

INSIDE THIS ISSUE:

CALENDAR & EVENTS	2
MESSIER MARATHON ANNOUNCEMENT	3
MESSIER MARATHON LINKS AND ASTRONOMY NEWS, BY JOHN LAND	6
LUNAR ECLIPSE, APR 4, 2015, BY JOHN LAND	7
PRESIDENT'S MESSAGE	8
TREASURER/MEMBERSHIP REPORT	9
SECRETARY'S CORNER	10
SPECIAL GUEST ARTICLE: "THE MAJESTY OF YESTERYEAR'S PLANETARIUM", BY F. JACK EASTMAN	12
SPECIAL GUEST ARTICLES: "THE CLEANING OF A CLASSIC, PARTS ONE AND TWO", BY F. JACK EASTMAN	15
NITELOG	19
WHERE WE MEET	24
OFFICERS, BOARD & STAFF	26



ASTRONOMY CLUB OF TULSA

OBSERVER

MARCH 2015



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THE ASTRONOMY CLUB TULSA IS A PROUD MEMBER OF



THE ASTRONOMICAL LEAGUE




PHOTOS:: Celebrating the Spirit of Adventure, in the form of the Annual Messier Marathon. Photos taken at Messier Marathons throughout the last few years, both at TUVA and at our own observatory in 2012 (weather had been really rainy that spring and the ground was soaked at TUVA). All photos by Tamara Green.

MARCH 2015

MOON PHASES AND HOLIDAYS:

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				



FULL MOON (Worm Moon) THU MAR 5
LAST QUARTER FRI MAR 13
ST PATRICK'S DAY TUE MAR 17
VERNAL EQUINOX FRI MAR 20
NEW MOON FRI MAR 20
FIRST QUARTER FRI MAR 27





DAYLIGHT SAVING TIME BEGINS SUN MAR 8

UPCOMING EVENTS:

GENERAL MEETING	FRI MAR 6	7:00 PM	JENKS HS PLANETARIUM
SIDEWALK ASTRONOMY	SAT MAR 7	6:30 PM	BASS PRO
CLUB WORK DAY	SAT MAR 14	TBA	ACT OBSERVATORY
MEMBERS' NIGHT	FRI MAR 20	7:30 PM	ACT OBSERVATORY
MESSIER MARATHON	SAT MAR 21	TBA	TUVA
PUBLIC STAR PARTY	SAT MAR 28	7:30 PM	ACT OBSERVATORY
GENERAL MEETING	FRI APR 3	7:00 PM	JENKS HS PLANETARIUM
SIDEWALK ASTRONOMY	SAT APR 4	7:00 PM	BASS PRO
INT'L DARK SKY WEEK	APR 12-18		
MEMBERS' NIGHT	FRI APR 17	7:30 PM	ACT OBSERVATORY
MESSIER MARATHON BACKUP	SAT APR 18	TBA	TUVA
PUBLIC STAR PARTY	SAT APR 25	8:00 PM	ACT OBSERVATORY

APRIL 2015

MOON PHASES & HOLIDAYS:

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		



FULL MOON (Pink Moon) SAT APR 4
EASTER SUN APR 5
LAST QUARTER SAT APR 11
NEW MOON SAT APR 18
FIRST QUARTER SAT APR 25

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

MESSIER MARATHON!

Saturday, March 21, 2015

TUVA Astronomy Club, Checotah, OK



Our Host, Ron Wood, will be giving a presentation on the Messier Marathon at our February General Meeting on Friday, February 6 at 7:00 PM.

In the event of adverse weather conditions, the back-up date is Saturday, April 18.

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.*

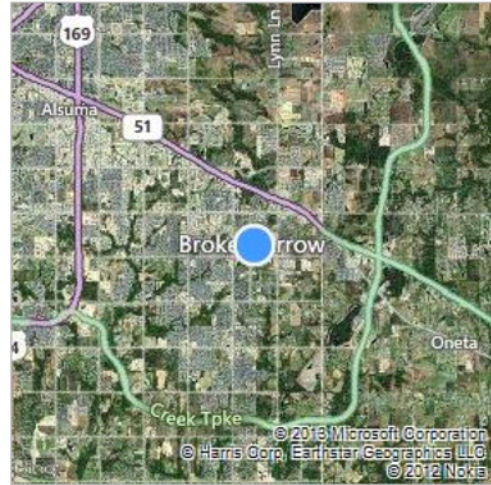
Map to the Burger King on Elm Place:



Broken Arrow, OK

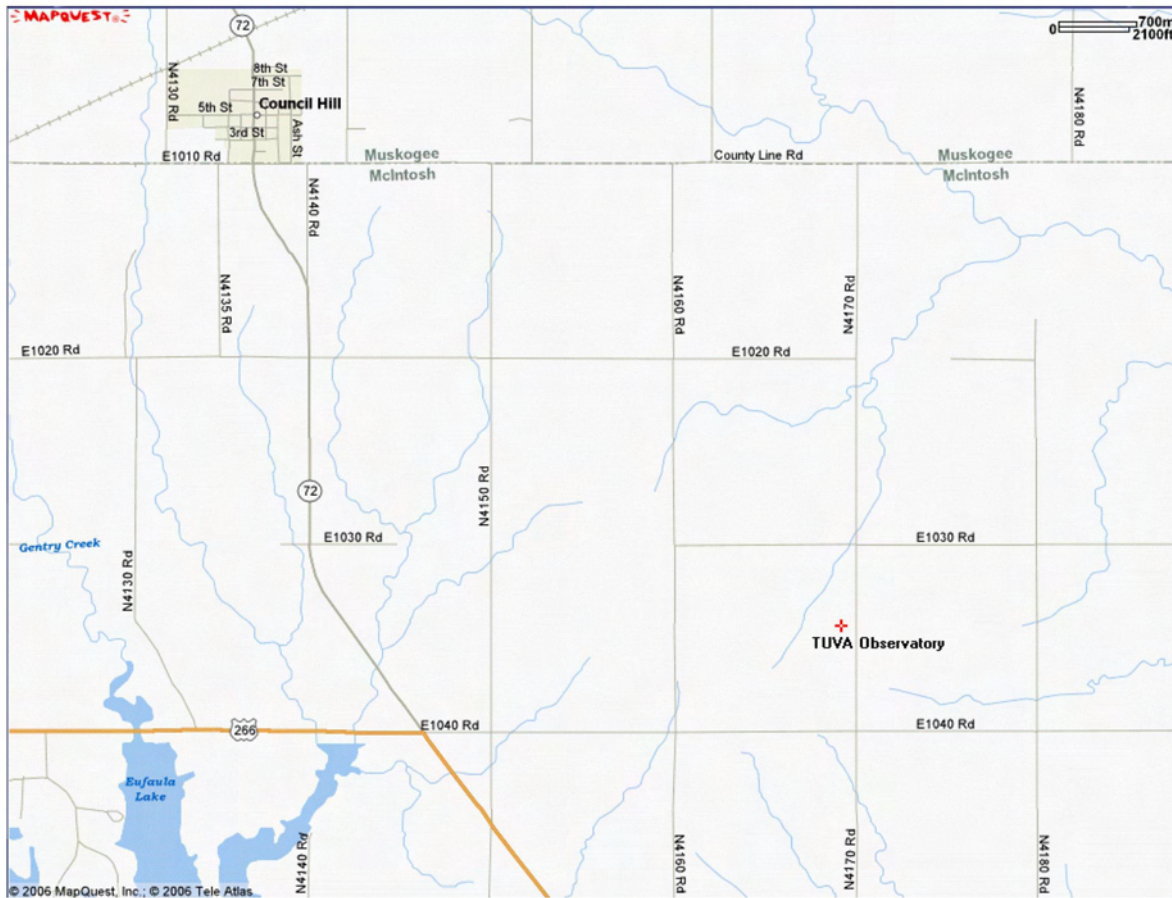
Burger King on N. Elm Pl., Broken Arrow. Building is on the Left side the map, blue roof.

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



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.



BY JOHN LAND

Get ready for the MARCH 21st

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 makes news in local magazine.

LIFE's *Vintage Newsmagazine* is a free monthly publication for seniors and their caregivers focusing on the needs of seniors and issues of aging. Produced by LIFE *Senior Services* this large format monthly magazine has a variety of articles to spark the interests of the Senior Adults in Tulsa and NE Oklahoma.

Their March 2015 issue has an Astronomy theme featuring six articles on astronomy and space exploration. The writers interviewed some of our Tulsa Club members, James Liley, Ed Downs and John Land, gathering background information on the topics. Articles titles include:

“The Big Cheese: A Lunar Lowdown”

“Sooners in Space”

“Eye to the Sky: Asteroids, Meteors and Comets”

“On the Horizon: Current and Future Space Exploration”

“Get Involved: Astronomy Clubs, Classes and Activities”

“NASA: Then and Now”

Copies of the magazine are available free on newsstands, health clubs and Senior Care Facilities.

or online at <http://www.virtualonlineeditions.com/publication/?i=246909>

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!

In January, Mercury and Venus were close together. In February, Mars and Venus were close together (closest on Feb. 20 joined by a nearly new moon), although clouds kept us from seeing this conjunction here in Tulsa. And Venus and Jupiter are also going to be close together around June 30. Venus is certainly having a lot of company this year.

March is Messier Marathon time. I plan on going for the first time this year. I'm hoping to see maybe 10-20 objects through the club binoculars. Each year several members caravan down to TUVVA Observatory, a private observatory near Checotah, owned by one of our members, Ron Wood. Tamara Green has more information elsewhere in this newsletter. If you are interested, please let Tamara know.

This month at the general meeting at the Jenks Planetarium we are having Ed Downs, one of our members, speak about his visit to NASA. He has had a long history working with NASA. He was able to get a hands-on look at the two Orion engineering prototypes which are fully decked out with full instrumentation and flight controls. Ed will share his experience and give us an inside look at the Orion hardware and mission.

Also on the day of our general meeting, Friday March 6, the NASA spacecraft Dawn is arriving at the dwarf planet Ceres. NASA considers it one of five dwarf planets. Dawn was launched in 2007 and spent 15 months (July 2011 – September 2012) orbiting Vesta. There are white spots on Ceres that no one knows what they are, at least when I am writing this. I'm sure the scientists at JPL, who are running the mission, will figure it out soon. I plan to show some pictures from Dawn at the general meeting.

I'm still looking for more people to come and present something at our club meetings. Please let me know of anyone who might be interested. And if there is something you would like to see, let me know that too.

If you are free Saturday, April 11, we are planning on having a work day at the observatory to get it ready for summer. We are making a list of things we want to accomplish. If you might be free that Saturday, we would love to have you come out. We always need help.

Clear Skies!
Richard Brady

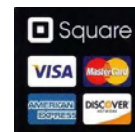
TREASURER'S AND MEMBERSHIP REPORT

BY TIM DAVIS



Astronomy Club of Tulsa: 139 members, including 12 new members in 2015.

Welcome to our new members this month: James Phillips, Brett Bible, Alan Leizear, Eric Hallett, Dennis Boutwell, Ayman Malas and Matt Ragina.



Club Accounts as of Feb 28, 2015:

Checking: \$ 4,603.49; Savings: \$ 3,773.33; Investment accounts: \$ 19,600.36 (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 2014 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 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



Astronomy Club of Tulsa Public Meeting Minutes
@ Jenks Planetarium
Friday, February 6, 2015

At 7:15pm Richard started the meeting by welcoming everyone to the astronomy club. He shared a few images, "What's Up in the Sky", and "The Majesty of Yesterday"

Some of the images shared included: The Orion Nebula in IR taken with the Earth orbiting WISE observatory and our Galaxy's Magnetic Field from Planck, an ESA mission to explore the CMB (Cosmic Microwave Background). Richard also introduced us to "zooniverse", a collection of web-based citizen astronomers. www.zooniverse.org

What's Up in the Sky: Jupiter in opposition today officially at 12:07pm. Something cool to observe: Callisto and Europa as the two are casting a shadow on the face of Jupiter. Also included Jupiter's belts and zones diagram. Venus and Mars will be very close on Feb 21st. The moon will be about 15 degrees away. Comet Lovejoy image taken by Skip Whitehurst was shown. It was taken while Lovejoy was near the Pleiades. Also included was a star map of Lovejoy's predicted positions.

Richard pointed out that the article in the latest edition of The Observer by Jack Eastman was not complete. It was about computers of yesteryear. Tamara explained that she did not include the full article so she will put the article in the newsletter again next month in its entirety.

The survey for the club will be out soon. Please take the time to fill it out and make suggestions. Some event possibilities: International sidewalk Astronomy Day Saturday, March 28. International Sun day is June 21st on Father's Day. We would host this on the Saturday before at TASM. International Observe the Moon Night: Saturday, September 19.

Our Next Up and coming Events:

Sidewalk Astronomy – Tomorrow, February 7th, at 6pm

Member's Night – Friday, February 20th, at 6:15pm

Public Night – Saturday, February 28th, 6:30pm weather permitting.

General Meeting – Friday, March 6th, 7pm at Jenks Planetarium

Our Speaker for next month: Ed Downs. Ed has a long history with NASA. He will be sharing a hands-on look at the two Orion engineering prototypes. With full access to Orion spacecraft, Ed will be able to share his experience and give us giving an inside look at the Orion mission.

We took a look at a chart of The 110 Messier Objects while Richard gave a summary of what these objects are and why they are called "M" objects.

Tamara Green gave a presentation about The Messier Marathon and was joined by Ron Wood from TUVA. We can find charts and log sheets at www.okmcd.com/astro.html. Tamara gave directions and referred to the map in the newsletter. She also invited members to join up with the caravan.

Next Ron: Gave awards for last year's marathon which included: Tom McDonough received the David Stein Award with 102 objects out of the 110. This was considered the big TOE award, TUVA Observing Extraordinaire.

The following received the little TOE awards:

Steve Chapman

Marshall Emmer

Mandy Nothangel

Ron presented a slide show which included the following TUVA trivia:

SECRETARY'S CORNER

BY TERESA DAVIS, CT'D.

It's all about adventure and astronomy.

Quotes were mentioned from Richard Feynman and Ralph Leighton.

"The Last Journey of a Genius. TUVVA or Bust by Ralph Leighton. The first principle is you must not fool yourself and you are the easiest person to fool.

Tuva is a little town that was the soviet republic. They printed lots of stamps. There was a PBS documentary about Tuva. Ron also presented a map, with Tuva highlighted.... Somewhere in Asia. TUVVA is famous for throat singing, similar to rock stars.

Slides in the presentation also included a picture of John Dobson who wrote a book "How and Why to Attention was brought to The Inner Reaches of Outer Space by Joseph Campbell as this was a Metaphor, Myth and Religion. Ron also brought a painting by Richard Feynman. Ron wrote asking for a relic and received the painting complete with a Certificate of the Feynman Relic. We were shown a slide of Certificate of Authenticity for the Genuine Feynman Relic.

This presentation would not have been complete without at least mentioning BART. Tuvan's built BART which was the 2nd version of Mira which was the name of the telescope made and brought to the Texas Star Party in 1993. Another slide included a picture of Mira with the telescope builder: Byron Melland.

After the throat singing, Richard thanked all the speakers and everyone else for coming to our meeting. Everyone was invited to gather at the restaurant "Louis"
There were 34 total present.

We adjourned at 9pm.

Link to Google Docs: <https://docs.google.com/document/d/1xYhIXivIZWWq7NQ89TZRif9ZYZKuydcZ1c-pcAjZrMX8/edit>

THE MAJESTY OF YESTERYEAR'S PLANETARIUM

by F. Jack Eastman

First, I'd like to thank Anthony Cook, Griffith Observatory in Los Angeles, California, for his help acquiring the accompanying photographs; also Ron Oriti, my boss at Griffith back then, as well as Carla Johns and Arthur Johnson, colleagues at Griffith, for reviewing this article.

I have spoken before of the things that got me hooked on astronomy, my view of the moon with Dad's 8 × 30 binoculars when I was a second grader, our subsequent move to Southern California and the encounter with Knott's Berry Farm's 9-inch reflector that gave a truly captivating view of Jupiter and its moons. We soon discovered the Griffith Observatory not long after and began making regular trips, in particular, for the monthly shows in their planetarium. These were truly inspiring events, and this article is an attempt to relay some of my impressions and recollections of those early planetarium experiences. My tenure there was from September 1959 to September 1969. I had to give it up due to the move here, to Colorado.

The Griffith Observatory (see the *Denver Observer*, October 2010, page 10) was finished in 1935, and was a small part of a gift from Colonel Griffith J. Griffith who wanted to have an observatory and planetarium for the purpose of public education. The celebrated firm of Carl Zeiss of Jena, Germany, supplied the 12-inch refracting telescope (see the *Denver Observer*, January 2012, page 4) and the Mark II planetarium projector (Figure 1). This projector was truly a state of the art machine for its time. The 29-inch diameter balls at either end of the 12-foot long structure contain 1,000 watt lamps and 32 separate projectors that fill the planetarium sky with more than 9,000 stars, all accurately placed on the sky and of the proper brightness. The Milky Way is also realistically reproduced, and the sun, moon and naked-eye planets are all in their proper locations in the sky. It's a truly striking and beautiful night sky—an experience not soon forgotten! The stars are made from tiny holes, 0.023 mm–0.452 mm in diameter, in 64 different sizes, carefully punched into copper foil that is 0.0152 mm thick. These are projected on the dome from the 32 star projectors on the spherical ends of the instrument. In the cages supporting these "star balls" are the projectors for the sun, moon and naked-eye planets. These projectors are all geared so that they may be run forward and backward in time, and manage to keep the sun, moon and naked-eye planets in the right places amongst the

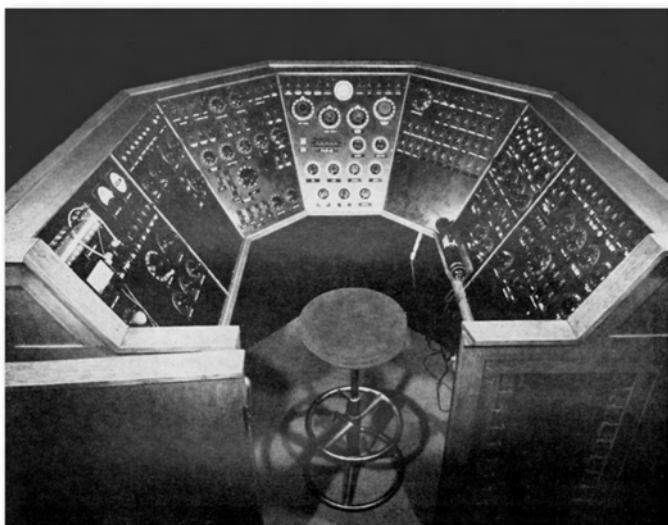


Figure 2. The Control Console of the Zeiss projector. This controlled the projector as well as the dozens of special effects projectors and sound system.

Courtesy, Griffith Observatory

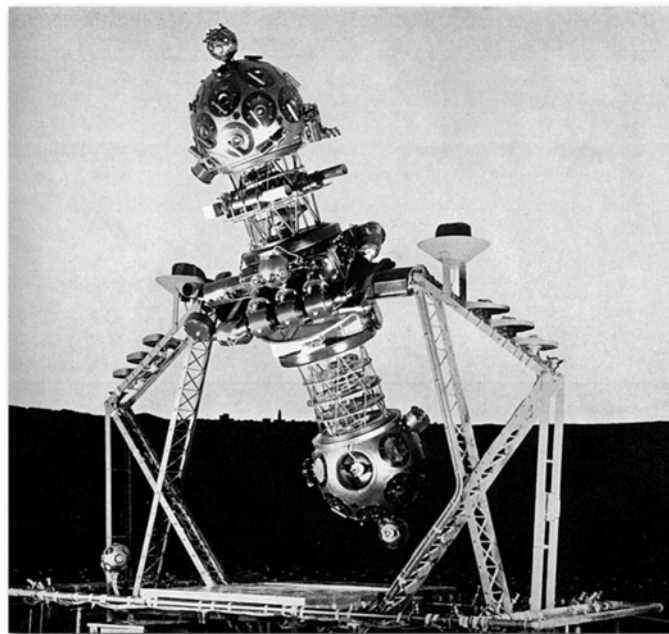


Figure 1. The Zeiss Mark II planetarium projector. Note the Los Angeles skyline in the background.

Courtesy, Griffith Observatory

stars. The instrument, 2,000 pounds of moving parts (6,000 pounds overall), will also reproduce the effect of the precession of the equinoxes accurately over thousands of years in the past and future. It's truly a monumental example of the machinist's art—purely mechanical via complex gear trains. No software involved! The "sky" is a dome 75 feet in diameter onto which the stars and all are projected. At the base of the dome is the horizon, cut out of thin metal accurately showing the Los Angeles skyline as seen from the observatory. Even a truly flat black paint would still show brighter objects setting below the horizon before the shutters on the projector cut them off. At Griffith, a short distance behind the thin cutout are glossy black slats, inclined at 45-degrees which reflect any stray stars down behind the wall—it's a very effective light trap.

In addition to the Zeiss, there are many dozens of special projectors—sunset and sunrise, coordinates on the sky, constellation outlines, very realistic meteors, aurorae (my favorite), a five-stage zoom system for travel to the moon, planets and much more. Most of these special instruments were built in the observatory's own shops. The lecturer, in addition to keeping the talk going, might be operating almost all of these instruments—and in the dark to boot! There is no automatic control!

All of this is controlled from the lecturer's console, which resembles the flight deck of an advanced spacecraft (Figure 2). This is how it was done before the now ubiquitous computer.

Now, let's take in a show or two.

ONE ENTERS THE "STAR THEATER"

The visitor first sees 650 or so seats arranged in circular rows centered around the "monster"—the Zeiss projector (Figure 1). In the background, classical music—Holst, Mozart or maybe Gilbert and Sullivan—is playing. With the bluish dome overhead and the L.A. skyline around the horizon, one could imagine being outside on a nice clear day.

THE MAJESTY OF YESTERYEAR'S PLANETARIUM

BY F. JACK EASTMAN, AUGUST 2013, CT'D.

AUGUST 2013



Figure 3. At the Planetarium Console. Dr. Dinsmore Alter (Left) was the Director and Clarence H. Cleminshaw, Associate Director. The "flashlight" is the "Green Arrow" pointer, long before the days of the laser pointer.

Courtesy, Griffith Observatory

The lecturer arrives and climbs into the console (Figure 2). "Welcome to the Griffith Observatory and Planetarium," he says, and announces the subject of the program—"The seasons and how they work," "The constellations of Spring," or maybe a "Trip to Jupiter and Saturn." The lights are lowered and a number of slides, diagrams and such are shown to introduce the subject at hand, as everyone's eyes become adjusted to the dark.

LET'S STEP OUTSIDE

A brilliant and glorious sunset graces the Western sky. "What a nice sunset," the lecturer says, "I'm told those clouds will be gone as darkness falls." Softly, the music begins: Claude Debussy's "Claire de Lune," or "Prelude to the Afternoon of a Faun," or maybe Igor Stravinsky's, "The Round of the Princesses" from the *Firebird Suite*. Stars begin to appear, perhaps preceded by a bright planet or two as the sunset colors fade into the night, and finally the sky fills with stars, the Milky Way and even a few naked eye nebulae. "Shooting stars" are seen streaking across the sky. One had to be careful not to program too soothing a selection of music, lest some of the audience start to snore!

The show proceeds with this evening's subject—perhaps the Solar System, how the planets move in the sky, the reason for the seasons, or perhaps the constellations of the season. Maybe we'll hear the story of King Cephus, Queen Cassiopeia, and their daughter Andromeda with her hero Perseus on his winged horse, Pegasus. The Zeiss projector, which faithfully reproduces the motions and positions of the planets over a simulated year or two is stationary while the outlines of the constellations are added to the sky. Perhaps

tonight's presentation is all about sky colors—rainbows, various weather effects, sunsets, sunrises, why the sky is blue, etc. We had a great demonstration regarding the blue of the sky and why sunsets are red. A roughly 5-inch diameter clear plastic tube, six feet long was aimed straight up and filled with Sodium Thiosulfate (photographer's "hypo" or "fix"). A bright light shone through this, putting a bright, white spot on the dome overhead. At the appointed moment we'd dump in a few ounces of sulphuric acid. Tiny particles of sulphur would begin to precipitate out, the tube would begin to glow blue (the blue of the sky) and the light overhead would

turn red as the shorter wavelengths were scattered out (red of the sunset/sunrise). However, the real highlight of this show was the aurorae.

LET'S HEAD TO NORTHERN CANADA, AND IF WE'RE LUCKY, WE'LL SEE THE NORTHERN LIGHTS

We travel north by moving the latitude motion of the Zeiss until we are about 60° northern latitude. We demonstrate how the sky moves at different latitudes and explain the aurorae, solar activity and charged particles in the magnetosphere. But, 1,000 or so years ago, what did the Norse and Vikings make of these? We'll talk about the Valkyries, handmaidens of the god Oden (Wotan) riding their fiery steeds across the sky to collect the fallen warriors and carry them back to Valhalla. The lecturer says, "So as we look to the north, let's be very quiet and see if we can hear those Valkyries as they ride across the sky." The aurorae start to appear, and the Valkyries do, indeed, ride. We hear Richard Wagner's "Ride of the Valkyries" and "Magic Fire Music" from the final act of his opera, *Die Walküre*. This is the one that hooked me on classical music forever after. The aurorae projectors were incredibly simple. Hand-painted slides were projected through 38mm Erfle eyepieces—the spherical aberration added to the diffuse character of the images. Disks of plastic, 1/2-inch thick and slightly warped, were turned by motors just behind the lenses which created movement and shimmering effects. It was one of

the best effects in the planetarium! As the aurorae fades it's time to head back south.

BLAST OFF

Before we are finished, let's look at another one of the shows—"A Trip to Jupiter and Saturn." This used the 5-stage zoom projector. We "travel" (latitude change, again) to an equatorial island for our launch. At this point the lecturer explains the fine points of space travel and shows why we will get a bit more of a boost if we leave from Earth's equator. We would also show some of the more prominent constellations visible in the Southern sky. We "step inside our spaceship" and then blast off with a roar, amidst flashing lights and all manner of what one would imagine blasting off would be like. A tiny Jupiter appears in the viewing screen and steadily grows in size, to the tune of, perhaps Debussy's *La Mer, 3rd movement*: "Dialogue of the Wind and the Waves." When we get close, we step outside and see a huge Jupiter, majestically rotating against the starry background. This is accomplished by a powerful opaque projector, with a ping-pong ball sized Jupiter (or Earth, Mars, etc. depending upon the subject of the particular show) projected on the dome. As the lecturer talks about Jupiter he's resetting the travel projectors, changing the image—he's hoping that all five of them change, if not he'll have to talk about space-time warps should things go awry—and then riding on the notes of Otterino Respighi's *Pines of Rome*: "Pines of the Appian Way," we're off to Saturn. This will involve a landing on Titan. Chesley Bonestell painted a great landscape for this, looking much like the Canyonlands in Utah—red rock formations coated with "snow," and a huge Saturn hanging in a dark blue sky (we knew Titan had an atmosphere, but being a "small" moon, we thought it couldn't be much. Did we ever get a lesson about that when Cassini's Huygens Probe landed on Titan in 2004). Upon our landing we listen to Vaughan Williams's *Sinfonia*

Continued on Page 7

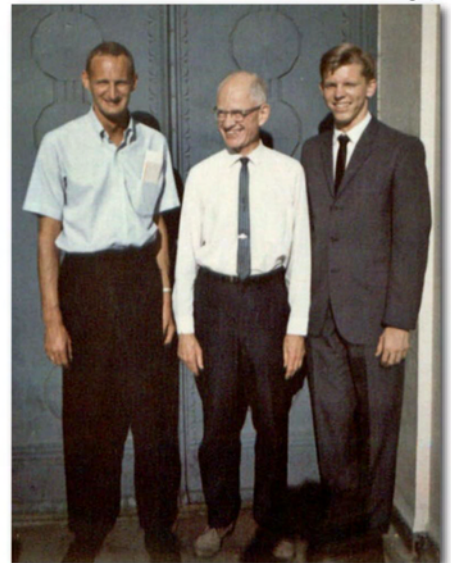


Photo right: Later Griffith Director C. H. Cleminshaw (center) and planetarium lecturers Arthur Johnson (R) and F. Jack Eastman, from the 1960s.

Courtesy, Arthur Johnson

THE MAJESTY OF YESTERYEAR'S PLANETARIUM

BY F. JACK EASTMAN, AUGUST 2013, CT'D.

YESTERYEAR'S PLANETARIUM

Antartica, his 7th symphony, adapted from his score for the movie, "Scott of the Antarctic." The section with the wind machines, vibraphone, celesta, pianoforte and organ within a large orchestra did evoke a feeling of cold and desolation.

One of the truly positive aspects of this form of presentation is that they were given live, by a real astronomer that could answer questions, and then after the show further discuss the topics presented.

My favorites, perhaps, were the sunrise sequences and the music that went with them. Usually during the last four minutes or so we'd listen to Maurice Ravel's "The Fairy Garden" from his *Mother Goose Suite* or the "General Dance or Day-break" from *Daphnis et Chloé*. Sometimes we'd hear Stravinsky's "Vanishing Palace," the finale of his

Firebird Suite, or Richard Strauss's *Tod und Verklärung* (*Death and Transfiguration*). Now and then we'd hear Wagner's "Liebistod" (Love's Death) from *Tristan und Isolde*, or even better, his "Pilgrim's Chorus" from *Tannhäuser*.

Sometimes things don't go as they should. I vividly recall a show involving radio astronomy. Out on the eastern horizon was a huge radio dish, the likes of Goldstone or Canberra, illuminated by spotlights. As the sunrise began, the lecturer had forgotten to fade out the dish. As the sunrise developed, the radio telescope morphed into a striking silhouette against the sunrise colors. It was just a little thing, but that is one, of many "little" things that made these shows a class act.

The show is almost over. Please accept our apologies for getting us home in the wee hours of

(CONTINUED FROM PAGE 5)

the morning. The stars before the dawn majestically drift overhead.

LET'S RELAX AND AWAIT THE COMING OF THE NEW DAY

A glow is seen in the east, the "false dawn," or Zodiacal light. A soft note from the French horn is heard. The east begins to brighten and the music builds. A glorious sunrise begins to develop and the music builds to a powerful fortissimo as the sunrise blazes forth. The colors slowly fade as the sky brightens, another fortissimo as the orange football-shaped sun pops above the horizon, turning white and round as it rises. The music subsides. "And with the rising of our own star, the Sun . . . may I wish all of you a good morning, and thank you for coming."★

Editor's Note: This article ran in last month's edition of The Observer, but not in its entirety. This page was accidentally omitted due to an oversight. I hope you enjoyed this article even more now that the COMPLETE article ran in this month's edition. I apologize for the inconvenience and hope I did better this time! :)

THE CLEANING OF A CLASSIC (Part One of Two)

Article by F. Jack Eastman

Photos courtesy of Chris Ray

A decision was made early in 2010, after the visit from Chris Ray and Fred Orthleib of the Antique Telescope Society (ATS) that we should remove, disassemble and thoroughly clean the 20-inch Clark objective of Chamberlin Observatory's historic telescope. The task was to begin September 28 and continue for at least four days.

To my knowledge, I don't believe the lens had been properly cleaned since it was installed in 1894. It most likely had its front surface cleaned in situ (perhaps during Dr. Everhart's directorship) and the front element may have been removed, but there are no records indicating what was actually done or when. We intended to provide complete documentation of the disassembly and cleaning process, as well as measure the curvatures, thicknesses and spacings of this lens assembly.

It is fortunate that this telescope is of the Boyden design, one of two (that I'm aware of) where the front element is in its own cell and is designed to be reversed, changing the airspace, thereby changing the color correction to the photographic blue and shortening the focal length by an order of a meter or so. This proved to be a distinct advantage, as the separate cells for the two lenses would be easier to handle and the removal of the glass from the cells would be considerably easier.

On Wednesday, September 29th, the team assembled at Chamberlin Observatory. It consisted of Chris Ray, from ATS, who would preside over the operation, Dr. Robert Stencel, Observatory Director, Aaron Reid, Observatory Administrator and me. Chris has had extensive experience in the restoration and maintenance of old and large telescopes, and his knowledge and experience was an invaluable asset to the success of this job. Also helping was DU student Brian Kloppenborg, whose assistance was greatly appreciated. Incidentally, Brian is featured in the April issue of Sky & Telescope in a wonderfully informative article on digital photometry.

The first operation was to aim the telescope down at the floor and securely tie the tube to the pier, as the instrument would be many foot-pounds out of balance after removal of the objective. Aaron produced plywood cutouts that fit against the telescope tube and the pier, secured these in place with two-by-fours, and tied the telescope to the pier with several turns of climbing rope. Earlier in the year, the loose screw that was rattling around in the tube had been removed (it proved to be a pin from a broken internal u-joint that was subsequently repaired last spring when the RA clamp and slow-motion system was serviced), so there was no danger of anything landing on the rear of the lens.

The three screws holding the front (crown element) cell to the rear cell were carefully removed and the cell carried by the four of us over to the table provided for the operation (cell and glass weight: 118.5 pounds.) The six screws holding the rear (flint element) cell were removed (again, carefully) and the cell containing the flint element was carried to the operating table (cell and glass, 80 pounds). The retaining ring was removed and the cell picked up and very carefully lowered over a table-mounted tripod, which would hold the glass as the cell was lowered over it, thereby removing the glass from the cell. This tripod was essentially an upside-down three-legged stool with soft lint-free pads on the "feet" that would support the glass.

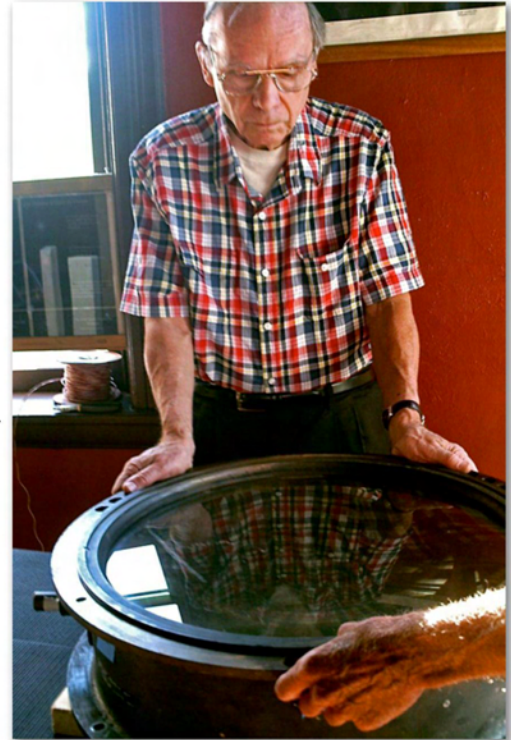
Once this was accomplished, the bare lens could be carried over to the cleaning stand and washed with mild detergent and distilled water, rinsed with distilled water and dried with lint-free cotton pads. While the glass was out, the cell was thoroughly cleaned and all signs of rust and corrosion were removed. It was interesting to see a polished silvery ring -6 mm wide inside the cast iron cell which defined the lateral position of the glass. The material of this ring may have been German Silver, a composite of copper, zinc and nickel that has great resistance to corrosion and is also used for the finely-engraved setting circles on the telescope and for transit instruments, sextants and the like.

The cleaning and rinsing procedure was repeated for the front cell. This time, however, we met with difficulty. There was much rust and corrosion which prevented the retaining ring from being removed. The retaining screws were reinstalled from the inside of the cell, giving us "handles" on which we could exert more force; the ring finally came out with much difficulty. This rust and corrosion also prevented the glass from coming out. One heart-

stopping moment Chris Ray, from the Antique Telescope Society, was when the glass examined the lens cell from the 20-inch Clark re- came partially up fractor at Chamberlin. Undertaking the cleaning of on one side, then the elements proved less daunting than first dropped back into thought, and Chris's knowledge and experience place with a re- were invaluable in understanding the various com- pounding "clack"— ponents of the assembly and how best to restore it probably fell them.

only a couple of millimeters, but it was a scary moment. No harm, no foul, but we gave up at this point and Aaron spent considerable time scraping rust and corrosion out of the cell, especially around the edge of the glass. The cell was flooded with soapy water and we tried again to remove the glass, this time with success.

As the glass was removed, the positions of the lenses (clock angle) relative to the cell were marked with a waterproof marker, also indicating the direction the lens element was found so we wouldn't replace the lens backwards. The outer surface of the front element (the crown) was very dirty, so Chris decided to give it a collodion treatment. Collodion is gelatin dissolved in ether (note: gotta be used in a well-ventilated area)! Chris painted a layer of the stuff on the lens, placed a sheet of cheesecloth on it and applied a second coat. After several minutes this coating was peeled off, and all the crud on the glass came with it, a very effective trick for removing all the particulate matter otherwise stuck to the glass without any rubbing or other action which could damage the lens surface. The lens was then washed as before with the flint element. The cell was thoroughly cleaned and treated with "rust reverser," a chemical that turns rust into a harmless polymer and prevents any further damage and corrosion. Aaron determined the point on the cell that is at the bottom when the telescope is stowed and drilled a small "weep hole" just behind the silver edge support which would allow condensed



THE CLEANING OF A CLASSIC (Part One of Two)

BY F. JACK EASTMAN, APRIL 2011, CT'D.

THE DENVER OBSERVER

APRIL 2011

moisture to drain out and help prevent any further corrosion. It was noted that there were stains on the lens from the bronze blocks that supported the glass, indicating that the crown element had rotated or was incorrectly assembled after a previous cleaning, with the position having shifted about twice the width of the blocks. After a best-effort at removing these stains, which involved a bit of polishing with optical rouge (well outside the clear aperture of the lens)! it was reassembled in what we thought was the proper orientation.

LENS CHARACTERIZATION:

With the objective completely disassembled we had the perfect opportunity to measure everything we could. Chris measured, and documented, every possible dimension of the cells and I measured the curvatures on the 4 lens surfaces using a spherometer with feet on a 202.6 mm circle. The probe was a Starrett dial indicator, 0.2" travel reading to .0001-inch (2.5 μ m). I have a 7-inch optical flat which can be used to zero the smaller instruments. I also have a larger (8.5-inch diameter) piece of glass, which looks much like a plate glass mirror blank and appeared to be flat on both sides. Using the small spherometer, I compared it to the known optical flat; it seemed to be flat to the accuracy of the small spherometer. I also placed it in front of my 32 cm Newtonian. It did defocus the image very slightly and caused a minimum of image degradation—it may have been a window of some sort in another life. Zeroing-out the large ($y=101.3$ mm) spherometer on this glass, then measuring the radius (R) of my 32-cm mirror, I came within less than -1% of the accepted value of 4866 mm—I declared it flat enough for our purposes.

The formula I used, $R=(Y^2)/2s$ (i) (where R=radius of curvature of the surface in question, Y=the radius of the circle containing the feet of the spherometer and s=sagitta [depth of the curve on the surface as read from the dial probe]) is exact for a paraboloidal surface. A small error is present for a spherical surface, but even for the strongest curve, it is less than the precision of the spherometer, so I ignored it for this exercise.

We measured the lens edge thicknesses, edge separation and lens glass diameter (21.38 inches [542.9 mm]), water, the crown lens rests on a special rack to air-dry. The cleaned elements revealed almost no flaws, save for some trapped air bubbles, a testament to the care given these pieces when they were crafted.



After cleaning and rinsing with purified distilled water, the crown lens rests on a special rack to air-dry. The cleaned elements revealed almost no flaws, save for some trapped air bubbles, a testament to the care given these pieces when they were crafted.



Chris applies a collodion preparation to the front surface of the crown element. This highly-flammable mixture of pyroxylin, ether and alcohol adheres to solid contaminants on the lens. Draping a layer of cheesecloth over the top and allowing the mixture to dry permits the debris to be removed safely, without scrubbing, by peeling the cloth slowly from the surface.

the front of the lens, $R_1=3151$. mm, $R_2=-2760$. mm, $R_3=2704$. mm and R_4 =flat. Positive radius is convex to the front (sky side) of the lens, negative is concave forward. Following this convention, the crown element is double convex, the flint plano-concave. We then set the flint element on the cleaning stand and with a small light determined the radius of curvature of the concave surface with a Foucault-like test, and obtained 2705 ± 5 mm, close enough to the spherometer reading. We feel the thicknesses and spacing are good to the order of one millimeter and the surface radii to the order of about ± 0.6 per cent.

The crown element weighed in at 31 pounds, the flint at 39 pounds—surprisingly light, but the lenses were very thin, much thinner than I expected; thinness seems to be a characteristic of Clark lenses. The cell's total weight added up to 128.5 pounds, and with 70 pounds of glass, the total weight of the lens and cells is 198.5 pounds, considerably less than my first guess at 500 pounds.

Table 1) 20-inch Lens Prescription (visual configuration)

Surf.	Radius (mm)	Thickness (mm)	Material	Nd	Vd
1	3151.	37.	Glass	Unk	Unk
2	-2760.	38.	Air		
3	-2704.	14.	Glass	Unk	Unk
4	Inf		Air		

Table 2) 20-inch Lens Prescription (photographic configuration)

Surf.	Radius (mm)	Thickness (mm)	Material	Nd	Vd
1	2760.	37.	Glass	Unk	Unk
2	-3151.	175.	Air		
3	-2704.	14.	Glass	Unk	Unk
4	Inf		Air		

(Note: Nd is the refractive index for the yellow helium line, Vd is the Abbe number, related to the dispersion of the glass, difference in index between the red C hydrogen line and the blue F hydrogen line. $Vd=(Nd-1)/(NF-NC)$, NF and NC being the indices at the F and C lines).

THIS ARTICLE (PT 2) WILL CONTINUE NEXT PAGE

THE CLEANING OF A CLASSIC (Part Two of Two)

Article by F. Jack Eastman

Photos courtesy of Chris Ray and Dr. Robert Stencel

This article is continued from the April 2011 Observer.

Once the glass was cleaned we marveled at the beauty of the polished surfaces—nary a blemish of any kind, no sleeks or other evidence of mistreatment in its 116 years of existence. There were a number of small bubbles in the glass, the largest being 2mm across; most of the rest were less than a millimeter.

After we were all done with the cleaning and measurements, the lenses were replaced in the cells, making very sure they went in the right way! There was no doubt about the flint, but we re-measured the radius on the front of the crown to be doubly sure we didn't get it backwards. The cells were replaced on the telescope, the telescope released from the tie-down and aimed at Venus. The image was very good, even in spite of marginal seeing. The collimation was checked with a Cheshire eyepiece and deemed good enough for the moment. The telescope was checked further that evening and pronounced in excellent condition. The collimation was further tweaked by Chris and deemed perfect.

FINDERS:

In a way, we goofed. Only after the telescope was secured to the pier in preparation for removal of the objective did we decide to clean the finders. Alas, their lenses were out of reach, now near the top of the dome! (At this point, I took advantage of some down time while Aaron was scraping rust out of the front cell to bring in my 6-inch Clark and give it "the treatment").

After we were done with the 20-inch, we removed the lens from the 6-inch Grubb, disassembled it and gave it a thorough cleaning. Although there was some confusion about how the elements were assembled, it made no difference, as the curvatures on the crown element were the same. We did find several arrows on the edges of the lenses (one with my initials from 30 years ago)! The flint was plano-concave, a true Littrow configuration, and there were very faint remnants of some pencil marks on the edges of the elements. I had disassembled this lens in the 1970s and noticed, on the edges of the lenses, "Spencer Lens Works 1926" (on the crown) and "Spencer Lens Works 1936" on the flint. Sometime later the lens was again cleaned, I think by Mike Ditto, who said he didn't see any notations on the glass. Ivan Geisler, Pat Ryan and I disassembled the lens (I think this was in 1980—my initials were on one of the arrows) with a view to documenting any notations that might be present. Sure enough, there was little left of those notes from before.



Jack carefully (very carefully) sets the spherometer on the lens surface to measure the radius of curvature of the Crown lens element.

As with the main lens, we measured all the parameters for the Grubb lens, and as mentioned before, it was a Littrow design. The crown is equi-convex (a good thing, as it cannot

be assembled backwards) and the flint, plano-concave. It is interesting that this lens has a very large spacing between the elements, on the order of a centimeter.

THE CLEANING OF A CLASSIC (Part Two of Two) CT'D.

BY F. JACK EASTMAN, MAY 2011

MAY 2011

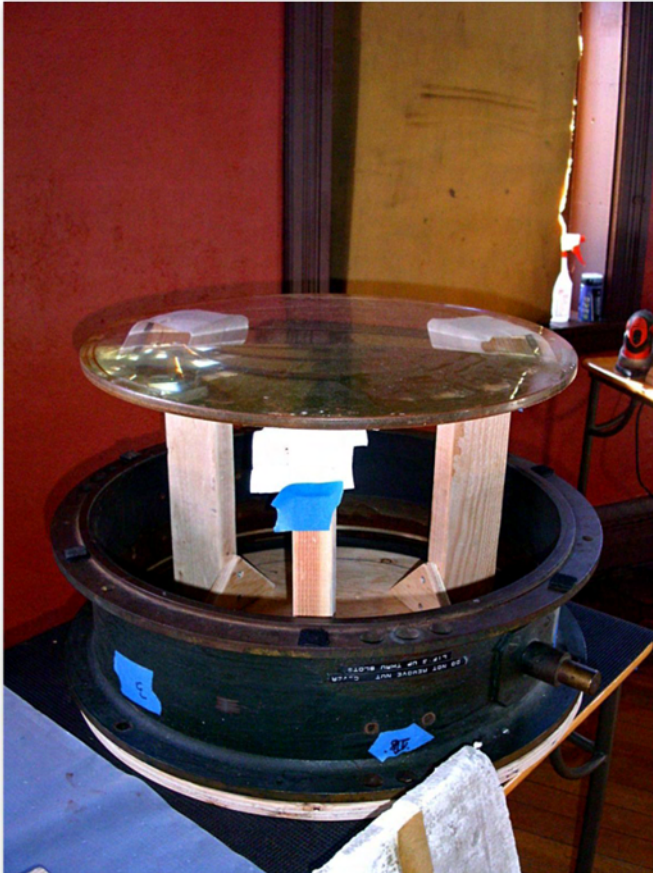
Table 3) 6-inch Grubb Lens Prescription

Surface	Radius(mm)	TH(mm)	Material	Nd	Vd
1	1251.	TBD	Glass	UNK	UNK
2	-1251.	9.4	Air		
3	-1206.	TBD	Glass	UNK	UNK
4	Inf. (flat)		Air		

The 5-inch Clark finder (1882) resisted all attempts to remove the front cell from the tube. This lens really looked awful, and probably was in the most need of a good cleaning (note: Aaron is coming up with some special tooling to attempt to remove the lens so it can be given the good cleaning it so badly needs).

While we were at it, we also disassembled the periscope-eye end from the system for reading the Hour Angle Circle. All the optical surfaces were cleaned except the rear of its objective, due to it being stuck; again,

Crown (convex) lens element removed from cell, preparatory to the cleaning operation.



proper tooling will be needed to remove this lens. After reassembly and subsequent realignment, the numbers on the hour circle could once again be read.

After these operations were completed, I escaped to Oklahoma for a week of observing under truly dark skies. The reports from the users/operators at Chamberlin indicated much improved performance of the 20-inch and the 6-inch Grubb. I can testify my 6-inch Clark showed

significant improvement as well; clearly, it had been time for this operation.

We should establish a realistic schedule for future maintenance of the optics of this fine telescope. I found it much easier than I had expected. The lens assembly was much lighter than I thought, and it can be safely removed and disassembled by four or five people. The cleaning procedure was straightforward, and required only about an hour and a half of actual handling of the lenses. The rest of the time was needed for securing the telescope, removal and cleaning of the cells and reassembly of the system.

All in all, it was a very successful and educational experience. I feel honored to have been included in this operation, and as mentioned, the telescope's performance is much improved.

NOTE: By differentiating (1), $y^2/2s$, above (See Part One, April 2011 Observer), with respect to y and s , we can get an estimate of the probable error in these measurements. The uncertainty in y , (dy) the radius of the spherometer feet, (due also in part to the tiny flat points of contact of radius 0.3mm), is the order of 0.5mm leading to an uncertainty in the lens radii of the order of 1%. The uncertainty due to the accuracy of the dial probe, uncertainty in s , (differentiate (1) with respect to s , $ds=0.005mm$) is small compared to that in y , the order of 0.08%. We feel the thicknesses and spacing is good to the order of one millimeter.



Jack is a member of the Denver Astronomical Society and a regular attendee of the Okie-Tex Star Party. He is always a fun friend to have around! Thank you Jack for the use of these articles!

—Editor, The Observer, Astronomy Club of Tulsa

NITELOG—NorwayInTErurbanLocalObservingGroup

BY TOM HOFFELDER

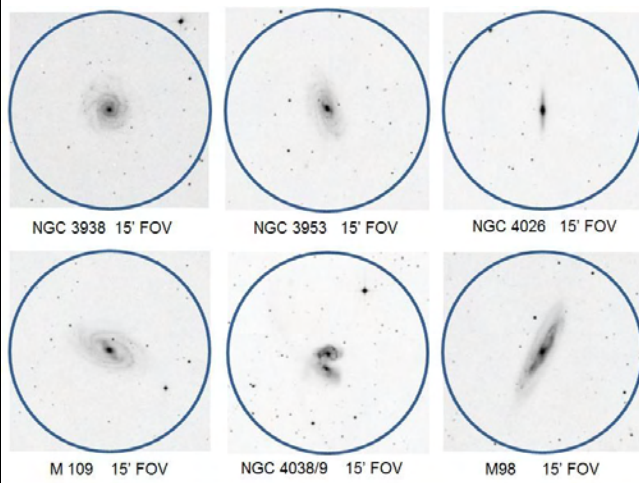
NITELOG - Norway InTErurban Local Observing Group

Making Maple, March Madness, Messier Marathon! This is a busy month!!! But only the last one applies to most of you reading this, so I'll limit the comments here to that endeavor. As most (maybe all) of you know, there are a total of 110 Messier Objects and, thanks to a small gap in the heavens where there are none which happens to be where the sun resides around the first day of the March equinox, it is possible to see all of the objects in one night, all night. Not everyone will enjoy participating in the marathon, but many do find it a fun challenge. The prime marathon night (the Saturday night/Sun morn nearest a new moon and the equinox) this year is March 21/22.

COMETS: Lovejoy, still up there, still bright (~6), moving thru Cas. Use Heavens-Above for daily location, <http://www.cobs.si/> for current mag estimates.

PLANETS: At the end of civil twilight on the 1st (6 PM in Maine), Jupiter (in Cancer) has risen to around 30 degrees in altitude, is twice as high near the meridian around 10 and by 4:30 AM is too low for observing. When civil twilight ends at month's end (7:40 PM, thanks to dopey DST), Jupiter is approaching an altitude of 60 degrees, reaches the meridian around 9 and observing ends around 3:30. Red spot and shadow transits attached. Venus is currently operating as the lovely "evening star" but doesn't reach max eastern elongation (when I start to point a scope at it) until early June. On the evening of the 22nd, the crescent moon will be nearby providing an even lovelier view. Saturn is in Scorpius (how low can you go?!!!) and still seven months from opposition.

STARS: Three carbons with B-Vs of 3.2 to 4.1 and current magnitudes approx 6.5 to 8.5, plus three doubles and two triples



THE GOOD STUFF: It's all galaxies! And somewhat strangely, there are only two Messiers in the section of the sky that needs to be covered this month in order to make all the M's in one year and all the H400's in two. One of the M's is also an H400, making a total of 20 objects from that list. Since there was room, I added two additional Herschel galaxies (not in the 400) that are nice edge-ons and a little "earlier" in the sky. You might be thinking, OH NO, a bunch of dim Herschels this month. But based on surface brightness values, nearly all of them should be easier to see than the two Messier Objects, a good opportunity to evaluate magnitude vs surface brightness.

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.

JUPITER IN MAR 2015 (EST/EDT)

DATE	GRST*	I SHAD	E SHAD	G SHAD	C SHAD
1					
2	00:17 & 20:08	03:33- 05:51		20:05-23:44	
3		22:02-			
4	01:55 & 21:47	00:19	03:49-06:43		
5					
6	03:33 & 23:25				
7	19:16		17:08- 20:02		
8					
9	02:03 & 21:54				
10				01:05-04:43	
11	03:41 & 23:33	00:56- 03:14			
12	19:24	19:25- 21:42			
13					
14	01:11 & 21:02		20:44-23:38		
15					

NITELOG—NorwayInTErurbanLocalObservingGroup

BY TOM HOFFELDER, CT'D.

16	02:49 & 22:40				
17					
18	04:27	02:51-05:08			
19	00:19 & 20:10	21:19-23:37			
20	01:57 & 21:48				
21			23:21-		
22			02:14		
23	03:35 & 23:27				
24	19:18				
25					
26	01:05 & 20:57	23:14-			
27		01:31			
28	02:44 & 22:35				
29			01:58-04:51		
30	04:22				
31	00:14 & 20:05				23:14-
1-Apr					03:57

*Transit, visible +/- 50 min

3/14		(3/15)		3/21			
SS	NTE	ATE	MR	SS	NTE	ATE	MS
18:47	19:50	20:24	03:23	18:56	19:59	20:34	20:47

Object (Type)	RA	Dec	Star	N/S	E/W	Mag*/(# of Stars)	Size (')/ Sep (")	Spect/ M# or H#	Dist (ly)	Uranio I Page	Comment, [B-V], {crnt mag} (opt x)
X Cnc (CS)	08 55.4	+17 14	δ Cnc	0.9 S	2.6 E	6.2-7.5		GII		142	[3.2] {6.3}
T Cnc (CS)	08 56.7	+19 51	δ Cnc	1.7 N	2.9 E	7.8-10.6		N		142	[4.1] {?}
Y Hya (CS)	09 51.1	-23 01	39 Hya	8.2 S	0.1 W	6.9-9...		C		323	[3.8] {7.7}
ζ Cnc (MS)	08 12.2	+17 39	-	-	-	5.3,6.2,6	1.1, 6.2	F8,G0,dG 2	70	140	(400)/(75)
ι Cnc (MS)	08 46.7	+28 46	-	-	-	4.5, 6.5	30	G8, A3		102	(20)
57 Cnc (MS)	08 54.2	+30 35	PRV	1.8 N	1.8 E	6, 6.5, 9	1.5, 5.5			102	(320)/(10)
66 Cnc (MS)	09 01.4	+32 14	PRV	1.5 N	1.7 E	6, 8.5	4.1			102	(120)
ε Hya (MS)	08 46.8	+06 25	-	-	-	3.5, 6.7	2.9			186	(160)
NGC 2820 (SBc/P)	09 21.8	+64 16	h UMa	1.3 N	1.0 W	[12.9]	4.1X0.4	H869-2	95M	23	GX 2814 is 0.1 W
NGC 3044 (SBc)	09 53.7	+01 35	α Sex	2.0 N	3.6 W	[12.9]	4.7X0.7	H254-3	70M	234	
NGC 3893 (SBc)	11 48.6	+48 43	χ UMa	0.9 N	0.4 E	[12.8]	4.5X2.8	*H738-2	60M	74	GX 3896 IS 0.1 SE
NGC 3898 (Sab)	11 49.3	+56 05	γ UMa	2.4 N	0.6 W	[13.3]	4.4X2.6	*H228-1	65M	47	GX 3888 is 0.3 SW
NGC 3900 (SO-a)	11 49.2	+27 01	93 Leo	6.8 N	0.3 E	[13.1]	3.2X1.7	*H82-1	95M	147	

NGC 3912 (SBb)	11 50.1	+26 29	PRV	0.6 S	0.2 E	[12.8]	1.5X0.9	*H342-2	80M	147
*NGC 3938 (Sc)	11 52.8	+44 07	χ UMa	3.7 S	1.2 E	[13.5]	5.4X4.9	*H203.1	50M	74
NGC 3941 (SB0)	11 52.9	+36 59	ν UMa	3.9 N	7.0 E	[12.5]	3.5X2.5	*H173-1	45M	107
NGC 3945 (SB0)	11 53.2	+60 41	γ UMa	7.0 N	0.1 W	[13.5]	5.2X3.5	*H251-1	70M	47
NGC 3949 (Sbc)	11 53.7	+47 52	χ UMa	-	1.3 E	[12.2]	2.9X1.7	*H202-1	60M	74
*NGC 3953 (SBbc)	11 53.8	+52 20	γ UMa	1.4 S	-	[13.1]	6.9X3.6	*H45-5	60M	47
*NGC 4026 (S0)	11 59.4	+50 58	PRV	1.4 S	0.9 E	[12.7]	5.2X1.3	*H223-1	50M	47
NGC 3962 (E1)	11 54.7	-13 58	η CrI	3.2 N	0.3 W	[12.7]	2.6X2.2	*H67-1	70M	282
NGC 3982 (SBb)	11 56.5	+55 07	γ UMa	1.4 N	0.4 E	[12.6]	2.3X2.0	*H62-4	70M	47
NGC 3998 (S0)	11 57.9	+55 27	PRV	0.3 N	0.2 E	[12.5]	2.7X2.3	*H229-1	60M	47
*NGC 3992 (SBbc)	11 57.6	+53 22	γ UMa	0.3 S	0.6 E	[13.4]	7.5X4.4	M109	70M	47
NGC 4030 (Sbc)	12 00.4	-01 06	β Vir	2.8 S	2.4 E	[13.3]	4.2X3.2	*H121-1	80M	237
NGC 4036 (E-S0)	12 01.5	+61 54	δ UMa	4.9 N	1.7 W	[12.7]	4.3X1.7	*H253-1	70M	47
*NGC 4038 (SBn)	12 01.9	-18 52	γ Crv	1.3 S	3.3 W	[12.1]	3.4X1.7	*H28.1-4	65M	328
NGC 4027 (SBd)	11 59.5	-19 16	PRV	0.4 S	0.5 W	[13.1]	3.3X2.4	*H296-2	75M	328
NGC 4179 (S0)	12 12.9	+01 18	η Vir	2.0 N	1.8 W	[12.6]	4.2X1.3	*H9-1	65M	238
*NGC 4192 (SBb)	12 13.8	+14 54	β Leo	0.3 N	6.0 E	[13.5]	9.8X2.8	M98	50M	193
NGC 4203 (E/SB0)	12 15.1	+33 12	γ Com	4.8 N	2.3 W	[13.4]	3.5X3.2	*H175-1	60M	107

*DSS image

*[Surf

Brtnss for

GX's] -

mag per

square

arcmin

*H400

ni=shown,

not iden-
tified

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

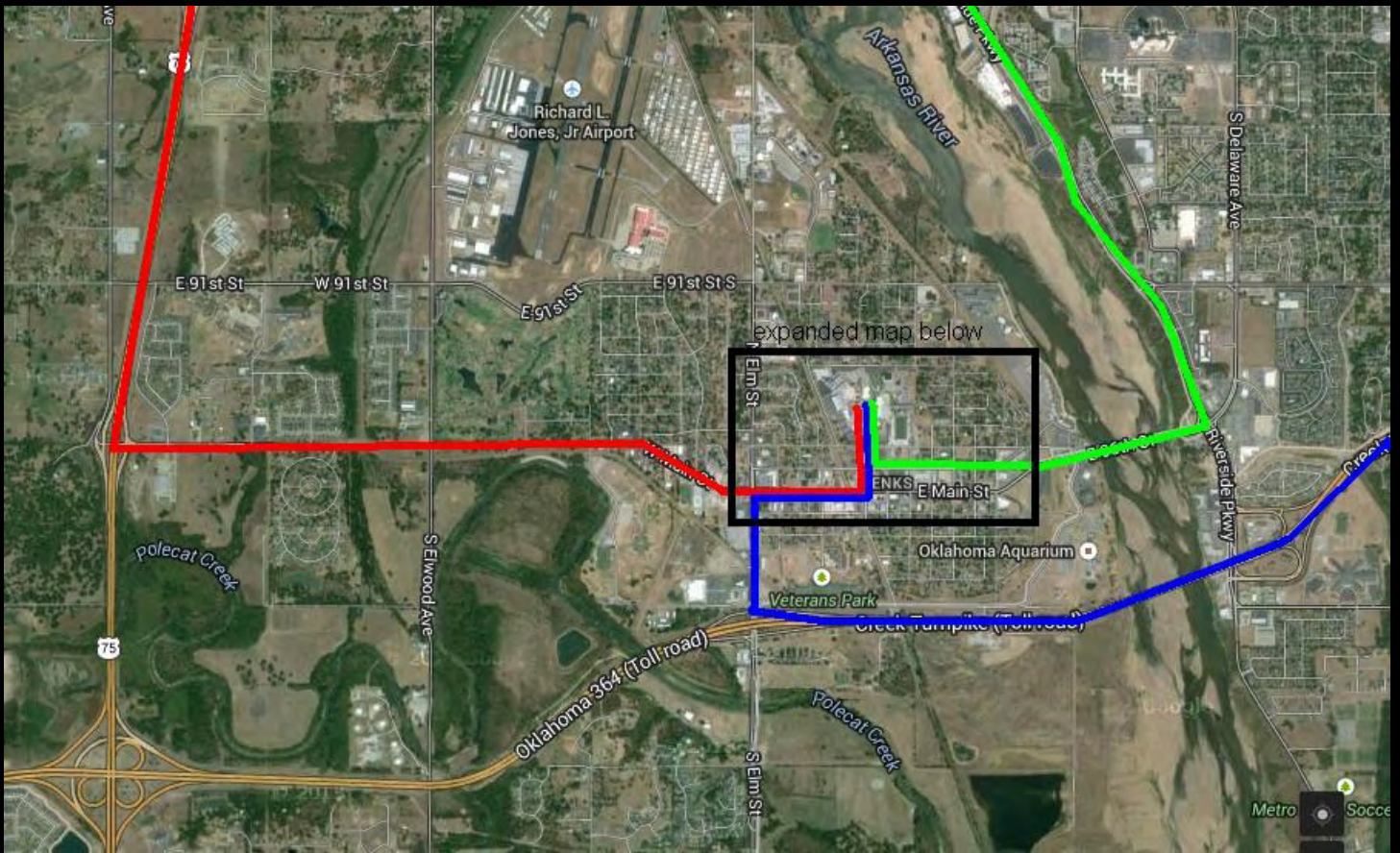
GO UP THE STAIRS TO THE 3RD FLOOR (THERE IS AN ELEVATOR FOR THOSE WHO NEED IT)

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

MAPS ON NEXT PAGE

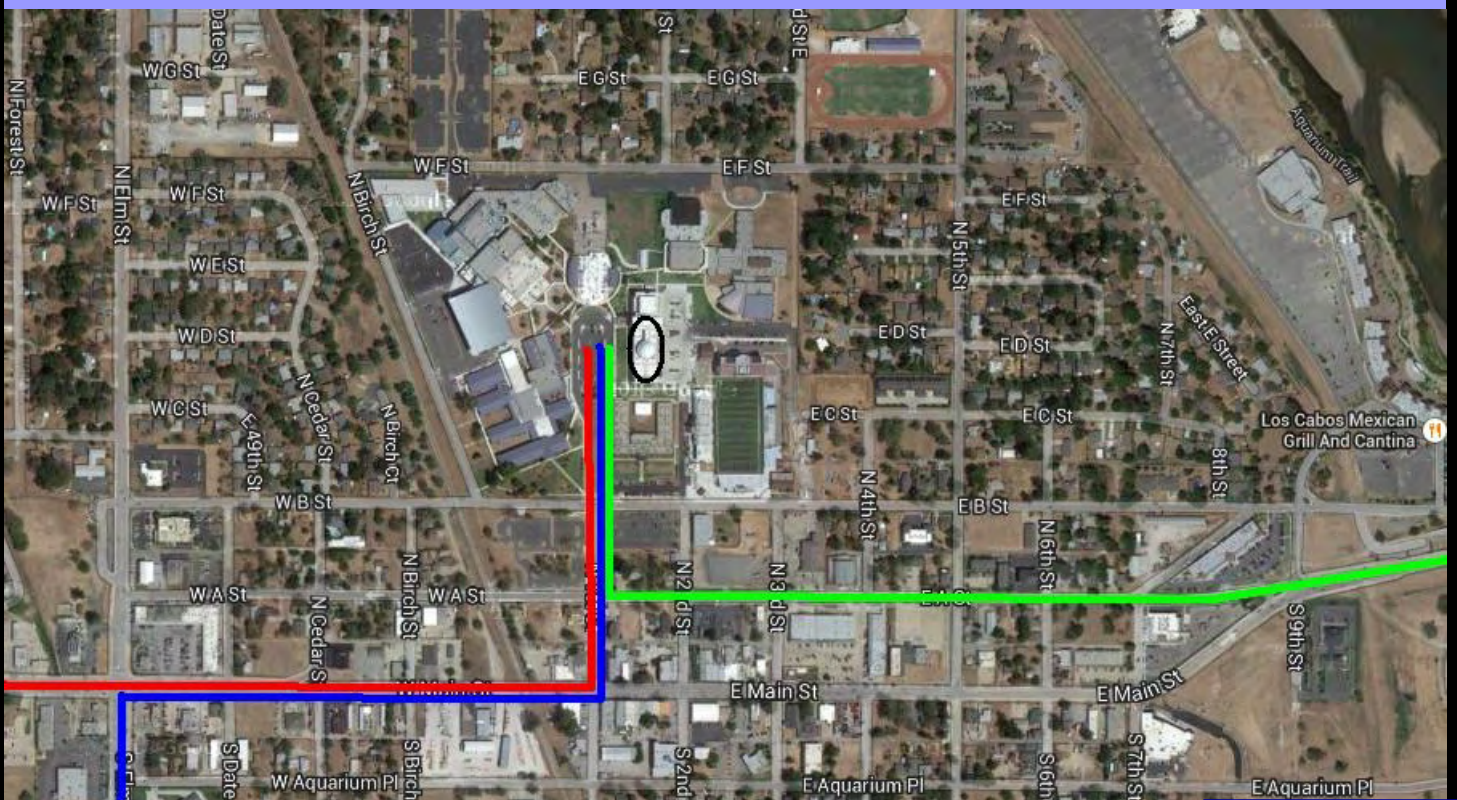
THE GENERAL MEETINGS ARE FREE AND OPEN TO THE PUBLIC.

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.

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SKY & TELESCOPE IS \$33 PER YEAR.

WEBSITE: www.skyandtelescope.com

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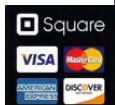
IF YOU ARE AN EXISTING S&T SUBSCRIBER, YOU CAN RENEW DIRECTLY WITH S&T AT THE SAME CLUB RATE. BOTH S&T AND ASTRONOMY NOW HAVE DIGITAL ISSUES FOR COMPUTERS, IPADS AND SMART PHONES.

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 WINTER TO JOIN US
AT A STAR PARTY!

OPEN TO THE PUBLIC

FOR MORE INFORMATION
PLEASE VISIT
WWW.ASTROTULSA.COM.

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

 Also find us on Facebook!

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



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

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

F. JACK EASTMAN, DENVER ASTRONOMICAL SOCIETY

TOM HOFFELDER

RICHARD BRADY

TIM DAVIS

TERESA DAVIS

JOHN LAND

TAMARA GREEN



PHOTO CREDIT: RICHARD BRADY. Taken with a Canon EOS Rebel
T3i on Jan. 15 at 7:29 PM. This is a 0.6 second exposure at f/5.6, FL 232
mm, ISO 800.



PHOTO CREDIT: RICHARD BRADY. Taken with same camera as used
in the image above, on Jan. 16 at 7:12 PM. This is a 1/40 second
exposure at f/4.0, FL 60 mm, ISO 3200.

THANK YOU RICHARD FOR YOUR GREAT PHOTOS!!!