Astronomy Club of Tulsa
Observer
April 2014

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UPCOMING EVENTS:

April 2014

General Meeting  Fri, Apr 11  TCC NE Campus  7:00 PM
Sidewalk Astronomy  Sat, Apr 12  Bass Pro  7:30 PM
Public Star Party  Fri, Apr 18  ACT Observatory  7:30 PM
Good Friday  Fri, Apr 18
Back-Up Night  Sat, Apr 19  ACT Observatory  7:30 PM
Easter  Sun, Apr 20
Members’ Night  Fri, Apr 25  ACT Observatory  7:30 PM
Club Work Day  Sat, Apr 26  ACT Observatory  TBA
Back-Up Night  Sat, Apr 26  ACT Observatory  7:30 PM
General Meeting  Fri, May 9  ACT Observatory  7:00 PM
Sidewalk Astronomy  Sat, May 10  Bass Pro  7:30 PM
Mothers’ Day  Sun, May 11
Public Star Party  Fri, May 23  ACT Observatory  8:00 PM
Back-Up Night  Sat, May 24  ACT Observatory  8:00 PM
Memorial Day  Mon, May 26
Members’ Night  Fri, May 30  ACT Observatory  8:00 PM
Back-Up Night  Sat May 31  ACT Observatory  8:00 PM

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Hello All,

I hope you have all had a great 2014 so far! It sure has been a busy one, for myself and for the club. In the last month, aside from our normal events, we've been invited to two lectures and have had many group requests. Spring is the beginning of the warm weather and the end of the school year - all of the schools are rushing to come to the observatory! Unfortunately, the weather has been pretty undesirable for Astronomy during our scheduled nights. The meteorologists are forecasting a very stormy but "unpredictable" Spring - but what do they know? Ha!

The first of the two lectures to which we were invited was that of Frank Wilczek, who won the Nobel Prize in Physics at the age of 21. As part of TU's Presidential Lecture series, Wilczek explained and demonstrated the color spectrum in his lecture titled "Expanding the Doors of Perception." One of my favorite parts, and also his, about his lecture was his section on the Mantis Shrimp - a fascinating little creature, really! He explained that Humans can only see what we know as the "visual spectrum" because we only have 3 photoreceptor proteins in our eyes. Some animals, such as birds, bees, and butterflies, have 4 to 5 of these receptors - depending on the species, they can see a mix of infrared, ultraviolet, and the familiar-to-us visible light. The Mantis Shrimp has 17 photoreceptor proteins - this means they can see A LOT of colors and things that we cannot - in my opinion, that's pretty awesome. He has written a few books, his latest titled The Lightness of Being, is now on my "must read" list.

The second lecture, hosted by Gentry Lee of the Jet Propulsion Laboratory and chief engineer of the Curiosity Mission to Mars, takes place on Friday, April 11th at 10:30am at the Chapman Music Hall in the Tulsa PAC. This is the same morning as our General Meeting. Hosted by the Tulsa Town Hall, Lee will be discussing his role and experiences with the NASA and the Curiosity Mission. He will provide a unique insight and perspective and share exciting stories about the team's adventures before, during, and after its landing. There will be many of us attending - if you haven't already, please make sure that you contact Richard (act_vp@astrotulsa.com) as soon as possible if you are interested in attending. This lecture will not be free, but the Tulsa Town Hall has offered the Astronomy Club of Tulsa discounted tickets. It is likely these tickets will cost $20 or less. I really hope you join us!

This is going to be an exciting season for us - hopefully filled with lots of cool storms (the pretty ones, not the damaging ones!) during the day and beautiful, clear skies for us during the evenings and weekends. We'll have a few groups out to the observatory in the next few months so be sure to check your email often if you'd like to help us inspire the current and future generations!

Peace, love, and clear skies,

Mandy Nothnagel
Treasurer’s and Membership Report

By Tim Davis

Astronomy Club of Tulsa: 128 members, including 19 new members in 2014.

Welcome to our new members this month: Russell Abbott, Dan Wooliver and Sherry Upton, and Jack Obeid.

Club Accounts as of Mar 31, 2014:
Checking: $3,779.41
Savings: $2,769.09
Investment accounts: $18,421.79 (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.

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 $34.00 for 1 year, or $60.00 for 2 years. www.astronomy.com
To get the club discount you must go through the club group rate.

Sky & Telescope is $33.00 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.
PRESENT:
Mandy Nothnagel, President
Richard Brady, VP
Tamara Green, Secretary
Tim Davis, Treasurer
Skip Whitehurst, Board
John Land, Board
Stan Davis, Board
Michael Blaylock, Board

NOT PRESENT:
Lee Bickle, Board
Christopher Proctor, Board
James Taggart, Board, Facilities Manager

The meeting was held at Tulsa Community College Northeast Campus and there were 28 attendees.

WELCOME AND INTRODUCTION: VP Richard called the meeting to order at 7:00 PM and welcomed members and guests while Mandy attempted to get the audio hooked up to the computer and projector for the presentation. When the audio was hooked up, the presentation began.

PROGRAM: “Live From Space” on the NatGeo channel, a special presentation from the International Space Station. Due to the program being streamed live, all officers and staff reports were given during commercial breaks.

OFFICERS'/STAFF REPORTS:

PRESIDENT – Mandy had a short powerpoint touching on the “Live from Space” program. She submitted a picture of us at the dinner meeting and a picture of just her, along with questions for the astronauts via Twitter, #hellofromearth. Plus, there was a cool photo of a volcano erupting, as seen from the ISS. She also talked about the new Cosmos series that airs on Fox on Sunday nights and on NatGeo on Monday nights. You can also watch it online at www.cosmosontv.com. Following Richard’s presentation (see below), Mandy then talked about “Spacey-type News and Stuff”. She then touched on upcoming club events.

VICE PRESIDENT – Richard talked about a couple of exciting events coming up, such as Gentry Lee, who is giving a lecture at Chapman Music Hall, Tulsa PAC on Friday Apr. 11 at 10:30 AM. We will get 10 free tickets. Richard will send an email to the club to see how many are interested, as there will be a small fee for extra tickets. Also, he talked about the “Mars Update” Night Sky Network Telecon. This will be on Mar. 26 at 8:00 PM, call 1-888-455-9236, up to 15 min prior. The passcode is NIGHT SKY NETWORK, THEN Your Name, then Astronomy Club of Tulsa. One winner will receive a free copy of The International Atlas of Mars Exploration: The First Five Decades, by Philip J. Stooke.

SECRETARY – There was no time after the presentation for other officers or staff reports.

TREASURER – There was no time after the presentation for other officers or staff reports.

GROUPS – There was no time after the presentation for other officers or staff reports.

FACILITIES - There was no time after the presentation for other officers or staff reports.

PR/OUTREACH/SIDEWALK – Owen announced the Sidewalk event, to take place on Sat, Mar 15 at 7:00 PM (or earlier if you are interested in doing solar observing, at about 3:00 or 4:00) at Bass Pro, provided it is not raining.

OBSERVING – There was no time after the presentation for other officers or staff reports. Mandy adjourned the meeting.
NITELOG - Norway InTEurban Local Observing Group

By Tom Hoffelder

So much stuff up there to check out this month; I’ll let you read about it below! Since the weather didn't cooperate for a Messier Marathon in March, we will hope it will do so the end of April. As last month, if you would like to be involved, at any level, please let me know and I will keep you updated should the opportunity arise.

OBSERVING: March open house at the Twitchell Observatory is scheduled for Monday the 7th at 8:00, weather permitting of course. With a first quarter moon, two planets, a dwarf planet and an asteroid up there, it's a Solar System extravaganza! If it wasn’t for the darn moon (which as some of you know I now tolerate as opposed to hate), we might have been able to throw in a comet also.

COMETS: Nothing earthshaking but there is the possibility of a four comet night, especially if you are doing an April Marathon the end of the month. The comet file lists the details and the locations for the "observable Saturdays;" extrapolate locations using the daily motion values for dates a few days either side.

PLANETS: Jupiter in Gemini still rules the evening skies as far as brilliance, but Mars being at opposition takes center stage. It's not a great opposition but better than the last two, and since it is the only planet that shows surface detail in our scopes, it always deserves some attention even tho it is always rather tiny in the eyepiece. (Don't know if those Mars in August emails are still being forwarded, but if they are and you get one later this year, do a reply-all and say, "Sorry, it was here in April this year, and it wasn’t that big!") I like to use S&T’s Mars Profiler (http://www.skyandtelescope.com/observing/objects/javascript/mars#) to get an idea of what surface features might be visible if I plan to view. Opposition is on the 8th and the diameter varies from 14.8 arcsec on the 1st, to 15.2 on the 12th thru 15th, to 14.5 on the 30th, which is along the lines of the "super moon" meaning not enough difference to notice. It is high enough to observe (in New England) around 9:30 PM on April 1st, and near the meridian (for everyone and best time to observe!) around 1 AM. By the 30th that has "improved" to as soon as you can see it and 10:30 PM. You can’t miss it in Virgo, so just "arc to Arcturus" and move on to Mars. With Saturn following in Libra, check a clear sky around 11 PM to see the three lights in the night sky that gave us Tuesday, Thursday and Saturday. If the moon is there, throw in Monday.

ASTEROIDS: February featured two relatively bright comets close enough together for viewing in a wide field scope; this month it is two asteroids, Ceres and Vesta at mag 7 and 6. As you probably know, Ceres was upgraded to a dwarf planet when Pluto (deservedly) went the other way, but as far as seeing the two at the same time I’m considering Ceres an asteroid. S&T.com has a chart (http://media.skyandtelescope.com/documents/ Web_Ceres_Vesta_2014.pdf) showing the path of the two, but those lines make me dizzy. Since they will look like stars, I need dots on a chart, and dots that represent the brightness of the asteroids similar to the star magnitudes. That is what I have attempted to do with the attached chart at two day intervals for select dates. (I originally started with red asteroids, but quickly remembered that is not a good idea.) The asteroid spreadsheet gives more detailed information, and you will note on it and the chart that the separation is less than 3 degrees the entire month.

STARS: Two carbon stars, one especially red with a B-V of 4.5 and current magnitude approx 9.5, and six doubles of varying magnitudes and separations ranging from 2.3 to 15 arcsec.
THE GOOD STUFF: Except for one lonely (but relatively large and bright) planetary, the list is again all galaxies, as would be expected this time of year. And as the DSS negatives indicate some of them could provide some interesting details in the eyepiece. Nine are Messier Objects, one of which, M61, doubles as a Herschel 400 Object, with ten more of those included. In the spreadsheet comments section, a “+” in front of an NGC number indicates the object is obvious in the DSS image. Two of my favorite views enhance the April list, one being the one degree field around M84/86 which includes seven other galaxies. The other, probably my all time favorite object, looks like a dim star but is so much more. 3C 273 is the brightest quasar and the only one “easily” seen in moderate sized scopes. On a clear day you can see forever; in our scopes on a clear night you can see 2.4 billion light years. Close enough!

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.
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<th>Object (Type)</th>
<th>RA</th>
<th>Dec</th>
<th>Star</th>
<th>N/S</th>
<th>E/W</th>
<th>Mag*/(# of Stars)</th>
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<th>Spect/ M# or H#</th>
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<th>Urano I Page</th>
<th>Comment, [B-V], {crnt mag}</th>
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<td>v Hya</td>
<td>2.9 N</td>
<td>3.0 W</td>
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<td>8.1X1.8</td>
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*DSS image

*Surf Brtnss for GX's*

*H400 ni=shown, not identified
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\(^1\)http://www.aerith.net/comet/future-n.html
\(^2\)Maine, at time noted
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Old Tool, New Use: GPS and the Terrestrial Reference Frame

By Alex H. Kasprak

Flying over 1300 kilometers above Earth, the Jason 2 satellite knows its distance from the ocean down to a matter of centimeters, allowing for the creation of detailed maps of the ocean’s surface. This information is invaluable to oceanographers and climate scientists. By understanding the ocean’s complex topography—its barely perceptible hills and troughs—these scientists can monitor the pace of sea level rise, unravel the intricacies of ocean currents, and project the effects of future climate change.

But these measurements would be useless if there were not some frame of reference to put them in context. A terrestrial reference frame, ratified by an international group of scientists, serves that purpose. “It’s a lot like air,” says JPL scientist Jan Weiss. “It’s all around us and is vitally important, but people don’t really think about it.” Creating such a frame of reference is more of a challenge than you might think, though. No point on the surface of Earth is truly fixed.

To create a terrestrial reference frame, you need to know the distance between as many points as possible. Two methods help achieve that goal. Very-long baseline interferometry uses multiple radio antennas to monitor the signal from something very far away in space, like a quasar. The distance between the antennas can be calculated based on tiny changes in the time it takes the signal to reach them. Satellite laser ranging, the second method, bounces lasers off of satellites and measures the two-way travel time to calculate distance between ground stations.

Weiss and his colleagues would like to add a third method into the mix—GPS. At the moment, GPS measurements are used only to tie together the points created by very long baseline interferometry and satellite laser ranging together, not to directly calculate a terrestrial reference frame.

“There hasn’t been a whole lot of serious effort to include GPS directly,” says Weiss. His goal is to show that GPS can be used to create a terrestrial reference frame on its own. “The thing about GPS that’s different from very-long baseline interferometry and satellite laser ranging is that you don’t need complex and expensive infrastructure and can deploy many stations all around the world.”

Feeding GPS data directly into the calculation of a terrestrial reference frame could lead to an even more accurate and cost effective way to reference points geospatially. This could be good news for missions like Jason 2. Slight errors in the terrestrial reference frame can create significant errors where precise measurements are required. GPS stations could prove to be a vital and untapped resource in the quest to create the most accurate terrestrial reference frame possible. “The thing about GPS,” says Weiss, “is that you are just so data rich when compared to these other techniques.”

You can learn more about NASA’s efforts to create an accurate terrestrial reference frame here: http://space-geodesy.nasa.gov/

Kids can learn all about GPS by visiting http://spaceplace.nasa.gov/gps and watching a fun animation about finding pizza here: http://spaceplace.nasa.gov/gps-pizza.
Artist’s interpretation of the Jason 2 satellite. To do its job properly, satellites like Jason 2 require as accurate a terrestrial reference frame as possible. Image courtesy: NASA/JPL-Caltech.

Editors: download photo at

http://www.jpl.nasa.gov/missions/web/ostm.jpg
The Space Place prides itself on its ability to be useful to educators—informal and formal alike. In an effort to reach as wide an audience as possible, we have made our popular ‘make-and-do’ activities available in a print-ready, downloadable PDF format. This will allow educators with more students than computers to easily run these fun, educational activities without limitation. Check it out at http://spaceplace.nasa.gov/make-do-pdf.

**What’s New? The Lone Planet**

What makes a planet a planet? In our own solar system we have a pretty clear definition—something that orbits our sun, and is large enough to have its gravity mold it into a sphere and clear out any objects floating around nearby. But what about outside our solar system? A recent discovery of a lonely planet hovering around in space without a star to call its sun makes classifying planets a bit less straightforward. The Space Place tackles this new discovery and the debate about planethood with two new articles: http://spaceplace.nasa.gov/lone-planet and http://spaceplace.nasa.gov/planet-what-is.

**Space Place en Español: Comet Quest**

Not only is our popular game—‘Comet Quest’—updated and better than ever. We also have a new Spanish version of the game on Space Place en Español. You get to land a rover on a comet and collect and transmit as much data as possible as you command a comet orbiter faced with an increasing number of challenges. http://spaceplace.nasa.gov/comet-quest/sp/.

**Spotlight on YouTube**

The Space Place now has its own YouTube channel! Be sure to check it for updates frequently. Not only will the channel be highlighting our popular ‘Space Place in a Snap’ videos, but we are also re-releasing our popular ‘Space Place Live’ animated series on YouTube in honor of the series' ten-year anniversary. http://www.youtube.com/nasaspaceplace.
**For the Classroom**

We have created a new informational brochure that would be a great addition to any classroom. Interested in knowing a little bit more about the things in our solar system that are not our sun or the planets? Find out what these smaller bodies tell us about our cosmic neighborhood’s formation. Check out and download ‘Small Worlds, Big Discoveries’ for your classroom today! http://spaceplace.nasa.gov/posters/en/#small-bodies.

**Special Days**

**March 7 - Kepler mission launched in 2009.**
Kepler looks for habitable planets outside our solar system. It has found thousands of candidate planets! Make a model of your own Kepler spacecraft! http://spaceplace.nasa.gov/build-a-spacecraft.

**March 11 - International Ask a Question Day.**
Visitors to Space Place partner museums have asked a lot of good questions, to which Dr. Marc has answers. http://spaceplace.nasa.gov/menu/dr-marc/.

**March 14: Albert Einstein’s Birthday and Pi Day.**
Not only was Einstein born on this day in 1875, but the day coincides with another very mathy holiday—Pi Day ($\pi = 3.14 = March 14th$)! Learn more about Einstein here: http://spaceplace.nasa.gov/what-is-gravity.

**April 1: April Fool’s Day.** At least teach your nose not to be fooled! http://spaceplace.nasa.gov/e-nose.


**April 22: Earth Day.** Play “Missions to Planet Earth”—an online card game. http://spaceplace.nasa.gov/earth-card-game/.

**April 27: Tell A Story Day.** Read a couple of the storybooks on The Space Place, then make up your own story about space! http://spaceplace.nasa.gov/menu/storybook.

**Share**

Want some help spreading the word about NASA’s Space Place? Check out http://spaceplace.nasa.gov/share.

**Send Feedback**

Please let us know your ideas about ways to use The Space Place in your teaching. Send to info@spaceplace.nasa.gov.
And For The Young Stargazers:

Check out these fun websites from NASA!

http://climate.nasa.gov/kids

http://scijinks.gov

http://spaceplace.nasa.gov
Where We Meet:

TCC Northeast Campus, 3727 E. Apache St., Student Union Bldg. 2, Room 1603

There is PLENTY of parking, lighting and security on this campus.

To get to TCC NE Campus, take the Harvard Exit off of Hwy. 11 (Gilcrease Expressway). Go south for about 1/2 mile to the campus located at the corner of N. Harvard and Apache. Turn east on Apache and take the entrance in front of Bldg. 3 (the large round building). Then turn right and park in front of Student Union Building #2. Room 1603 is just off of the lobby.

Google-type driving direction map at http://www.tulsacc.edu/13273/

The General Meetings are free and open to the public.

We hope to see you there!
## CLUB OFFICERS

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<th>Name</th>
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<tr>
<td>President</td>
<td>Mandy Nothnagel</td>
<td><a href="mailto:act_pres@astrotulsa.com">act_pres@astrotulsa.com</a></td>
</tr>
<tr>
<td>Vice President</td>
<td>Richard Brady</td>
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</tr>
<tr>
<td>Secretary</td>
<td>Tamara Green</td>
<td><a href="mailto:astronomer.misstamara@yahoo.com">astronomer.misstamara@yahoo.com</a></td>
</tr>
<tr>
<td>Treasurer</td>
<td>Tim Davis</td>
<td><a href="mailto:act_tres@astrotulsa.com">act_tres@astrotulsa.com</a></td>
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## BOARD MEMBERS AT LARGE

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<td>Lee Bickle</td>
<td><a href="mailto:blotobeast@gmail.com">blotobeast@gmail.com</a></td>
</tr>
<tr>
<td>Michael Blaylock</td>
<td><a href="mailto:mblaylock535@gmail.com">mblaylock535@gmail.com</a></td>
</tr>
<tr>
<td>Stan Davis</td>
<td><a href="mailto:stan.home@cox.net">stan.home@cox.net</a></td>
</tr>
<tr>
<td>John Land</td>
<td><a href="mailto:astroclubbiz@windstream.net">astroclubbiz@windstream.net</a></td>
</tr>
<tr>
<td>Christopher Proctor</td>
<td><a href="mailto:bishop@busoutoshi.net">bishop@busoutoshi.net</a></td>
</tr>
<tr>
<td>James Taggart</td>
<td><a href="mailto:act_maint@astrotulsa.com">act_maint@astrotulsa.com</a></td>
</tr>
<tr>
<td>Skip Whitehurst</td>
<td><a href="mailto:skip.whitehurst@gmail.com">skip.whitehurst@gmail.com</a></td>
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## APPOINTED STAFF

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<tr>
<td>Newsletter Editor</td>
<td>Tamara Green</td>
<td><a href="mailto:astronomer.misstamara@yahoo.com">astronomer.misstamara@yahoo.com</a></td>
</tr>
<tr>
<td>Webmaster</td>
<td>Jennifer Jones</td>
<td><a href="mailto:jones@seedtechnologies.com">jones@seedtechnologies.com</a></td>
</tr>
<tr>
<td>Membership Chairman</td>
<td>John Land</td>
<td><a href="mailto:astroclubbiz@windstream.net">astroclubbiz@windstream.net</a></td>
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<tr>
<td>Observing Co-Chairman</td>
<td>Owen Green</td>
<td><a href="mailto:darthnewo@yahoo.com">darthnewo@yahoo.com</a></td>
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<tr>
<td>Observing Co-Chairman</td>
<td>Tamara Green</td>
<td><a href="mailto:astronomer.misstamara@yahoo.com">astronomer.misstamara@yahoo.com</a></td>
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<td>PR/Outreach</td>
<td>Owen Green</td>
<td><a href="mailto:darthnewo@yahoo.com">darthnewo@yahoo.com</a></td>
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<td>Sidewalk Astronomy</td>
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<td><a href="mailto:darthnewo@yahoo.com">darthnewo@yahoo.com</a></td>
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<tr>
<td>Group Director</td>
<td>Mandy Nothnagel</td>
<td><a href="mailto:actgroupscheduling@gmail.com">actgroupscheduling@gmail.com</a></td>
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<tr>
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<td>Mandy Nothnagel</td>
<td><a href="mailto:act_pres@astrotulsa.com">act_pres@astrotulsa.com</a></td>
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<td>James Taggart</td>
<td><a href="mailto:act_maint@astrotulsa.com">act_maint@astrotulsa.com</a></td>
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## MEMBERSHIP INFORMATION

### MEMBERSHIP RATES FOR 2014 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.**

### MAGAZINES:

- **Astronomy** is $34 for one year or $60 for 2 years. [www.astronomy.com](http://www.astronomy.com)
- **Sky & Telescope** is $33 per year. [www.skyandtelescope.com](http://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)
For some really cool Easter fun, after you’ve dyed your hard-boiled eggs and hidden your plastic, prize-filled ones about, try this fun idea from NASA’s The Space Place! You can make your own SATELLITE! How do it is in the link below:

http://spaceplace.nasa.gov/build-a-spacecraft

Maybe you can find the Easter Bunny with it! So why not give it a try?

Also, check out this great link on BLACK HOLES!

http://spaceplace.nasa.gov/black-holes
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.

The Observer is a publication by the Astronomy Club of Tulsa. The Astronomy Club of Tulsa is a 501C 3 non-profit organization open to the public. The Club started in 1937 with the single mission to bring the joy and knowledge of astronomy to the community of Tulsa, OK and the surrounding area. Today our mission remains exactly the same. We travel to local schools, churches and many other venues with scopes and people to teach. Our observatory is located in Mounds and many public programs are offered there. To join the Astronomy Club of Tulsa please visit www.astrotulsa.com where you will find all the information necessary to become a member.