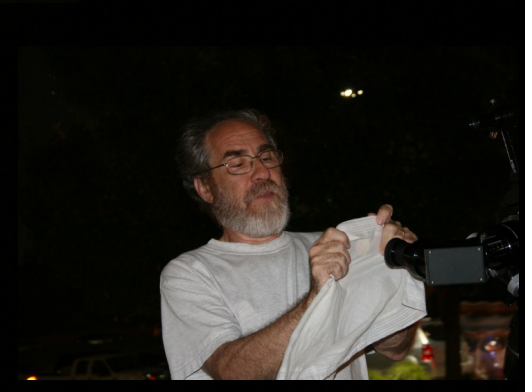




Astronomy Club of Tulsa

Observer

May 2012



Photos: From the Super Moon event at Sidewalk Astronomy, Bass Pro, May 5, 2012. All above photos by Tamara Green.

Permission to reprint anything from this newsletter is granted, **PROVIDED THAT CREDIT IS GIVEN TO THE ORIGINAL AUTHOR AND THAT THE ASTRONOMY CLUB OF TULSA "OBSERVER" IS LISTED AS THE ORIGINAL SOURCE.** For original content credited to others and so noted in this publication, you should obtain permission from that respective source prior to re-printing. Thank you very much for your cooperation. Please enjoy this edition of the Observer.



Inside This Edition:

Calendars and Upcoming Events..... 3

President’s Message, by Ann Bruun.....4

Land’s Tidbits, by John Land (*includes Venus Transit Press Release*)..... 5

Workday Photos Collage, by John Land..... 7

The Secretary’s Stuff, by Tamara Green.....8

“How High the Moon”, by Ron Wood..... 10

“Merry is May-Time for Astronomy”, by Tamara Green.....14

Space Place Partners Column, “Thank Goodness for Magnetism”
By Dr. Tony Phillips.....17

Club Space Place Activity Guide, “Clues From Ancient Light” 19

Officers, Board Members at Large and Staff Information..... 22

Membership Information..... 23

I hope you will enjoy this edition of the Astronomy Club of Tulsa “Observer”. For those of you who are interested, please feel welcome to send me any articles, pictures, and what-not for future editions!

Thank you!

Tamara

astronomer.misstamara@yahoo.com

June 2012
Tulsa, Oklahoma

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
					1 Sunrise: 6:08am Sunset: 8:35pm Moonrise: 5:43pm Moonset: 3:40am	2 Sidewalk Astronomy Sunrise: 6:08am Sunset: 8:36pm Moonrise: 6:55pm Moonset: 4:25am
3 Sunrise: 6:07am Sunset: 8:36pm Moonrise: 8:05pm Moonset: 5:16am	4 Sunrise: 6:07am Sunset: 8:37pm Moonrise: 8:09pm Moonset: 6:15am Full Moon: 5:13am	5 Venus Transit Sunrise: 6:07am Sunset: 8:38pm Moonrise: 10:06pm Moonset: 7:20am	6 Sunrise: 6:07am Sunset: 8:38pm Moonrise: 10:55pm Moonset: 8:27am	7 Sunrise: 6:06am Sunset: 8:39pm Moonrise: 11:36pm Moonset: 9:36am	8 Public Star Party Sunrise: 6:06am Sunset: 8:39pm Moonrise: none Moonset: 10:42am	9 Sunrise: 6:06am Sunset: 8:40pm Moonrise: 12:12am Moonset: 11:45am
10 Sunrise: 6:06am Sunset: 8:40pm Moonrise: 12:44am Moonset: 12:45pm	11 Sunrise: 6:06am Sunset: 8:41pm Moonrise: 1:14am Moonset: 1:44pm Last Qtr: 4:42am	12 Sunrise: 6:06am Sunset: 8:41pm Moonrise: 1:14am Moonset: 2:40pm	13 Sunrise: 6:06am Sunset: 8:41pm Moonrise: 2:13am Moonset: 3:36pm	14 Sunrise: 6:06am Sunset: 8:42pm Moonrise: 2:44am Moonset: 4:32pm	15 M.O.O.N. Sunrise: 6:06am Sunset: 8:42pm Moonrise: 3:17am Moonset: 5:27pm	16 Sunrise: 6:06am Sunset: 8:43pm Moonrise: 3:54am Moonset: 6:22pm
17 Sunrise: 6:06am Sunset: 8:43pm Moonrise: 4:35am Moonset: 7:14pm	18 Sunrise: 6:06am Sunset: 8:43pm Moonrise: 5:21am Moonset: 8:04pm	19 Sunrise: 6:07am Sunset: 8:44pm Moonrise: 6:11am Moonset: 8:51pm New Moon: 9:03am	20 Sunrise: 6:07am Sunset: 8:44pm Moonrise: 7:06am Moonset: 9:34pm	21 Sunrise: 6:07am Sunset: 8:44pm Moonrise: 8:04am Moonset: 10:13pm	22 Sunrise: 6:07am Sunset: 8:44pm Moonrise: 9:03am Moonset: 10:49pm	23 Sunrise: 6:07am Sunset: 8:44pm Moonrise: 10:04am Moonset: 11:22pm
24 Sunrise: 6:08am Sunset: 8:45pm Moonrise: 11:06am Moonset: 11:56pm	25 Sunrise: 6:08am Sunset: 8:45pm Moonrise: 12:08pm Moonset: none	26 Sunrise: 6:08am Sunset: 8:45pm Moonrise: 1:12pm Moonset: 12:27am First Qtr: 9:32pm	27 Sunrise: 6:09am Sunset: 8:45pm Moonrise: 2:16pm Moonset: 1:00am	28 Sunrise: 6:09am Sunset: 8:45pm Moonrise: 3:26pm Moonset: 1:37am	29 Sunrise: 6:09am Sunset: 8:45pm Moonrise: 4:35pm Moonset: 2:18am	30 Sidewalk Astronomy Sunrise: 6:10am Sunset: 8:45pm Moonrise: 5:44pm Moonset: 3:04am

Daylight Saving/Summer Time is in effect for the entire month.
Courtesy of www.sunriseandsunset.com
Copyright © 2011 Steve Edwards

UPCOMING EVENTS:

- | | | | |
|---------------------------------------|--------------------|-----------------|--------------------|
| Sat., June 2 | Sidewalk Astronomy | Bass Pro | 8:30 PM |
| Mon., June 4 | View on your own | | 5:04 AM to Moonset |
| Tues., June 5 | Transit of Venus | TASM | 4:30 PM to Sunset |
| Transit begins shortly after 5:00 PM. | | | |
| Fri., June 8 | Public Star Party | ACT Observatory | 8:00 PM |
| Fri., June 15 | Members' Night | ACT Observatory | 8:00 PM |
| Sat., June 16 | Club Cookout | ACT Observatory | 5:00 PM |
| Sat., June 30 | Sidewalk Astronomy | Bass Pro | 8:30 PM |



President's Message

By Ann Bruun

June is going to be a very exciting month for the Astronomy Club of Tulsa. First up is the Venus transit. The Club is partnering with the Tulsa Air and Space Museum Planetarium for this event. Members with solar telescopes or sun filters will be setting up outside TASM at 4:30 PM on June 5th. Everyone is welcome to come and have a look and hang out. The transit lasts for hours so there is no rush.

Also in June we are having a Members' Appreciation barbeque. It will be held Saturday June 16th at the Observatory. The club will be providing hamburgers, hot dogs, condiments, and drinks. Members are welcome to bring a dish or desert to add to the feast. The gate will be open at 5:30 PM; we will start cooking at 6:00 PM. After dinner we can break out our scopes and do some observing. It is a great opportunity to socialize and relax.

Add to these two events, Sidewalk Astronomy at Bass Pro June 2nd, our Public Star Party June 8th and the Members Only Observing Night June 15th and this month is full of opportunities to do whatever kind of observing you like to do. I look forward to these events and hope you will be able to come out and join us.

Ann Bruun

Astronomy Club of Tulsa President

Act_pres@astrotulsa.com



Land's Tidbits

By John Land

Treasurer / Membership Report - John Land

The club has **105 members** including **9 new memberships** this year. Newest Members are Roger Anderson, Kenneth Haack, Susan Dorey, Shelly Ingles, Cornelius Johnson

In addition we have had **74** people request information on the website visitor section.

Checking Account \$ 1,169.92 Savings Account \$ 9,001.19

Investment accounts as of April 30 **\$ 16,240.96**

Values will vary due to market values.



Regional Summer Astronomy Events

2012 MidStates Regional Convention. June 1st to June 3rd in Kansas City

Our Tulsa club is a member of this 5 state region called Midstates.

Registration at <http://msral.org/>



Celebrating 150 years of the Astronomical League

National Convention **July 4** to July 7 <http://alcon2012.astroleague.org/> This year

ALCon convenes in Chicago. In addition to great speakers and meeting fellow astronomers from all over the world. This year's venue includes side trips to such iconic places a Yerkes observatory, Adler Planetarium and particle accelerators at Fermilab.

Star Bright – Star Light – Where shall I pitch my tent tonight?

Making plans for your summer travels. Here are a few places to pitch your tent. Actually several also have more comfortable lodgings on site or nearby.



29th Okie-Tex Star Party

Sept 8th to Sept 16th

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

Details for registration and meals at website.

Dozens of our Tulsa members join with more than 300 fellow astronomers each fall to marvel at the dark skies in the tip of the Oklahoma Panhandle. Al Nagler of Tel-Vue optics proclaimed it as one of the darkest sites in America. [Get your registrations in early.](#) Especially for the on site meals.

Since the nearest eating places are nearly 40 miles away.

Land's Tidbits, Ct'd.

Other regional Star parties include: This is by no means a complete listing.



Rocky Mountain Star Stare June 13 to June 17
<http://www.rmss.org/index.html>



Nebraska Star Party July 15th to July 20th
<http://www.nebraskastarparty.org/index.html>



Heart of America Star party near Butler, MO
Oct 10 to Oct 14 <http://www.hoasp.org/>



Tuesday June 5, 2012 Transit of Venus Watch

4:30 PM to 8:35 PM (Sunset)

Tulsa Air & Space Museum

624 North 74th East Ave [Directions](#)



On June 5th TASM and the Astronomy Club of Tulsa will be setting up telescopes for our guests to watch the planet Venus cross in front of the face of the Sun. This will be your LAST CHANCE to observe the rare event as the next one occurs December 2117 ! Venus will begin its transit at 5:08 PM and slowly move across the face of the sun for the next 6 hours however the Sun will set in Tulsa about midway through. There will also likely be some sunspot groups for viewing also. This is a come and go event so you won't need to stay the whole time but do recommend you come by 7:30 or earlier.

NOTE: NEVER LOOK AT THE SUN WITHOUT APPROVED SAFE SOLAR FILTERS

This is a weather permitting event. – Overcast sky will prevent viewing

Some Resources

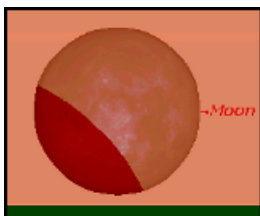
Astronomy Club of Tulsa – www.AstroTulsa.com

TASM <http://www.tulsaairandspacemuseum.org/index.php>

5 minute video explaining the transit <http://stargazersonline.org/episodes/1215.html>

Two card pamphlet <http://www.astrosociety.org/tov/almanac2012-FINAL.pdf>

Partial Lunar Eclipse Monday June 4, 2012 5:03 AM to 6:10 AM (Moonset)



During the predawn hours of the full moon will slip into the upper edge of Earth's shadow called the Umbra. At maximum eclipse about 1/3 of the moon will be covered by the umbra. No special filters are needed to observe a Lunar eclipse. You can observe this eclipse from anywhere with a clear SW horizon. As the eclipse begins the moon will be only 10 degrees above the horizon. To look for the shadow imagine the moon as the face of a clock and look for the shadow to first appear about the 8 o'clock position. Binoculars or a small telescope will enhance the view but are not necessary.

Observatory Work Day - April 28, 2012

BIG THANKS to Chris & Adam, Ann, John, Tamara & Owen, Skip, Mike, James, Stan & Lee

Getting down and Dirty



Father & Son Project

Woman Power at work

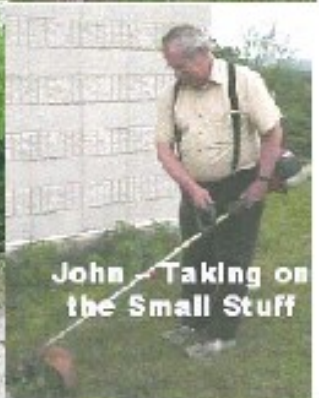


Gateway to the Stars



James & Stan

"R U Looking for Bears?"



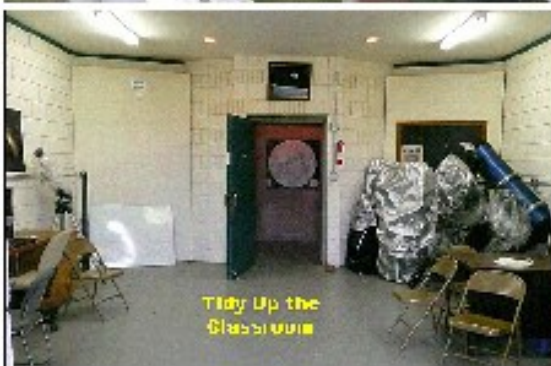
John Taking on the Small Stuff



Skip & Owen preparing the surface



Picasso at Work



Tidy Up the Classroom



Eureka !!



The Secretary's Stuff

By Tamara Green

ASTRONOMY CLUB OF TULSA – MINUTES – GEN. MEETING FRI MAY 4, 2012

PRESENT:

Ann Bruun, President

Tony White, Vice President

Tamara Green, Secretary/Obs. Co-Chair/NL Editor

John Land, Treasurer

Catherine Kahbi, Board

Tom McDonough, Board

Owen Green, PR/Outreach/Sidewalk

The meeting was held at Tulsa Community College, Northeast Campus. There were around 27 attendees.

WELCOME AND INTRODUCTION:

Ann called the meeting to order at 7:03 PM and welcomed all attendees.

PROGRAM:

Neta Apple, NASA Educator Ambassador. "The Search For Another Earth", a presentation on extrasolar planets. Also, Ron Wood of TUVA gave a brief talk about the Messier Marathon and gave out the awards.

OFFICERS'/STAFF REPORTS:

PRESIDENT – Ann announced that not only will there be a supermoon on SW Astro night, but it is also Cinco De Mayo, so there will be a band, so it should be a big night! She brought the laptop and projector so we could all see them. Also, there are sign-in sheets from Neta's presentation. Jennifer Jones showed a preview to Ann of what our new website is going to look like but it is going to take longer, but will be worth the wait.

VICE PRESIDENT- MidStates in June in KC, Tony has all the info but does not have it with him, just email him and he will forward the info to you. He is going to try to go.

SECRETARY – Ann, due to time constraints, suggested that Tamara announce that since the minutes from the last meeting appear in the last newsletter, for everyone to just refer to the newsletter. Tamara made the announcement.

TREASURER – John gave a picture presentation on the work day at the observatory last weekend. He went over the Club's finances.

OBSERVING – Tamara announced that there were no AL Club Awardees at this time.

GROUPS – No one has volunteered to do the groups, Chris cannot do it anymore, it will be discussed at the Board meeting. One member asked about what the position requires, and Ann gave her some information.

FACILITIES – Chris was not here, Ann said that he would say thank you to all who came to the workday.

PR/OUTREACH/SIDEWALK – Owen made the announcement about sidewalk at Bass Pro, saying he was planning to be there early so he could try out his new solar filter.

FUNDRAISING – Catherine talked about the garage sale briefly, just had a few donations, said we could try again next year. She passed out flyers about the Club.

OTHER BUSINESS: Ann announced the upcoming events, including the Annular Solar



Eclipse on May 20,
about 7:30 PM. Ann
adjourned the
meeting at 9:24 PM



HOW HIGH THE MOON

By Ron Wood

There is a 1940 Broadway jazz tune titled "How High the Moon" which, according to Paul McCartney, was the first song performed by the Beatles at The Cavern in Liverpool. I'm not exactly sure how high the Moon was in 1940, but I can say now, 72 years later, it is 9 feet higher. I say this simply to make the point that the Moon is slowly receding from the Earth at the precisely known rate of 3.82 ± 0.07 cm/year (Dickey et al., 1994). This rate is observed directly by laser ranging using the corner-cube reflectors left on the Moon by the Apollo astronauts.



LUNAR RECESSION

Lunar recession is a consequence of the dynamic interaction known as tidal acceleration which operates in the Earth/Moon system. Historically it has also been important in another way. Since the time of George Darwin, the son of Charles, attempts have been made to compute the maximum possible age of the Moon by assuming that it was created at the closest possible distance from earth known as the Roche limit (15,800 miles) and has receded steadily since that time. This computation has been exploited by Creationists since it gives a value far below the age accepted in the scientific community, although still not anywhere near the Biblical value of 6000 years.

Lunar recession involves the concepts of conservation of energy and angular momentum, so a few words on these subjects seems in order. Kinetic energy, as the term suggests, is a form of energy associated with motion. Potential energy is a form of energy associated with the position of a mass in a force field such as gravity. In any given physical system the amount of energy and angular momentum involved may be computed from mathematical formulae involving the parameters of the system.

The reason energy and angular momentum are so important is that given a system which undergoes change, the amount of these two quantities remains unchanged provided that the system is isolated from external influences such as forces. This law of conservation of energy and angular momentum is a powerful tool as will become clear in this discussion of lunar recession.

For our purposes it is assumed that the solar influence is negligible and the Earth/Moon is an isolated system. If I calculate the amount of energy and angular momentum of the Moon at two different times, say one year apart, I will find that both its energy and angular momentum have increased. Clearly, the Moon has moved higher in the Earth's gravitational field (3.82 cm) and has increased potential energy. Knowing the laws of conservation for these quantities the question then is: Where did these increases come from?

It is well known that the Earth's rotation is slowing at the rate of about one second every 50,000 years. This represents a loss of both angular momentum and rotational kinetic energy sufficient to account for the gain seen for the moon. In fact, only 1/30th of the rotational energy lost by the Earth is sufficient to produce the observed gain of potential energy for the Moon. The process by which this energy and momentum transfer takes place is called tidal acceleration, but before modeling that process we should clearly understand the earth's tides.

THE TIDES

We all know that the gravitational attraction of the Moon is strongest on the side of the earth nearest the Moon and weakest on the side most distant, so that the ocean is stretched into an egg shape with its long (tidal) axis oriented in the general direction of the Moon. There are two tidal bulges produced by the Moon, one on the side nearest the Moon and one on the far side.

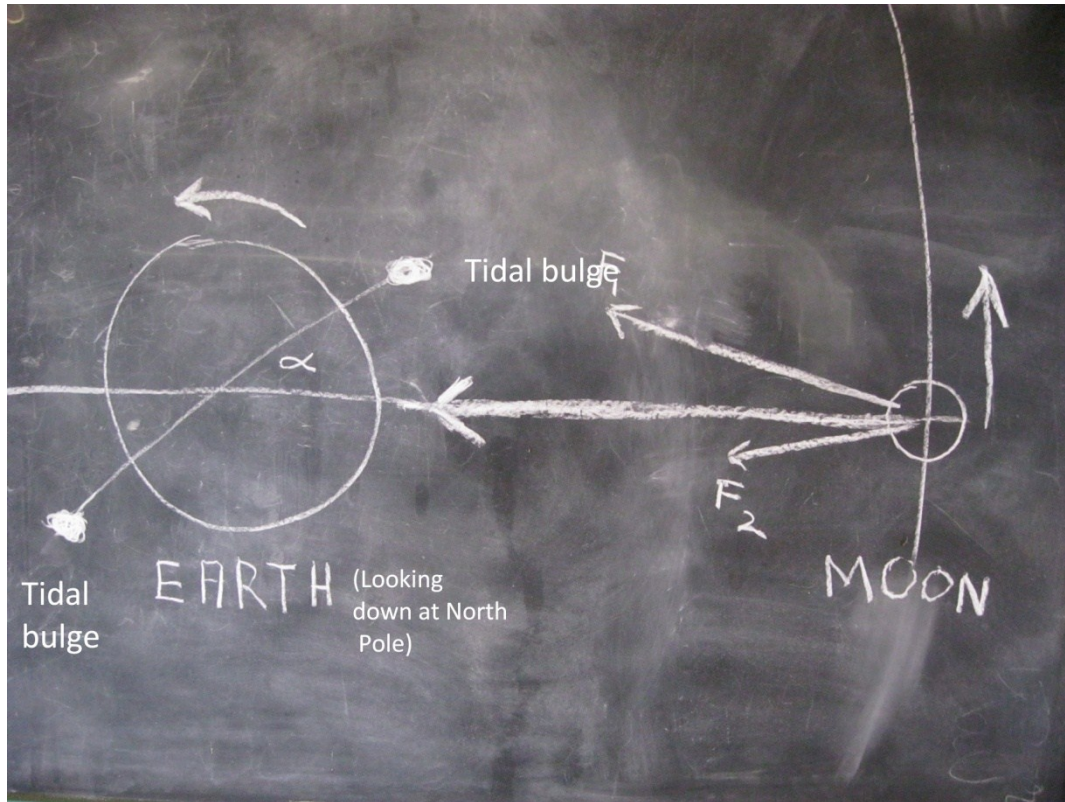
As the Earth turns the tidal axis remains pointing more or less toward the moon so that as we are swept through the bulges we see the ocean rise and fall twice a day. Most people are familiar with this idea, but what is less well known yet crucial to understanding tidal acceleration is that the tidal axis does not point straight toward the moon as most people suppose. Instead, it points ahead of the Moon in its orbital path at a constant angle (α in the illustration).

This seems very strange at first, but the explanation is simple. The rapid rotation of the earth with respect to the tidal bulges creates frictional forces between the sea bottom and the ocean which continually drag the bulges forward, maintaining the constant angle ahead of the Moon. The frictional forces dissipate 2.5 terawatts of rotational kinetic energy partly as heat to the ocean, with the remainder reappearing as gravitational potential energy of the moon as it recedes to a higher orbit. Slower rotation also means reduced angular momentum and since momentum must be conserved it is transferred to the moon by the mechanism of tidal acceleration which we will now discuss.

TIDAL ACCELERATION

Our model, shown in the illustration, represents the centers of mass of the two tidal bulges by the dots on the tidal axis, one on either side of the Earth. Also shown by vector arrows are three gravitational forces experienced by the

moon. There is the strong force exerted on the moon by the solid body of the Earth along the Earth/Moon axis and two much weaker forces exerted on the moon by the smaller masses of the two tidal bulges.



We are now interested only in these two tidal forces. Note that these forces both have a very weak component tangent to the moon's path, one in the forward direction from the near side bulge and the other in the backward direction from the far side bulge. Next, note that the two tidal forces are not of equal strength. The trailing bulge is farther from the Moon and therefore slightly weaker. This means that the two tangential components, when added, give a net force on the Moon in the forward direction.

This forward force constitutes a torque about the Moon's orbital axis. This torque transfers angular momentum and energy to the moon causing it to spiral slowly outward and orbit more slowly in accordance with Kepler's third law. Although its kinetic energy is decreased, its gravitational potential energy is increased by a greater amount.

WHAT NEXT?

There are a troubling set of consequences expected from tidal acceleration and lunar recession. A time will come when the angular size of the Moon will be smaller than that of the Sun, and our beautiful solar eclipses will be a thing of the past. But that's just the beginning. If other effects are ignored, tidal acceleration will continue until the rotational period of the Earth matches the orbital period of the Moon. At that time, the Moon will always be overhead of a single fixed place on Earth. Such a situation already exists in the Pluto/Charon system. Not to worry though, since the time frame for this event is about fifty billion years.

More troubling is the fact that in the relatively near future, two billion years, the continual increase of the Sun's radiation is expected to vaporize our oceans rendering moot the subject of tidal acceleration, but, at long last, nailing down a definitive answer to the vexing question: "How high the Moon?"



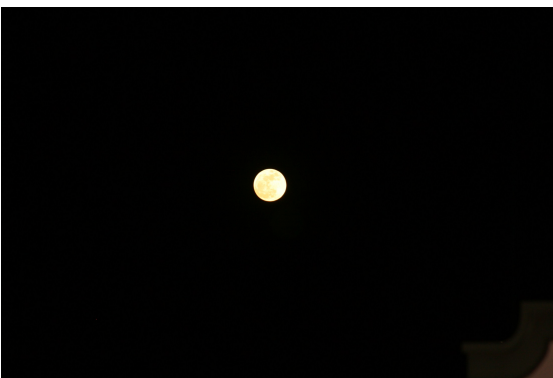
Merry is May-Time (and the rest of the summer too) for Astronomy!

By Tamara Green

The merry month of May has been great for the Club, with a fantastic guest speaker, the Super Moon and the Annular Eclipse. All events got everyone happy and geared up for more wonderful summer events to happen soon!



The General Meeting on Friday, May 4 was fairly well-attended; there were approximately 27 of us there to hear our guest speaker Neta Apple give her talk on extrasolar planets, entitled “A Search For Another Earth”. Neta is a NASA Educator Ambassador and former Astronomy Club of Tulsa member. Her talk was really fascinating, making us think that yes, there is a definite possibility that there are other earth-type planets somewhere in the universe that could very well sustain life. Many planets have already been found orbiting their distant parent stars, and a small number of those are within their “habitable zone”. She also explained how scientists have found these planets and the methods they employed to find them. There was even some audience participation; two of our members helped Neta give a demonstration on the “habitable zone” for a planet, with blue and yellow transparent plastic and a red candle, representing hot, medium, and relatively cold stars and how close or far away a planet would have to be to support life. It was fun as well as informative and I believe everyone enjoyed it.

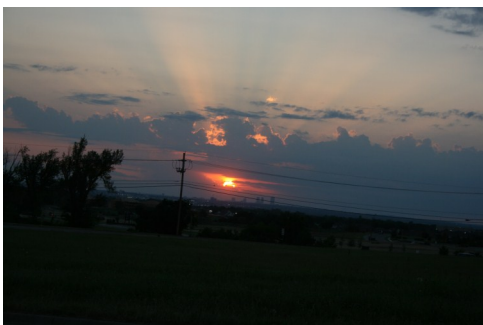


On the following evening, Saturday, May 5, we had our monthly Sidewalk Astronomy event at Bass Pro Shops. This was a very special Sidewalk event due to the Super Moon. The Super Moon is actually the full moon at perigee and it did look much larger than a normal full moon. There were quite a few of our Club members on hand with their telescopes, and Owen, Tom and I had solar filters on ours so that we could look at some sunspots before the sun went down too far for us to see them. Plus, with it being Cinco de Mayo, there was music from a live band at the neighboring Los Cabos restaurant to keep us entertained and bring even more members of the public to our event and look through our telescopes! We had quite a crowd that night. Many people enjoyed seeing the big fat moon, especially the kids. This was one of the best Sidewalk events that we have had in a while and was loads of fun for all.



The public star party, unfortunately, was cancelled due to cloud cover. Mother Nature can be a total swamp hag when she wants to be.

The member's night, although fairly well-attended, did not turn out so well. High clouds made it pretty much impossible for any deep-sky observing. I managed to find only 3 of my Herschel objects. Not a very good night for observing.



On Sunday, May 20, many of our Club members gathered together to see a rare and spectacular solar event called an Annular Eclipse. We had quite a turnout. Many of our members came out with solar telescopes and telescopes with solar filters. We had a pretty good crowd of the public too! Many people came out and looked through our telescopes as the moon's shadow started to cover the sun. Unfortunately, the clouds decided to muscle in on the action and eclipsed the whole thing. We did get to see some of it, at least!



Even though we are in our summer hiatus for the General Meetings and will not have another one until September, we do have a couple of really nice events coming up soon that you will not want to miss. There will be a transit of Venus that will take place on Tuesday, June 5. ***This viewing event will take place at the Tulsa Air and Space Museum and Planetarium and will start at 4:30 PM and end at sunset. It will be open to the public.*** This will be an exceptionally special event, as none of us will ever get a chance to see this again in our lifetimes. Per the article "Transit of Venus: June 5-6, 2012", by the Editors of Sky and Telescope, March 4, 2012, www.skyandtelescope.com this transit happens ***ONLY FOUR TIMES EVERY 243 YEARS!!!*** What is really weird is the spacing between the transits. The spacing between each occurrence is 121.5 years, then 8 years, then 105.5 years, then 8 years. The last transit of Venus occurred in June of 2004, and won't occur again until December of 2117!

Those of us here in North America are in a position to view at least a portion of this transit on the afternoon of June 5. It will begin within a few minutes of 22:10 Universal Time (or 10:10 PM UT) on June 5 and will end within a few minutes of 04:45 Universal Time (or 4:45 AM UT). In our time zone and from our latitude, this will roughly translate to 17:04 Central Daylight Time (5:04 PM CDT) to 20:25 Central Daylight Time (8:25 PM CDT). You may even get a chance to view some sunspots during this transit! The transit is supposed to last until 11:48 PM, but will only be viewable from regions in the Pacific. You don't want to miss this event, so please join us at TASM and enjoy it with us.

Also, on Monday, June 4, there will be a partial Lunar eclipse, however, it occurs at 05:03 Central Daylight Time (5:03 AM CDT) and ends at 06:10 Central Daylight Time (6:10 AM CDT). The Club most likely will not be holding an official Lunar Eclipse watch due to the timing, but that should not stop you from enjoying it. Take some pics if you can and share them with us!!!

And, of course, there are many other events in the works for the summer that are going to be really fun, so stay tuned!

And now, some other fun pictures, courtesy of Ron and Maura Wood of TUVA! Pics are of Messier Marathon awardees and Ron posing with Owen and the Super Moon! Thank you very much Ron and Maura for your contribution!



Thank Goodness for Magnetism

By Dr. Tony Phillips

Only 93 million miles from Earth, a certain G-type star is beginning to act up.

Every 11 years or so, the solar cycle brings a period of high solar activity. Giant islands of magnetism—"sunspots"—break through the stellar surface in increasing numbers. Sometimes they erupt like a billion atomic bombs going off at once, producing intense flares of X-rays and UV radiation, and hurling massive clouds of plasma toward Earth.

This is happening right now. Only a few years ago the Sun was in a state of deep quiet, but as 2012 unfolds, the pendulum is swinging. Strong flares are becoming commonplace as sunspots once again pepper the solar disk. Fortunately, Earth is defended from solar storms by a strong, global magnetic field.

In March 2012, those defenses were tested.

At the very beginning of the month, a remarkable sunspot appeared on the Sun's eastern limb. AR1429, as experts called it, was an angry-looking region almost as wide as the planet Jupiter. Almost as soon as it appeared, it began to erupt. During the period March 2nd to 15th, it rotated across the solar disk and fired off more than 50 flares. Three of those eruptions were X-class flares, the most powerful kind.

As the eruptions continued almost non-stop, Earth's magnetic field was buffeted by coronal mass ejections or "CMEs." One of those clouds hit Earth's magnetosphere so hard, our planet's magnetic field was sharply compressed, leaving geosynchronous satellites on the outside looking in. For a while, the spacecraft were directly exposed to solar wind plasma.

Charged particles propelled by the blasts swirled around Earth, producing the strongest radiation storm in almost 10 years. When those particles rained down on the upper atmosphere, they dumped enough energy in three days alone (March 7-10) to power every residence in New York City for two years. Bright auroras circled both poles, and Northern Lights spilled across the Canadian border into the lower 48 states. Luminous sheets of red and green were sighted as far south as Nebraska.

When all was said and done, the defenses held—no harm done.

This wasn't the strongest solar storm in recorded history—not by a long shot. That distinction goes to the Carrington Event of September 1859 when geomagnetic activity set telegraph offices on fire and sparked auroras over Mexico, Florida, and Tahiti. Even with that in mind, however, March 2012 was remarkable.

It makes you wonder, what if? What if Earth didn't have a magnetic field to fend off CMEs and deflect the most energetic particles from the Sun.

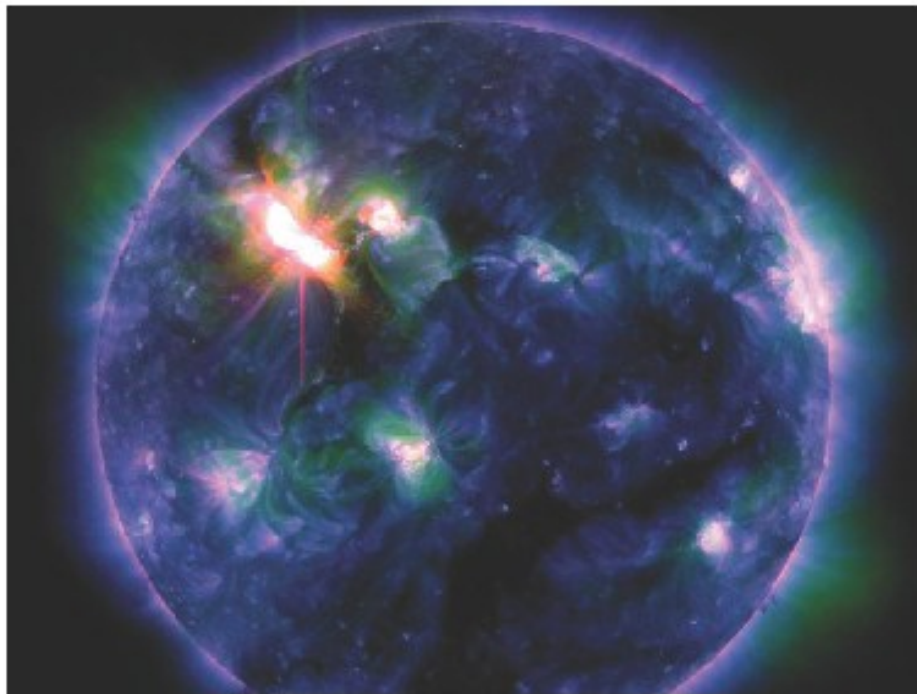
The answer might lie on Mars. The red planet has no global magnetic field and as a result its atmosphere has been stripped away over time by CMEs and other gusts of solar wind. At least that's what many researchers believe. Today, Mars is a desiccated and apparently lifeless wasteland.

Only 93 million miles from Earth, a G-type star is acting up. Thank goodness for magnetism.

With your inner and outer children, read, watch, and listen in to "Super Star Meets the Plucky Planet," a rhyming and animated conversation between the Sun and Earth, at

<http://spaceplace.nasa.gov/story-superstar>.

This article was provided by the Jet Propulsion Laboratory, California Institute of Technology, under a contract with the National Aeronautics and Space Administration.



Multiple-wavelength view of X5.4 solar flare on March 6, captured by the Solar Dynamics Observatory (SDO) in multiple wavelengths (94, 193, 335 angstroms). Credit: NASA/SDO/AIA

Download this image from <http://spaceplace.nasa.gov/news-images/sdo-march-solar-flare.jpg>

CLUB OFFICERS

PRESIDENT	ANN BRUUN 918-231-0301
VICE PRESIDENT	TONY WHITE 918-231-0900
SECRETARY	TAMARA GREEN 918-851-1213
TREASURER	JOHN LAND 918-695-3195

BOARD MEMBERS AT LARGE

STAN DAVIS	918-294-3196
TERESA DAVIS	918-637-1477
TIM DAVIS	918-665-8134
BILL GOSWICK	918-742-6146
CATHERINE KAHBI	918-230-8480
TOM MCDONOUGH	918-851-2653

APPOINTED STAFF

NEWSLETTER EDITOR	TAMARA GREEN 918-851-1213
FACILITIES MANAGER	CHRISTOPHER PROCTOR 918-810-6210
MEMBERSHIP CHAIRMAN	JOHN LAND 918-695-3195
OBSERVING CO-CHAIRS	OWEN & TAMARA GREEN 918-851-1213
GROUP DIRECTOR	JENNIFER JONES 918-629-8732
PR/OUTREACH/SIDEWALK ASTRONOMY	OWEN GREEN 918-851-8171
NIGHT SKY NETWORK	TERESA DAVIS 918-637-1477
WEBMASTER	JENNIFER JONES 918-629-8732
FUNDRAISING CHAIR	CATHERINE KAHBI 918-230-8480

MEMBERSHIP INFORMATION

Adult Membership, \$45 per year. Includes membership in the Astronomical League, a Subscription to the Astronomy Club of Tulsa's "Observer" and a Subscription to the Astronomical League's "Reflector".

Senior Adult Membership, \$35 per year. Includes all of the benefits of the Adult Membership, for those age 65 and older.

Student Membership, \$30 per year with Astronomical League membership, \$25 without Astronomical League membership.

The regular Adult and Senior Adult memberships allow all members in the member's family to participate in Club events, but only ONE voting member and ONE Astronomical League membership per family.

For additional Family memberships, \$15 per family member with Astronomy Club of Tulsa voting rights, \$20 per family member with Astronomy Club of Tulsa voting rights and Astronomical League membership.

Magazine Subscriptions, \$34 per year for "Astronomy" and \$33 per year for "Sky and Telescope".

For more information, contact Membership Chair/Treasurer John Land at 918-695-3195 or astroclubbiz@windstream.net.

THE ASTRONOMY CLUB OF TULSA INVITES YOU TO

MAKE PLANS THIS SUMMER TO JOIN US AT AN ASTRONOMY CLUB OF TULSA 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.

