ASTRONOMY CLUB OF TULSA

OBSERVER

MAY 2015

INSIDE THIS ISSUE:

THE ASTRONOMY CLUB TULSA IS A PROUD MEMBER OF

THE ASTRONOMICAL LEAGUE

ABOVE PHOTO: *A Last Look at Some Winter Stars Before They Leave Us for the Season, by Tamara Green. Taken at the Public Star Party, ACT Observatory, Apr 25, 2015.*

BELOW PHOTO: *Follow the Arc to Arcturus, by Tamara Green. Taken at the Public Star Party, ACT Observatory, Apr 25, 2015.*

MAY 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 AND HOLIDAYS:

FULL MOON (Flower Moon)	SUN MAY 3
MOTHERS' DAY	SUN MAY 10
LAST QUARTER	MON MAY 11
NEW MOON	SUN MAY 17
FIRST QUARTER	MON MAY 25
MEMORIAL DAY	MON MAY 25

UPCOMING EVENTS:

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	8:00 PM	BASS PRO
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 OR SUN, JUN 21		
SIDEWALK ASTRONOMY	SAT, JUN 27	8:15 PM	BASS PRO

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 & 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

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.

PRESIDENT'S MESSAGE

BY RICHARD BRADY

Hi everyone!

I want to thank everyone for coming out and helping with our Public Night on April 25. We had another large crowd show up. It was a beautiful night for star gazing, for once.

This summer we are going to have another SUN-day event on Saturday, June 20 at the Jenks Planetarium. 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.

Last Friday, April 24th, was the 25th anniversary of the launching of the Hubble Space Telescope. This amazing piece of technology has helped revolutionize our understanding of the universe. It has helped us determine the age of the universe to unprecedented accuracy, 13.7 billion years, helped us discover the fact that the expansion of the universe is accelerating (contrary to the idea that gravity would be slowing it down), which lead to learning of the existence of dark matter and dark energy.

It brought (and continues to bring) us amazing photographs of the wonders in our night sky. One of the most famous was captured in 1995, the Pillars of Creation in the Eagle Nebula, M16. (http://apod.nasa.gov/apod/ap070218.html and a wider view http://apod.nasa.gov/apod/ap080719.html) To celebrate the 25th anniversary, NASA revisited this iconic image. The finer detail of the new image taken last year shows changes to the pillars as the new-born stars move through the pillars. (http://apod.nasa.gov/apod/ap150107.html A full discussion of what the new image shows can be found at http://hubblesite.org/newscenter/archive/releases/2015/01/full/)

Another thing that Hubble has shown us is how many billions of galaxies there are in the universe. Hubble has taken the Hubble Deep Field (http://www.jpl.nasa.gov/spaceimages/details.php?id=PIA12110), Hubble Ultra Deep Field (http://www.nasa.gov/mission_pages/hubble/multimedia/hs-2012-48a.html), and Hubble Extreme Deep Field (http://www.nasa.gov/mission_pages/hubble/science/xdf.html).

These are only a few of the things Hubble has revealed to us. Much more about the Hubble and the 25th anniversary can be found at http://hubblesite.org/ and http://hubble25th.org/. There is also http://www.nasa.gov/, http://www.esa.int/ESA, and http://www.stsci.edu/portal/.

I'm biased, but I think the Hubble Space Telescope is the most important piece of science technology ever created. Eventually it will re-enter the atmosphere in another 10 to 20 years, due to atmospheric drag on the telescope. Hopefully until then it will continue to amaze and inform us.

Clear Skies!
Richard Brady

TREASURER'S AND MEMBERSHIP REPORT

BY TIM DAVIS

Astronomy Club of Tulsa: 138 members, including 20 new members in 2015.

Welcome to our new members this month: Colton Moser, Leda Laurence, Dennis Berney, Divaldo Pereira and Deepak Sawant.

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Club Accounts as of Apr 26, 2015:
Checking: $ 4,860.79; Savings: $ 3,774.08; Investment accounts: $ 19,635.10 *(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 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

Editor's Note: At last month's general meeting, I took notes for Teresa, as she was unable to attend that night. Due to some personal events that occurred during this past month over which I had no control, I forgot to send the notes to Teresa so she could compile them into something resembling coherent minutes! So, I have compiled the minutes for her. Here they are:

General Meeting, Fri April 3, 2015

Meeting was held at the Jenks HS Planetarium, Jenks, OK

Present:	Not Present:
Richard Brady, President	James Taggart, Board
Tamara Green, Vice President	Christopher Proctor, Board
Tim Davis, Treasurer	John Land, Board
Skip Whitehurst, Board	Teresa Davis, Secretary
Ed Underhill, Board	

There were 19 members and guests in attendance.

Richard called meeting to order at 7:05 pm. Dan Zielenski had a Planetarium show called "Cosmic Collisions" ready for us.

Richard also did a short presentation on the double partial solar eclipse, the total solar eclipse and other eclipses in 2015. Dan recommended viewing tomorrow's lunar eclipse at 5:15 am. Richard then talked about the new nova in Sagittarius. He then had Tamara make an announcement about the messier Marathon on April 18.

Following that, he talked about NASA's new mission in 2020, in which they plan to send a spacecraft to an asteroid to pick up a 4-meter wide boulder and pull it into lunar orbit for astronauts to explore. After that, he showed us a video about the possible extinction of the monarch butterfly and a possible Club project to help prevent it. He proposed buying milkweed to plant around the observatory to attract the butterflies and give them something to eat. There is a website to a video by National Geographic: http://nationalgeographic.com/video/butterfly_monarch

He then talked about the following upcoming events:

Total Lunar Eclipse, Sat, Apr 4 at 6:54 – 7:06 AM,

Sidewalk Astronomy, Sat, Apr 4 at 7 PM at Bass Pro,

Work Day, Sat, Apr 11 at the observatory,

Members' Night, Fri, Apr 17 at 7:30 PM at the observatory,

Messier Marathon, Sat, Apr 18 at TUVA,

NSN Telecon, 25 Years of the Hubble Space Telescope, Tues, Apr 28 at 6:00 PM,

General Meeting, Fri, May 1 at 7:00 PM at Jenks HS Planetarium.

SECRETARY'S CORNER

BY TERESA DAVIS, CT'D.

Then he touched on the Group Events scheduled:

Booker T Washington HS, 36 Seniors and 3 chaperones, Fri, Apr 10, 7:30 PM at the observatory,

Pathfinders Advanced Honors Award, 10 teens and 5 adults, Sat, Apr 11 at 7:00 PM at the observatory,

Roy Clark Elementary, Fri, Apr 24, 5:00 to 7:00 PM, ACT hosting a booth at the school.

Following that, Owen announced the Sidewalk event and a 5 min and 12 sec ISS pass that is happening this evening, at -3.2 mag. After the announcement was the Planetarium show.

Meeting was adjourned at 8:30 and some of us stayed to watch the ISS pass.

My apologies to Teresa.

HAPPY BIRTHDAY HUBBLE SPACE TELESCOPE AND EXPLORING THE DWARF PLANETS ANNOUNCEMENTS

BY JOHN LAND

Happy 25th Birthday Hubble Space Telescope ! Launched April 24, 1990

On April 22, 2015 the PBS show NOVA carried a special on the history of the Hubble and its astounding accomplishments in the last 25 years.

The program is available for online viewing at http://www.thirteen.org/programs/nova/#invisible-universe-revealed

Exploring the Dwarf Planets

Friday May 1 at 7:00 PM

Jenks High School Planetarium

2015 is banner year for space exploration. In February 2015 the Dawn spacecraft began orbiting the nearest dwarf planet "Ceres" and has completed its first imaging survey. Meanwhile the New Horizons spacecraft is closing in on Pluto. Travelling at 33,000 mph it will soon be sending back our first ever detailed images of Pluto and its five moons. It will make its closest approach on July 14th and will continue to take images as it travels beyond Pluto to worlds unknown. Come join us as we discover the latest of news from these missions of discovery.

THE EDDINGTON VALVE

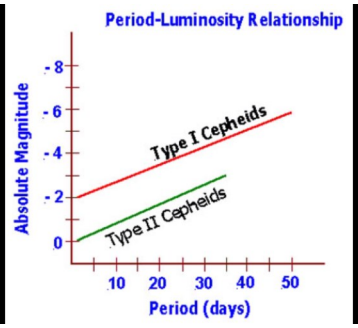
BY RON WOOD

In spite of all the talk in astronomy about cepheid variables, one of the most interesting things about them is routinely ignored, the mechanism by which they pulsate.

We are often told how in 1912 Henrietta Leavitt discovered that their luminosity (absolute magnitude) can be determined by measuring their period, and that their distance can be determined by knowing their luminosity.

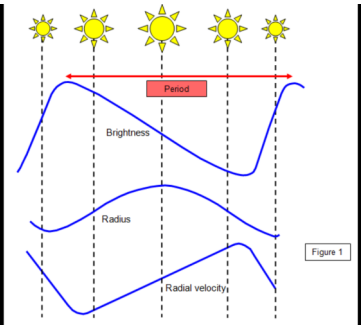
We are told how Edwin Hubble used cepheid variables, first to discover that the Andromeda Galaxy lay outside our Milky Way and then to discover that the universe is expanding.

We are often reminded that cepheids are the foundation of the cosmic distance scale, and no one would deny the importance of that, but there is something else about cepheids that is seldom mentioned, which I find most intriguing. How do they pulsate? What is the mechanism by which they can become 10 times brighter in two months or less? But first, what kind of stars are these? There are three types of cepheids: type I, type II and anomolous. The discussion here concerns type I which goes by several names: population I cepheids, delta cepheids and classical cepheids.



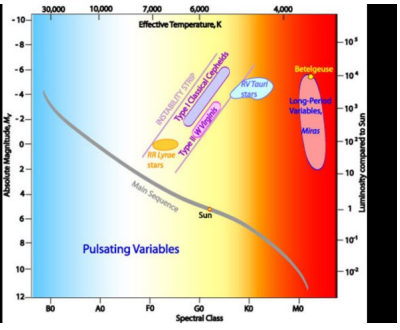
On September 10, 1784, Edward Pigott detected the variability of Eta Aquilae, the first known classical cepheid. However, the name "cepheid" comes from Delta Cephei which was discovered to be variable a few months later by the British amateur John Goodricke. Coincidentally, he was also the first person to propose an explanation for the variability of Algol.

Delta Cephei is close enough to Earth to make the parallax measurements, which index the cosmic distance scale. Cepheid variables can be used to measure distances out to about 150 million light years.



Cepheids spend most of their lives as normal, yellow main sequence stars of spectral class F6 – K2, but as they exhaust their hydrogen fuel they pass through a swollen red giant phase to become a pulsating cepheid variable before completely exhausting their fuel.

Classical cepheids undergo pulsations with very regular periods of 1 to 70 days during which they may show a 25% change in radius. They are several times more massive than the Sun, and up to 30,000 times more luminous, making them visible over great distances.



In 1917, only 5 years after Leavitt realized the importance of cepheids, a possible mechanism for their variability was suggested by Arthur Stanley Eddington, but it was not fully developed until 1953 by S. A. Zhevakin. The mechanism is called the Eddington valve, or κ-mechanism, where the Greek letter κ (kappa) denotes gas opacity. Helium is the gas thought to be most active in the process.

Doubly ionized helium (helium whose atoms are missing both electrons) is more opaque than singly ionized helium. The more helium is heated, the more ionized it becomes. At the dimmest part of a cepheid's cycle, the ionized gas in the outer layers of the star is opaque, and so is heated by the star's trapped radiation, With increasing temperature it begins to expand and cool. As it cools, it becomes less ionized and therefore more transparent, allowing the radiation to escape. Then the expansion stops, and reverses due to the star's gravitational attraction. The process then repeats. It is in effect a heat engine putting Sisyphus to shame by heaving countless tons of matter upward over and over again.

---Ron Wood

A BRIEF HISTORY OF THE DENVER ASTRONOMICAL SOCIETY

(ORIGINALLY RAN IN THE NEW PACIFIC STARGAZER APR 2015)

https://drive.google.com/file/d/0B5I869rZBwb5c0NaLUhIMWFZY0E/view?usp=sharing

BY F. JACK EASTMAN

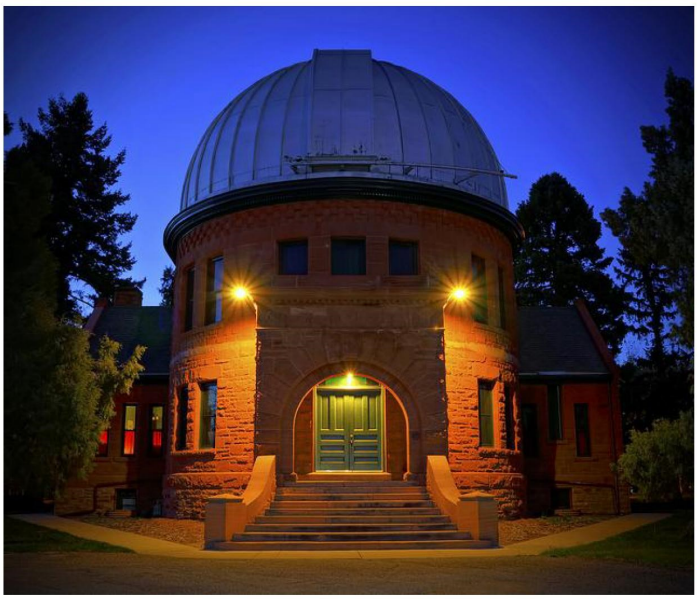
Club Spotlight

A Brief History of the Denver Astronomical Society

by Jack Eastman

The Denver Astronomical Society (DAS) began in 1948, when a bunch of like-minded folks with an interest in astronomy and related sciences began meeting at the University of Denver's historic Chamberlin Observatory. Back in the day, when making one's own Newtonian was the only way to obtain a telescope for most people, the club established a telescope making workshop which included mirror grinding and fabricating the rest from almost anything available. The organization was incorporated and later obtained 501(c)3 tax exempt status which allowed for tax free donations to be made to the organization.

Unfortunately, much, if not all, of the Club's history was lost in the 1980s when a flooded basement at Chamberlin destroyed all the records and documents stored there. When I joined the organization in 1969 there were two meetings every month - quite a chore for the Vice President, who organized the programs. Under my tenure as President, we made one of the meetings the formal program, usually with a professional from one of the nearby universities or aerospace facilities; the other was a member-produced program. The meetings usually began with club business (President's message, Treasurer's report etc.) Since this was of little interest to most folks, the Executive Board decided to hold business meetings separately from the general meetings, allowing for a much smoother operation. Of course, board meetings are open to the general membership should anyone have an interest, or wants to bring something before the Board. The second meeting became the monthly star party at Chamberlin which evolved into our 'Chamberlin Open House,' one of many outreach activities the Club is involved in. We usually have a couple dozen members' telescopes out on the south lawn, as well as operating the observatory's fine, historic (circa 1894) 20-inch Clark/Saegmuller refracting telescope. The club was also instrumental in getting the Observatory on the National Register of Historic Places.



Chamberlin Observatory

After the aforementioned flood (6-feet of water in the basement from a leaking pipe), the Club became proactive in serious refurbishment of the observatory. It was obvious the building was in need of major repairs, with water leaks, decrepit plaster, infrastructure and the like. The Club was instrumental in obtaining a quarter million dollar grant from the Colorado Historical Society for a complete structural facelift, bringing things up to code and guaranteeing the survival of the observatory for another 100+ years. During this refurbishment, the University of Denver kicked-in a substantial amount more to ensure all the work could be accomplished. The club outgrew the observatory as a meeting venue and today holds its Monthly General Meeting on the University campus. Upon conclusion of the formal program, we migrate over to the observatory for refreshments and, weather permitting, observing with the 20-inch. The organization's major thrust, today, is Public Outreach and Education, and operating the Monthly Open House at Chamberlin, as well as two Public Nights a week, also at Chamberlin. We also do a fair number of outreach events at local schools and for other organizations. We have a very diverse membership numbering about 390; folks interested in all aspects of the science, from imaging, visual observing, instruments and optics as well as learning as much as possible by attending our Monthly General Meetings. We draw on a wide range of programs from local research organizations, universities, aerospace organizations and other resources.

Continued Page 3

Club Spotlight cont'd from Page 2

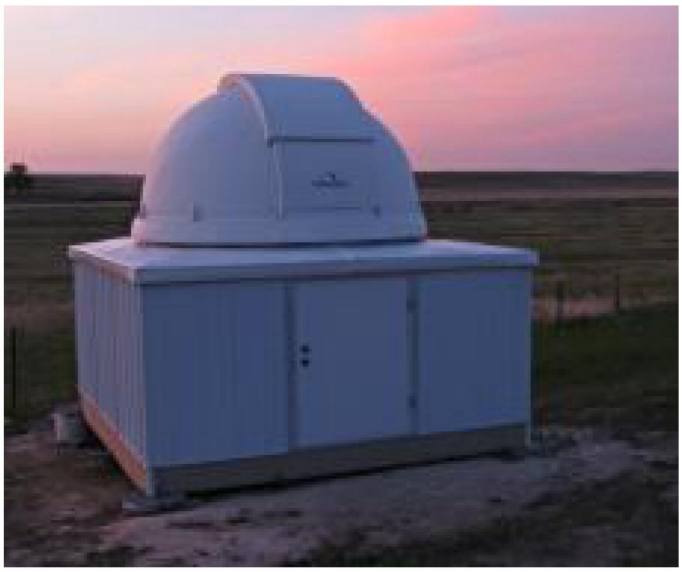
The DAS has a lease on approximately 6 acres about 60 miles east of the greater-Denver area which we have named the Edmund G. Klein Dark Sky Site, where there is a couple dozen pads with electricity, a vault toilet, warming hut and the Brookes Observatory which houses a Celestron 14 telescope. Skies are quite good out there, though there is a noticeable glow to the West from the aforementioned Denver area. We like to think of ourselves as stewards of the Chamberlin Observatory. In recent times, some of our members have been involved in the disassembly, measurement and cleaning of the 20-inck Clark objective; we've done some 'emergency' mechanical repairs, and recently the complete disassembly of the right ascension slewing gear train that seized up earlier this year. Happily I can report that operation was a complete success.

The Denver Astronomical Society continues to flourish and continues to provide Outreach/Educational programs, and stewardship of the Historic Chamberlin Observatory with it's magnificent 120-year old refractor.

The Denver Astronomical Society is a member of the Astronomical League (Mountain Astronomers Research Section), International Dark Sky Association, Antique Telescope society, Western Amateur Astronomers and NASA/JPL Night Sky Network.

The DAS homepage is at http://denverastro.org/.

Jack Eastman with the Chamberlain Observatory 20" aperature Alvan-Clark Saegmuller refractor



▲Brooks Observatory with 14-inch Celestron Schmidt-Cassegrain telescope mounted on a Losmandy G11 equatorial mount.

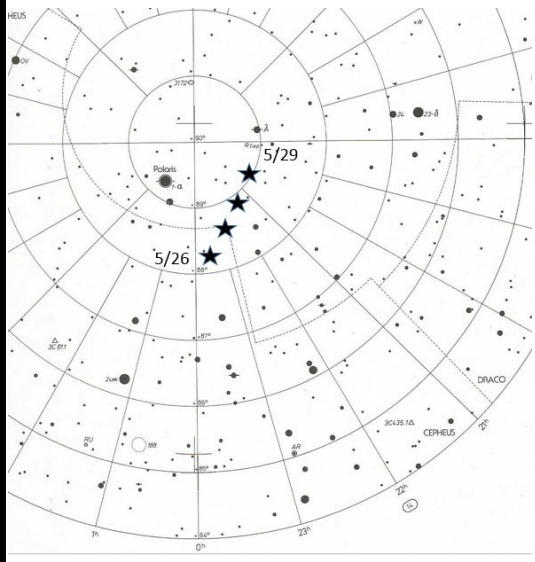
▲Fourteen 10x10' N/S-aligned concrete pads (3 doubles and 8 singles), each with grounded AC electric outlets.

* * *

NITELOG—NorwayInTErurbanLocalObservingGroup

BY TOM HOFFELDER

As promised, once we made it to the spring galaxies, the sky would "catch up" with us. The end of astronomical twilight here in the North Woods occurs a little after 10 PM mid month, which is when we'll be observing since that is where new moon currently resides, and by 10 all the deep sky objects are already near the meridian. (The list of deep sky objects is actually attached this month!)

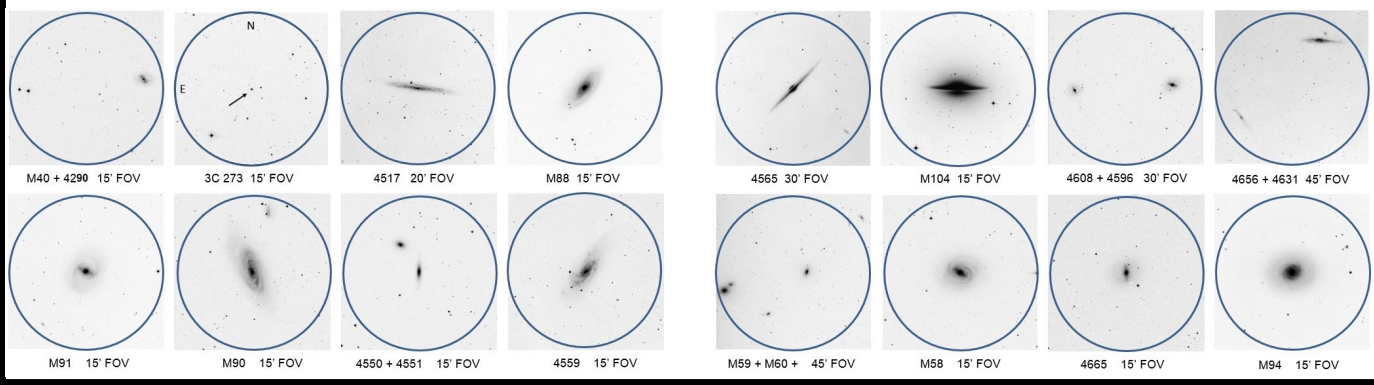


COMETS: Lovejoy's magnitude is approaching the value (10th) that would result in it no longer being mentioned; however, from the 26th thru the 29th it will be less than 1.5 degrees from Polaris. As far as I can remember, I've never seen a comet and Polaris in the same field. With my memory as it is, that doesn't mean a whole lot, but the fact that my comet records do not mention such an event probably means the view is somewhat unique. It won't be easy since a relatively small scope will be required for a field greater than one degree, plus the moon will be in the way until early morning hours. The attached chart shows the approx. location at 11 PM EDT for the dates indicated.

PLANETS: Jupiter, yeh, still up there. Venus next month, when it reaches max eastern elongation. The best time to view any outer planet is when it is at opposition (opposite the sun and therefore closest to us), which is where Saturn is this month, and the rings are near maximum tilt. Unfortunately, especially for New England, the planet lies among the stars of Scorpius and even when near the meridian (its highest), the altitude is only 27 degrees. (That's for me at 44 degrees latitude; if you are somewhere in FL, say Yeehaw Junction perhaps, which is ~ 28 deg latitude, the planet obviously reaches an altitude of 43 degrees.) Max altitude (again for me in Norway Maine) occurs around 2 AM on the 1st and then of course midnight at month's end.

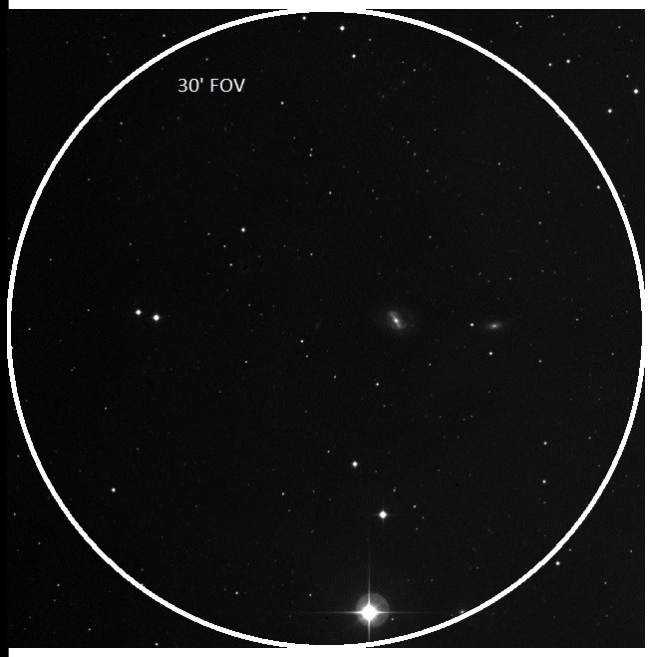
STARS: Three carbon stars with B-V's of 3.something and current mags of 7 .5 or brighter, plus five nice doubles of varying magnitudes and separations ranging from 1.9 to 24 arc seconds.

THE GOOD STUFF: Except for one lonely globular, the list is again all galaxies. Well, OK, there is a double star, which is only there because it is M40. There are ten other Messiers, one being the globular, and also ten Herschel 400 objects. Maybe you would have noted (if I had attached last month's list) that the final object on last month's list is the fourth object here. That's because I want all of you to be able to say that once upon a time 2.4 billion year old photons triggered the rhodopsin in one of your retinae.



NITELOG—NorwayInTErurbanLocalObservingGroup

BY TOM HOFFELDER, CT'D.



Back to M40, perhaps one of you accidentally noticed on the Marathon spreadsheet last month (which was attached!) that there is a small galaxy, NGC 4290, just to the west of the double star. Just west of that galaxy is another even smaller dimmer one; both are in the list of objects and shown on an attached DSS photo. If you happen to observe M40, let me know if you can see one or both galaxies. I've seen 4290 in our 8 inch scope, but have never tried 4284 in any scope, because I didn't know it was there until now!

THE QUESTION OF THE 20TH CENTURY: Why wasn't NGC 4517 included on either the Herschel 400 or the HII?!!! Maybe it was added to revisions, but it is not on either of the original versions. How do I know? It's on my H3 list, the next Herschel list, which consists of 300 galaxies, because the first two Herschel lists pretty much used up all H objects that weren't galaxies. Let my know if you'd like the Excel file, which now includes Surface Brightness values.

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.

5/9			(5/10)	5/16			
SS	NTE	ATE	MR	SS	NTE	ATE	MS
19:55	21:10	21:57	00:49	20:03	21:20	22:10	18:23

Object (Type)	RA	Dec	Star	N/S	E/W	Mag*/(# of Stars)	Size (')/ *Sep (")*	Spect/ M# or H#	Dist (ly)	Urano I Page	Comment, [B-V], {~crnt 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] {7.5}
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}
δ Crv (MS)	12 29.9	-16 31	-	-	-	3, 8.5	*24*	A0, dK2	125	284	(20)
γ Vir (MS)	12 41.7	-01 27	-	-	-	3.5, 3.5	*1.9*	F0, F0	32	239	(280)
24 Com (MS)	12 35.1	+18 23	γ Com	10.0 S	2.0 E	5, 6.5	*20*	K2, A7		149	(24)
2 CVn (MS)	12 16.1	+40 40	β CVn	0.7 S	3.4 W	6, 8.5	*12*	M1, F7		74	(44)
α CVn (MS)	12 56.0	+38 19	-	-	-	3, 5.5	*19*	A0, F0	120	109	(24)
*WNC 4 (MS)	12 22.2	+58 05	δ Uma	1.0 N	0.9 E	9.0, 9.3	*52*	M40	500	47 (ni)	(10)
*NGC 4290 (Sbab)	12 20.8	+58 06	PRV	-	0.2 W	[13.2]	2.2X1.6	H805-2	150M	47	
NGC 4284 (Sbc)	12 20.2	+58 06	PRV	-	0.1 W	[14.6]		H798-3	200M	47	
*3C 273 (Q)	12 29.1	+02 03	η Vir	2.8 N	2.2 E	12.9	---	---	2.4B	238	
*NGC 4517 (Sc)	12 32.8	+00 07	γ Vir	1.6 N	2.2 W	[13.3]	10X1.5	H5-4	50M	239	
*NGC 4501 (Sb)	12 32.0	+14 25	β Leo	0.2 S	10.5 E	[12.8]	6.8X3.7	M88	60M	194	4516: 0.1 N/0.3 E
*NGC 4548 (SBb)	12 35.4	+14 30	PRV	0.1 N	0.9 E	[13.3]	5.2X4.2	M91	60M	194	4571: 0.3 S/0.3 E

*NGC 4569 (Sbab)	12 36.8	+13 10	PRV	1.3 S	0.4 E	[13.3]	9.5X4.4	M90	60M	194	IC 3583: 0.1 N
NGC 4552 (E)	12 35.7	+12 33	PRV	0.5 S	0.3 W	[12.7]	3.5	M89	60M	194	
*NGC 4550 (SB0)	12 35.5	+12 13	PRV	0.4 S	---	[12.5]	3.3X0.9	*H36-1	50M	194	4551: 0.1 NE
*NGC 4559 (SBc)	12 36.0	+27 58	γ Com	0.3 S	2.0 E	[13.6]	10X4	*H92.1	30M	149	
*NGC 4565 (Sb)	12 36.3	+25 59	PRV	2.0 S	0.1 E	[13.2]	15X2	*H24-5	50M	149	4562: 0.1 S/0.2 E
NGC 4570 (S0)	12 36.9	+07 15	δ Vir	3.9 N	4.7 W	[12.3]	3.7X1.2	*H321	55M	194	
NGC 4590 (GC)	12 39.5	-26 45	β Crv	3.4 S	1.2 E	7.3	11	M68	33K	329	
*NGC 4594 (Sa)	12 40.0	-11 37	δ Crv	4.8 N	2.4 E	[12.0]	8.6X4.2	M104	50M	284	*H43-1 Sombrero
*NGC 4608 (SB0)	12 41.2	+10 09	30 Vir	0.1 S	0.2 W	[13.3]	3.3X2.9	H69-2	60M	194	
*NGC 4596 (SB0-a)	12 39.9	+10 11	PRV	---	0.3 W	[13.0]	4.0X3.0	*H24-1	55M	194	
NGC 4654 (SBcd)	12 43.9	+13 08	ε Vir	2.2 N	4.5 W	[13.2]	5.0X3.1	*H126-1	50M	194	4639: 0.3 NW
*NGC 4656 (SBm)	12 44.0	+32 10	α CVn	6.2 S	2.6 W	[13.9]	15X2	*H176-1	25M	108	4631: 0.5 NW
NGC 4660 (E)	12 44.5	+11 11	ε Vir	0.3 N	4.3 W	[12.7]	2.1X1.7	*H71-2	40M	194	
*NGC 4649 (E2)	12 43.7	+11 33	PRV	0.4 N	0.2 W	[13.1]	7.6X6.2	M60	60M	194	4647: 0.1 NW
*NGC 4621 (E5)	12 42.0	+11 39	PRV	0.1 N	0.4 W	[13.0]	5.4X3.7	M59	60M	194	4606/07: 0.3 N/0.2 W
*NGC 4579 (SBb)	12 37.7	+11 49	PRV	0.3 N	1.0 W	[13.1]	6.0X4.8	M58	60M	194	
*NGC 4665 (SB0-a)	12 45.1	+03 03	δ Vir	0.4 S	2.8 W	[12.9]	3.5	*H142-1	50M	239	
*NGC 4736 (Sab)	12 50.9	+41 07	β CVn	0.2 S	3.2 E	[13.6]	5.0X3.5	M94	14.5M	75	

*DSS image

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

*H400

ni=shown, not identi-fied

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.

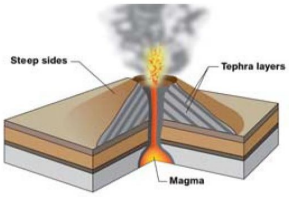
Life is full of moments of wonder if only we stop to notice—moments when we learn something new or see something beautiful. Space exploration provides a wealth of such moments, and the Space Place is here to make these moments, these discoveries, these captured images of the beauty of the universe available 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.

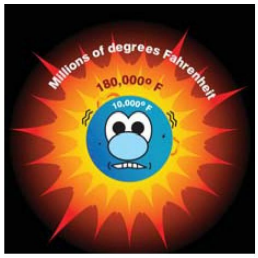
April 4—National Reading a Road Map Day
It's fun to speculate on how racing pigeons can find their way home from anywhere without consulting a map—that is if a recent solar storm isn't messing with their navigation equipment! Go to http://spaceplace.nasa.gov/pigeons.

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

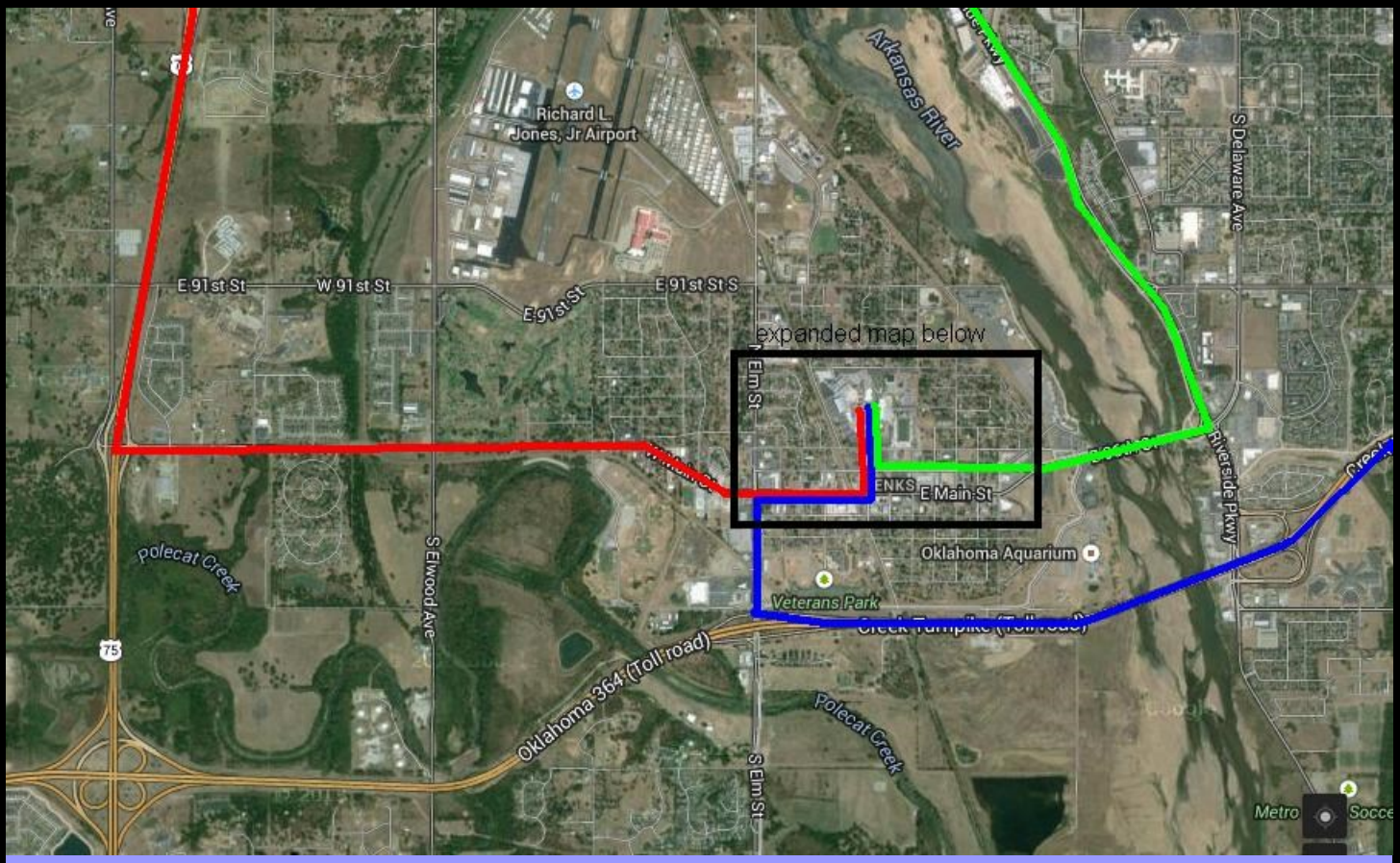
GO UP THE STAIRS TO THE 3RD FLOOR (THERE IS AN ELEVATOR FOR THOSE WHO NEED IT)

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

MAPS ON NEXT PAGE

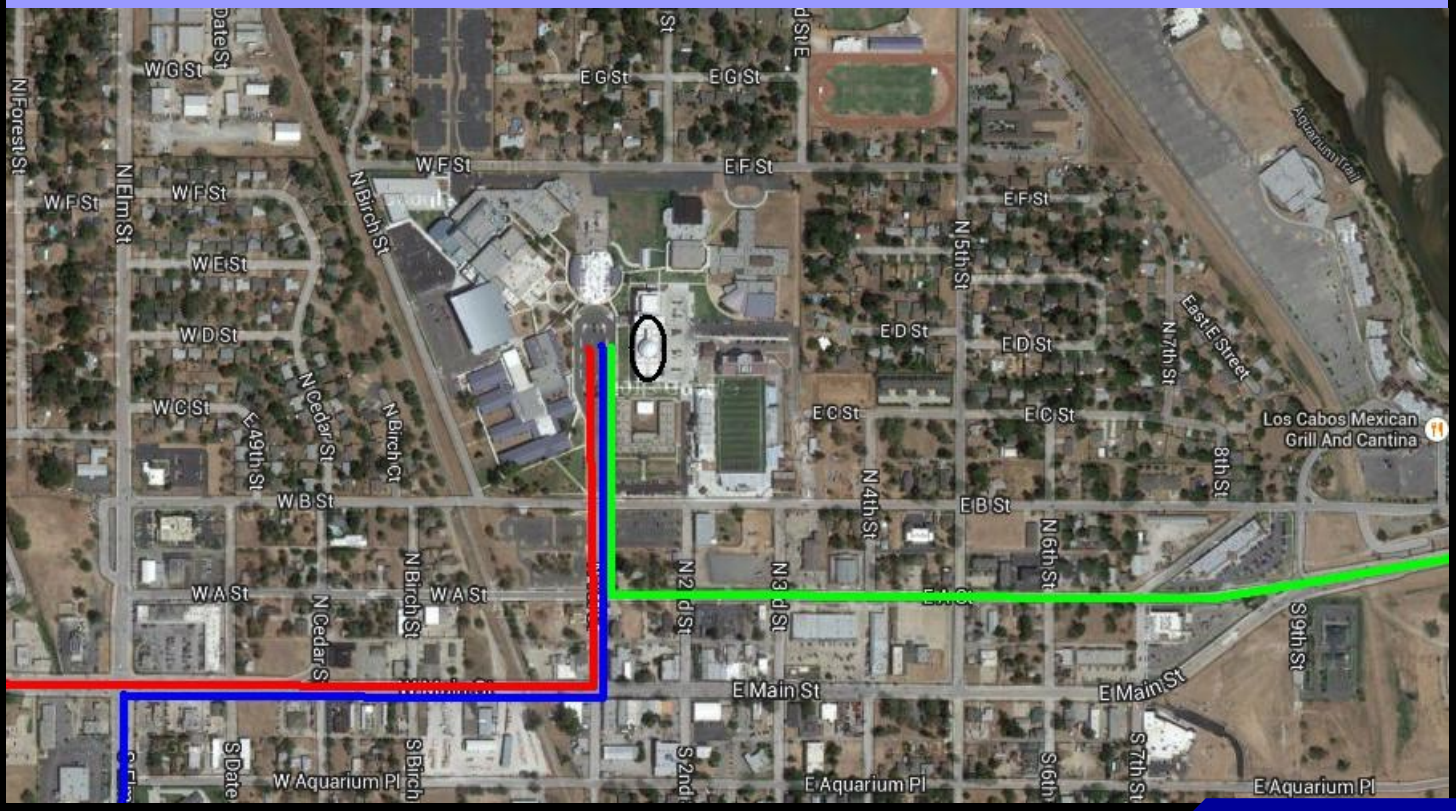
THE GENERAL MEETINGS ARE FREE AND OPEN TO THE PUBLIC.

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!

OPEN TO THE PUBLIC

FOR MORE INFORMATION PLEASE VISIT WWW.ASTROTULSA.COM.

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Also find us on Facebook!

https://www.facebook.com/AstronomyClubofTulsa

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

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

RON WOOD

F. JACK EASTMAN

TOM HOFFELDER

RICHARD BRADY

TIM DAVIS

TERESA DAVIS

JOHN LAND

TAMARA GREEN

SPRING STAR PARTIES (and gearing up for Summer)!!

PHOTO: *Corvus and Spica, by Tamara Green. Taken at the Public Star Party, ACT Observatory, Apr 25, 2015.*