ASTRONOMY CLUB OF TULSA

OBSERVER

APRIL 2015

INSIDE THIS ISSUE:

THE ASTRONOMY CLUB TULSA IS A PROUD MEMBER OF

THE ASTRONOMICAL LEAGUE

SPRING STAR PARTIES

PHOTO: Leo rising over the microwave tower, Feb 2014, by Tamara Green.

PHOTO: Club members and guests wait for the sky to darken and the fun to begin, by Tamara Green. Taken Mar 28, 2015.

APRIL 2015

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:

UPCOMING EVENTS:

GENERAL MEETING	FRI APR 3	7:00 PM	JENKS HS PLANETARIUM
SIDEWALK ASTRONOMY	SAT APR 4	7:00 PM	BASS PRO
CLUB WORK DAY	SAT APR 11	TBA	ACT OBSERVATORY
INT'L DARK SKY WEEK	APR 12-18		
MEMBERS' NIGHT	FRI APR 17	7:30 PM	ACT OBSERVATORY
MESSIER MARATHON	SAT APR 18	TBA	TUVA
PUBLIC STAR PARTY	SAT APR 25	8:00 PM	ACT OBSERVATORY
GENERAL MEETING	FRI MAY 1	7:00 PM	JENKS HS PLANETARIUM
SIDEWALK ASTRONOMY	SAT MAY 2	7:30 PM	BASS PRO
MEMBERS' NIGHT	FRI MAY 15	8:15 PM	ACT OBSERVATORY
PUBLIC STAR PARTY	SAT MAY 23	8:15 PM	ACT OBSERVATORY
SIDEWALK ASTRONOMY	SAT MAY 30	8:30 PM	BASS PRO

MAY 2015

SUN	MON	TUE	WED	THU	FRI	SAT
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10	11	12	13	14	15	16
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24	25	26	27	28	29	30
31						

MOON PHASES & HOLIDAYS:

The Astronomy Club of Tulsa and TUVA Astronomy Club Cordially Invite you to our Annual

MESSIER MARATHON!

Saturday, April 18, 2015

TUVA Astronomy Club, Checotah, OK

Each year, around late Winter/early Spring, observers can potentially find and log all 110 of the wonderful objects in Charles Messier's famous catalog IN ONE NIGHT! Many of our Club members enjoy going out to challenge each other to see who can find the most, or challenge themselves to see if they can beat their last year's score. The one who finds the most objects wins the coveted David Stine Award. Some come out to just have a good time with friends under the stars. Any way you slice it, the Messier Marathon is one of the highlights of our year!

A Caravan to the event will be led by our very own Vice President, Tamara! The Caravan will meet at the Burger King located at 1600 N. Elm Pl., Broken Arrow, OK (on the West side of Elm Pl. (161st E. Ave.), just South of Highway 51 (the BA Expwy.). ***The Caravan will leave promptly at 3:00 PM.*** Maps to appear on next page.

There will be a pot-luck dinner before the marathoning begins! So bring your favorite dish or dessert to share!

*Please note: This event is for Astronomy Club of Tulsa and TUVA members and their families only.**

For more information, including information on how to get in on the Caravan to TUVA, contact Tamara Green at astrotulsa.vp@gmail.com.

**As with any members-only event, any ACT member may invite up to, but not exceeding, two (2) individual non-family guests. TUVA may or may not have its own rule regarding same.*

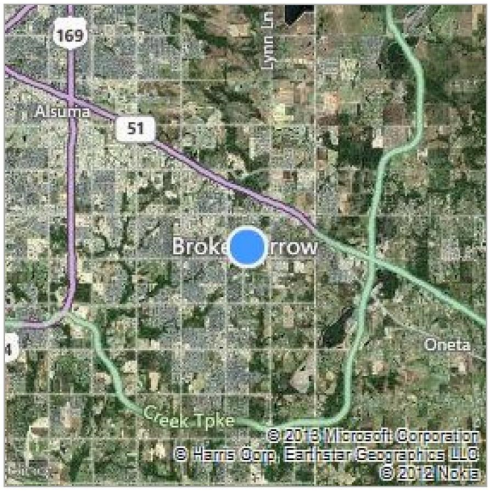
Map to the Burger King on Elm Place:

bing Maps

Broken Arrow, OK

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

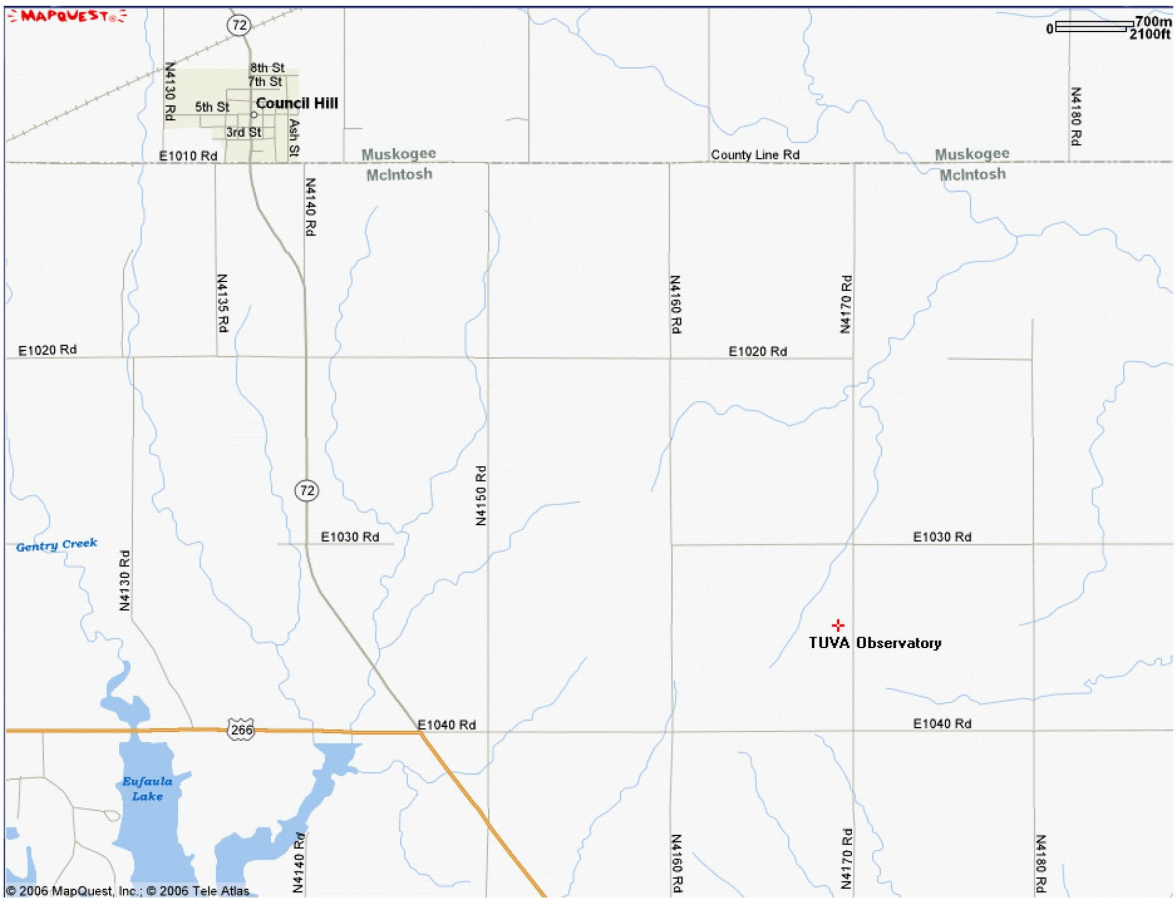
On the go? Use **m.bing.com** to find maps, directions, businesses, and more



Map to TUVA

1. From the Broken Arrow Expressway going east, exit at 81st St. which is also Highway 51 (last exit before the Muskogee Turnpike).
2. Go about nine miles to Coweta. Watch for Wal-Mart on the left, go under the railroad bridge and through downtown Coweta on Highway 72.
3. Continue on Hwy 72 through Haskell, Boynton, and Council Hill. (Watch speed traps through these little towns).
4. About 3½ miles after you go through Council Hill, Hwy 72 ends. Watch for signs that say this and "Junction 266". To the right is 266 west to Henryetta and straight ahead is 266 to Checotah.
5. At this junction turn left (east) onto a county road.
6. Go ¼ mile to a stop sign, past a white church. Continue two miles east to another stop sign and a white two-story house on your left.
7. Turn left (north) and go ½ mile to a silver and red gate on your left (west).
8. There is a black mailbox and white Muskogee Phoenix box at the entrance of the site. Turn in and you are at TUVA.

Option: You can also bypass Coweta by going south on Memorial through Bixby, make the big curve to the east and go through Leonard to Haskell and follow the directions starting at step 3.



Get ready for the APRIL 18TH

Messier Marathon

Some great websites to prepare you.

Guide to Messier Marathon Observing
http://www.richardbell.net/marathon.html

Great Single page search list
http://www.richardbell.net/Files/messier_list.pdf

Enjoy a Live Video Marathon Mar 28
http://www.mvastro.org/starparty/messier.php

Composite Image of all 110 M objects
http://apod.nasa.gov/apod/ap000311.html

Awesome APOD Image of a Messier Night
http://apod.nasa.gov/apod/ap110527.html

World @ Night Messier Video
http://www.twanight.org/newTWAN/photos.asp?ID=3003232&Background=dark

7 Minute Video of a Messier Marathon
Including great images at the last 2 mins.
https://www.youtube.com/watch?v=HfxDOxYfAGo

B & W video Images on ALL 110 M objects
https://www.youtube.com/watch?v=OPXmEsDRP14

Star Hopping Guide to the Messier Marathon
http://www.robhawley.net/mm/

Messier Marathon on the **App** Store on iTunes – Apple $1.99 - iOS
https://itunes.apple.com/ca/app/messier-marathon/id594617818?mt=8

ASTRONOMY CONVENTIONS THIS SUMMER

Get your Reservations in Early and save.

Astronomy conventions are a great way to meet other astronomers and find out what is going on in other clubs in the region. They feature a variety of guest speakers plus a number of astronomer vendors are usually present. Plus you get a chance to travel and see what kind of facilities other clubs are using.

MIdStates Astronomy convention

Friday May 29 thru Sun May 31 at University of Arkansas in Little Rock.

Our Tulsa Club is a member of a 5 state region of the Astronomical League.

Each year one of the regional clubs hosts the convention in their area. This year the Central Arkansas Astronomical Society is acting a host. They have an impressive list of guest presenters lined up.

Details at www.MSRAL.org

https://alcon2015.astroleague.org/

https://www.astroleague.org/files/reflector/Mar_2015.issue_.Web_.pdf page 2

The astronomical leagues national convention is in Los Cruces New Mexico. These national events attract several 100 of the nation's leading astronomy professionals as well as amateurs. Speakers include well known astronomy authors and professionals. This year's event is held in the dark skies of SW New Mexico. A number of optional side trips are available: White Sands Missile base museum, Very Large Array Radio observatory, Apache Point observatory and Dunn Solar telescope plus many natural attractions.

LUNAR ECLIPSE APRIL 4, 2015

BY JOHN LAND

PREDAWN LUNAR Eclipse Sat April 4 begins at **05:16 AM CDT**

By John Land

(Note: Due to the predawn time of the event our club is not planning any group viewing)

You don't need dark sky or any special equipment to safely observe an eclipse of the moon. (However a warm cup of coffee or cocoa might be just the thing you need to get going before dawn.) You'll need a clear view to the horizon in the WSW. At the beginning of the eclipse the moon will be only 20 degrees above the horizon in the SW. Just go outside and locate the moon about 30 degrees up in the West-Southwestern sky and enjoy. You don't need to drive to the country since the full moon is easily seen from town. Binoculars or a low power telescope will enhance the view but certainly are not required. It will be easier to **locate the moon BEFORE it is totally eclipsed**. If you aren't brave enough to get out at 5:15 AM to see the beginning of the eclipse then be sure to **be outside by 6:00 AM.** You'll have to look harder for the partially eclipsed moon only 12 degrees above the horizon. **Totality begins at 6:58 AM** and lasts less than 5 minutes **ending at 7:03 AM** and the **moon is setting in the west at 7:09 AM.** The sun will be rising in the east at **7:06 AM**

During a lunar Eclipse the Full Moon passes through the Earth's shadow. The outer region of the shadow is called the **Penumbra** – where the sun's light is partly eclipsed by the Earth shadow. An observer on the moon would see a solar eclipse as the Earth passed in front of the sun. Typically you won't notice much of the dull gray shading of the penumbra until about 05:00 AM CDT

The Dark inner shadow of the Earth is called the **UMBRA.** The Umbra will appear as small "bite" out of the left side of the moon and progress across to the right. Finally the Umbra will completely cover the moon during totality. However the Earth's atmosphere still bends some sunlight onto the moon. The moon takes on an eerie orange or reddish color. The color varies depending on how much dust is in the Earth's upper atmosphere. I have seen eclipses as bright as a new penny – a dark brick red – and even one that was almost an invisible gray due to a recent volcanic eruption in Mexico. In ancient times people described the moon as turning to blood evoking fear and panic. In modern times we aren't much better as all sorts of misinformed people post wild speculations about impending disasters.

The Umbral phase of the eclipse starts about **05:16 AM CDT** on **Saturday April 4th**

Look for a small "nibble" on the Left side of the moon.

Totality begins at 6:58 AM CDT and lasts until **Totality Ends at 7:03 AM CDT**

Sunrise at 7:06 AM CDT (Times of Sunrise and Moonset will vary with horizon profile)

The **Moon Sets at 7:09 AM** so we'll miss the last partial phase of the eclipse

There is a **great animation** of Apr 4, 2015 Eclipse at **http://shadowandsubstance.com/**

Scroll down the screen to find the animation of the April 4 eclipse

Details and Diagrams of the Eclipse (Note: For CDT Times **Subtract 5 hrs** from the UT times given)

http://eclipsewise.com/oh/ec2015.html#LE2015Apr04T

This is the third of Four Total Lunar Eclipses in a row called a Tetrad

Apr. 15, 2014 – Oct 8, 2014 – **April 4, 2015** – Sept 27, 2015

These two short videos give a though explanation of the Oct 8, 2014 Eclipse and the Tetrad.

http://stargazersonline.org/lunar_eclipse_10-08-14.html

https://www.youtube.com/watch?v=wmCK2Pfsh0Y&feature=youtu.be

PRESIDENT'S MESSAGE

BY RICHARD BRADY

Hi everyone!

March is Messier Marathon time. Unfortunately, our planned trip the weekend of March 21st was clouded out. (Another club event clouded out. :() But never fear marathoners! We have a backup weekend planned for April 18th. Same plans otherwise as before. Meet in Broken Arrow and caravan down.

April is going to be a busy month for the club. Besides our regular club events (General Meeting, Sidewalk Astronomy, Member Night, Public Night) and the Messier Marathon, we have a work day scheduled for Saturday, April 11th, and three groups coming on three separate nights. And as always, we are looking for volunteers. Contact our facilities manager, James Taggart, if you can help at the observatory, or Teresa Davis if you can help at any of the group events.

Speaking of Teresa, I have appointed her Group Coordinator. She has done this for the groups coming in April, along with a couple more scheduled for May and later. She has already proved what she can do. If you know of groups that would like to come to our observatory or have someone come and speak to their group, let Teresa know and she will take care of it.

Now for something not astronomy related. Last month, KOTV Channel 6, had a story about the possible extinction of the Monarch Butterfly. You can watch Scott Thompson's report at http://www.newson6.com/story/28099718/oklahoma-critical-piece-in-preventing-extinction-of-monarch-butterfly. There is also a NOVA episode you can watch online at http://www.pbs.org/wgbh/nova/search/results/page/1/include-education/only/include-all/Y/include-teachers/N?q=monarch+butterflies&x=0&y=0. There are many other sites about Monarchs. Just Google "Monarch Butterflies". Why I bring this up is that Monarchs feed on milkweed. I think we should plant some milkweed around the periphery of our observing field. Wouldn't it be wonderful to have them flutter by as you are setting up to observe! We love looking up at the wonders of the universe; let's take some time to look around us and see the beauty all around us too.

Back to astronomy things now. On Saturday morning, April 4th, there is a total lunar eclipse. But we won't see every part of the eclipse here in Tulsa. The moon sets soon after the end of the total phase of the eclipse. It passes through the northern most part of the Earth's shadow. The total eclipse is only 12 minutes long. Below is the timetable for the eclipse.

Partial eclipse begins	5:15 AM
Total eclipse begins	6:54 AM
Mid-eclipse	7:00 AM
Total eclipse ends	7:06 AM
Moon sets	7:14 AM

There is an article in Sky & Telescope online with more details and diagrams at http://www.skyandtelescope.com/astronomy-news/observing-news/preview-of-april-4ths-total-lunar-eclipse-033020152/

Clear Skies! (At least Saturday morning!)
Richard Brady

TREASURER'S AND MEMBERSHIP REPORT

BY TIM DAVIS

Astronomy Club of Tulsa: 142 members, including 15 new members in 2015.

Welcome to our new members this month: John Patchett, Wayne Burris, Chris Birdwell and Berend Meiling.

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Club Accounts as of Mar 28, 2015: Checking: $ 5,096.88; Savings: $ 3,773.33; Investment accounts: $ 19,125.10 *(Value Fluctuates with Market)*; **PayPal: $ 0.00**

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 2015 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

SECRETARY'S CORNER

BY TERESA DAVIS

What is our ACT Board up to this month? We are calling on all members: get ready to work with groups! Several sponsors of groups from churches, schools, scouts, and more are contacting our club with requests. They are of various ages and a variety of interests in astronomy. One thing they all want is our help as a club to share in educating their patrons with what we can in astronomy. We have already planned some fun events to do just that. Richard, John, and myself have worked together to get plans on our calendar for a variety of events. I hope many of you members are able to come out and join us as we work together. The biggest thrill I get from being part of this club is when I have the privilege of stirring the curiosity of our visitors coming to us in groups. Every time we set up telescopes for another group, there is always a few that are in awe by the observing session, especially when viewing Jupiter or Saturn for the first time. Then sharing in a lesson from a simple poster or a hands-on activity from the NSN kits in spire them even more. This spring and into the early summer we will have many opportunities for all of our members to participate in sharing our passion with others. Some of the groups want us to set up a presentation or hands-on activities for them at their location. Others want us to bring our telescopes to them or meet us at the observatory. We would appreciate any of our members to come out and help. Through working with the groups we always get to know one another better and through sharing our hobby we begin to build a community together. If you haven't joined us to volunteer in one of these group sessions before, just watch for the emails coming your way. Respond and let us know if you have any questions about how you can help. I would be glad to introduce you to this side of the club. Anyone that wants to get to know how to use a telescope better will improve by rubbing elbows with us in the field during these group events. Each time you come out we develop a stronger community with a common goal of sharing our views, curiosities, and passion for the stars, planets, and more.

Also, look for details coming to us soon about the work day at the observatory. We should have a list of items that need to be done and what tools we might need to bring. There will likely be sweeping, moping, mowing, brush hogging?? James Taggart is our observatory and grounds keeper, so we will need to take his lead. This is another volunteering event we can use as an excuse to get together.

Last weekend we sure had a good time entertaining over 130 visitors at our Public Star Party on Saturday night. Chris Proctor ran over 8 presentations in the dome with 10-12 visitors at a time. Tim and I worked inside the packed classroom most of the night, and Tamara pointed out the constellations and gave a nice talk with it, Richard managed the crowds both in the classroom and out on the grounds. It was such a nice evening for viewing the moon and Jupiter, even if we only got a few peeks between working with the public. My son, Jason, kept my telescope going all night for our visitors with their requests. Many of our members stayed late in the field making their instruments available for observers. Our board appreciates everyone that contributed to our mission that night. We hope to have clear skies again for our next event.

That's about all the goings on for the board this month. For the full minutes of our last Public Meeting on March 6, 2015, go to this link: March Observer Sec Corner.docx. The minutes for our latest Board Meeting held March 14, 2015, click on this link: https://drive.google.com/file/d/0B0Buo9ksHSVrWTJ2VlBWMmY3RTg/view

Anyone that has access to the internet can click on either link to view each document.

NITELOG—NorwayInTErurbanLocalObservingGroup

BY TOM HOFFELDER

Last month I mentioned Messier Marathons as a March thing, but only because that applies to most of the world. If you are in New England, especially the northern part, it really makes sense to wait until April. You can get as many objects and the weather will surely be "bettah." Thusly for new moon weekend, the sun/moon data (which is for northern New England) includes the beginning of nautical twilight at the top of the file listing the objects for this month. It is also why I have attached my revised list of M objects in order of search (more or less) for a marathon. I have added surface brightness for all the galaxies (except M31), because in most cases SB is a better indication, compared to magnitude, of which ones are easier to see. ""Most cases" does not include large galaxies with a large gradient in brightness from center to edge, like M31, because surface brightness is an average value. I did not change the order of search, but in the April version, some of the objects found in the northwest near the beginning of a March Marathon are more easily found among the last objects, as they rise in the northeast.

COMETS: Lovejoy: the comet that won't give up! Expected to still be around 7th magnitude this month, its orbital motion carries it north of Cassiopeia, toward a rendezvous with Polaris the end of May. Heavens-Above for location, http://www.cobs.si/ for up-to-the-minute mag info.

PLANETS: On the first, Jupiter is way up there (~ 60 degrees altitude) at 8 PM and too low for observing by 3 AM. On the 30th, it is still at 60 degrees around 8 o'clock, but on the downward side of the meridian, and too low for meaningful observation soon after 1 AM. There are two good mutual eclipses (good meaning a "combined magnitude" drop of 0.8 minimum) this month, and they are the last good ones of this series of events. Supposedly they'll be back in about six years; if they are and if I'm still around, I'll let you know. Interesting eyepiece views range from the knock-your-sox-off to the subtly unusual, with these eclipses fitting somewhere towards the latter end of that scale, but I did finally get to witness one and it was interesting. Per the graphics (stolen from S&T.com), both involve Ganymede being eclipsed by Europa and both happen to occur while Io's shadow is on Jupiter. The graphics show the locations of the moons at mid eclipse; the eclipses last about 9 minutes so there will be little change in location. The thing to note while observing is how G starts out the brightest of the moons and at mid eclipse equals the dimmest. Numbers near the moons are magnitudes; the eclipsed moon has two numbers, its normal magnitude and the eclipsed value. (More or less, I'm still not sure how to exactly convert the the combined magnitude drop of the two eclipsed moons to the magnitude change of only the eclipsed one, which is all that matters.)

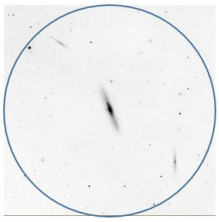
2E3, 4/11, 21:46 EDT, altitude 60° (Norway, ME)

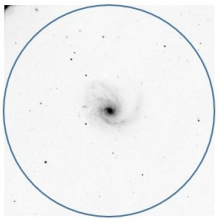
2E3, 4/19, 01:03 EDT, altitude 20° (Norway, ME)

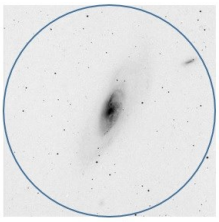
Venus continues its steady climb into the western evening sky, but still two months from turning back toward the sun, which is when I would start to aim a scope at it. I might check it with the 1x7s (probably more like 1x5s at my age) on the 21st when a 3 day old crescent cruises by. Mercury is within 1.3 degrees of Mars on the 22nd but they are only at an altitude of 6 degrees at the end of civil twilight. (Statements like that always apply to Maine specifically and New England in general. Sometimes being farther south can improve the situation, and for this one being way down in Florida gains you a couple degrees.) Saturn still is not high enough to observe until after 1 AM (in Maine anyway) on the 1st, so that is all I'm saying about it for now - next month!

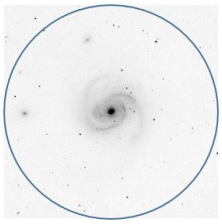
STARS: Two carbon stars, one especially red with a B-V of 4.5 and current magnitude approx 10.5, and five doubles of varying magnitudes and separations ranging from 1.6 (can anyone separate it?) to 15 arcsec.

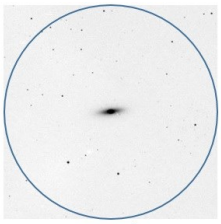
THE GOOD STUFF: Except for one lonely (but relatively large and bright) planetary, the list is again all galaxies, as would be expected this time of year. And as the DSS negatives indicate some of them could provide some interesting details in the eyepiece. Nine are Messier Objects, one of which, M61, doubles as a Herschel 400 Object, with ten more of those included. In the spreadsheet comments section, a "+" in front of an NGC number indicates the object is obvious in the DSS image. Two of my favorite views enhance the April list, one being the one degree field around M84/86 which includes seven other galaxies. The other, probably my all time favorite object, looks like a dim star but is so much more. 3C 273 is the brightest quasar and the only one "easily" seen in moderate sized scopes. On a clear day you can see forever; in our scopes on a clear night you can see 2.4 billion light years. Close enough!

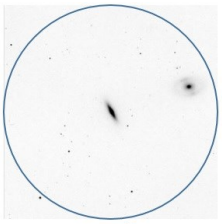

4216 30′ FOV

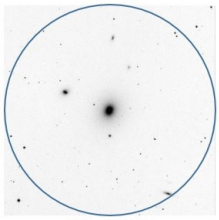

M99 15′ FOV

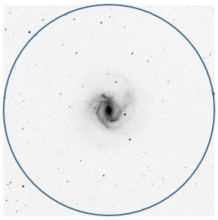

M106 30′ FOV

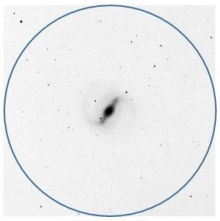

M100 15′ FOV

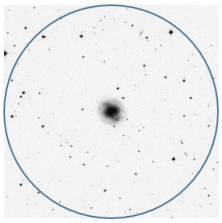

4346 15′ FOV

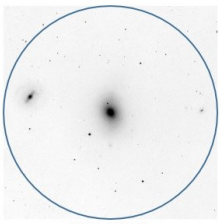

4350 15′ FOV

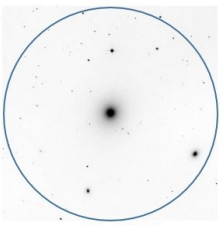

4261 15′ FOV

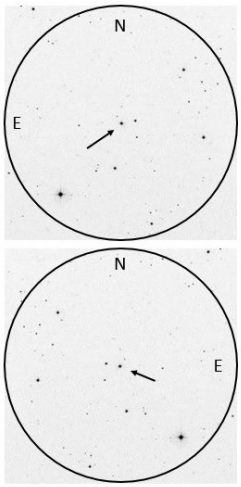

M61 15′ FOV


4314 15′ FOV

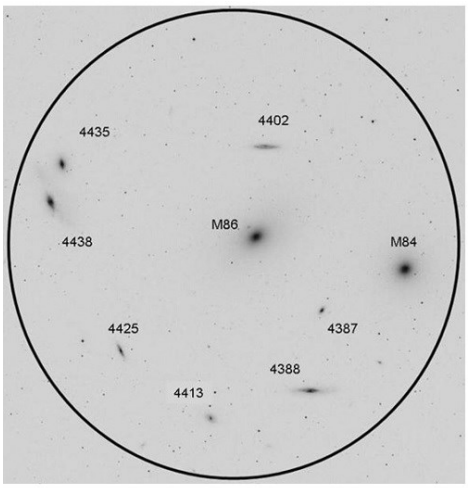

4361 15′ FOV


M85 20′ FOV


M87 20′ FOV



3C 273 15′ FOV



M84/86+++ 60′ FOV

QUESTIONS: As always, questions and comments are welcome!

tom hoffelder
rocksnstars@gmail.com
Come with me now, Pilgrim of the stars,
For our time is upon us and our eyes
Shall see the far country
And the shining cities of infinity ~ Robert Burnham, Jr.

M#	From	Const	Sweep (deg)	Type	Mag	SB	Size (')	Time	Comments
77	δ	Cet	0.3 S / 0.8 E	GX	10.5	12.8	6x5		
74	η	Psc	0.4 N / 1.3 E	GX	10.5	13.9	10x9		
33	α	Tri	1.0 N / 4.0 W	GX	7.0	14.0	65x35		
31	μ	And	2.8 N / 2.6 W	GX	4.5		160x35		Andromeda Galaxy
32	prv	---	0.4 S / ------	GX	10.0	12.5	3		
110	prv	---	0.8 N / 0.4 W	GX	10.0	13.8	10x4		
52	β	Cas	2.4 N / 5.1 W	OC	8.0		12		
103	δ	Cas	0.5 N / 1.0 E	OC	7.0		5		
76	ϕ	Per	0.9 N / 0.2 W	PN	12.0		2x1		Little Dumbbell Nebula
34	γ	And	0.4 N / 6.9 E	OC	6.0		20		
45	---	---	---	OC	---		75		Pleiades
79	β	Lep	3.8 S / 0.9 W	GC	8.5		3		
42	---	---	---	DN	---		60		Orion Nebula
43	prv	---	0.1 N / -----	DN	---		20x15		
78	ζ	Ori	2.0 N / 1.5 E	DN	---		8x6		
1	ζ	Tau	0.9 N / 0.7 W	SR	8.5		6x4		Crab Nebula
37	θ	Aur	4.7 S / 1.6 W	OC	6.0		20		
36	prv	---	1.6 N / 3.2 W	OC	6.5		12		
38	prv	---	1.7 N / 1.5 W	OC	7.0		20		OC NGC1907 0.5S/0.2W
35	1	Gem	1.1 N / 1.1 E	OC	5.5		40		OC NGC2158 0.3S/0.4W
41	α	CMa	4.0 S / 0.4 E	OC	5.0		30		
50	θ	CMa	3.7 N / 2.1 E	OC	7.0		16		
47	γ	CMa	1.2 N / 8.0 E	OC	4.5		25		OC NGC2423 0.8N
46	prv	---	0.4 S / 1.1 E	OC	6.5		25		PN NGC2438 0.1N of cntr
93	ξ	Pup	1.0 N / 1.1 W	OC	6.5		25		
48	ζ	Mon	2.8 S / 1.6 E	OC	5.5		30		
44	δ	Cnc	1.6 N / 1.0 W	OC	4.0		60		Beehive Cluster
67	α	Cnc	0.1 S / 1.8 W	OC	7.5		15		
81	h	UMa	6.0 N / 2.2 E	GX	8.5	13.0	20x10		
82	prv	---	0.6 N / 0.1 E	GX	9.5	12.7	9x4		
108	β	UMa	0.7 S / 1.4 E	GX	11.0	13.0	8x1		
97	prv	---	0.7 S / 0.4 E	PN	12.0		3		Owl Nebula
109	γ	UMa	0.3 S / 0.6 E	GX	11.0	13.4	6x3		
106	χ	UMa	0.5 S / 5.6 E	GX	9.5	13.5	19x7		

40	δ	UMa	1.0 N / 0.9 E	DS	9.0		50" sep		GX NGC4290 0.2W (13th mag)
95	α	Leo	0.2 S / 8.7 E	GX	11.0	13.6	6x4		
96	prv	---	0.1 N / 0.7 E	GX	10.5	13.2	5x4		
105	prv	---	0.7 N / 0.2 E	GX	11.0	13.1	2		GX NGC3384 0.1NE (11.5 mag)
65	θ	Leo	2.3 S / 1.2 E	GX	10.5	12.7	7x1		
66	prv	---	0.1 S / 0.3 E	GX	10.0	12.7	8x2		GX NGC3628 0.6 N
51	η	UMa	2.1 S / 3.0 W	GX	10.0	12.7	10x5		Whirlpool Galaxy
63	prv	---	5.2 S / 2.7 W	GX	10.0	13.2	10x5		
101	η	UMa	5.0 N / 2.3 E	GX	8.5	14.6	20		
94	α	CVn	2.8 N / 1.0 W	GX	9.5	13.6	5x3		
3	β	Com	0.5 N / 6.6 E	GC	7.0		10		
53	α	Com	0.6 N / 0.7 E	GC	8.5		3		
64	α	Com	4.2 N / 3.1 W	GX	9.0	12.7	6x3		Blackeye Galaxy
98	β	Leo	0.3 N / 6.0 E	GX	11.0	13.5	8x2		
99	prv	---	0.5 S / 1.2 E	GX	10.5	13.0	4		
100	prv	---	1.4 N / 1.0 E	GX	10.5	13.3	5x4		
85	prv	---	2.4 N / 0.5 E	GX	10.5	13.0	2		GX NGC4394 0.1 E (12.5 mag)
84	ο	Vir	4.2 N / 4.8 E	GX	11.0	13.2	1		GX NGC4388 0.3SE (12th mag)
86	prv	---	----- / 0.3 E	GX	11.0	13.3	2x1		9 GX's in one degree field
88	prv	---	1.5 N / 1.5 E	GX	11.0	12.8	5x2		
91	prv	---	0.1 N / 0.8 E	GX	11.5	13.3	4x3		
49	ο	Vir	0.7 S / 6.1 E	GX	10.0	13.2	2x1		
60	ε	Vir	0.6 N / 4.5 W	GX	10.5	13.1	2		GX NGC4647 0.1 NW (12th mag)
59	prv	---	0.1 N / 0.4 W	GX	11.5	13.0	2x1		
58	prv	---	0.2 N / 1.1 W	GX	11.0	13.1	4x3		
90	prv	---	1.3 N / 0.2 W	GX	11.0	13.3	7x2		
89	prv	---	0.6 S / 0.3 W	GX	11.5	12.7	1		
87	prv	---	0.2 S / 1.2 W	GX	11.0	13.0	2		GX NGC4478 0.1SW (12th mag)
61	η	Vir	5.1 N / 0.5 E	GX	10.5	13.1	5		
104	η	Crv	4.6 N / 1.9 E	GX	9.5	12.0	6x2		Sombrero Galaxy
68	β	Crv	3.4 S / 1.2 E	GC	9.0		3		
83	γ	Hya	6.7 S / 4.0 E	GX	8.5	12.8	10x8		
102	ι	Dra	3.2 S / 2.6 W	GX	11.5	13.0	2x1		GX NGC5907 0.6N/1.4E
5	α	Ser	4.3 S / 6.4 W	GC	7.0		12		
13	η	Her	2.5 S / 0.2 W	GC	7.0		10		GX NGC6207 0.5NE (11.5 mag)
92	π	Her	6.3 N / 0.4 E	GC	7.5		8		
12	δ	Oph	1.7 N / 8.2 E	GC	8.0		9		
10	prv	---	2.3 S / 2.4 E	GC	7.5		8		
14	β	Oph	7.8 S / 1.5 W	GC	9.5		3		

107	ζ	Oph	2.5 S / 1.2 W	GC	10.0		2		
9	η	Oph	2.8 S / 2.1 E	GC	9.0		2		
80	δ	Sco	0.4 S / 3.9 E	GC	8.5		3		
4	α	Sco	0.1 S / 1.3 W	GC	7.5		14		
19	α	Sco	0.2 N / 7.5 E	GC	8.5		4		
62	prv	---	3.8 S / 0.3 W	GC	8.0		4		
57	β	Lyr	0.3 S / 0.8 E	PN	9.5		1		Ring Nebula
56	β	Cyg	2.2 N / 3.0 W	GC	9.5		1		
29	γ	Cyg	1.7 S / 0.3 E	OC	9.0		12		
39	α	Cyg	3.2 N / 8.5 E	OC	5.5		30		
27	γ	Sge	3.2 N / 0.2 E	PN	7.5		8x4		Dumbell Nebula
71	γ	Sge	0.7 S / 1.2 W	GC	8.5		6		
11	β	Sct	1.5 S / 1.0 E	OC	7.0		10		
26	prv	---	3.2 S / 1.5 W	OC	9.5		9		
16	γ	Sct	0.8 N / 2.5 W	DN			20		Eagle Nebula
17	γ	Sct	1.6 S /2.0 W	DN			20x10		Swan Nebula
18	prv	---	1.0 S / 0.2 W	OC	8.0		12		
24	prv	---	1.3 S / 0.3 W	MWP	4.5		90x60		OC NGC6603 near center
23	prv	---	0.5 S / 5.0 W	OC	6.0		25		
25	γ	Sct	4.7 S / 0.6 E	OC	6.5		40		
7	λ	Sco	2.3 N / 4.3 E	OC	3.5		60		
6	prv	---	2.6 N / 2.9 W	OC	4.5		25		
28	λ	Sgr	0.6 N / 0.7 W	GC	8.5		5		
8	prv	---	0.6 N /4.6 W	DN			60x35		Lagoon Nebula
20	prv	---	1.3 N / 0.6 W	DN			20		Trifid Nebula
21	prv	---	0.5 N / 0.7 E	OC	7.0		10		
22	λ	Sgr	1.5 N / 1.9 E	GC	6.5		17		
69	ε	Sgr	2.0 N / 1.5 E	GC	9.0		3		
70	prv	---	----- / 2.7 E	GC	9.0		2		
54	prv	---	1.8 N / 2.6 E	GC	8.5		2		
55	ζ	Sgr	1.1 S /8.1 E	GC	7.0		10		
15	ε	Peg	2.3 N / 3.5 W	GC	7.5		7		
75	β	Cap	7.1 S / 3.5 W	GC	9.5		2		
72	ε	Aqr	3.0 S / 1.4 E	GC	10.0		2		
73	prv	---	0.1 S / 1.4 E	OC	9.0				4 Stars
2	β	Aqr	4.8 N / 0.5 E	GC	7.5		8		
30	γ	Cap	6.5 S / -----	GC	8.5		6		

OC=Open Cluster; GC=Globular Cluster; DN=Diffuse Nebula; PN=Planetary Nebula; GX=Galaxy; SR=Supernova Remnant; MWP=Milky Way Patch

atı nal Aer nautics and Space Administrati n

the Space Place

April - May 2015 / Vol. 8, Issue 1

NOTES FOR FORMAL AND INFORMAL EDUCATORS

The 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 450 separate modules for kids, including hands-on projects, interactive games, animated cartoons, and amazing facts about space and Earth science and technology.

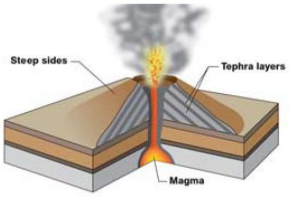
Life is full of moments of wonder if only we stop to notice—moments when we learn something new or see something beautiful. Space exploration provides a wealth of such moments, and the Space Place is here to make these moments, these discoveries, these captured images of the beauty of the universe available and accessible to children and educators. In this issue, we bring your attention to some of the newest features on the website that, once again, shine a spotlight on awesomeness.

What's New?

This new article on the Space Place explains what interstellar space means. In 2012, scientists declared that the NASA spacecraft, Voyager 1, had finally left the heliosphere and reached interstellar space. What does that mean? And how did they know? How did Voyager's instruments give clues that it had arrived in that region? And why did it take so long? After all, Voyager 1 was launched in 1977 and has been traveling through space at around 38,000 miles per hour continuously—no rest stops. Check it out at http://spaceplace.nasa.gov/interstellar.

Los volcanes de la Tierra en español

Volcanoes are perhaps the most violent events one can see on Earth—from a distance, preferably! What causes them? Do other planets or moons in the solar system have volcanoes too? This simple article has lots of graphics and video clips showing just how dramatic these Earthly temper tantrums can be. And, as with our entire Space Place en español site, you can toggle back and forth between the English and Spanish versions, so it makes a good reading exercise for both Spanish and English learners. Visit http://spaceplace.nasa.gov/volcanoes2/sp to learn about volcanoes and http://spaceplace.nasa.gov/volcanoes/sp/ to learn about volcanoes elsewhere in the solar system.



Cinder Cone Volcano

Spotlight on GPS

Global Positioning System technology is used every day by millions of people—people who take it for granted, but haven't got the foggiest idea how it works. Wouldn't it be nice to understand it? After all, it isn't magic, although it seems so. To reinforce this simple explanation is an animated "Space Place in a Snap" video and printable poster explaining how your smart phone can use GPS satellites to help you find the nearest place to get a pizza. Go to http://spaceplace.nasa.gov/gps and http://spaceplace.nasa.gov/

Where kids and grown-ups have fun with space science and technology

NASA Space Place: News & Notes *Vol. 8, No. 1: April - May 2015*

gps-pizza to learn and teach about this technology. In addition, at the middle school level, Space Place has a classroom activity and article on how GPS works. This article is also helpful in answering any questions younger, curious students have about how GPS works. That article is in .pdf form at http://spaceplace.nasa.gov/classroom-activities/#watery.

For the classroom

Space Place has compiled a gallery of 3-D anaglyph images of Earth and other planets, moons, and smaller objects taken from space. The images range from of a human boot print on the Moon to the Sun's stormy surface, to a crater on the asteroid Vesta. Anaglyphs appear three-dimensional when viewed with red and blue 3-D glasses, which are inexpensive. Bargains may be found on the internet, so that you could buy these for a whole classroom for around $12-15. The anaglyphs on the site are large images that will project well onto a screen so the whole class can see them at once. These images are at http://spaceplace.nasa.gov/3d-gallery.

For out-of-school time

April 22 is Earth Day. What better time to make a beautiful "stained glass" Earth to hang in the window. This activity uses a paper plate and colored tissue paper, along with other simple and common materials to celebrate the beauty of Earth from afar. The "stained glass" Earth ends up looking like the jewel suspended in space that it is, helping to remind us of its loveliness and fragility and how important it is to take good care of our home. For this activity, go to http://spaceplace.nasa.gov/stained-glass-earth.

Special days to celebrate

April is Math Education Month
For a whole page of math-related classroom activities, check out http://spaceplace.nasa.gov/math-activities.

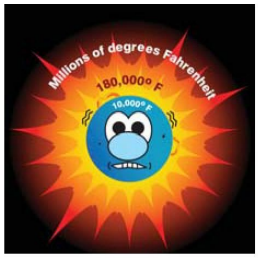
April 4—National Reading a Road Map Day
It's fun to speculate on how racing pigeons can find their way home from anywhere without consulting a map—that is if a recent solar storm isn't messing with their navigation equipment! Go to http://spaceplace.nasa.gov/pigeons.

April 10—Encourage a young writer day
Creative juices will start to flow when students choose a topic to write their own "Loopy Legend" about. Visit http://spaceplace.nasa.gov/loopy-legends.

May 4—National Weather Observers Day
Anyone can be a weather observers when they play the Weather Slyder game at http://spaceplace.nasa.gov/weather-slyder.

May 18—Mt. St. Helens blew its top in 1980
An opportunity to talk about volcanoes, what causes them, and how common they are in our solar system. http://spaceplace.nasa.gov/volcanoes2

May 29—Daniel Gabriel Fahrenheit (1686–1736) invented a precise thermometer in 1724.
A good time to talk about the Sun, and the weird fact that the Sun's corona is millions of degrees Fahrenheit, while the Sun's core is "only" 10,000 °F. Check out this solar mystery at http://spaceplace.nasa.gov/sun-corona.



WHERE WE MEET

JENKS HIGH SCHOOL PLANETARIUM

105 E. B ST. JENKS, OK

DIRECTIONS TO THE JENKS HIGH SCHOOL CAMPUS:

FROM THE WEST: (MARKED IN RED ON MAPS)

TAKE US 75 TO THE MAIN ST. - JENKS EXIT

FOLLOW MAIN ST. APPROXIMATELY 2 MILES AND CROSS THE RAILROAD TRACKS

TURN LEFT ON 1ST ST.

FROM CENTRAL PART OF TULSA: (MARKED IN GREEN ON THE MAPS)

TAKE RIVERSIDE DRIVE TO THE 96TH STREET BRIDGE

TURN RIGHT AND GO OVER THE RIVER

FOLLOW A ST. APPROXIMATELY 7 BLOCKS

TURN RIGHT ON 1ST ST.

FROM THE EAST: (MARKED IN BLUE ON THE MAPS))

TAKE THE CREEK TURNPIKE TO S. ELM ST. IN JENKS

FOLLOW ELM ST. NORTH TO MAIN ST.

TURN RIGHT ON MAIN ST. AND CROSS THE RAILROAD TRACKS

TURN LEFT ON 1ST ST.

FOR EACH:

PARK IN THE LOT AT THE END OF 1ST ST.

USE THE DOORS AT THE NORTH SIDE OF THE BUILDING

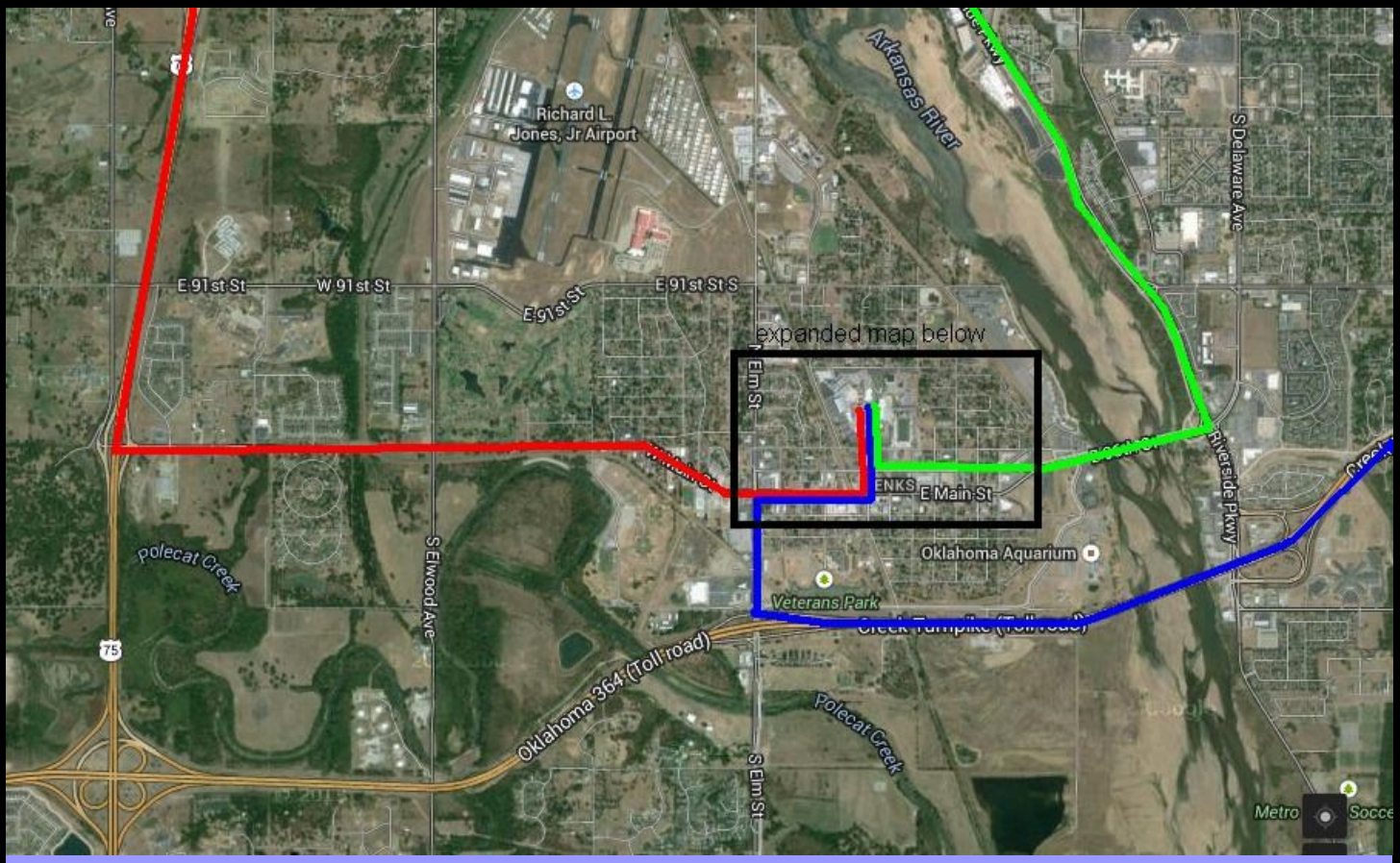
GO UP THE STAIRS TO THE 3RD FLOOR (THERE IS AN ELEVATOR FOR THOSE WHO NEED IT)

TURN RIGHT AND GO DOWN THE HALLWAY TO EITHER SIDE OF THE PLANETARIUM

MAPS ON NEXT PAGE

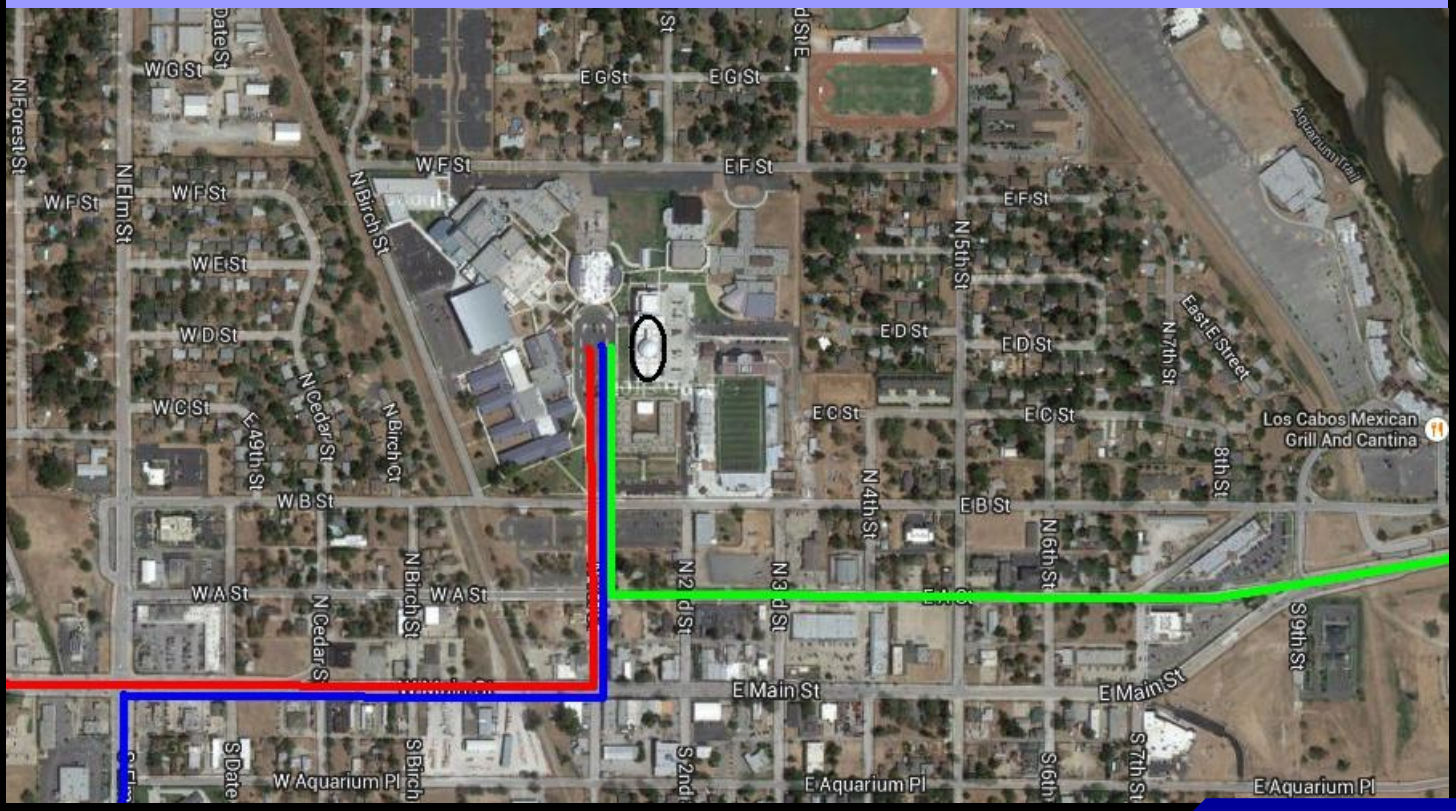
THE GENERAL MEETINGS ARE FREE AND OPEN TO THE PUBLIC.

WE HOPE TO SEE YOU THERE!



ABOVE: DIRECTIONS TO JENKS HIGH SCHOOL FROM CENTRAL TULSA, WEST OF TULSA AND EAST OF TULSA

BELOW: MAP SHOWING ROUTE INTO PARKING LOT



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MEMBERSHIP INFORMATION

MEMBERSHIP RATES FOR 2015 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!

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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 MONTH:

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PHOTO: Volunteers and Guests at Sidewalk Astronomy, by Tamara Green. Taken at Bass Pro Shops Feb 7, 2015.

PHOTO: Orion in the Sky over Bass Pro, Feb 7, 2015, by Tamara Green.