INSIDE THIS ISSUE:

THE ASTRONOMY CLUB TULSA IS A PROUD MEMBER OF

THE ASTRONOMICAL LEAGUE

ASTRONOMY CLUB OF TULSA

OBSERVER

AUGUST 2016

IMAGES OF THE MONTH: TOP: MARS AND ANTARES TAKEN AT THE ACT OBSERVATORY JUNE 6, 2016 BY BYRON LABADIE.

BOTTOM: A BEAUTIFUL SKYSCAPE OVER BEAR LAKE, WITH THE FLATTOP MTNS. IN THE BACKGROUND, TAKEN AT COLORADO'S ROUTT NATIONAL FOREST, BY STAN DAVIS.

AUGUST 2016

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:

NEW MOON	TUES, AUG 2
FIRST QUARTER	WED, AUG 10
FULL (Sturgeon) MOON	THU AUG 18
LAST QUARTER	WED AUG 24

UPCOMING EVENTS:

SIDEWALK ASTRONOMY	SAT, AUG 13	7:15 PM	BASS PRO
PUBLIC STAR PARTY	SAT AUG 27	8:00 PM	ACT OBSERVATORY
MEMBERS' NIGHT**	FRI SEP 2	7:45 PM	ACT OBSERVATORY
GENERAL MEETING***	FRI SEP 9	7:00 PM	JENKS HS PLANETARIUM

*** Date and time may change to Sat, Sep 10 due to upcoming large group event

SIDEWALK ASTRONOMY***	SAT SEP 10	6:30 PM***	BASS PRO***

***Date, time and location may change to Fri, Sep 9 due to upcoming large group event

OKIE-TEX STAR PARTY	SEP 24 THRU OCT 2		BLACK MESA, OK
PUBLIC STAR PARTY	SAT SEP 24	7:30 PM	ACT OBSERVATORY
MEMBERS' NIGHT**	FRI SEP 30	7:15 PM	ACT OBSERVATORY

SEPTEMBER 2016

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 & HOLIDAYS:

NEW MOON	THU SEP 1
LABOR DAY	MON SEP 5
FIRST QUARTER	FRI SEP 9
FULL (Harvest) MOON	FRI SEP 16
LAST QUARTER	FRI SEP 23
NEW MOON	FRI SEP 30

PRESIDENT'S MESSAGE

BY RICHARD BRADY

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Hi everyone!

There's a lot happening in the sky this month. The Perseids are coming in August as usual. In addition, the planets are putting on two shows this month, one in the west right after sundown and the other in the south.

One of the best meteor showers of the year happens in August, the Perseid meteor shower. It is expected to reach its peak the night of August 11-12. Sky & Telescope is reporting the peak could be anywhere between midnight to after sunrise. On that Friday the moon sets around 1:30 AM. Is anyone interested in coming up to the observatory to view the shower that night? If so, let me know and I will open up the observing field. (If I don't hear from anyone, I won't.) I would come up around 11 PM, since the peak is not supposed to be until early in the morning.

You don't need to have a telescope for a meteor shower. In fact it's not recommended. Any telescope just sees a small portion of the sky, whereas a shower can cover much more. All you really need is a lawn chair to lie back on and watch the sky, and maybe something to drink and snack on. And maybe some bug spray. The radiant is in Perseus to the northeast. Several meteor showers happen at this time of year. An article about these showers is on Sky & Telescope's News page. The Perseids are discussed near the bottom of the article. The link to it is http://www.skyandtelescope.com/astronomy-news/observing-news/delta-aquarids-kick-off-summer-meteor-showers/.

Jupiter, Venus, and Mercury are low in the west right after sundown. On Saturday, August 27th, Jupiter (magnitude -1.7) and Venus (magnitude -3.9) will be only 8 1/2 minutes apart, less than 1/3 the moon's diameter. (The moon is around 30 minutes across.) But you need to look for them right after sunset. The pair sets around 8:57, just an hour after the sun sets at 7:56. (Did someone say photo op? Our newsletter editor and vice-president, Tamara Green, is always looking for photos to put in the Observer.) Also Mercury will be to the lower left of Jupiter and Venus, but it is only magnitude +0.9 and will set at 8:40. Good luck finding it. (This happens to be the evening of our Public Observing Night. This wasn't planned, just a lucky coincidence.)

Also, the previous week, Mars (magnitude -0.4) and Saturn (magnitude +0.4) are putting on a show in the south. On August 23rd, Saturn, Mars, and Antares (magnitude +1.1) will be in an almost straight line running vertically. Saturn will be on top, Mars in the middle, and Antares on the bottom. Saturn will be about 4 ½ degrees above Mars and Antares will be less than 2 degrees below Mars. (Another photo op!) If you watch them for a few evenings before and after the 23rd you can see Mars move to the east from night to night.

Sky & Telescope has an 8 minute podcast about the Perseids and the planets at http://www.skyandtelescope.com/astronomy-news/observing-news/astronomy-podcast-for-august-2016/.

TREASURER'S AND MEMBERSHIP REPORT

BY TIM DAVIS

Astronomy Club of Tulsa: 177 members, including 44 new members in 2016.

Welcome to our new members this month:

Donita Gray and Mijael Martinez.

Club Accounts as of July 31, 2016:
Checking: 7,769.34; Savings: $4,775.80; Investment accounts: $19,687.99 *(Value Fluctuates with Market)*; **PayPal: $ 0.00**

T**he 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 2016 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

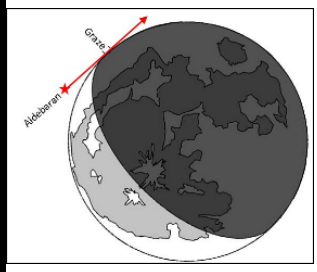
Sky & Telescope also offers a 10% discount on their products.

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

Grazing Occultation of the star Aldebaran by the Moon.

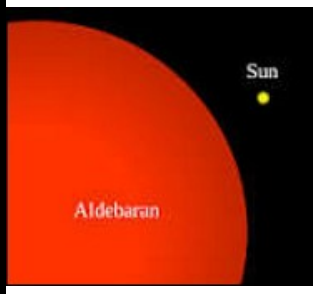
Friday July 29, 2016 05:08 to 05:10 CDT **By John Land**



An occultation takes place when one celestial object passes directly in front of another hiding it from view. The most commonly observed occultations occur when the moon passes in front of a star or planet however asteroids or planets can also occult a star. Occultations have scientific value in that they provide a method of precisely measuring the position and size of the object involved in the occultation.

A grazing occultation occurs when the star skims along the edge of the moon alternately popping in and out of view as it passes behind a mountain and then reappears through a valley. Since the moon is relatively close to the Earth its position as seen against the background of stars changes depending on where the observer is located. A person in Dallas may see the moon pass in front of the star while an observer in Kansas City may see the moon pass just south of the star. Our moon moves toward the east among the stars at the rate of about one diameter (1/2 degree) per hour. For this event we wanted to be positioned at just the right place for the star Aldebaran to just graze the edge of the moon.

NOTE: Links to YouTube recordings of this event are at the end of the article. Don't miss them !



Aldebaran is the brightest star in the constellation of Taurus on the eastern edge of the Hyades star cluster. At magnitude 0.9 this K5 star is easily recognized by its distinctly orange hue. Its color reflects its cooler temperature 3910 K compared to the sun's hotter 5780 K. Aldebaran is a giant star 44 times the diameter of the sun (62 million miles across) and 518 times brighter than the sun and lies 65 light years away.

We were alerted to this Grazing Occultation by a post on Sky & Telescope website. The Astronomy Club of Tulsa (**ACT**)also received a detailed email from David Dunham one of the founding members of **IOTA** (International Occultation Timing Association) IOTA was holding its annual meeting in Stillwater that weekend specifically to organize teams to observe and measure the event. John Land sent out an email to the ACT members announcing the event and asking for volunteers to participate.

Our occultation team consisted of John Land, Skip Whitehurst, Bill Collier from the Tulsa club and John Grismore from the Bartlesville Astronomical Society. The team set up on the south side of Oologah. Member John Moore set up some 35 miles west at Washington Irving South recreation area on the shore of Lake Keystone. Except for John Grismore the rest of us were novices at this sort of thing.

Location, Location, Location ! After consulting the IOTA website John Land had decided he would set up near Oologah, OK high school. Fortunately he sent an email to Brad Timerson, who coordinates the Lunar Occultation section of IOTA who told him that this particular section of the moon's profile was lower than the nominal (average) diameter of the moon. Brad sent John a link to an interactive map suggesting the best line would be 1.49 km farther south. The lunar profile was only 0.5" (0.5 arcseconds) lower than the nominal but that made a big difference on the ground. 0.5" of angle is 1/7200th of a degree! We relocated our planned observing site to a car wash near the corner of Hwy 169 & Hwy 88 on the south edge of Oologah. John Moore also relocated his site based on the new information. For a grazing occultation a change of a couple of hundred meters can mean the difference between success or a total miss!

The weather forecasts all week had been calling for rain Friday morning and each new forecast was increasing the chance of rain; by Thursday evening the forecast was 60% ! Ever hopeful we all loaded up our equipment and determine to see what the sky was like at 3:00 AM. The event was at **5:00 AM** and we needed to arrive an hour early to get set up. At 3:00 AM I arose and looked timidly out the back door. There was Capella shining boldly in the NE. I stepped into the yard and the sky was CLEAR 360 DEGREES! What an amazing blessing! As I loaded the final things in the car and opened the garage door there was the slim crescent moon peeking over the neighbor's house with Aldebaran to its left!

Bill and Skip were first to arrive, followed by John L and John G. Each chose a location to set up his telescope. John G., Skip and Bill all had video recording equipment attached to their scopes. John L did his observing visually making an audio recording on his iPhone. For accurate time we used the time signals from the shortwave radio station WWV. John G. had a clever app on his iPhone that would precisely trigger the phone's flash and log the precise time. This makes an identifiable frame to calibrate a time line for extrapolation of data from the recordings.

Meanwhile, further west, John Moore encountered a big problem. In his words *"I had to negotiate the tire shredder at the exit gate at Washington Irving South - they lock the entry gate at 10:00. I barely was able to get through without ruining my tires, but I was on a mission and wasn't to be deterred! The clouds held off just long enough to complete the viewing."* He set up his 120mm refractor and video equipment to record his observation.

As 5:00 AM approached everyone was at his station and eagerly anticipating the occultation. The 5:08 beep chimed on WWV and things started happening. Aldebaran blinked out – then back on again. Off – on – then dimly peeking through a valley and off again. 5 – 6 – 7 times or so this repeated over the next two minutes. Time seemed to both stand still and rush by simultaneously. After the occultation was over we were busy getting GPS coordinates for each scope's position making sure the video recordings were time stamped again and stored, and taking pictures to document each scopes position. As we started loading up our equipment the clouds rolled in and portions of Tulsa got a good rain by 9:00 AM. The IOTA conference teams near Stillwater were also successful in getting observations before clouds moved in.

Observing a grazing occultation is a rare and fascinating adventure well worth the time and effort to enjoy just visually as I did. However the video recordings hold scientifically valuable data. One of the goals of this occultation timing project was to better determine the diameter of Aldebaran. At the moon's distance the star's angular size translates to about 40 m. During an occultation a typical star blinks instantaneously out. However we were able to observe Aldebaran dimly flicker over the edge of a couple of valleys as part of its disk was still visible. Also data can reveal subtle differences in the surface profile of the moon and its own orbital motion.

John Grismore and Skip Whitehurst processed their videos to correlate each frame to the Coordinated Universal Time. They then used software to measure and graph a light curve of the dimming and brightening of the star. Many emails went back and forth refining their data. Brad Timerson of IOTA was very helpful getting the data into the right format to be matched up with other observing teams across the nation. Brad was also able to match Skip and John G's light curves with the actual mountains and valleys along the lunar limb.

You can see **YouTube postings** of the occultation at the links below.

Skip Whitehurst **https://www.youtube.com/watch?v=7OBqphaVRxQ&feature=youtu.be**

Note: the radio in the background is the WWV radio - Coordinated Universal Time UT = CDT + 5 hrs

John Grismore **https://www.youtube.com/watch?v=sgPGTFW4DkM**

John's video does an excellent job showing the small fluctuations in the stars image.

Plus he has a great close up replay at the end.

John Moore **https://www.youtube.com/watch?v=nhjN2vwd-j8**

This was John's first time but he was able to get a video of the event and has great plans to try again.

Caught the OCCULTATION BUG? Need a Cure? The asteroid 85 Io will be casting a long shadow over NE Oklahoma on the Evening of Friday Aug 26 around 11:30 PM (Aug 27 04:30 UT)

For this sort of event they want observers at many places across the path not just the center line.

The star it is occulting is 7.5 mag which can be seen in most telescopes from your backyard.

See a map of its path at **http://www.poyntsource.com/New/Google/20160827_36978.HTM**

If you want to get involved in this team contact John Land or another member of our occultation team.

Cropped frames from Skip's video – his video is full resolution

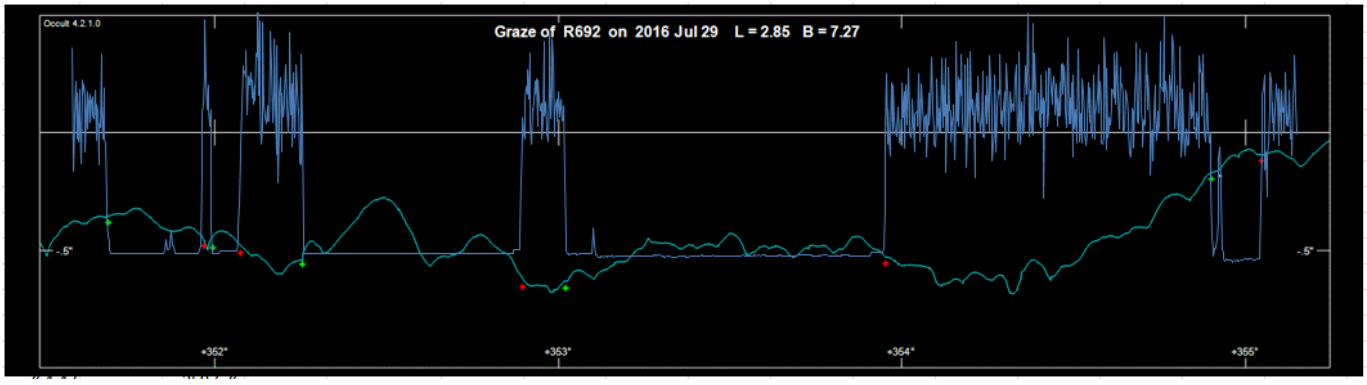
Appear **Occulted** **Reappear**

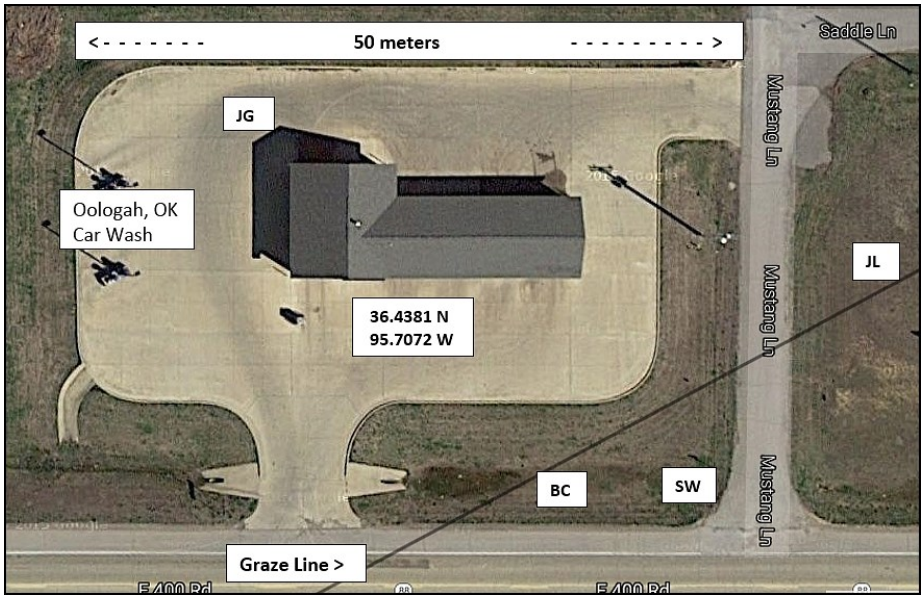
Below is the light curve from Skip's video superimposed on the profile of the limb of the moon.

Time increases from **< < <** RIGHT to LEFT since the moon moves east relative to the fixed star.

RED + is a Disappearance: star goes behind a mountain and light curve dips.

GREEN + is a Reappearance: star peeks through a valley and light level jumps up.

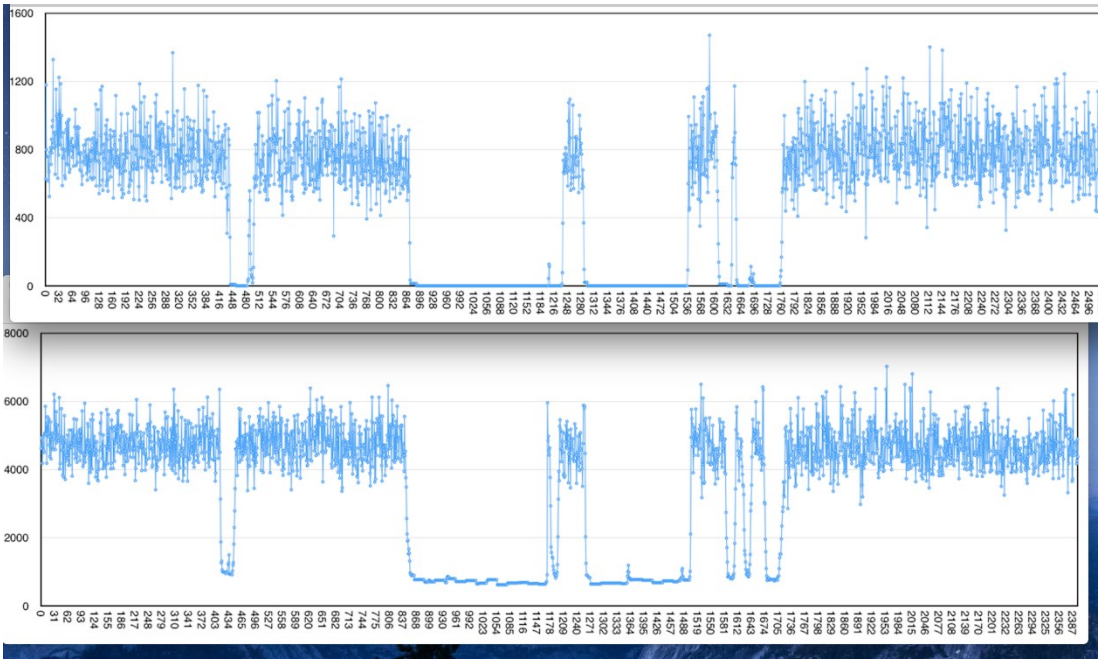




Comparison of **Skip's Light Curve (Top)** to **John Grismore's (Bottom)**

They were about 65 meters apart John was about 50 m north of the graze line

Look for subtle differences in the patterns. Time increases here from Left to Right **> > >**



The Team – John Land - Skip Whitehurst – John Moore

John Grismore Bill Collier

OKIE-TEX STAR PARTY

SEPTEMBER 24-OCT 2, 2016

If you have not done so already, it is not too late to register for Okie-Tex Star Party 2016, which runs September 24 to October 2, 2016!

Per the Oklahoma City Astronomy Club's Okie-Tex website: **http://www.okie-tex.com/registration.php:**

Pre-Registration and Fees:

The pre-registration fee is $50.00 for each primary registrant and $25.00 for each additional family member 16 years old or older. Children under 16 are admitted free of charge. Only primary registrants are eligible for the *Great Okie-Tex Giveaway* Adult guests may register as primary registrants for $50.00 if they wish to be eligible in the giveaway or may upgrade their registration for $25.00 at the party by checking in at the registration desk at anytime prior to the giveaway.

Pre-registration submissions must be post-marked no later than Saturday *September 3, 2016* and must be paid in full. Online Registrations must be completed and paid in full by midnight CDT on Monday *September 5, 2016*.

At-The-Door Registration and Fees:

Registrations received with postmarks after September 3, 2016 and registrations at the door are $100.00 for all adult guests. At-the-door registrants are eligible to participate in the *Great Okie-Tex Giveaway*.

Facility Fee:

As part of our ongoing investment in and improvements to Camp Billy Joe, a $5.00 per day facility fee is charged for **all registrants**. The facility fee is waived for children under 16.

Meals are catered by Jody's Catering of Boise City, OK.

In camp meals provided by Jody's Catering may be purchased. Please refer to the Meal Request Form. Checks for meals are made payable to Jody's Catering. Please pre-purchase meals to ensure enough food is available. At the door meal purchases will be limited. Meal request form and payment must be received, with a postmark, no later than August 26, 2016.

Link to the Okie-Tex Star Party Website: http://www.okie-tex.com/

Link to the Online Registration Form: http://www.okie-tex.com/Registration/

Link to the Meals Request Form: http://www.okie-tex.com/Files/2016meals.pdf

Many of us go to Okie-Tex each year and it is really a fantastic star party and a great observing experience. There are also side trips you can take to the dinosaur tracks, the Oklahoma/Colorado/New Mexico tri-state marker, a hike up Black Mesa, nearby Black Mesa State Park and Lake Carl Etling, and Capulin Volcano National Monument.

Hope to see you there!

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!

Venus and Jupiter prepare for their close-up this August

By Ethan Siegel

As Earth speeds along in its annual journey around the Sun, it consistently overtakes the slower-orbiting outer planets, while the inner worlds catch up to and pass Earth periodically. Sometime after an outer world—particularly a slow-moving gas giant—gets passed by Earth, it appears to migrate closer and closer to the Sun, eventually appearing to slip behind it from our perspective. If you've been watching Jupiter this year, it's been doing exactly that, moving consistently from east to west and closer to the Sun ever since May 9th.

On the other hand, the inner worlds pass by Earth. They speed away from us, then slip behind the Sun from west to east, re-emerging in Earth's evening skies to the east of the Sun. Of all the planets visible from Earth, the two brightest are Venus and Jupiter, which experience a conjunction from our perspective only about once per year. Normally, Venus and Jupiter will appear separated by approximately 0.5º to 3º at closest approach. This is due to the fact that the Solar System's planets don't all orbit in the same perfect, two-dimensional plane.

But this summer, as Venus emerges from behind the Sun and begins catching up to Earth, Jupiter falls back toward the Sun, from Earth's perspective, at the same time. On August 27th, all three planets—Earth, Venus and Jupiter—will make nearly a perfectly straight line.

As a result, Venus and Jupiter, at 9:48 PM Universal time, will appear separated by only 4 arc-minutes, the closest conjunction of naked eye planets since the Venus/Saturn conjunction in 2006. Seen right next to one another, it's startling how much brighter Venus appears than Jupiter; at magnitude -3.80, Venus appears some *eight times brighter than* Jupiter, which is at magnitude -1.53.

Look to the western skies immediately after sunset on August 27th, and the two brightest planets of all—brighter than all the stars—will make a dazzling duo in the twilight sky. As soon as the sun is below the horizon, the pair will be about two fists (at arm's length) to the left of the sun's disappearance and about one fist above a flat horizon. You may need binoculars to find them initially and to separate them. Through a telescope, a large, gibbous Venus will appear no more distant from Jupiter than Callisto, its farthest Galilean satellite.

As a bonus, Mercury is nearby as well. At just 5º below and left of the Venus/Jupiter pair, Mercury achieved a distant conjunction with Venus less than 24 hours prior. In 2065, Venus will actually occult Jupiter, passing in front of the planet's disk. Until then, the only comparably close conjunctions between these two worlds occur in 2039 and 2056, meaning this one is worth some special effort—including traveling to get clear skies and a good horizon—to see!

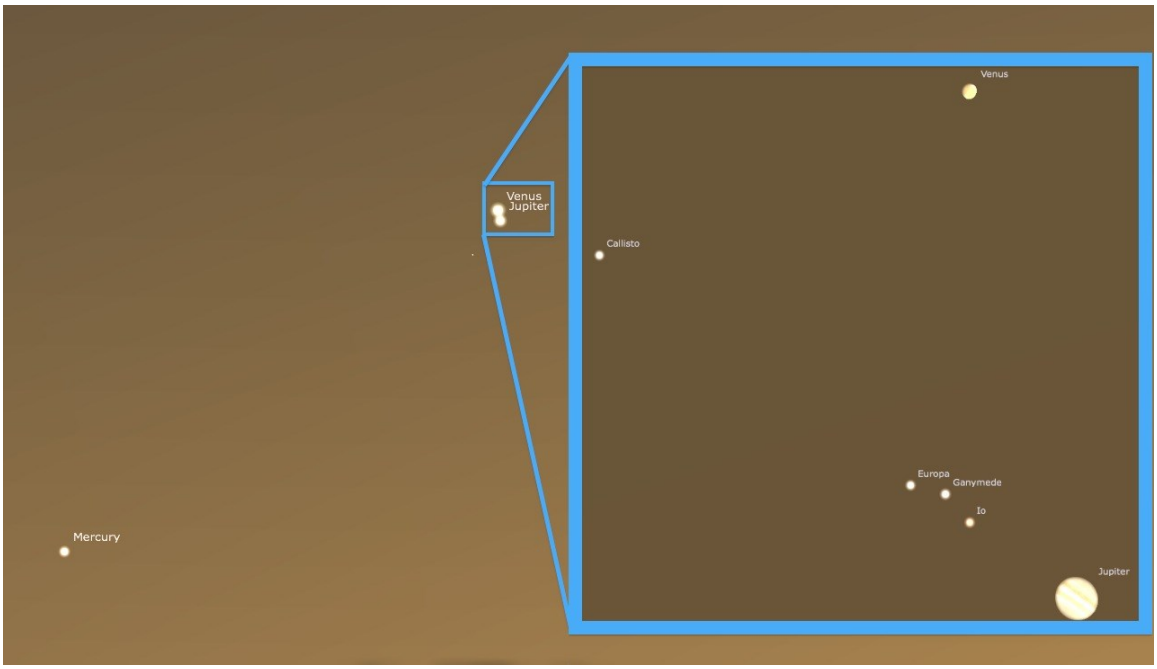


Image credit: E. Siegel, created with Stellarium, of a small section of the western skies as they will appear this August 27th just after sunset from the United States, with Venus and Jupiter separated by less than 6 arc-minutes as shown. Inset shows Venus and Jupiter as they'll appear through a very good amateur telescope, in the same field of view.

To teach kids more about Venus and Jupiter, visit the NASA Space Place webpages titled "All About Venus" [http://spaceplace.nasa.gov/all-about-venus/en/] and "All About Jupiter" [http://spaceplace.nasa.gov/all-about-jupiter/en/].

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/

We hope to see you there!

ASTRONOMY CLUB OF TULSA OFFICERS:

PRESIDENT **RICHARD BRADY**

astrotulsa.pres@gmail.com

VICE PRESIDENT **TAMARA GREEN**

astrotulsa.vp@gmail.com

SECRETARY **TERESA DAVIS**

astrotulsa.sec@gmail.com

TREASURER **TIM DAVIS**

astrotulsa.tres@gmail.com

BOARD MEMBERS-AT-LARGE:

JOHN LAND

CHRISTOPHER PROCTOR

JAMES TAGGART

SKIP WHITEHURST

JAMES LILEY

STAFF:

NEWSLETTER EDITOR TAMARA GREEN

astrotulsa.vp@gmail.com

WEBMASTER JENNIFER JONES

jjones@seedtechnologies.com

MEMBERSHIP CHAIRMAN JOHN LAND

astroclubbiz@windstream.net

OBSERIVING CHAIRS OWEN AND TAMARA GREEN

darthnewo@yahoo.com, astrotulsa.vp@gmail.com

SIDEWALK ASTRONOMY OWEN GREEN

darthnewo@yahoo.com

PR AND OUTREACH OWEN GREEN

darthnewo@yahoo.com

GROUP DIRECTOR TERESA DAVIS

astrotulsa.sec@gmail.com

NIGHT SKY NETWORK RICHARD BRADY

astrotulsa.pres@gmail.com

FACILITIES MANAGER JAMES TAGGART

astrotulsa.obs@gmail.com

MEMBERSHIP INFORMATION

MEMBERSHIP RATES FOR 2016 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 SUMMER TO JOIN US AT A STAR PARTY!

OPEN TO THE PUBLIC

FOR MORE INFORMATION PLEASE VISIT WWW.ASTROTULSA.COM.

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DR. ETHAN SIEGEL

BYRON LABADIE

STAN DAVIS

JOHN LAND

RICHARD BRADY

TIM DAVIS

TAMARA GREEN

PHOTO: Corvus, Hydra and Spica in Virgo over the observatory building, June 2015, by Tamara Green.

PHOTO: The Summer Triangle over the observatory, June 2015, by Tamara Green.