Big Bang theory of the formation of the universe.

If you have a spectrograph available, you can replicate this discovery yourself. Barring this, just go out and admire our Milky Way or another galaxy some night either visually or with imaging and realize that it's been barely a century since we first understood what these islands of other stars were.

Image by Author

To determine the distance to other galaxies, supernovae are imaged and typified as either Type I or II. The light curve determined by observation identifies the type, and the apparent brightness can be used to approximate distance. This allowed Hubble and others to note that the further from Earth a galaxy was, the faster it was receding from us – now known as Hubble's Law

v = H x D

or recessional velocity of a galaxy from us is proportional to its distance from us. The constant H (Hubble's Constant) is a measure of the "expansion factor" of the universe. This constant has been highly controversial as it determines whether the universe is "open" (will expand forever) or "closed" (will ultimately crash back into a Big Crunch).

Observing Extragalactic Supernovae

You can approximate the distance to a galaxy by observing extragalactic supernovae, such as SN2022hrs in NGC 4647. This galaxy happens to appear to be next to Messier 60, a bright galaxy in Virgo. See my article on it to find its location. Once the light curve is complete, astronomers will use the data reported to AAVSO to review their current distance (63 million light years away) listed for NGC 4647.

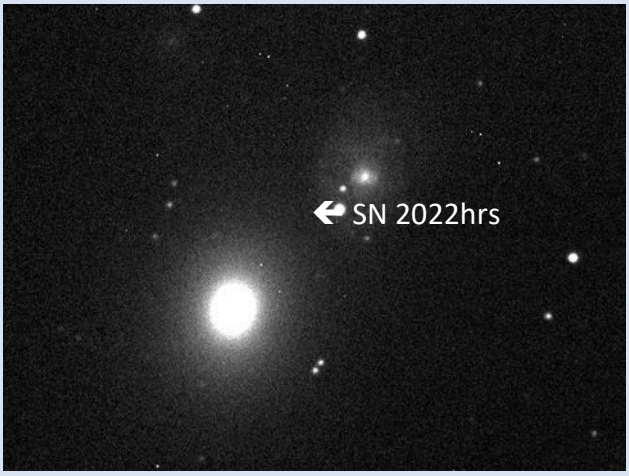


Image by Author

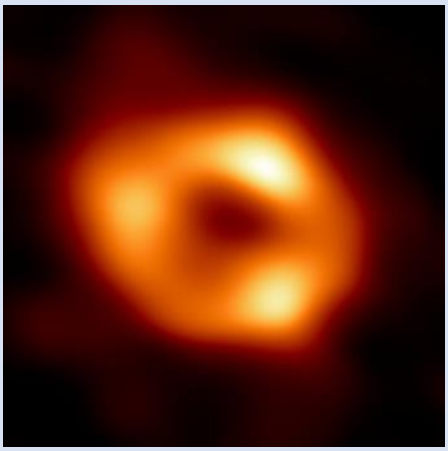
Check sites such as Latest Supernova to find opportunities to image or visually observe these amazing sights. Until we finally have one here again in the Milky Way, these are the supernovae we can see.

Radio and Other Wavelengths

“Decide yourself if radio's gonna stay - reason it could polish up the gray” “Radio Free Europe” by R.E.M.

Though not specifically tied to astrophotography and imaging, understanding that there were other wavelengths of light that could be studied led to other useful tools. Radio astronomy has proven to be essential to understanding how objects such as pulsars (neutron stars spinning and pulsing light in our direction) work. The background radiation left over from the Big Bang was discovered in the microwave region of the spectrum. Unfortunately, some of the wavelengths of light are blocked by our atmosphere and their use would have to wait for space-based observatories (see next article). On the other hand, I think it's okay that ultraviolet light from the sun is not allowed at full power directly to our skin.

Radio astronomers keep making news, even during the writing of this article. To quote Wikipedia:



Sagittarius A the black hole at center of Milky Way*

On May 12, 2022, astronomers, using the Event Horizon Telescope, released a photograph of Sagittarius A produced using data from radio observations in April 2017, confirming the object to be a black hole. This is the second confirmed image of a black hole, after Messier 87's supermassive black hole in 2019.*

Radio astronomy is available to amateurs via DIY setups that can be put together with a little effort and expense. Examples include the SuperSID receiver (left) to monitor solar activity, and the Radio Jove setup (antennae on right, separate receiver) to monitor storms on Jupiter.

With special permission, you can even use radio scopes remotely, such as the 20-meter Green Bank radio scope. I observed many objects using that setup a few years ago, including this record of radio source 3C123.

But one thing you can observe with no expense at all is the background radiation discussed above. Just turn your old (analog) TV to a station that doesn't broadcast and look at the snow on the screen. A few of those pixels are lit up by the microwave radiation left over from the beginning of the universe!

A Picture is Worth a Thousand…Hours of Processing?

"I got a Nikon camera; I love to take a photograph"- "Kodachrome" by Paul Simon

"Dreamy" Jupiter drawn by Trouvelot, 1880's

"Official" Jupiter image released by NASA et al, 2017

Astrophotography and later digital imaging have changed both the professional and amateur astronomical communities in enormous ways. Professional astronomy now relies exclusively on the use of imaging. The availability of the entire electromagnetic spectrum has made investigating our universe much easier and has provided the basis for our current astrophysical theories.

Amateur astronomy has also been changed by photography but has not entirely switched over to imaging only. Hopefully, the visceral experience of visual observing will survive, and imaging will be synergistic, not supplanting eyes at a telescope.

The next article, Part Four, completes this survey of the objects that changed astronomy by looking at the Space Age, and all the unparalleled discoveries made possible by space-based observatories and probes.

Credits:

- NASA & Wikipedia
- Leavitt, Henrietta S; Pickering, Edward C "Periods of 25 Variable Stars in the Small Magellanic Cloud" Harvard College Observatory Circular, vol. 173, Public Domain, retrieved May 12, 2022, at https://commons.wikimedia.org/w/index.php?curid=34747012
- https://www.aavso.org/cosmic-distance-ladder
- http://iasc.cosmosearch.org/
- http://www.warrenastro.org/was/newsletter/WASP-2022-05.pdf
- https://www.rochesterastronomy.org/supernova.html
- EHT Collaboration - Astronomers reveal first image of the black hole at the heart of our galaxy (Image link), CC BY 4.0, https://commons.wikimedia.org/w/index.php?curid=117932040
- https://www.gb.nrao.edu/20m/peak/3C123/Skynet_57458_3C123_17889_18894.htm
- https://www.theatlantic.com/science/archive/2017/11/juno-jupiter-pictures/546146/
- https://digitalcollections.nypl.org/items/510d47dd-e821-a3d9-e040-e00a18064a99

Telescopes for Sale

Celestron CGX Mount and Heavy-duty Tripod
with 2 extra 11 lb. counterweights
Seldom used, stored indoors, near-mint condition
Asking $ 2,100 its New Cost was $ 3,000
Two, 11 lb counterweights for $50 each,
-- cost $90 each new.
Fits shaft having a diameter of 19 mm (3/4")

Contact Byron Labadie poisonokie@aol.com

Orion XT 10 - 10-inch f 5
Dobsonian Telescope
2 Inch Focuser w 1.25 adapter
Older Scope - Good Condition
No Eyepieces or Finder

Asking $ 350
Compare to Cost of New AD

Contact John Land
Tulsaastrobiz@gmail.com

TREASURER'S and MEMBERSHIP Report

BY JOHN NEWTON

As of May 22, we had 198 members - 18 New member for 2022
We welcome this month our newest members - **Jeremy DeJournett, Cameron Walker, Dana Walker, Collier Imgrund, Shelby Conatzer, and Ken Black.**
Hello and welcome to ACT!

In addition, we want to recognize our long-term members who continue to renew their memberships with the club even in these restricted times. Finally, we can breathe easy again soon as restrictions continue to lift. Also, we look forward to seeing everyone at our virtual meetings by Zoom, General Meetings and at club events throughout the year when possible.

Accounts as of May 22, 2022
Checking: $ 5,559,41
Savings: $ 15,787.35
Investments: $ 30,545.10 (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 **2022** 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.
Astronomy is $ 34 for 1 year, or $ 60 for 2 years. www.astronomy.com
To get the club discount you must go through the club group rate.
Sky & Telescope is $ 33 per year https://skyandtelescope.org/
Sky & Telescope also offers a 10% discount on their products.
You may renew Sky & Telescope subscriptions directly by calling their number -**be sure to ask for the club rate**

Solstice Shadows

David Prosper

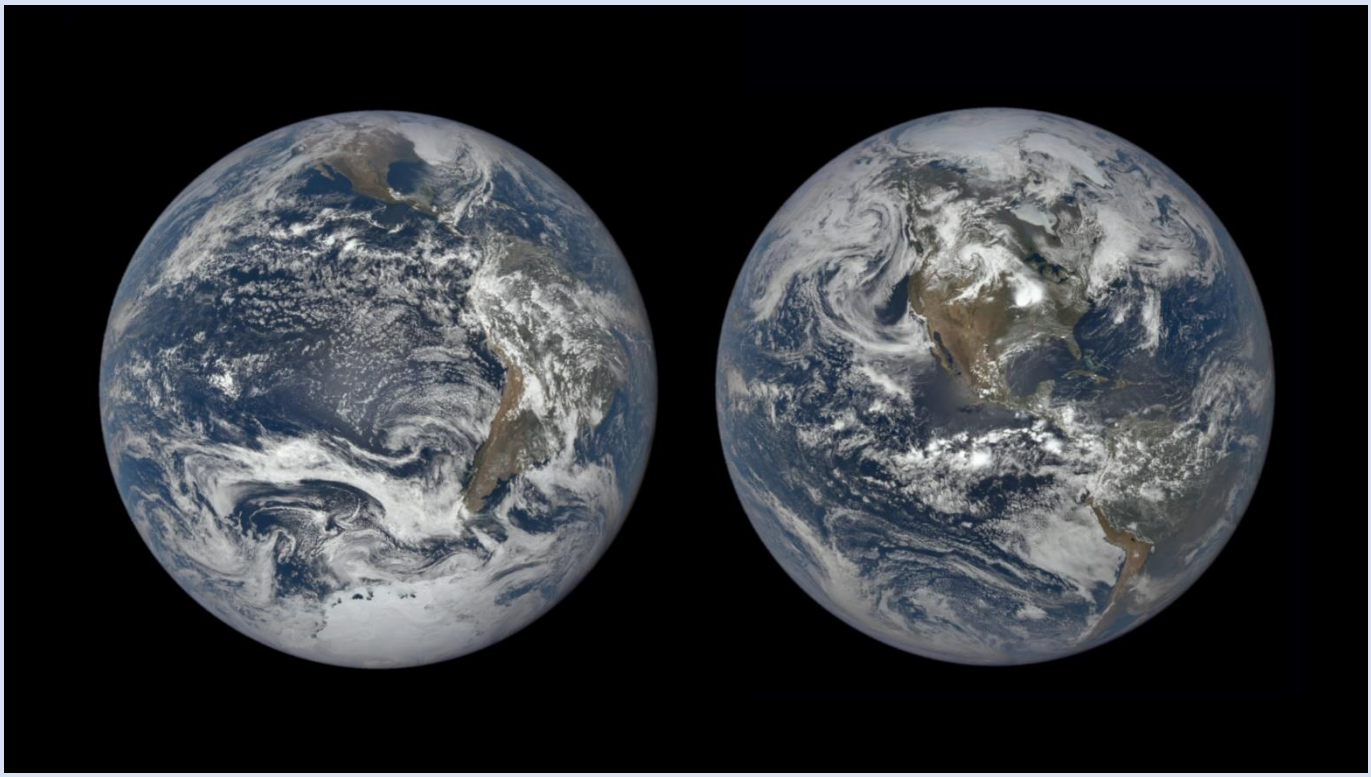
Solstices mark the changing of seasons, occur twice a year, and feature the year's shortest and longest daylight hours - depending on your hemisphere. These extremes in the length of day and night make solstice days more noticeable to many observers than the subtle equality of day and night experienced during equinoxes. Solstices were some of our earliest astronomical observations, celebrated throughout history via many summer and winter celebrations.

Solstices occur twice yearly, and in 2022 they arrive on June 21 at 4:13 am CDT (9:13 UTC), and December 21 at 3:48pm CST (21:48 UTC). The June solstice marks the moment when the Sun is at its northernmost position in relation to Earth's equator, and the December solstice marks its southernmost position. The summer solstice occurs on the day when the Sun reaches its highest point at solar noon for regions outside of the tropics, and those observers experience the longest amount of daylight for the year. Conversely, during the winter solstice, the Sun is at its lowest point at solar noon for the year and observers outside of the tropics experience the least amount of daylight- and the longest night – of the year. The June solstice marks the beginning of summer for folks in the Northern Hemisphere and winter for Southern Hemisphere folks, and in December the opposite is true, as a result of the tilt of Earth's axis of rotation. For example, this means that the Northern Hemisphere receives more direct light from the Sun than the Southern Hemisphere during the June solstice. Earth's tilt is enough that northern polar regions experience 24-hour sunlight during the June solstice, while southern polar regions experience 24-hour night, deep in Earth's shadow. That same tilt means that the Earth's polar regions also experience a reversal of light and shadow half a year later in December, with 24 hours of night in the north and 24 hours of daylight in the south. Depending on how close you are to the poles, these extreme lighting conditions can last for many months, their duration deepening the closer you are to the poles.

While solstice days are very noticeable to observers in mid to high latitudes, that's not the case for observers in the tropics - areas of Earth found between the Tropic of Cancer and the Tropic of Capricorn. Instead, individuals experience two "zero shadow" days per year. On these days, with the sun directly overhead at solar noon, objects cast a minimal shadow compared to the rest of the year. If you want to see your own shadow at that moment, you have to jump! The exact date for zero shadow days depends on latitude; observers on the Tropic of Cancer (23.5° north of the equator) experience a zero shadow day on the June solstice, and observers on the Tropic of Capricorn (23.5° south of the equator) get their zero shadow day on December's solstice. Observers on the equator experience two zero shadow days, being exactly in between these two lines of latitude; equatorial zero shadow days fall on the March and September equinoxes.

There is some serious science that can be done by carefully observing solstice shadows. In approximately 200 BC, Eratosthenes is said to have observed sunlight shining straight down the shaft of a well during high noon on the solstice, near the modern-day Egyptian city of Aswan. Inspired, he compared measurements of solstice shadows between that location and measurements taken north, in the city of Alexandria. By calculating the difference in the lengths of these shadows, along with the distance between the two cities, Eratosthenes calculated a rough early estimate for the circumference of Earth – and also provided further evidence that the Earth is a sphere!

Are you having difficulty visualizing solstice lighting and geometry? You can build a "Suntrack" model that helps demonstrate the path the Sun takes through the sky during the seasons; find instructions at stanford.io/3FY4mBm. You can find more fun activities and resources like this model on NASA Wavelength: science.nasa.gov/learners/wavelength. And of course, discover the latest NASA science at nasa.gov.



These images from NASA's DSCOVR mission shows the Sun-facing side of Earth during the December 2018 solstice (left) and June 2019 solstice (right). Notice how much of each hemisphere is visible in each photo; December's solstice heavily favors the Southern Hemisphere and shows all of South America and much of Antarctica and the South Pole, but only some of North America. June's solstice, in contrast, heavily favors the Northern Hemisphere and shows the North Pole and the entirety of North America, but only some of South America.

Credit: NASA/DSCOVR EPIC Source: https://www.nasa.gov/image-feature/goddard/2021/summer-solstice-in-the-northern-hemisphere

A presenter from the San Antonio Astronomy Club in Puerto Rico demonstrating some Earth-Sun geometry to a group during a "Zero Shadow Day" event. As Puerto Rico lies a few degrees south of the Tropic of Cancer, their two zero shadow days arrive just a few weeks before and after the June solstice. Globes are a handy and practical way to help visualize solstices and equinoxes for large outdoor groups, especially outdoors during sunny days!

Credit & Source: Juan Velázquez / San Antonio Astronomy Club

Note to Editors: The images attached to March's "Embracing the Equinox" article can also be used with this article if desired, though slight updates to the captions might be desired to change to focus from equinox to solstice. You can find the archive at: https://nightsky.jpl.nasa.gov/docs/PartnerArticleMarch2022.zip

Plan to be outside by the night of May 30 / 31 Tulsa time. - Multiple forecasters agree that a meteor shower could erupt when Earth runs into one or more debris streams from Comet 73P. The display could be as intense as a meteor storm (1000 or more meteors per hour) or as weak as nothing at all. No one knows how much debris is inside the approaching streams, so meteor rates are hard to estimate.

See more details at
https://spaceweather.com/archive.php?view=1&day=24&month=05&year=2022#

A Montage of photos for the May 15 Lunar Eclipse (Tulsa was overcast)
https://spaceweathergallery.com/index.php?&starting_point=200

ASTRONOMY CLUB OFFICERS:

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WEBMASTER JENNIFER JONES

Thanks to Don Sailing for sharing

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