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ASTRONOMY CLUB OF TULSA

OBSERVER

JUNE 2015

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THE ASTRONOMY CLUB TULSA
IS A PROUD MEMBER OF



THE ASTRONOMICAL LEAGUE

PHOTO: *Scorpius Over the Observatory*, by Tamara Green.

JUNE 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:








FULL MOON (Strawberry Moon) TUE JUN 2
 LAST QUARTER TUE JUN 9
 NEW MOON TUE JUN 16
 SUMMER SOLSTICE SUN JUN 21
 FATHERS' DAY SUN JUN 21
 FIRST QUARTER WED JUN 24

UPCOMING EVENTS:

MEMBERS' NIGHT	FRI, JUN 12	8:30 PM	ACT OBSERVATORY
PUBLIC STAR PARTY	SAT, JUN 20	8:30 PM	ACT OBSERVATORY
INT'L SUN DAY	SAT, JUN 20	1:00 PM	JENKS HS PLANETARIUM
SIDEWALK ASTRONOMY	SAT, JUN 27	8:15 PM	BASS PRO
MEMBERS' NIGHT	FRI, JUL 17	8:30 PM	ACT OBSERVATORY
PUBLIC STAR PARTY	SAT, JUL 25	8:30 PM	ACT OBSERVATORY

JULY 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	31 	

MOON PHASES & HOLIDAYS:



FULL MOON (Buck Moon) TUE JUL 1
 INDEPENDENCE DAY SAT JUL 4
 LAST QUARTER WED JUL 8
 NEW MOON WED JUL 15
 FIRST QUARTER THURS JUL 23
 FULL MOON (Sturgeon Moon) FRI JUL 31

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.



<https://alcon2015.astroleague.org/>

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

The astronomical leagues national convention is in Las 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.



Okie-Tex Star Party
September 12-20, 2015

<http://www.okcastroclub.com>
<http://www.okie-tex.com>

Pre-registration submissions must be post-marked no later than *August 24, 2015* and must be paid in full. Online Registrations must be completed and paid in full by midnight CDT that evening. See above websites for complete details.

Meals catered by Jody's Catering, Boise City, OK. Their meal request form and payment must be received, with a postmark, no later than August 21, 2015.

Many of our Astronomy Club of Tulsa members go to this fun star party every year and it is WELL WORTH IT! Some of the most beautiful scenery in Oklahoma and the darkest skies! Plus a swap meet, great food, great guest speakers and the Okie-Tex Giveaway! Enjoy yourself with us at this magnificent dark sky site!

TELESCOPE FOR SALE!

Contact Jane Johansson at the E-mail address below.

For Sale: 12" Meade Light Bridge on a JMI wheeley bar cart

Purchased about four years ago, this 12" Meade Light Bridge has not been used very often. It has been stored in a dry storage building with the dust cover on the primary mirror. It is easy to move around thanks to the JMI wheeley bar cart. The telescope comes with a 2" Meade QX Wide Angle 26 mm eyepiece, a light shroud, a Telrad base on the tube, and a set of Bob's Knobs for collimation adjustment on the primary. The whole set-up can be yours for a greatly discounted price of \$700! I am unable to deliver this, so it must be picked up at my house in Pryor. Will accept payment in cash or a cashier's check. Please contact me at okiejohan@hotmail.com



PRESIDENT'S MESSAGE

BY RICHARD BRADY



Hi everyone!

I hope everyone has survived the monsoons.

This July 14 the New Horizons spacecraft will finally arrive at Pluto after a 9 ½ year voyage. As I write this (the end of May) the images returned are already better than anything we have seen from here, both from the earth and from Hubble. So far it hasn't found any new moons or rings. Who knows what we will see when New Horizons does its fly-by. I'll write more on New Horizons next month.

There is a new app available for both Apple and Android, Pluto Safari. It comes from the same people who created Sky Safari 4 (a great app in its own right). Pluto Safari has both the history of New Horizons and current updates, along with views of the spacecraft and solar system from various perspectives. I highly recommend both.

This month we are going to have another SUN-day event on Saturday, June 20 at the Jenks Planetarium from 1 to 3 PM. Last fall we were there for the partial solar eclipse and had a huge crowd. Not only did the skies cooperate but the sun on that day had a huge sunspot plainly visible at the same time as the eclipse. We won't have an eclipse this time, but hopefully the sun will put on another show for us. Everyone is invited to bring their solar scopes and join in the fun. Or just come on out for an enjoyable time. We also intend on selling safe solar glasses again.

As always we are looking for volunteers to help at this event and the other events we have throughout the year. Many of you checked the volunteer box when joining the club, but rarely if ever come and help out. You might think you really don't know enough to help. (Actually just your basic interest in astronomy puts you ahead of the general public.) So I would like to suggest having a few informal meetings (not classes, just informal Q&As) to help you learn more about this hobby. Topics could range from telescopes to learning the constellations or the solar system to astrophotography. It depends on what you are interested in. With all the expertise in the club I'm sure we can answer any questions you might have. If you would like to have this type of meeting, email me at astrotulsa.pres@gmail.com and let me know what you would like to know more about. I don't care if there are just 2 interested in a topic or 20. Just let me know.

And if there is anything else you would like to see the club do, let me know that too.

Finally, summer is just around the corner. Would anyone be interested in getting together for camping and stargazing somewhere? The club has been to Hulah Lake in previous years. Or since we didn't get to have the Messier Marathon this year, (has it really been raining since March?) maybe we could go down to TUVAS sometime.

Clear Skies! [Please, Please, Please!!!]
Richard Brady

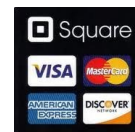
TREASURER'S AND MEMBERSHIP REPORT

BY TIM DAVIS



Astronomy Club of Tulsa: 140 members, including 25 new members in 2015.

Welcome to our new members this month: Ray Longstreet, Gary Martin, Cheryl and Daniel Van Den Handel, and Megan Hall.



Club Accounts as of May 31, 2015 :

Checking: \$ 5,320.90; Savings: \$ 3,774.08; Investment accounts: \$ 19,482.84 (*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



This time I would like to share the minutes from our last public meeting and the current calendar of events for our club including the Group Events.

The secretary's notes from the Gen Meeting:

Friday, May 1, 2015

At Jenks Planetarium

Richard began by welcoming any visitors, the clubs agenda for May, and the following items of things that caught his eye:

Sun and Moon Halo, APOD on April 3, 2015

Sun dog which is the halo formed by atmospheric ice crystals and the reflection

ISS over lunar terminator, APOD April 27, 2015

A Digital Model of Asteroid Vista

3-D interactive complete with a map

The end of Messenger –space craft orbiting mercury beginning March 18, 2011. Crashed just yesterday, Thursday, April 30. This was an expected impact and prediction of the impact time and place were close. Predictions were based on fuel calculations.

Hubble Space Telescope Happy Birthday – Launched April 24, 1990. Richard gave the list of the 5 servicing missions and expectations for the telescope to continue for another 5-10 years. The hope is there will be an overlap with Hubble and the James Webb Space Telescope set to launch in 2018.

Hubble's Instruments and accomplishments.

April 25th aired "Invisible Universe Revealed" Nova episode ...aired the day after anniversary.

NSN Telecom Last Tuesday, April 28th

With slides, Richard shared the calendar of events planned for the rest of the summer and announced that we will be having our public meeting as the public night at the observatory until next fall. He continued with a list of Group events for May and June.

At approximately 8pm Richard introduced John Land, the club long time board member and past president. He gave a talk on Dwarf Planets.

We have the following events planned for the month of June.

Monday, June 8th ----- ORU group hosted by John Land at the ACT Observatory (back up date: June 9th)

Friday, June 12 ----- Members Only @ 8:30pm

Saturday, June 13th ---- Kiefer Schools group of 45 @ ACT Observatory 8:00pm

Saturday, June 20th ---- International Sun Day @ Jenks Planetarium 1pm to 3pm

-----That evening head to the Observatory for Our Public Star Party @ 8:30pm

Saturday, June 27th ---- Sidewalk Astronomy @ Bass Pro 8:15pm

Keep watching for updates, as we get more groups scheduled, I will send out emails to all of you on the volunteer list. If you have not joined the volunteer list and would like to do so, send an email to

astrotulsa.sec@gmail.com

NITELOG—NorwayInTErurbanLocalObservingGroup

BY TOM HOFFELDER

It's June! It doesn't get dark! Well, OK it doesn't get completely dark - per the objects spreadsheet for new moon Saturday - until 11 PM up here in the Maine north woods. And the darkness ends only 3.5 hours after that! In Florida, it's more like 10 PM and 7 hours of darkness, so enjoy if you are down there!

Questions: Below, just before my name, it says something about asking questions. On rare occasions, like last month, some brave person actually does! It was a good question, about surface brightness vs magnitude; and he liked my answer enough to suggest I add it to this month's NITELOG. Thus the attached Word document.

Recommended Book: <http://www.amazon.com/gp/product/B00XIHMFGO> Not recommended because the author is a very good friend of mine, but because he is a very good writer and the book is full of interesting stories. The fact that I'm mentioned 8 times is totally irrelevant. (And yes, I had to break down and read a book on-line!)

Planets: Venus reaches greatest eastern elongation on the 6th, when it will be half illuminated (as you would expect) with a diameter of 23 arc seconds. By the 30th it will have grown to 32 seconds showing a cute crescent only 1/3rd illuminated. (Show it to people at your sidewalk events without telling them what it is and see if they think it's the moon.) The last half of the month Jupiter catches up to Venus (conjunction on July 1st when they will be separated by less than one degree) and June photo op days are the 19th and 20th when the two brightest planets are joined by the crescent moon.

Saturn has risen high enough for viewing as soon as you can see it low in the southeast twilight. On the first it transits around midnight, at an altitude of 27.5 degrees for me; for you, add the number of degrees you are south of latitude 44. Rings are tilted 24 degrees, only two degrees shy of the max that will be seen in 2017. Transit at month's end is of course two hours earlier, so check it out! (You won't have to tell anyone on the sidewalk what it is, and if they haven't seen before, they'll go crazy, especially if you are in Manhattan.)

STARS: The three carbon stars are the same as the ones last month, because this section of the sky is lacking in these objects. Seven doubles are listed, of varying separations and magnitudes; note the first is a binocular object.

THE GOOD STUFF: Mostly galaxies, since we are still in Virgo/Coma, but now since we are on the eastern edge of that area, three globulars have snuck in, one of them being one of the best. There are seven Messier Objects and 14 Herschel 400 Objects. Then there is NGC 4889, a giant elliptical 250,000 light years across, sending us light that takes 300 million years to get here, along with light from a whole bunch of other smaller galaxies (and one of similar size) that make up the "Coma Cluster." How many can you see in your scope? One of the easiest ways to determine the identity of all those galaxies is WIKISKY (<http://www.wikisky.org/>). Enter n4889 in the search box and then run the cursor over each object.

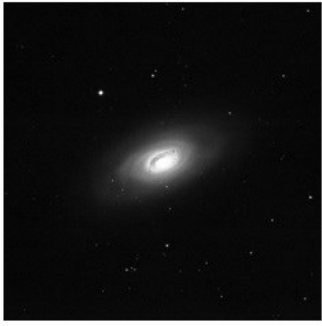
QUESTIONS: As always, questions and comments are welcome!

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.*

NITELOG—NorwayInTErurbanLocalObservingGroup

BY TOM HOFFELDER, CT'D.



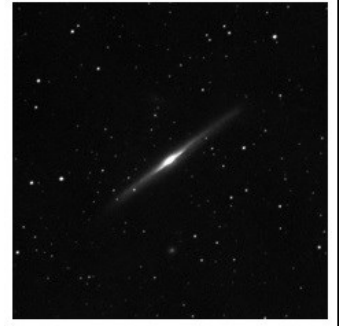
M64 15' FOV



NGC 4762/54 20' FOV



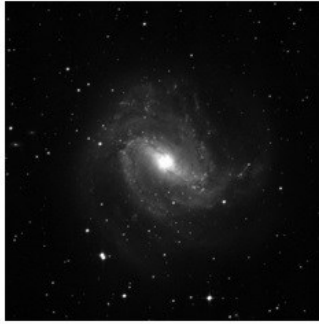
M63 15' FOV



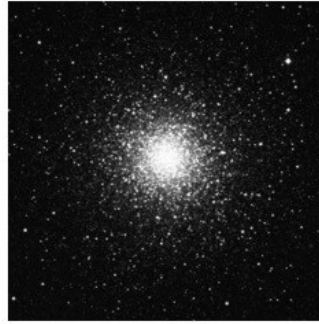
NGC 5170 15' FOV



M51 15' FOV



M83 15' FOV



M3 15' FOV



M101 30' FOV



Surface Brightness of Galaxies vs Magnitude

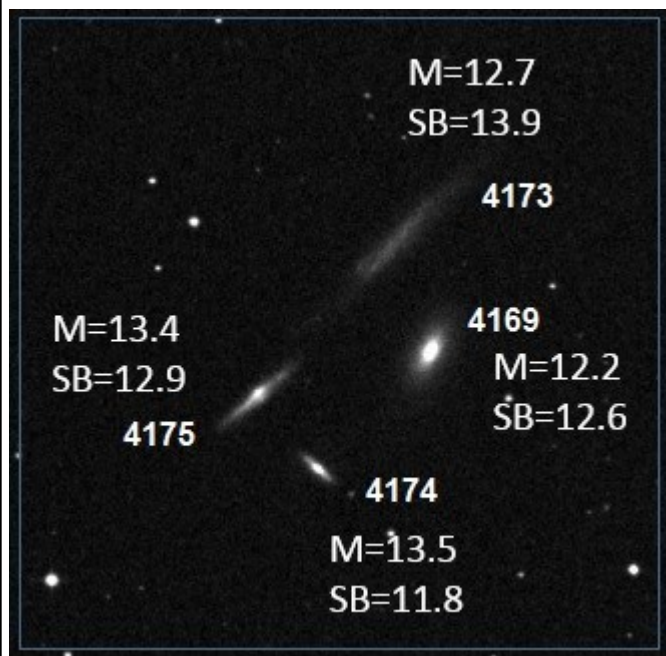
QUESTION: I was wondering how "surface brightness" is determined scientifically. I understand what it is supposed to represent if you condense all that light into a pin point, and I agree it is a better measure to use (better than "magnitude") for extended objects like galaxies and nebulae. But it seems to me to be an inherently subjective determination because the amount of visible "surface" that can contribute to "surface brightness" varies with the optics being used. Maybe I'm wrong but it seems to me that estimating magnitude of a pin point object is child's play compared to the complexities in determining surface brightness for an extended object. Is there some optical template that it is based on?

ANSWER: Mag and SB both have problems, but putting all the light of a large dim galaxy into a point and calling that the magnitude of the galaxy means magnitude usually has the bigger problem, at least with "big" galaxies. The DSS photo below provides a good example. If all you knew was magnitude, you'd think NGC 4173 would be the 2nd easiest to see. But Surface Brightness tells the real story: it is obviously the most difficult!

With surface brightness being the magnitude averaged over the area, you are correct that it makes a difference what size scope is used to determine the size of the galaxy. I don't think there are any rules, so hopefully whoever does the calculations uses something like the DSS photos.

Another "problem" with SB being an average value is not all galaxies are uniformly bright, so even tho the average SB is low, the galaxy might have a much brighter core that you could see in a smaller than expected scope.

But overall, I have found SB to be a better indicator in most cases. However, in any one particular case, you really need to know four things: mag, SB, size and brightness gradient. I think the best way to get an idea of what you might see in any scope is to look at the DSS photo first, then the object in your scope and compare. Once you've done that a few times, you'll be able to get a good idea of what you'll see in your scope by looking at DSS photos before observing. http://stdatu.stsci.edu/cgi-bin/dss_form



(6/14)			
SS	NTE	ATE	MR
20:27	21:52	22:53	03:43

Object (Type)	RA	Dec	Star	N/S	EW	Mag*/(# of Stars)	Size (')/ Sep ('')	Spect/ M# or H#	Dist (ly)	Urano I Page	Comment, [B-V], {~crrt mag} (opt x)
SS Vir (CS)	12 25.2	+00 46	η Vir	1.4 N	1.3 E	6.0-9.6		CII		238	[3.9] {8}
Y CVn (CS)	12 45.1	+45 26	α CVn	7.1 N	1.9 W	5.0-6.4		Clab		75	[3.2] {5.5}
RY Dra (CS)	12 56.4	+66 00	κ Dra	3.8 S	2.2 E	6.0-8.2		C		26	[3.6] {7.5}
32+33 Com (MS)	12 52.3	+17 05	24 Com	1.3 S	4.2 E	6.5, 7	195	gM0, F8		149	(3)
α CVn (MS)	12 56.0	+38 19	-	-	-	3, 5.5	19	A0, F0	120	109	(24)
25 CVn (MS)	13 37.5	+36 18	PRV	2.0 S	8.5 E	5, 7	1.7			109	(280)
OΣΣ125 (MS)	13 47	+36 36	PRV	2.3 N	1.9 E	6, 8.5	71			110 (ni)	yellow/blue (10)
ζ UMa (MS)	13 23.9	+54 56	-	-	-	2.2, 3.9	14	A2, A7	83	48	(35)
84 Vir (MS)	13 43.1	+03 32	ζ Vir	4.2 N	2.1 E	5.5, 8	2.6	K2, dG5		241	(190)
Σ1764 (MS)	13 38	+02 20	PRV	1.2 S	1.3 W	7, 8.5	16			241 (ni)	(30)
*NGC 4762 (SB0)	12 52.9	+11 14	ε Vir	0.2 N	2.3 W	[12.9]	8.7X1.7	*H75-2	57M	239	
*NGC 4754 (SB0)	12 52.3	+11 19	PRV	0.1 N	0.2 W	[12.9]	4.4X2.4	*H25-1	57M	239	
NGC 4800 (Sb)	12 54.6	+46 32	α CVn	8.2 N	0.3 W	[12.2]	1.6X1.2	*H211-1	54M	75	
*NGC 4826 (Sab)	12 56.7	+21 41	α Com	4.2 N	3.1 W	[12.7]	10X5.4	M64	17M	149	Blackeye Galaxy
*NGC 4884 (E)	13 00.1	+27 59	β Com	0.1 N	2.6 W	[13.4]	2.8X2.0	---	300M	149	Coma GX Cluster

NGC 4995 (SBb)	13 09.7	-07 50	θ Vir	2.3 S	-	[12.6]	2.4X1.7	*H42-1	90M	285	
NGC 4958 (SB0)	13 05.8	-08 01	PRV	0.1 S	1.0 W	[12.4]	3.9X1.4	*H130-1	78M	285	GX 4948 0.1N/0.3W
NGC 5005 (SBbc)	13 10.9	+37 04	α CVn	1.3 S	3.0 E	[12.7]	5.8X2.9	*H96-1	60M	109	
NGC 5033 (Sc)	13 13.5	+36 36	PRV	0.5 S	0.5 E	[14.2]	10X5.0	*H97-1	59M	109	
NGC 5024 (GC)	13 12.9	+18 10	α Com	0.6 N	0.7 E	7.7	13	M53	58K	150	GC 5053 0.4S/0.9E
*NGC 5055 (Sbc)	13 15.8	+42 02	α CVn	3.7 N	3.8 E	[13.2]	12X7.2	M63	26M	75	
*NGC 5170 (Sc)	13 29.8	-17 58	α Vir	6.8 S	1.1 E	[13.5]	8.2X1.0	*H22-5	82M	285	
*NGC 5194 (Sbc)	13 29.9	+47 12	η UMa	2.1 S	3.0 W	[12.7]	11X6.9	M51	26M	76	Whirlpool Galaxy
NGC 5195 (SB0-a)	13 30.0	+47 16	PRV	0.1 N	---	[13.0]	5.9X4.6	*H186-1	26M	76	
*NGC 5236 (Sc)	13 37.0	-29 52	π Hya	3.2 S	6.3 W	[12.8]	13X11	M83	16M	371	
*NGC 5272 (GC)	13 42.2	+28 23	β Com	0.5 N	6.6 E	6.3	18	M3	34K	109	
NGC 5466 (GC)	14 05.5	+28 32	PRV	0.1 N	5.1 E	9.2	9.0	*H9-6	52K	109	
NGC 5273 (S0)	13 42.1	+35 39	20 CVn	4.9 S	4.9 E	[13.5]	2.8X2.5	*H98.1	57M	110	GX 5276 0.1 E
NGC 5322 (E2)	13 49.2	+60 11	α Dra	4.2 S	1.9 W	[13.6]	6.0X4.1	*H256-1	90M	27	
*NGC 5457 (Sc)	14 03.2	+54 21	ζ UMa	0.7 S	5.8 E	[14.6]	27	M101	21M	49	
NGC 5473 (E/SB0)	14 04.7	+54 54	PRV	0.5 N	0.2 E	[12.9]	2.2X1.7	*H231-1	108M	49	
NGC 5474 (Sc)	14 05.0	+53 40	M 101	0.7 S	0.3 E	[13.8]	4.7	*H214-1	21M	49	

*DSS image

*[Surf
Brtnss for
GX's] -
mag per
square
arcmin

*H400

ni=shown,

not iden-
tified

The "G" in GOES Is What Makes It Go

By Ethan Siegel

Going up into space is the best way to view the universe, eliminating all the distortionary effects of weather, clouds, temperature variations and the atmosphere's airflow all in one swoop. It's also the best way, so long as you're up at high enough altitudes, to view an entire 50 percent of Earth all at once. And if you place your observatory at just the right location, you can observe the *same* hemisphere of Earth continuously, tracking the changes and behavior of our atmosphere for many years.

The trick, believe it or not, was worked out by Kepler some 400 years ago! The same scientist who discovered that planets orbit the sun in ellipses also figured out the relationship between how distant an object needs to be from a much more massive one in order to have a certain orbital period. All you need to know is the period and distance of one satellite for any given body, and you can figure out the necessary distance to have any desired period. Luckily for us, planet Earth has a natural satellite—the moon—and just from that information, we can figure out how distant an artificial satellite would need to be to have an orbital period that exactly matches the length of a day and the rotational speed of Earth. For our world, that means an orbital distance of 42,164 km (26,199 miles) from Earth's center, or 35,786 km (22,236 miles) above mean sea level.

We call that orbit *geosynchronous* or *geostationary*, meaning that a satellite at that distance always remains above the exact same location on our world. Other effects—like solar wind, radiation pressure and the moon—require onboard thrusters to maintain the satellite's precisely desired position above any given point on Earth's surface. While geostationary satellites have been in use since 1963, it was only in 1974 that the Synchronous Meteorological Satellite (SMS) program began to monitor Earth's weather with them, growing into the Geostationary Operational Environmental Satellite (GOES) program the next year. For 40 years now, GOES satellites have monitored the Earth's weather continuously, with a total of 16 satellites having been launched as part of the program. To the delight of NASA (and Ghostbusters) fans everywhere, GOES-R series will launch in 2016, with thrice the spectral information, four times the spatial resolution and five times the coverage speed of its predecessors, with many other improved capabilities. Yet it's the simplicity of gravity and the geostationary "G" in *GOES* that gives us the power to observe our hemisphere all at once, continuously, and for as long as we like!

THE "G" IN GOES IS WHAT MAKES IT GO
BY ETHAN SIEGEL, CT'D.

Astronomy Club Article

May 2015

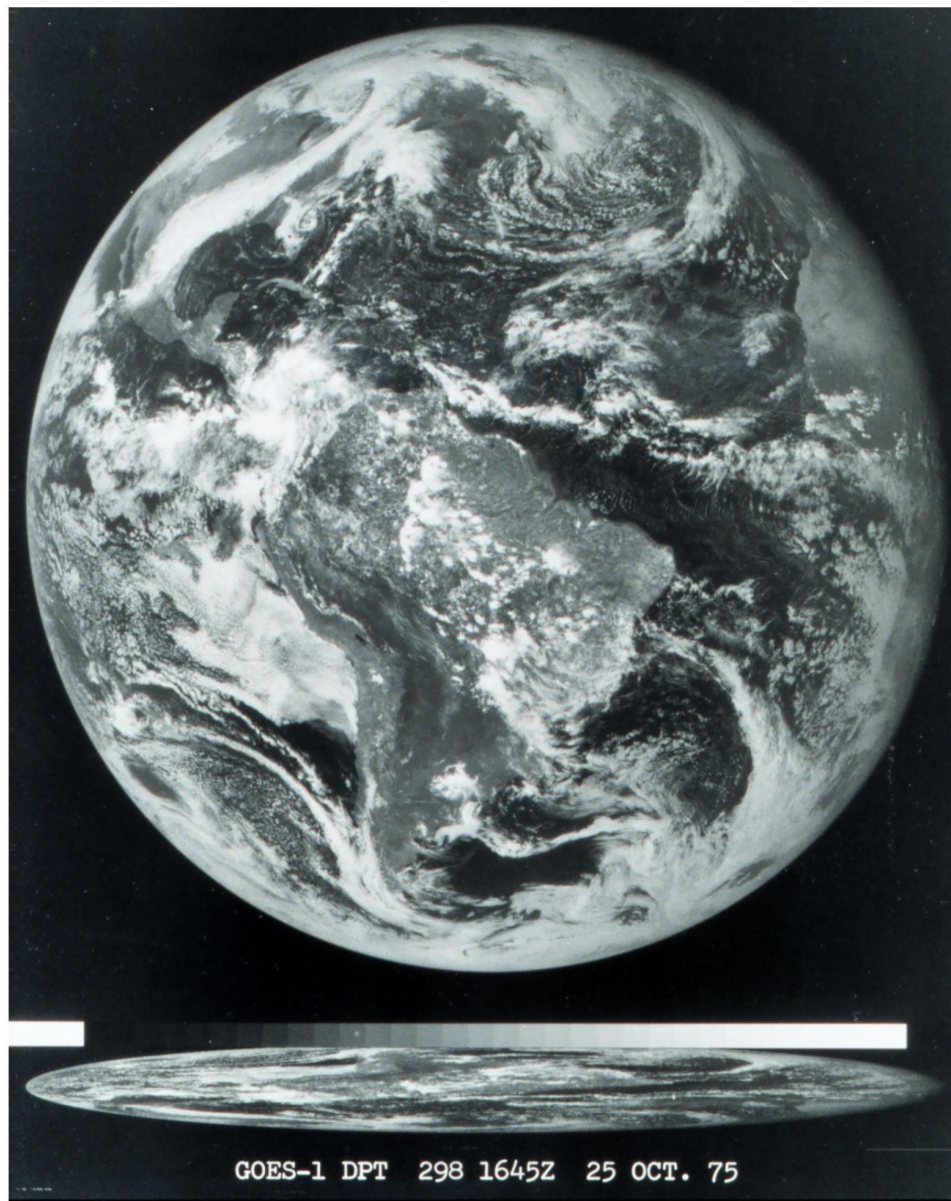


Image credit: National Oceanic and Atmospheric Administration, of the first image ever obtained from a GOES satellite. This image was taken from over 22,000 miles (35,000 km) above the Earth's surface on October 25, 1975.

National Aeronautics and Space Administration



the Space Place

June - July 2015 / Vol. 8, 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 and Earth science and technology.

Summer is upon us! What will you do with the extra sunlight and, hopefully, a little bit of extra time? At Space Place, we have you covered with new articles and activities.

New!

The Age of the Sun

We see it in the sky every day, but how much do we know about the sun? What about something basic, like its age? Find out the sun's age, and just how it is that we know how old it is.

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



Space Place en Español

We are always adding new articles and activities translated into Spanish for our language learner audiences. Be sure to check out our Spanish language site.

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



New!

How Far Away is the Moon?

It seems close because we can see it easily with the naked eye, but 30 Earths could fit between us and the moon.

<http://spaceplace.nasa.gov/moon-distance>

New!

How Many Moons?

Go on a tour of our solar system and meet some of the most popular moons. Saturn has the most confirmed moons, but Jupiter has the biggest one, Ganymede. Do you know why Mercury doesn't have any moons at all?

<http://spaceplace.nasa.gov/how-many-moons>



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

Printable Content

You can decorate your classroom with the official **Space Place calendar** for the **2015-2016** school year. It has beautiful images, NASA facts and trivia, and links to relevant content. Download individual months or the entire set today.

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



The Space Place Experiment Center



Introducing a new way to spice up your classroom or after-school experience—the “Space Place Experiment Center.” Loaded with two classic bean-sprout experiments, this web app brings the excitement of the scientific method into the digital age with a framework for students to input observations and record daily changes—all online. How much water does a bean need to sprout? What happens if you try to grow a bean plant without light? Start your investigation today!

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



www.nasa.gov

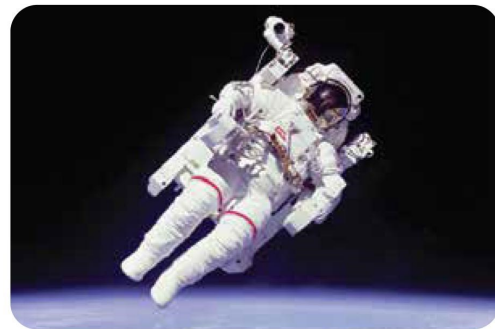
Special Days

June 5 — World Environment Day

Play the Missions to Planet Earth card game.
<http://spaceplace.nasa.gov/earth-card-game>

June 18 — Sally Ride became first U.S. woman in space, 1983.

Look at our photo gallery of astronauts and rockets!
<http://spaceplace.nasa.gov/gallery-technology>



June 21 — Summer Solstice and the First Day of Summer

Find out why we have seasons on Earth, and how it's related to long and short days.
<http://spaceplace.nasa.gov/seasons>

July 6 — Aphelion: on this day we are farthest from the sun.

Learn about the sun and Earth's special relationship in our animated storybook, “Super Star Meets the Plucky Planet.”
<http://spaceplace.nasa.gov/story-superstar>

July 16 — Apollo 11 launched in 1969, bringing astronauts to the moon for the first time.

Why does the moon have so many craters?
<http://spaceplace.nasa.gov/craters>

July 29 — NASA established in 1958.

Download your own Space Place desktop wallpaper to celebrate!
<http://spaceplace.nasa.gov/wallpaper>

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

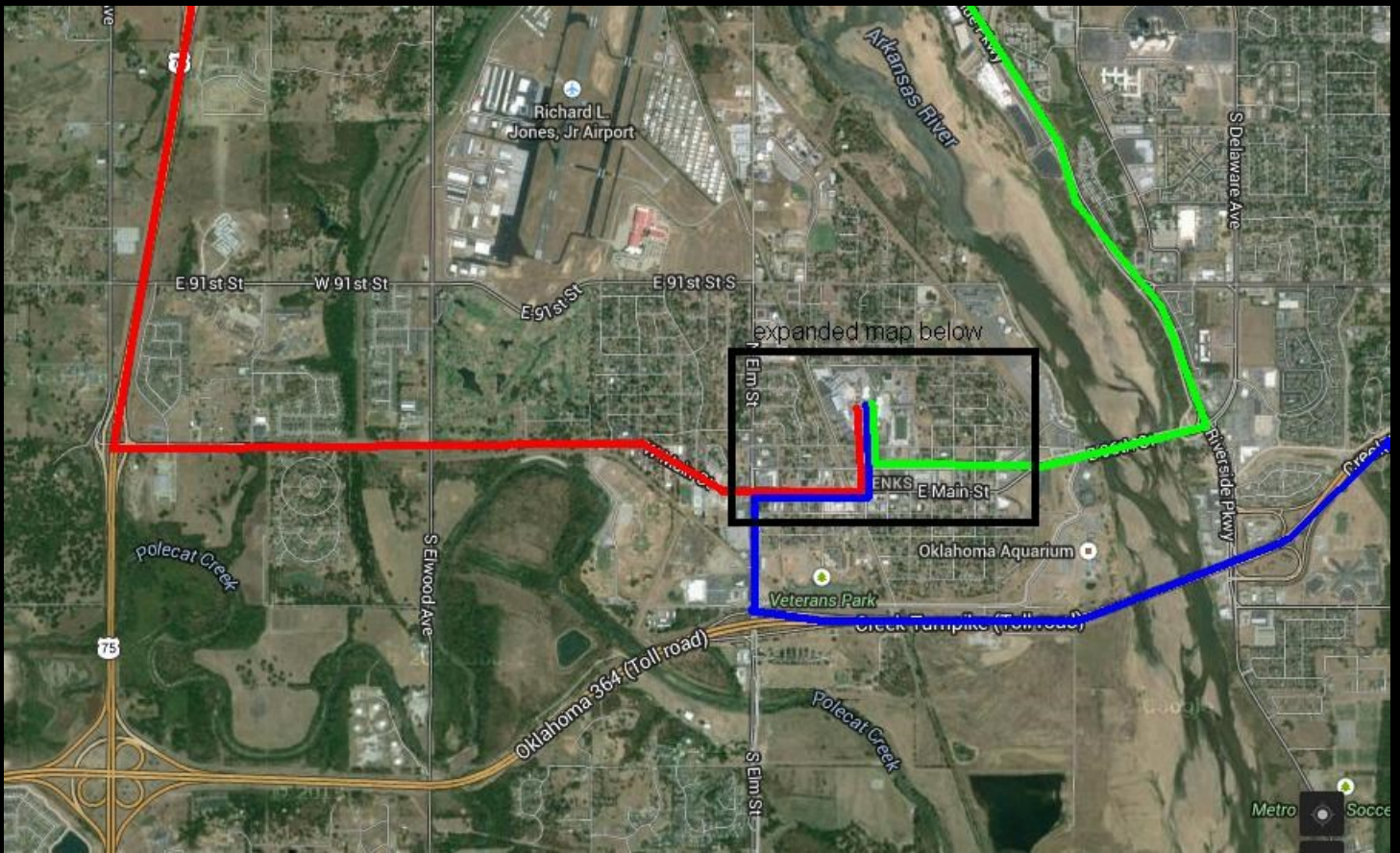
GO UP THE STAIRS TO THE 3RD FLOOR (THERE IS AN ELEVATOR FOR THOSE WHO NEED IT)

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

MAPS ON NEXT PAGE

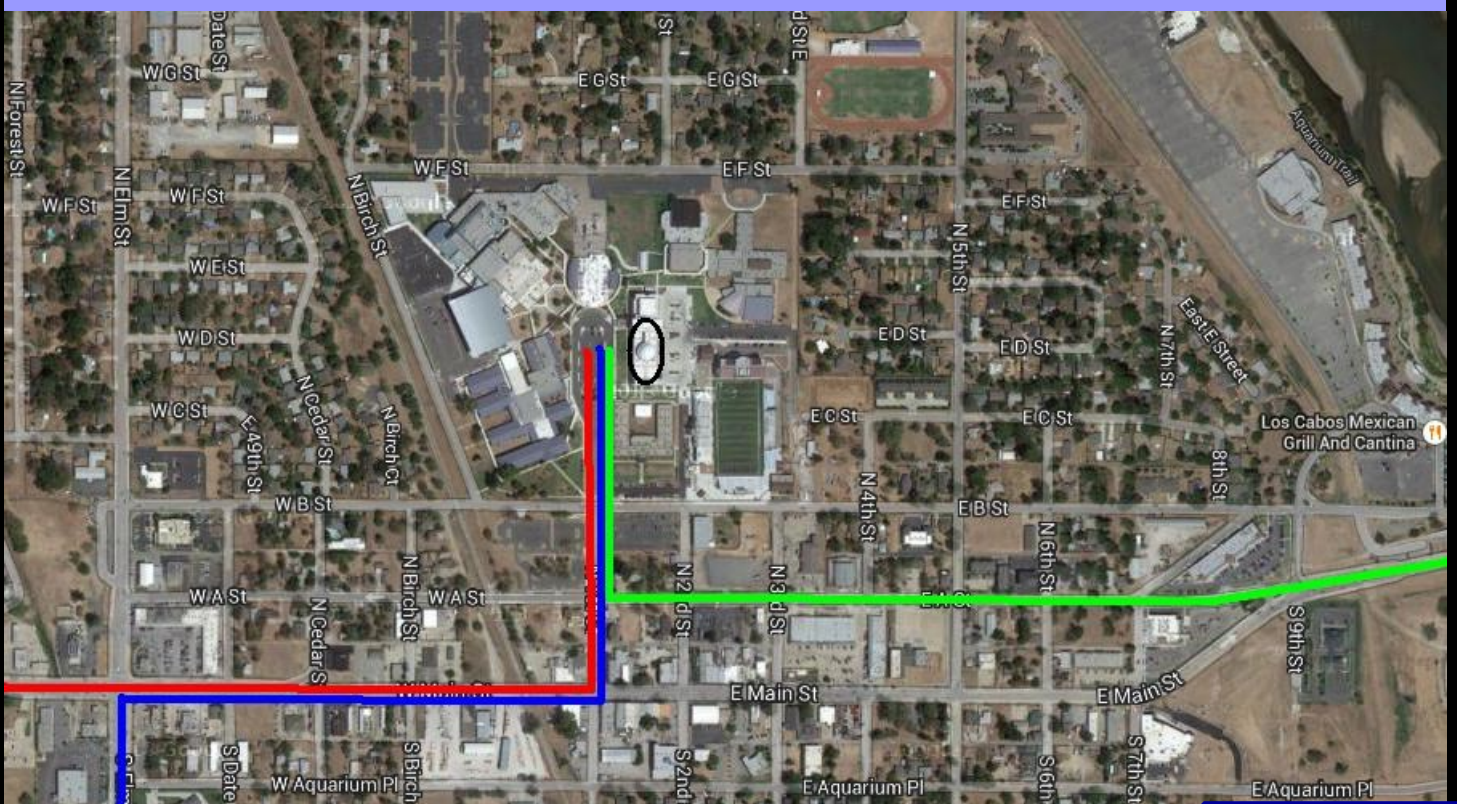
THE GENERAL MEETINGS ARE FREE AND OPEN TO THE PUBLIC.

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



MEMBERSHIP INFORMATION

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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.

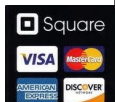
IF YOU ARE AN EXISTING S&T SUBSCRIBER, YOU CAN RENEW DIRECTLY WITH S&T AT THE SAME CLUB RATE. BOTH S&T AND ASTRONOMY NOW HAVE DIGITAL ISSUES FOR COMPUTERS, IPADS AND SMART PHONES.

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 SUMMER TO JOIN
US AT A STAR PARTY!

OPEN TO THE PUBLIC

FOR MORE INFORMATION
PLEASE VISIT
WWW.ASTROTULSA.COM.

THE OBSERVER IS A PUBLICATION BY THE ASTRONOMY CLUB OF TULSA. THE ASTRONOMY CLUB OF TULSA IS A 501C 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

TOM HOFFELDER

DR. ETHAN SIEGEL

RICHARD BRADY

TIM DAVIS

TERESA DAVIS

JOHN LAND

TAMARA GREEN

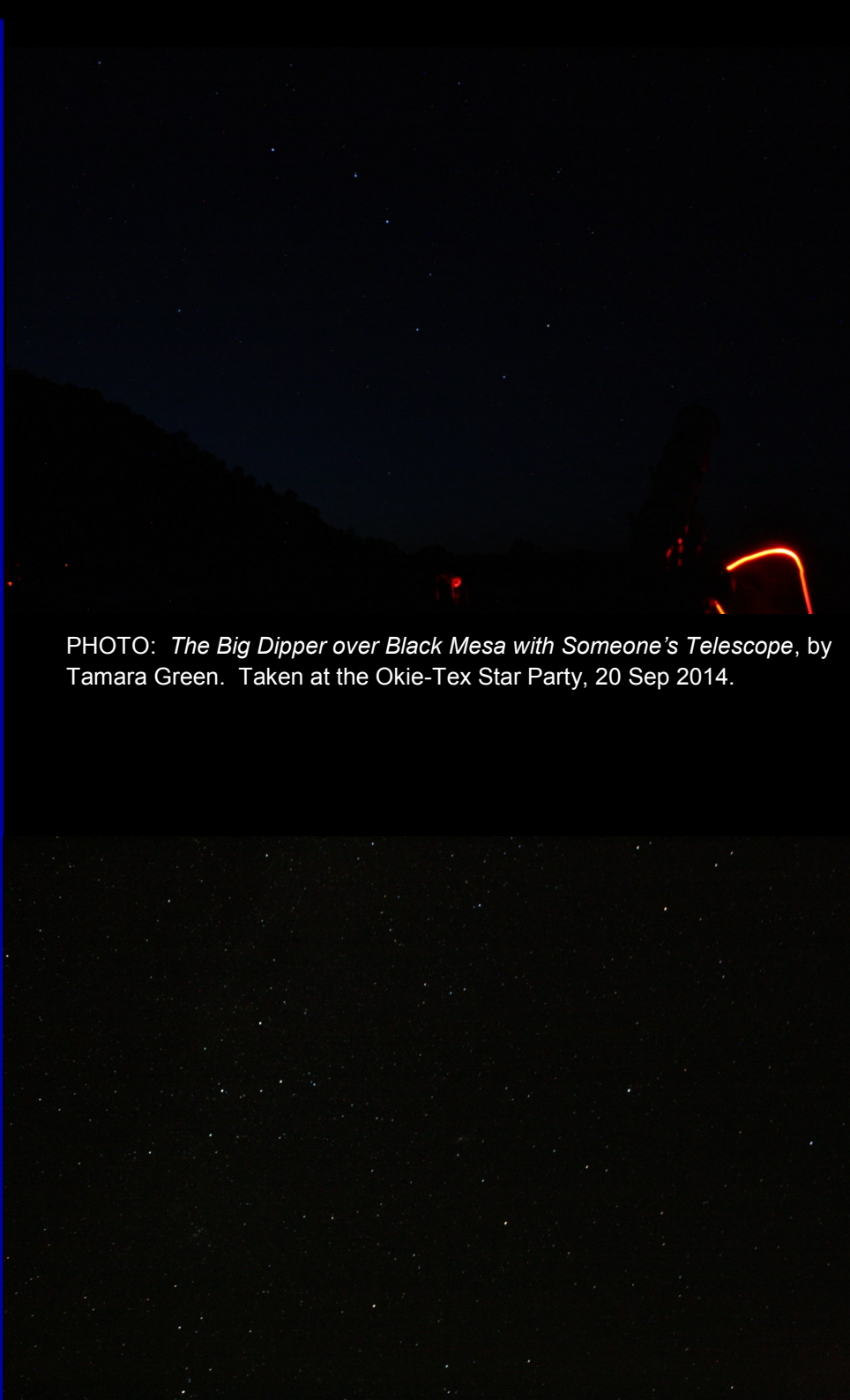


PHOTO: *The Big Dipper over Black Mesa with Someone's Telescope*, by Tamara Green. Taken at the Okie-Tex Star Party, 20 Sep 2014.

PHOTO: *Cassiopeia and Andromeda with the Galaxy Just Beginning to Come Into View*, by Tamara Green. Taken at the Okie-Tex Star Party, 27 Sep 2014.