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ASTRONOMY CLUB OF TULSA

OBSERVER

MARCH 2017







THE ASTRONOMY CLUB TULSA
IS A PROUD MEMBER OF



PHOTOS: So Long to Winter, Hello to Spring! Above, Orion Setting. Below, Corvus over the Observatory. Both photos by Tamara Green.

THE ASTRONOMICAL LEAGUE

MARCH 2017

SUN	MON	TUE	WED	THU	FRI	SAT
			1	2	3	4
5 	6	7	8	9	10	11
12 	13	14	15	16	17	18
19	20 	21	22	23	24	25
26	27 	28	29	30	31	

MOON PHASES AND HOLIDAYS:



FIRST QUARTER	SUN MAR 5
FULL MOON	SUN MAR 12
ST PATRICK'S DAY	FRI MAR 17
LAST QUARTER	MON MAR 20
NEW MOON	MON MAR 27

UPCOMING EVENTS:

GENERAL MEETING	FRI MAR 3	7:00 PM	JENKS HS PLANETARIUM
SIDEWALK ASTRONOMY	SAT MAR 4	6:00 PM	BASS PRO
DAYLIGHT SAVING TIME BEGINS	SUN MAR 12		
PUBLIC STAR PARTY	SAT MAR 18	7:30 PM	ACT OBSERVATORY
VERNAL EQUINOX	MON MAR 20		
MEMBERS' NIGHT	FRI MAR 24	7:30 PM	ACT OBSERVATORY
MESSIER MARATHON**	SAT MAR 25	TBA	TUVA
GENERAL MEETING	FRI APR 7	7:00 PM	JENKS HS PLANETARIUM
SIDEWALK ASTRONOMY	SAT APR 8	7:30 PM	BASS PRO
PUBLIC STAR PARTY	SAT APR 15	8:00 PM	ACT OBSERVATORY
MEMBERS' NIGHT**	FRI APR 21	8:00 PM	ACT OBSERVATORY

**MEMBERS AND FAMILY ONLY PLEASE.

APRIL 2017

SUN	MON	TUE	WED	THU	FRI	SAT
						1
2	3 	4	5	6	7	8
9	10	11 	12	13	14	15
16	17	18	19 	20	21	22
23	24	25	26 	27	28	29
30						

MOON PHASES AND HOLIDAYS:

APRIL FOOLS' DAY	SAT APR 1
FIRST QUARTER	MON APR 3
FULL MOON	TUES APR 11
GOOD FRIDAY	FRI APR 14
EASTER SUNDAY	SUN APR 16
LAST QUARTER	WED APR 19
EARTH DAY	SAT APR 22
NEW MOON	WED APR 26

Great American Solar Eclipse and Make your own SAFE SOLAR FILTER—by John Land



Monday Aug 21, 2017 is the date of the long awaited the Great American Solar Eclipse. Everyone continental United States will be able to see at least a partial solar eclipse. Tulsa will experience an 88.6 % partial eclipse.

This is the first Total Solar Eclipse on the continental United States since Feb 1979 and the first eclipse to transverse the entire continent since 1918 ! The central path of Totality makes a 2,500 mile long 70 mile wide path extending diagonally from Oregon to South Carolina. The closest locations to Tulsa extend through Nebraska, far NE Kansas and across Missouri. It will be a 6 to 8 hour drive depending on where you decide to observe. Lodging reservations along the path have been booked for months but areas an hour or two off the path may likely still be open if you act soon.

For State by State details of viewing locations and planned events go to

http://www.eclipse2017.org/2017/path_through_the_US.htm

Also has many helps and suggestions for preparing and viewing the eclipse.

For a Google style map to zoom into any specific location go to

http://xjubier.free.fr/en/site_pages/solar_eclipses/TSE_2017_GoogleMapFull.html

Note: You'll have to read the map instructions details and click agreed button to see the map.

Once you choose a location Click on that spot and a box will pop up showing times and details for that location. You can even get info for sites not on the eclipse path.

For Tulsa you'll find >

36° 08' 40.30" N <-> 36.14453°	(partial solar eclipse)	Help				
96° 00' 24.39" W <-> -96.00677°						
Obscuration : 88.664%	Max	Magnitude at maximum : 0.90436 Moon/Sun size ratio : 1.03091				
Event ($\Delta T=68.8s$)	Date	Time (UT)	Alt	Azi	P	V
Start of partial eclipse (C1) :	2017/08/21	16:39:38.2	+55.7°	128.3°	297°	12.7
Maximum eclipse (MAX) :	2017/08/21	18:08:30.8	+65.4°	169.1°	023°	10.9
End of partial eclipse (C4) :	2017/08/21	19:37:14.1	+61.0°	217.5°	108°	09.4

CHOOSING SAFE SOLAR FILTERS

TO AVOID THE RISK OF **IRREVERSIBLE EYE DAMAGE** YOU MUST USE SCIENTIFICALLY TESTED SAFE SOLAR FILTERS !! These filters must not only block out excessive Visible light but also prevent eye damage from invisible Ultraviolet and Infrared radiation.

NAKED EYE OBSERVING

A number of companies sell Eclipse Viewing Glasses. They are made of layers of specially designed material that safely reflect and block 99.9% of the Sun's energy.

Most give a pleasing yellow orange view of the sun's disk.

They are **NOT** to be used with binoculars or telescopes!



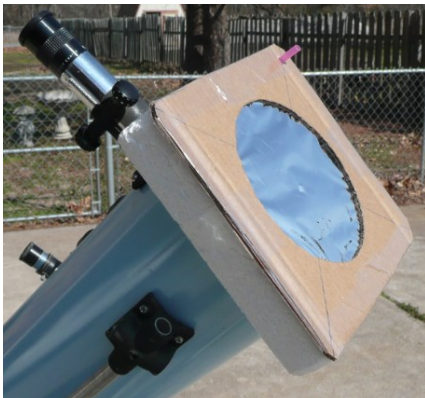
The Tulsa Astronomy club has individual solar glasses that you can purchase at meeting or events. <https://www.rainbowsymphony.com/> has a good prices on Eclipse glasses and viewing cards. You can purchase bulk orders in lots of 25 or more. For the younger kids Eclipse Cards are recommend. Mount them taped securely on a larger sheet of stiff cardboard with a cutout section for the viewing area. This allows their face to be covered from the sun when observing. I bought sets of glasses and cards for friends and each of my grandkids' school classes.

Make Sure to Supervise children (and Adults) so they understand how to safely view the eclipse. Sunglasses and improvised materials are NEVER SAFE ! There is nothing Extra Dangerous about the sun during an eclipse. It's the same sun we see every day. Except During an Eclipse people want to see want is happening up there on other days people don't try to look at the sun because it is too bright.

BUILD A SAFE SOLAR FILTER for your telescope, binoculars or camera.

Telescopes collect larger amounts of light a concentrate it into a small focused spot.

Extra care must be used to safely view the eclipse telescopically. Anyone who has ever focused a magnifying glass on a leaf or paper knows that it quickly begins to smoke and catch fire. You eye would be damaged even more quickly.



SAFE SOLAR FILTERS must be on the **FRONT** of the **TELESCOPE** where they can safely reflect and block the light from entering the telescope.

CAUTION Some cheap telescopes have been sold with a so called "Sun Filter" that screws into the eyepiece. These heat up quickly and have been known to crack sending intense unfiltered light in to the eye of an unlucky observer. If you or a child have one of these **THROW IT AWAY !!!**

You can make your own Safe Solar Filter using a sheet of Mylar Baader coated material from AstroPhysics. This specially designed material gives safe images with excellent resolution.

It has been used safely for years and gives better images than many expensive glass filters.

The Astronomy Club of Tulsa has ordered some of the material in bulk.

25 cm Sqaure (~ 9 in) for \$ 12 available at our March 3rd meeting

You can see specifications on the material at

http://www.astro-physics.com/index.htm?products/accessories/solar_acc/astrosolar

The material comes with suggested method of assembling and cleaning your filter.

http://www.astro-physics.com/products/accessories/solar_acc/make_sol.pdf

Don't forget filters for your finders and cameras.

Page 6-7 more about Solar Filters in the club's March 2010 newsletter has an article about making your own Solar Filter http://www.astrotulsa.com/cms_files/201003.pdf

PRESIDENT'S MESSAGE

BY RICHARD BRADY



Hi everyone. There are many things happening this month in the skies above us. This Saturday, March 4, the moon occults Aldebaran, also known as Alpha Tauri. It can be seen across most of the United States, except the far northern Great Plains and New England. Here in Tulsa it will disappear at 9:45 PM on the east (dark) side of the moon, and reappear at 10:45 on the west (bright) side. You don't need anything but your eyes to see the disappearance, but it will probably take a minute or two to see the reappearance, since it will be on the bright side. The moon will also be occulting several members of the Hyades cluster before then.

If you've never seen Mercury, you may get your chance this month. Right after sundown on Saturday, March 18 look near the horizon and find the brighter planet Venus. Mercury will be 8 1/2 degrees directly south of Venus, or about the width of your fist at arms length. The sun sets at 7:33, with Mercury and Venus setting about an hour later. (Mercury at 8:27 and Venus at 8:30.) So start looking soon after sunset. You might also be able to see it a few days before or after the 18th. Coincidentally, we are having our monthly public night on the 18th at our observatory and we will all be looking for it (weather permitting of course).

And here's something else you probably have never seen: during the last part of the month, Venus will be both a morning and evening star! How is this possible? It's because the orbit of Venus is tipped slightly to the orbit of our Earth. If it weren't so, Venus would transit the sun every orbit. This time Venus goes about 8 degrees north of the sun. Venus is at inferior conjunction on March 25.

Mars is still in the southwest sky this month, staying roughly 30 degrees up at sundown all month.
J

Jupiter rises at 9:25 PM at the beginning of the month and at 8:12 by the end. It is the brightest object in the southeastern sky at magnitude -2.3 to -2.5.

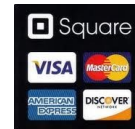
Saturn is still a morning planet, rising at 2:37 AM at the beginning of the month and 1:43 at the end.

Closer to home, it's Messier Marathon time again. Tamara Green will be leading us down to TUVA again on Saturday, March 25. More information can be found elsewhere in this newsletter.

Clear skies!
Richard Brady

TREASURER'S AND MEMBERSHIP REPORT

BY TIM DAVIS



Astronomy Club of Tulsa: 171 members, including 7 new members in 2017.

Welcome to our new members this month: Travis Crouse, Rachael Hunsucker, Tom Ellis, Jeff Thorne, Joshua Forschen and Ethan King.

Club Accounts as of February 28, 2017:

Checking: \$7,107.80; Savings: \$5,776.40; Investment accounts: \$21,190.05 (*Value Fluctuates with Market*)

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 <http://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 whatever 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. Contact their websites for details.

Membership rates for 2017 are as follows:

Adults: \$45.00 per year, includes Astronomical League Membership.


Sr. Adult: \$35.00 per year for those 65 or older, includes Astro League Membership.

Students: \$30.00 with League membership; **Students: \$25.00** without League membership.

Additional Family membership: \$20.00 with voting rights and League membership, **\$15.00** 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. <http://www.astrotulsa.com/page.aspx?pageid=16>

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

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



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

Sky & Telescope is \$33 per year www.skyandtelescope.com

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

Note: You may renew your Sky & Telescope subscription directly by calling the number on the renewal form, be sure to ask for the club rate.

NEW SUBSCRIPTIONS must still be sent to the club.

2017 Wall Calendar

The 2017 Astronomy Magazine Wall Calendars are here and we still have a few available. If you would like to reserve one, send me an email at astrotulsa.tres@gmail.com, or call me at 918-665-8134 and let me know how many you would like. Otherwise, they will be available on a first come, first served basis at our upcoming events. Calendars are available for \$8.00 each, cash, check or credit cards accepted.

Calendars must be picked up in person at a club event, we can not ship these to you. If you reserve one, just let me know at which event you will pick it up.



Get yours while they last!

Tim Davis
ACT Treasurer

MESSIER MARATHON!! Saturday, March 25

BY TAMARA GREEN



Hello All!

Our Annual Messier Marathon will be on Saturday, March 25. We will be going to TUVVA again to have us a marathon!

There will be a caravan to the marathon, and I will be leading it again this year. Details on next page of this article.

There will be a pot-luck dinner at TUVVA before the marathon begins, so if you wish to, you are welcome to bring a dish, dessert or beverage to share.

TENTATIVELY, the back-up date is Saturday, April 22; however, considering how late in the month that is, we will not have a chance at all 100 objects. Details on that will be in next month's newsletter.

PLEASE NOTE THAT DUE TO THE LIMITED ROOM AT TUVVA, AND THE FACT THAT PARTICIPANTS WILL WANT TO CONCENTRATE ON THEIR MARATHONING, THE MESSIER MARATHON IS FOR CLUB MEMBERS AND THEIR FAMILY MEMBERS ONLY (OUR MEMBERS AND TUVVA MEMBERS). THANK YOU FOR YOUR COOPERATION.

Hope to see you there!

Tamara



CARAVAN TO THE MESSIER MARATHON:

The caravan will meet on Saturday, Mar. 25 at the parking lot of the Burger King, located at 1600 N. Elm Pl., Broken Arrow, OK. This will be just south of the BA on the west side of the street (across from the Ferguson dealership). The caravan will leave Burger King PROMPTLY at 3:00 PM. This is because it takes a little over an hour to get to TUVA and we want to have plenty of time to set our telescopes and gear up, and then enjoy a pot-luck dinner and socializing before the marathoning begins! If you are interested in joining in on the caravan, please email Tamara Green at astrotulsa.vp@gmail.com and let her know what the make, model and color of your car is so that she will know who belongs in her caravan (and who doesn't!). Hope to see you there!

PLEASE NOTE: The caravan only goes TO the marathon on Saturday afternoon. Sunday morning, you are on your own getting back to town. This is because not everyone leaves TUVA at the same time, or even stays all night. A map to the caravan meeting place is below.

Print - Maps

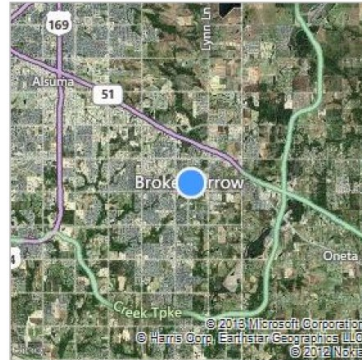
Page 1 of 1

bing Maps

Broken Arrow, OK

Burger King on N. Elm Pl., Broken Arrow. Building is on the Left side the map, blue roof.

On the go? Use m.bing.com to find maps, directions, businesses, and more

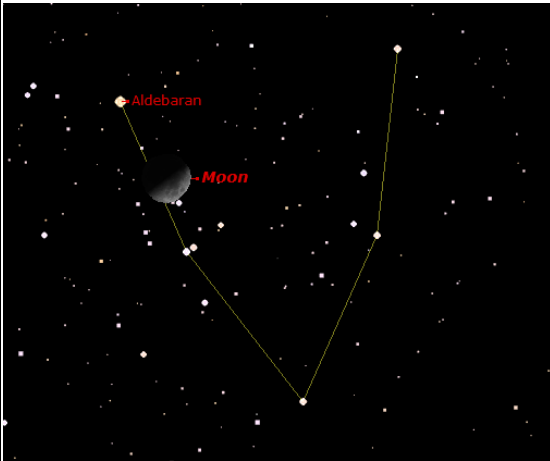


See a Star Disappear! - by John Land

Saturday evening March 4, 2017 the First Quarter moon will be passing through the Hyades star cluster in Taurus. As it does it will Occult several stars in the cluster. The term Occultation is used to describe when a solar system object passes in front of a star or other object.

Approximate Times **Occultation Aldebaran 9:45 PM - Reappearance 10:45 PM**

Occultations of dimmer stars may be seen beginning a couple hours earlier.



You can observe this event with the naked eye but binoculars or a small telescope will enhance your view.

Or join us for **SIDEWALK ASTRONOMY night at Bass Pro** beginning about sunset.

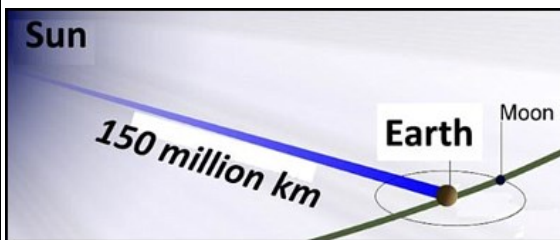
Telescopes will be set up to view the moon and other objects.

Aldebaran is the brightest star in Taurus. This red giant star shines with a magnitude of 0.84. It's cool surface temperature causes its orange appearance. The giant star

is 43 times larger than our sun and shines 425 times brighter. At 65 Light years away Aldebaran is the 14th brightest star in the night sky.

To read more about occultations of Aldebaran read our Aug 2016 newsletter.

http://astrotulsa.com/CMS_Files/201608.pdf



Scale Models of the Solar system and Stars.

We are often asked "How far away are the stars or planets?" One of the easiest ways for people to understand the vast distances to planets and stars is with a scale model. The distance from the Earth to the Sun is measured in a unit called an **AU – Astronomical Unit**. In rounded units 1 AU = 150 million Kilometers (93 million miles) The AU is used to express the distances to planets and other solar system bodies. The distance to Jupiter is 5.2 AU - Saturn 9.5 AU's.

Measuring the distances to stars requires a much longer unit. A **Light Year (LYr)** is the distance that light travels in one Earth year. Think of it as distance unit not a time unit. The Alpha Centauri star system is our nearest neighbor at about 4.3 LYrs. The bright winter star Sirius is 8.6 LYr and the great Andromeda galaxy M 31 is 2.5 million light years away.

Light travels at 300,000 km/sec (186,000 mi/sec). The Earth takes a bit more than 365.25 days to make one orbit around the Sun. To be precise Earth's takes 31,558,196 seconds to complete an orbit. So a **Light Year** is 9,467,000,000,000 km / LYr (**9.5 Trillion km**) To put that in perspective –

\$ 1 million dollars in **\$100** bills makes a stack about 1 foot deep. It would take a stack of \$100 bills

1,793 miles high to equal a light year. Last I checked our Nat'l Debt is over \$19 Trillion :-)

An easy to remember relationship between AU's and Light Years.

1 Light Year = 63,116 AU's coincidentally 1 mile = 63,360 inches

Rounding off the ratio of both is 1 to 63,000. If you lay out a Scale Solar system model where

1 AU equals 40 inches then a light year on this scale would be 40 miles. So Sirius on this scale would

be 8.4 times 40 = 344 miles away. So the simple rule is for any scale model the measure distance you use for an AU in inches and that will be the number of miles per light year.



National Aeronautics and Space Administration



NASA Space Place

Educator Newsletter

March-April 2017 / Vol. 10, Issue 2

NEWS AND NOTES FOR FORMAL AND INFORMAL EDUCATORS

Space Place is a NASA website for elementary school-aged kids, their teachers, and their parents.

It's colorful!
It's dynamic!
It's fun!

It's rich with science, technology, engineering, and math content!

It's informal.

It's meaty.

It's easy to read and understand.
It's also in Spanish.
And it's free!

It has over 150 separate modules for kids, including hands-on projects, interactive games, animated cartoons, and amazing facts about space, Earth science, and technology.

Don't forget to subscribe to our monthly e-newsletter, the NASA Space Place Gazette!

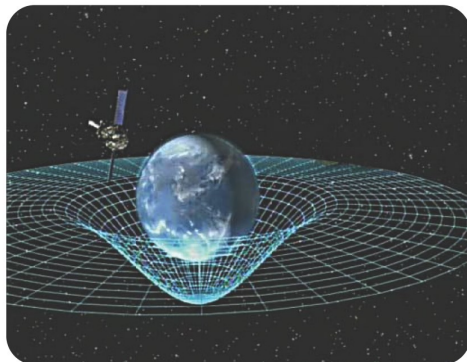
<http://spaceplace.nasa.gov/subscribe>

New!

What are gravitational waves?

Gravitational waves are invisible (yet incredibly fast) ripples in space. Here's how we know they exist:

<http://spaceplace.nasa.gov/gravitational-waves>

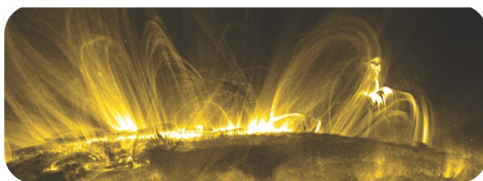


New!

Sun's Corona

The corona is the outermost part of the sun's atmosphere. Its high temperatures are a bit of a mystery! Here's why:

<http://spaceplace.nasa.gov/sun-corona>

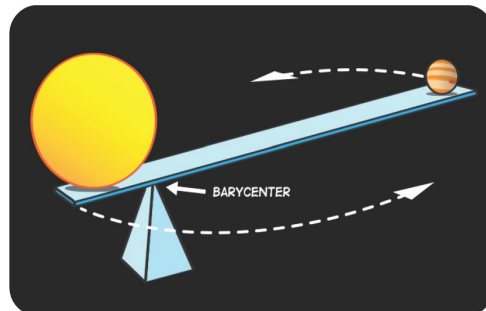


New!

What's a barycenter?

We say that planets orbit stars, but that's not exactly the whole truth! Planets and stars actually orbit around their common center of mass—the barycenter. Learn more about barycenters and how they can help us find other planets outside our solar system:

<http://spaceplace.nasa.gov/barycenter>



Why do we care about water on Mars?

Because on Earth, almost everywhere there is water, there is also life! If water once flowed on Mars, did life once thrive there too?

<http://spaceplace.nasa.gov/mars-adventure2>

Explore Earth and space at spaceplace.nasa.gov

What are satellite galaxies?

They are less massive galaxies that orbit a larger galaxy. Our Milky Way has a number of satellite galaxies, but the biggest one is called the Large Magellanic Cloud!

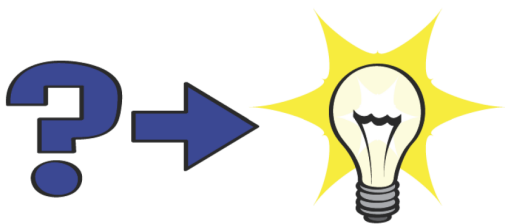
<http://spaceplace.nasa.gov/satellite-galaxies>



Science Fair

Are your kids searching for some science fair project ideas? Look no further! Click to explore various topics:

<http://spaceplace.nasa.gov/science-fair>



Space and Earth Glossary

What's the difference between an asteroid and a comet? Check out our glossary to find out and explore more space and Earth terms!

<http://spaceplace.nasa.gov/glossary>

Special Days

Noteworthy days in NASA and space history you can observe in your classroom.

March 13 — Uranus was discovered on this day in 1781.

Learn all about this blue planet here:

<http://spaceplace.nasa.gov/all-about-uranus>

March 14 — Albert Einstein was born on this day in 1879.

Learn about gravitational waves, which Einstein predicted over 100 years ago!

<http://spaceplace.nasa.gov/gravitational-waves>

March 20 — Today is the first day of spring in the Northern Hemisphere.

Why do we have seasons?

<http://spaceplace.nasa.gov/seasons>

April 22 — Happy Earth Day!

Explore Earth's atmospheric layers:

<http://spaceplace.nasa.gov/atmosphere>

April 28 — Astronomer Jan Oort was born on this day in 1900.

Learn all about the Oort Cloud that was named after him!

<http://spaceplace.nasa.gov/oort-cloud>

April 29 — Happy Astronomy Day!

Budding astronomers can learn more about our solar system here:

<http://spaceplace.nasa.gov/menu/solar-system>



This article is provided by NASA Space Place.

With articles, activities, crafts, games, and lesson plans, NASA Space Place encourages everyone to get excited about science and technology.

Visit spaceplace.nasa.gov to explore space and Earth science!

**Solar Eclipse Provides Coronal Glimpse**

By Marcus Woo

On August 21, 2017, North Americans will enjoy a rare treat: The first total solar eclipse visible from the continent since 1979. The sky will darken and the temperature will drop, in one of the most dramatic cosmic events on Earth. It could be a once-in-a-lifetime show indeed. But it will also be an opportunity to do some science.

Only during an eclipse, when the moon blocks the light from the sun's surface, does the sun's corona fully reveal itself. The corona is the hot and wispy atmosphere of the sun, extending far beyond the solar disk. But it's relatively dim, merely as bright as the full moon at night. The glaring sun, about a million times brighter, renders the corona invisible.

"The beauty of eclipse observations is that they are, at present, the only opportunity where one can observe the corona [in visible light] starting from the solar surface out to several solar radii," says Shadia Habbal, an astronomer at the University of Hawaii. To study the corona, she's traveled the world having experienced 14 total eclipses (she missed only five due to weather). This summer, she and her team will set up identical imaging systems and spectrometers at five locations along the path of totality, collecting data that's normally impossible to get.

Ground-based coronagraphs, instruments designed to study the corona by blocking the sun, can't view the full extent of the corona. Solar space-based telescopes don't have the spectrographs needed to measure how the temperatures vary throughout the corona. These temperature variations show how the sun's chemical composition is distributed—crucial information for solving one of long-standing mysteries about the corona: how it gets so hot.

While the sun's surface is ~9980 Fahrenheit (~5800 Kelvin), the corona can reach several millions of degrees Fahrenheit. Researchers have proposed many explanations involving magneto-acoustic waves and the dissipation of magnetic fields, but none can account for the wide-ranging temperature distribution in the corona, Habbal says.

You too can contribute to science through one of several citizen science projects. For example, you can also help study the corona through the Citizen CATE experiment; help produce a high definition, time-expanded video of the eclipse; use your ham radio to probe how an eclipse affects the propagation of radio waves in the ionosphere; or even observe how wildlife responds to such a unique event.

Otherwise, Habbal still encourages everyone to experience the eclipse. Never look directly at the sun, of course (find more safety guidelines here: <https://eclipse2017.nasa.gov/safety>). But during the approximately 2.5 minutes of totality, you may remove your safety glasses and watch the eclipse directly—only then can you see the glorious corona. So enjoy the show. The next one visible from North America won't be until 2024.

For more information about the upcoming eclipse, please see:

NASA Eclipse citizen science page

<https://eclipse2017.nasa.gov/citizen-science>

NASA Eclipse safety guidelines

<https://eclipse2017.nasa.gov/safety>

Want to teach kids about eclipses? Go to the NASA Space Place and see our article on solar and lunar eclipses! <http://spaceplace.nasa.gov/eclipses/>

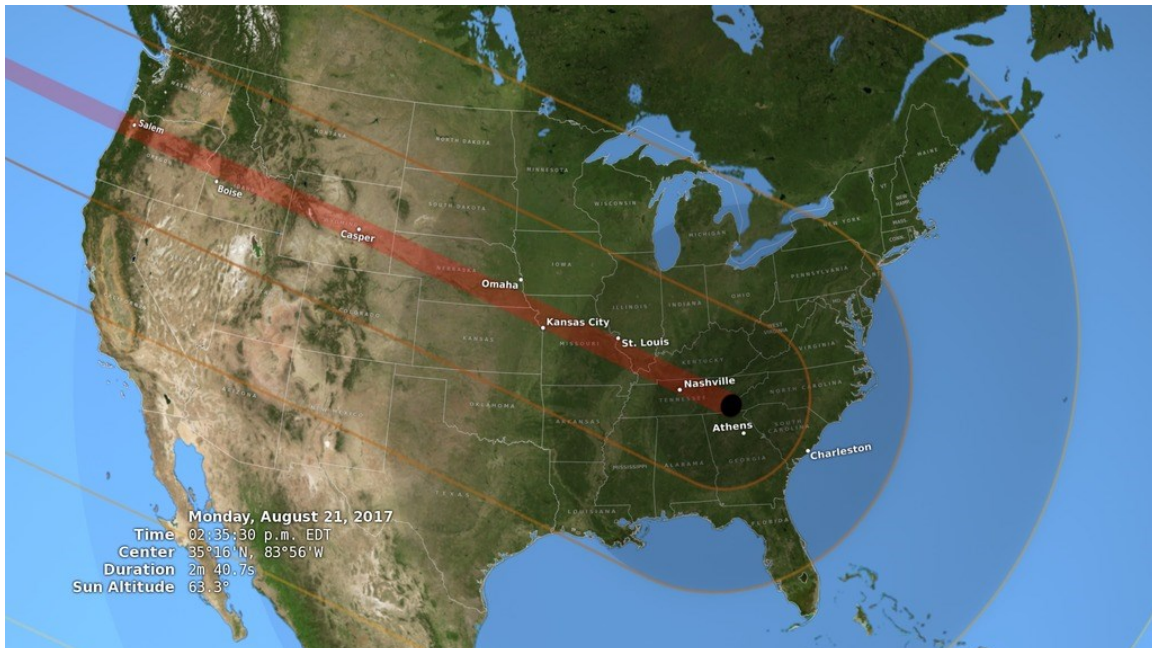


Illustration showing the United States during the total solar eclipse of August 21, 2017, with the umbra (black oval), penumbra (concentric shaded ovals), and path of totality (red) through or very near several major cities. Credit: Goddard Science Visualization Studio, NASA

WHERE WE MEET

JENKS HS PLANETARIUM



**Our Club General meetings are held at the
Jenks Public Schools Planetarium
105 East B St, Jenks, OK**

When you enter the building lobby, take the elevator to the 3rd floor.

Meetings begin at 7:00 PM

**Printable Detailed map available at [http://astrotulsa.com/cms_files/
Directions_JenksPlanetarium.pdf](http://astrotulsa.com/cms_files/Directions_JenksPlanetarium.pdf)**

We hope to see you there!

MEMBERSHIP INFORMATION

ASTRONOMY CLUB OF TULSA OFFICERS:

PRESIDENT RICHARD BRADY

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MEMBERSHIP RATES FOR 2017 WILL BE AS FOLLOWS:

ADULTS - \$45 PER YEAR. INCLUDES ASTRONOMICAL LEAGUE MEMBERSHIP.

SENIOR ADULTS - \$35 PER YEAR. **FOR THOSE AGED 65 AND OLDER.** INCLUDES ASTRONOMICAL LEAGUE MEMBERSHIP.

STUDENTS - \$30 PER YEAR. INCLUDES ASTRONOMICAL LEAGUE MEMBERSHIP.

STUDENTS - \$25 PER YEAR. **DOES NOT INCLUDE ASTRONOMICAL LEAGUE MEMBERSHIP.**

THE REGULAR MEMBERSHIP ALLOWS ALL MEMBERS OF THE FAMILY TO PARTICIPATE IN CLUB EVENTS, BUT ONLY ONE VOTING MEMBERSHIP AND ONE ASTRONOMICAL LEAGUE MEMBERSHIP PER FAMILY.

ADDITIONAL FAMILY MEMBERSHIP - \$15 WITH ASTRONOMY CLUB OF TULSA VOTING RIGHTS, \$20 WITH CLUB VOTING RIGHTS AND ASTRONOMICAL LEAGUE MEMBERSHIP.

THOSE WISHING TO EARN ASTRONOMICAL LEAGUE OBSERVING CERTIFICATES NEED TO HAVE A LEAGUE MEMBERSHIP.

MAGAZINE SUBSCRIPTIONS:

ASTRONOMY IS \$34 FOR ONE YEAR OR \$60 FOR 2 YEARS.

WEBSITE: www.astronomy.com

SKY & TELESCOPE IS \$33 PER YEAR.

WEBSITE: www.skyandtelescope.com

SKY & TELESCOPE OFFERS A 10% DISCOUNT ON THEIR PRODUCTS.

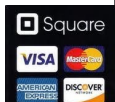
IF YOU ARE AN EXISTING S&T SUBSCRIBER, YOU CAN RENEW DIRECTLY WITH S&T AT THE SAME CLUB RATE. BOTH S&T AND ASTRONOMY NOW HAVE DIGITAL ISSUES FOR COMPUTERS, IPADS AND SMART PHONES.

ONLINE REGISTRATION

WE NOW HAVE AN AUTOMATED ONLINE REGISTRATION FORM ON THE WEBSITE FOR NEW MEMBERSHIPS, MEMBERSHIP RENEWALS AND MAGAZINE SUBSCRIPTIONS. JUST SIMPLY TYPE IN YOUR INFORMATION AND HIT "SEND" TO SUBMIT THE INFORMATION. YOU CAN THEN PRINT A COPY OF THE FORM AND MAIL IT IN WITH YOUR CHECK, OR USE OUR CONVENIENT PAYPAL OPTION. .

LINK: <http://www.astrotulsa.com/Club/join.asp>

OR, IF AT A STAR PARTY OR MEETING, SIMPLY FIND A CLUB OFFICER TO ASK ABOUT JOINING OR RENEWING WITH YOUR DEBIT OR CREDIT CARD THROUGH OUR CONVENIENT SQUARE OPTION!



THE ASTRONOMY CLUB OF
TULSA INVITES YOU TO MAKE
PLANS THIS SPRING TO JOIN US
AT A STAR PARTY!

OPEN TO THE PUBLIC
FOR MORE INFORMATION
PLEASE VISIT
WWW.ASTROTULSA.COM.

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3 NON-PROFIT ORGANIZATION OPEN TO
THE PUBLIC. THE CLUB STARTED IN
1937 WITH THE SINGLE MISSION TO
BRING THE JOY AND KNOWLEDGE OF
ASTRONOMY TO THE COMMUNITY OF
TULSA, OK AND THE SURROUNDING
AREA. TODAY OUR MISSION REMAINS
EXACTLY THE SAME. WE TRAVEL TO
LOCAL SCHOOLS, CHURCHES AND
MANY OTHER VENUES WITH SCOPES
AND PEOPLE TO TEACH. OUR
OBSERVATORY IS LOCATED IN MOUNDS
AND MANY PUBLIC PROGRAMS ARE
OFFERED THERE. TO JOIN THE
ASTRONOMY CLUB OF TULSA, PLEASE
VISIT WWW.ASTROTULSA.COM WHERE
YOU WILL FIND ALL THE INFORMATION
NECESSARY TO BECOME A MEMBER.



Also find us on Facebook!

<https://www.facebook.com/AstronomyClubofTulsa>



WE ALSO ARE A PROUD PARTICIPANT IN NASA'S NIGHT SKY
NETWORK.

THE EDITOR WISHES TO THANK THE FOLLOWING FOR
THEIR CONTRIBUTIONS TO "THE OBSERVER" FOR
THIS ISSUE:

MARCUS WOO

JOHN LAND

RICHARD BRADY

TIM DAVIS

TAMARA GREEN



PHOTOS: Sidewalk Astronomy for the birds??? Above: Owen makes a couple of feathered friends while visiting with guests at Bass Pro.

Below: Our two new avian "members" decide to visit Sheldon and Richard!

Both photos taken at Sidewalk Astronomy at Bass Pro, February 2017 by Tamara Green.