



Astronomy Club of Tulsa

Observer

June 2013



Photo: Scorpius Rises, by Tamara Green.

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Inside This Edition:

Article/Item	Page
Calendar and Upcoming Events	3
President's Message, by Lee Bickle	4
Membership and Treasurer's Report, by John Land	5
<i>Pictures of the Planetary Conjunction</i> , by John Land	6
Starlight Bands Event Invitation	7
The Secretary's Stuff, by Tamara Green	8
<i>Some Pictures of Club Events</i> , by Lee Bickle, Richie Shroff and Tamara Green	10
<i>StarQuest 2012, Green Bank, WV</i> , by Skip Whitehurst	12
Observations of a Supernova by Tom Hoffelder	16
NASA's The Space Place Newsletter	18
<i>High-Energy Spy</i> , by Dr. Martin C. Weisskopf	20
Where We Meet	23
Officers, Board, Staff and Membership Info	24

ALSO: If you are looking for good information on collimation, check out this link, sent to me by Jerry Mullenix! Thank you Jerry!

<http://blog.scientificsonline.com/2013/05/star-testing-your-telescope/>

June 2013

Sun	Mon	Tue	Wed	Thu	Fri	Sat
						1 PSP Backup/Groups
2	3	4	5	6	7 Members' Night	8  Members' Backup
9	10	11	12	13	14	15
16  FATHERS' DAY	17	18	19	20	21	22 Sidewalk Astronomy
23 	24	25	26	27	28 Public Star Party	29  PSP Backup/Groups
30						

UPCOMING EVENTS:

Fathers' Day	Sun, Jun 16		
Sidewalk Astronomy	Sat Jun 22	Bass Pro	8:30 PM
Public Star Party	Fri Jun 28	ACT Observatory	8:30 PM
Independence Day	Thu Jul 4		
Club Picnic	Fri Jul 5	ACT Observatory	8:00 PM
<i>(Please Note: This Event is for Club members and their families only.)</i>			
Sidewalk Astronomy	Sat Jul 20	Bass Pro	8:30 PM
Public Star Party	Fri Jul 26	ACT Observatory	8:30 PM



President's Message

By Lee Bickle

Aside from a few storms and tornadoes, we've finally had some decent, clear nights lately! We've been busy at the observatory too: the regular public night, members night, and recent ORU math & science academy were enjoyed by a good number of members and guests in decent weather under clear skies. There was even a marriage proposal on the grounds! At Bass Pro, sidewalk astronomy drew a good crowd even though there were a few clouds. And finally, the outing at Hulah Lake was a lot of fun. If you have any photos or stories to tell from any of these events, let us know about it! Mandy has been busy putting up photos on Facebook, don't forget to check us out there.

Saturn is high in the sky this month along with the summer triangle and of course all of the other goodies that also come along this time of year. After Tom Hoffelder mentioned a supernova which was very recently discovered in NGC 4414, I knew I wanted to give it a shot. So a couple of days later, a few of us stuck around for a few minutes after the ORU math & science academy group had left (which was a great group by the way) and hunted down the nova. It was faint, but shimmered like a diamond out of the faint disk of its host galaxy through our 14" RCX under the dome - with the help of a really nice eyepiece KC let us use. Afterward, KC went back on the field and found the supernova herself using her retooled Coulter reflector. That night, Jim Z, one of our new members, also alerted us of a bright iridium flare. It appeared right on cue, and slowly brightened to at least -5 or -6 magnitude. Heavens-above.com predicted this particular flare was two magnitudes brighter in Mounds than from my backyard in Broken Arrow due to the center of the flare's greatness brightness being west of town. I look forward to more fun observing nights this month. Check our calendar posted on our website for upcoming events and dates, this month's offerings should be listed here in the newsletter as well.

News: the club now accepts payment for new memberships and membership renewals through PayPal on the astrotulsa.com website. Thank you Jennifer Jones and John Land for getting it set up! If you have been thinking about joining the club or are behind on your current dues, this helps make your membership a little easier to come by.

A few important notes: a few weeks ago there was an apparently ragtag effort to break into the observatory building. The front door lock was tampered with and became difficult to use, so it has been replaced. Club member Brad Young offered to pay to have the new locks purchased and installed so a big thank you for that from all of us, Brad! If you have been a member in good standing for at least one year, and would like a new key, please contact our facilities manager James Taggart or me. Also just a reminder, if you are closing up the grounds, please double check the procedures to make sure everything is put away, lights off, litter under control, etc. We are planning on looking toward a vote soon on an expenditure for a new metal roof for the classroom. This will take care of a leak and a flawed design, and protect the club's investment for more years to come.

To our board, volunteers, members, and guests who have been involved in club activities over the last month, thank you so much for participating and making the club what it is! If you are interested in volunteering, just come out to the next event, ask around and you will be guided toward someone who is happy to put you to work- er, I mean show how you can help!

Happy June and clear skies,

Lee Bickle



Treasurer's and Membership Report

By John Land

Astronomy Club of Tulsa has 117 members, including 22 new members.

New members this month : Jared Corey, Sanat Kulkari, Nicholas Haugen, Roger West

Club Accounts June 13, 2013:

Checking \$3,608.62; Savings \$7,012.27; Investment account \$18,638.66 (Value Fluctuates with Market); PayPal \$135.03

NOTE: The Club has two large annual payments due in mid Summer.

Our Astronomical League membership of \$600 - due June 25

Annual Property and Liability Insurance of Approx \$2,500 - due July 19

Each year we set aside sufficient funds in savings to cover those costs when due.



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 2013 as follows.

Adults - \$45 per year includes Astronomical League Membership

Sr. Adult \$35 per year for those 65 or older includes Astronomical League Membership

Students \$30 with League membership **Students \$25** without League membership.

Additional Family membership \$20 with voting rights and League membership.

\$15 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 / yr www.skyandtelescope.com

Sky and 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.

Planetary conjunctions
Photos taken with a Panasonic "point and shoot"
about 5 seconds at ASA 100
By John Land

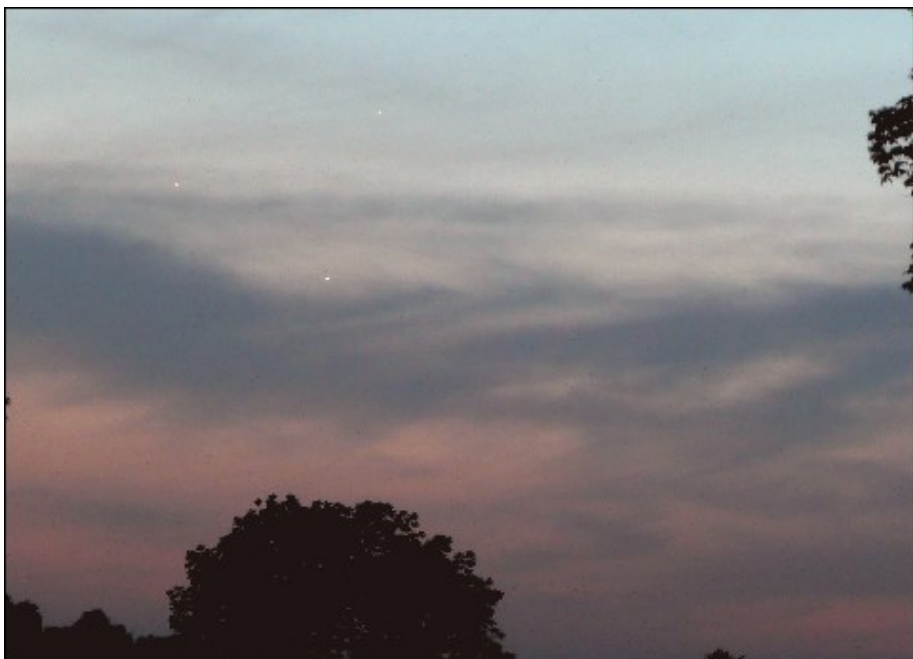
May 25, 2013 21:14 CDT

Jupiter Left **Mercury** Right
Venus bottom center



May 26, 2013 21:10 CDT

Jupiter Left **Mercury** Right
Venus bottom center





STARLIGHT BAND PERFORMS NIGHT MUSIC UNDER A NIGHT SKY

Free Starlight Concert Tuesday, June 18 at 8pm

Our Astronomy Club has been invited to bring telescopes to set up prior to, during and after the concert. Volunteers need to arrive by about 7:45 to set up.

A bright waxing gibbous moon laying between Saturn and Spica will be visible before sunset. Venus and Mercury can be seen in a close conjunction after sunset.

[Click here for a map](#)

www.Starlightbands.net

Whether it is Cole Porter crooning, “When the jungle shadows fall...when the summer shower is through....in the silence of my lonely room I think of you; night and day, day and night”, or the Phantom of the Opera singing, “Nighttime sharpens, heightens each sensation; darkness stirs and wakes imagination”, the theme of the mysteriousness of the night has been explored in music for many years.

Starlight’s concerts are ideal entertainment for the entire family. The festival park offers free parking and is accessible to those with disabilities. Concessions will be available. The public is invited to bring blankets, lawn chairs, picnic dinners and pet dogs on leashes.

Starlight Band will expound on that theme with “Music of the Night” on Tuesday, June 18 at 8pm. The free concert will be at **River West Festival Park, 2100 S. Jackson in Tulsa**, and is sponsored in part by First Fidelity Bank. “We want to give the audience an experience they can see, hear and feel,” said Starlight’s Artistic Director, L. Dale Barnett.

Selections for the evening will include “Night and Day” by Cole Porter, “The Phantom of the Opera” by Andrew Lloyd Webber, “Nightsong” by Richard Saucedo and selections from “The Planets” by Gustav Holst.

Special guests for the evening will be “Spotlight Brass” and members of the Tulsa Astronomy Club.

“Spotlight Brass” is an 11-member brass group, whose website— www.spotlightbrass.com—promises “a fresh approach to jazz and Broadway” and is worth visiting for the brass-related jokes alone. **The Tulsa Astronomy Club will bring telescopes, which will be trained on highlights in the night sky for audience members to view.**



Images below from previous club participation





The Secretary's Stuff

By Tamara Green

ASTRONOMY CLUB OF TULSA – MINUTES – GEN. MEETING FRI MAY 17, 2013

PRESENT:

Lee Bickle, President

Tamara Green, Secretary

John Land, Treasurer

Mandy Nothnagel, Board

Michael Blaylock, Board

NOT PRESENT:

Stan Davis, Vice President

Jody Ray-Fleetwood, Board

James Taggart, Board, Facilities Manager

Tony White, Board

The meeting was held at Tulsa Community College, Northeast Campus. There were 26 attendees, including several guests.

WELCOME AND INTRODUCTION: Lee called the meeting to order at 7:00 PM and welcomed all members and guests. Then he introduced our special guest speaker.

PROGRAM: Dr. Karen Leighly, University of Oklahoma, *Exploring the Astrophysics of Quasars using Spectroscopy*.

OFFICERS'/STAFF REPORTS:

PRESIDENT – Lee mentioned that there is still an open board position if anyone is interested or wants to nominate someone for it. Next election is in October.

VICE PRESIDENT- Stan not present, no report.

SECRETARY – Tamara said that if anyone wants a copy of the minutes from the April meeting, or from any other meeting, to email her. Also, she made a call for articles for the June newsletter, to be out on June 14.

TREASURER –Following the presentation, John showed us the “Observe” section of our website and pointed out the visible satellite loop. You can see what direction the clouds are moving so you can get potentially what the sky is expected to be like for that evening. He also showed us the Clear Sky Clock. You can click on it for a view of sky conditions, and it is predictive. Times are in UTC so you have to adjust for your own time zone. He also showed us the Stargazers Online website, <http://stargazersonline.org>. You can watch a variety of different episodes about varying astronomy topics. The club now has PayPal so you can use that now to join or renew your membership. You can also set up or renew your magazine subscriptions. He then talked about Comet PANSTARRS, which is still visible at about 8.5 magnitude. He did not actually bring the numbers for our accounts, but we are doing okay financially. He will try to write an article for the newsletter on the Observe section of our website.

FUNDRAISING – This position is open.

OBSERVING – Tamara told everyone that if they had any projects that have been completed or if there are any questions about observing to call, email or text her.

GROUPS – Mandy announced that we have quite a few groups scheduled and touched on the BTWHS physics group and how successful it was, we made about \$56. On the 24th (or 25th in the event of bad weather) , we are going to have a gentleman bring his girlfriend to the observatory to propose to her. He is a soldier who is currently home on leave and goes back to duty on the 26th. Any ideas to make the evening more cool or romantic would be great. On the 31st is our public night. We are hoping for clear weather, as most of our public nights this year have been cancelled due to weather. June 7 is member's night and the 10th will be ORU Science Academy. Volunteers will be needed. She also asked for us to try and find some cool activities for public and group events. June 11th is the backup night for them. July 5 is our members' picnic. Please give her any suggestions or comments via email. June 7, we have a group of members going to Hulah Lake, just Northwest of Bartlesville for an observing event with a Greek theme. Bring whatever food you like, but Greek would be nice. There will be bathroom facilities.

FACILITIES – James not present, but he sent Lee an Email about meeting with a contractor tomorrow about patching up the classroom ceiling and replacing the metal roof, per Lee. John said the expense will need to be brought to the Club for a vote.

PR/OUTREACH/SIDEWALK – Owen Green not present, Tamara announced that there will be a Sidewalk event at Bass Pro on Saturday, May 18 at 8:30 for those who want to come out . She advised all present that there have been folks showing up for past Sidewalk events only to find nobody there, and, with that, she strongly suggested that people show up with telescopes and a willingness to help out.

NIGHT SKY NETWORK – Teresa not present, no report.

OTHER BUSINESS – None

Lee adjourned the meeting at 8:45 AM.

Some Fun Pictures of What We've Been Up to
With Photos by Lee Bickle, Richie Shroff and Tamara Green



Owen , Lee and Emily look at the sun,
by Tamara



Scorpius Rising, by Tamara



Enjoying all the pretty rainbows, by Richie



Little Emily in the sun, by Lee



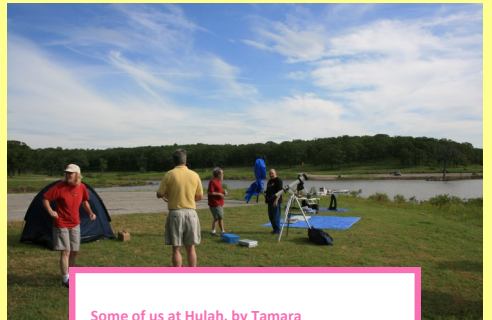
Brad's new Obsession, by Lee



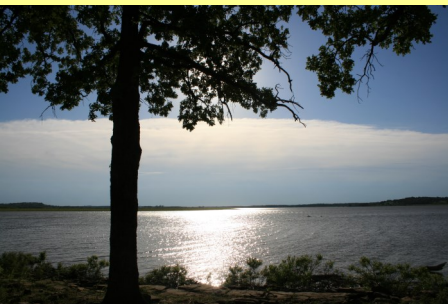
Our Observatory, by Lee



Sunset, by Lee



Some of us at Hulah, by Tamara



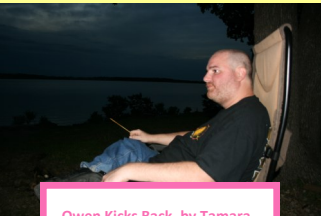
Sunlight on Lake Hulah, by Tamara



The Sun, by Lee



Sittin' round the campfire, by Tamara



Owen Kicks Back, by Tamara



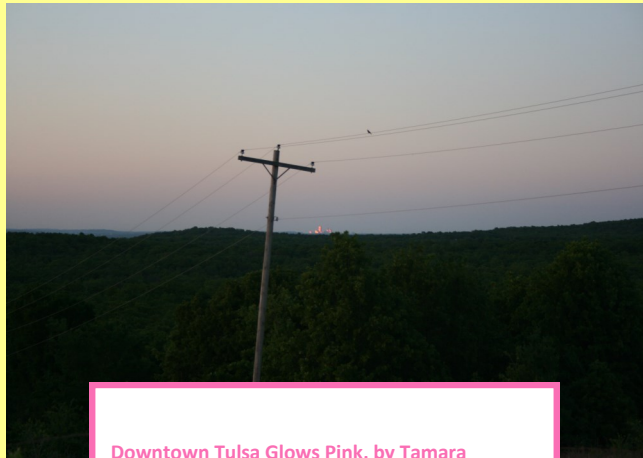
Photobomb of a Greek Chef, by Tamara



Hulah after sunset, by Tamara



Sunspots, by Lee



Downtown Tulsa Glows Pink, by Tamara



Owen and Skip looking at the sun, by Tamara



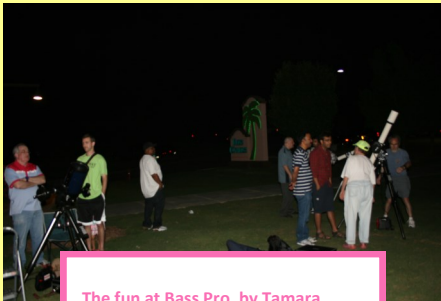
The crescent moon after sunset, by Tamara



Sharing views of the sun, by Tamara



Lee's Kids feed the ducks, by Tamara



The fun at Bass Pro, by Tamara



The moon with Comet Pan-STARRS, by Tamara

StarQuest 2012
Green Bank, WV

By Skip Whitehurst

West Virginia

If you've never been to West Virginia, go. It's awesome! Nearly the entire state is thick eastern woodlands with many spectacular Appalachian Mountain vistas – long, linear valleys and ridges in the east and dissected plateau with narrow stream valleys in the central and western parts of the state. It's rich with historic sites and a colorful history, being the only state to secede from the Confederacy by partitioning itself from Virginia after the beginning of hostilities (with the usual political intrigue and requisite skullduggery expected with such).



New River Gorge Bridge from the Fayette Station Bridge
That's a 70-foot-wide 4-lane highway up there.

The New River Gorge Bridge is a graceful steel arch bridge 3,030 feet long. Carrying 4-lane US 19 just shy of 900 feet above the river, it was the highest bridge for transportation and longest steel arch bridge in the world when it was built in 1977 (the Royal Gorge



Cass Scenic Railway Shay Locomotive

Suspension Bridge in Colorado, at 956 feet above the Arkansas River, the same Arkansas River that flows through Tulsa, was built as a tourist attraction, not for traffic). If you have time and aren't driving a large RV, take WV82 to Fayette Station for the view from river level. If you have even more time and are so inclined, whitewater rafting on the New is worth the trip.

The Cass Railroad, in Cass (duh!), was built early in the 20th Century to harvest timber, including highly-desired Red Spruce which grows only at elevations above 4000' at this latitude. Present-day Cass Scenic Railroad has the largest fleet of

operational Shay steam locomotives in existence, now used for tourist excursions up the mountain. The workhorse Shay "Sidewinder" Locomotive (so called because it uses an exposed longitudinal crankshaft outside the drive wheels) has all axles direct-driven by gears from a driveshaft. This allows a low gear ratio and all-wheel drive for maximum torque and traction on the steep tracks. The driveshaft has universal joints so the trucks can swivel in the hairpin turns necessary on the switchbacks.

For bird watchers and rock climbers West Virginia is a paradise, and cavers have claimed eastern WV as their own for well over 70 years, with a phenomenal number of spectacular but often very difficult caves in the area. Seneca Rocks is (are?) a popular spot with 300 feet of vertical Oriskany Sandstone beds for climbers.

The National Radio Astronomy Observatory

Because of the rugged terrain, most of WV is very sparsely populated, and the mountains and narrow valleys effectively block terrestrial radio signals. Because of this, it is a favorable location for an observatory for Radio Astronomy. When the National Science Foundation (NSF) began petitioning for funds to establish such a facility in the 1950s, Green Bank, located in a narrow and fully-enclosed valley in eastern WV, had



140-foot Radio Telescope

numerous advantages and only a few shortcomings compared to other potential sites; proximity to Washington, DC not least among the advantages. It was selected in late 1956.

Construction of a fully-steerable (equatorial, no less) 85-foot parabolic dish antenna, laboratory, workshops and residence buildings began in late 1957. Plans for the main research instrument, a 140-foot equatorially-mounted radio telescope, were finalized and its construction began in 1958. The initial schedule called for completion of the 140 by 1960, but the project was stalled by technical problems almost immediately (the approved design turned out to be “nearly impossible to actually build”). By 1960 the schedule was already two years behind. The completed instrument finally began observations in 1965. This still is the world’s largest equatorially-mounted telescope.

Because of the delays building the 140, plans for a much simpler 300-foot telescope, steerable in elevation (e.g. declination) only, were hastily developed and completed in just 700 days, in 1962. The 300 relied on the rotation of the earth to sweep the sky in RA at an observer-selected declination. This telescope performed so well that even though it was designed and built to be used for only a few years until the 140 was complete, the 300 was kept in operation, with numerous upgrades, for 26 years, until it collapsed in 1988 from metal fatigue. In the catastrophic collapse, several large pieces of steel crashed through the control building’s roof, narrowly missing the telescope operator on duty at the time.

With the loss of the 300, the Radio Astronomy research community immediately began to plan for its replacement. Long-time West Virginia Senator Robert Byrd became a champion of the project, secured funding, and the resulting 100 meter (328-foot) Robert C. Byrd Green Bank Telescope (GBT) went into operation in 2000.

Far superior to its “temporary” predecessor in all ways, the GBT is fully steerable in altitude and azimuth and has an off-axis design giving a totally unobstructed aperture. It remains one of the premier radio telescopes today and is the world’s largest “go-to” telescope.

You are free to take pictures on the observatory grounds, but, away from the immediate area of the visitor center, only with film cameras. Digital cameras produce a surprising amount of RF noise. If you visit, bring your old film SLR (and film). If you don’t have one, one-use cameras are on sale in the gift shop.

Star Quest

The annual Star Quest gathering is scheduled to coincide with annual maintenance of the radio telescopes so many of the problems associated with a large gathering of technology-heavy nerds are



**Robert C. Byrd 100-meter
Green Bank Telescope**



simply avoided. The observatory cooperates by turning all non-critical white lights off and blacking out windows in rooms that must

have them. It’s very dark, but it’s also the east, so cloudy nights in the summer are pretty common. Since it is so humid, dew is a significant problem as the evenings cool down. On the clear night I tried to observe from the NRAO campus, every exposed surface was wringing wet with dew after only a few hours. Keep this in mind if you want to go east with an SCT or other telescope with a front lens unless you have effective dew control.

Since the event is hosted by a radio observatory, there was a not-unexpected emphasis on radio astronomy. In addition to the technical sessions dealing with radio observations, the observatory makes its 40-foot “outreach” instrument available to the interested public after a one-hour training session. The 40 is steerable only in declination, so when you observe depends on when your desired target is crossing the meridian; Radio Astronomy isn’t affected by daytime skies, so observations can take place around the clock. The training session lab exercise is to map hydrogen in our galaxy by turning the telescope to the declination of the galactic equator currently at the meridian (they provide a chart), and sweeping the spectrum around the frequency emitted by neutral hydrogen (1420.4 MHz, or roughly 20 cm wavelength) to determine the frequency, and thus the Doppler shift of radiation emitted by hydrogen atoms from the point you’re looking; this will tell you whether parts of the galaxy within the beam are approaching or receding (or both), and how fast.

Much of the equipment here is the original equipment used when this telescope was used for research in the '60s, resplendent with "steam gauges" (analog meters), pen and ink chart recorders and the like. For the training lab, participants form teams of two, where one person mans a 2-pen chart recorder and the other controls the telescope and changes the receiver frequency. After the dish is set to the current declination of the galactic plane, the receiver is tuned to 1419.9 MHz, the chart recorder is set to record received signal strength with one pen, and 1-per-second pulses with another. Whenever the 1 Hz pen clicks, the frequency is increased by 10 kHz (manually) by one operator, who also calls out when he hits each 100 kHz frequency. His partner marks the called frequency on the chart paper. After a 1 MHz sweep is complete, there should be one or more significant peaks in signal strength, each due to a volume of gas traveling at some radial velocity which can be determined by the frequency shift.

After the training, users can sign up for antenna time in half-hour blocks. For our experiment, we wanted to measure the radial velocity of Andromeda Galaxy, which, unfortunately, crossed the meridian at about 7 AM. An Internet search gave us a ballpark estimate of what Doppler shift to expect, but after showing early in the morning, we didn't see a whisper in the expected frequency range. So it goes. Before we'd completed our sweep, a high-school kid and his father showed up early for their time to look for "ET" in, I think, Cetus. Once we were finished with our experiment, we turned control of the telescope to them, and stuck around and chatted for an hour. Their result wasn't any more successful than ours, but both were interesting exercises.



Control Room for the 40-foot Outreach Telescope

Observations of a Supernova by Tom Hoffelder!

From an E-mail dated June 9, 2013:

For me anyway, since it's suppose to be clear and new moon was yesterday. Around 14th mag and just posted today:

<http://www.rochesterastronomy.org/supernova.html#PSNJ12262933+3113383>

NGC 4414 info: <http://simbad.u-strasbg.fr/simbad/sim-id?Ident=n4414&NbIdent=1&Radius=2&Radius.unit=arcmin&submit=submit+id>

At a distance $\sim 60\text{M ly}$, it could get a little brighter during the next month. 4414 is 3 deg N of gamma Com.

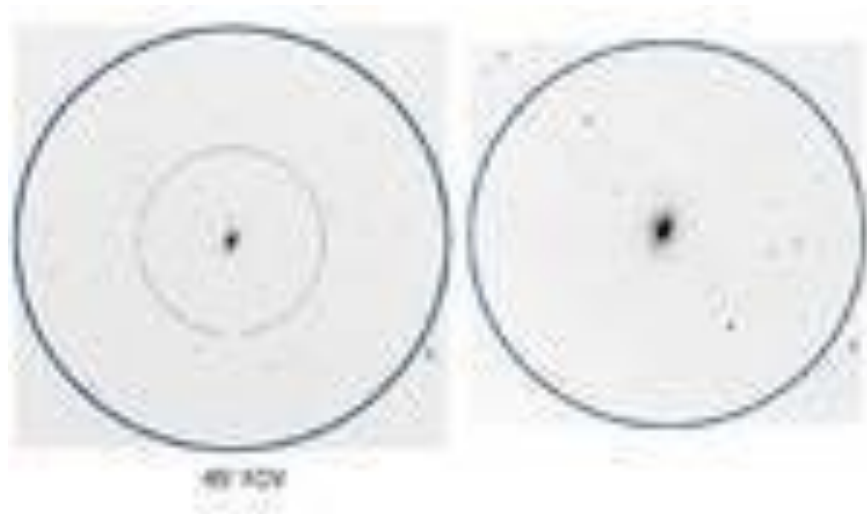
Tom

Supernova Captured!

From an E-mail dated June 10, 2013:

Visually of course! #19 was considerably easier than the last four. No problem seeing in the C14 using a 16 mm Nagler. And very nicely accompanied by owls, loons and lightning bugs!

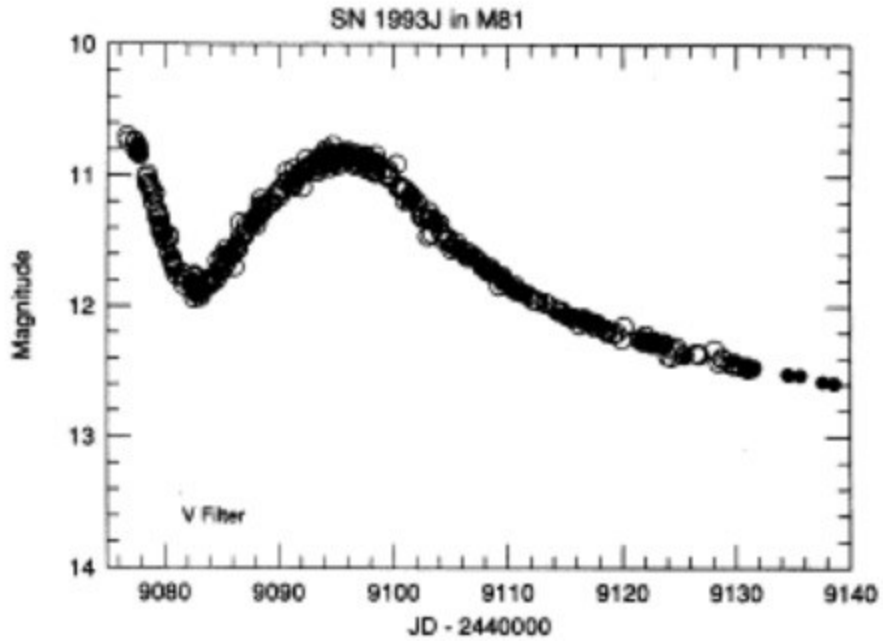
Tom



Observations of a Supernova by Tom Hoffelder, Ct'd.

From an E-mail dated June 15, 2013:

The SN in NGC 4414 has been given the designation 2013df. In case anyone was planning on trying it, the magnitude has dropped to 14.8. At least it was yesterday; this is very unusual, a drop of nearly 2 in only 3 days. Apparently it is because the SN is a type IIb, the first one I've seen. It may brighten again if it follows this curve, the first type IIb identified.





the Space Place

May – June 2013 / Vol. 6, Issue 3

NEWS AND NOTES FOR FORMAL AND INFORMAL EDUCATORS

The Space Place is a NASA website for elementary school-aged kids, their teachers, and their parents.

It's colorful!

It's dynamic!

It's fun!

It's rich with science, technology, engineering, and math content!

It's informal.

It's meaty.

It's easy to read and understand.

It's also in Spanish.

And it's free!

It has over 160 separate modules for kids, including hands-on projects, interactive games, animated cartoons, and amazing facts about space and Earth science and technology.

More and more of our readers are using mobile devices. For that reason, we have recently optimized the design of *The Space Place* to work well on even a mobile phone screen. You will see only what fits comfortably (at a readable size) on even the smallest screen, with the rest of the page accessible at your touch. Here's what else we've been doing . . .

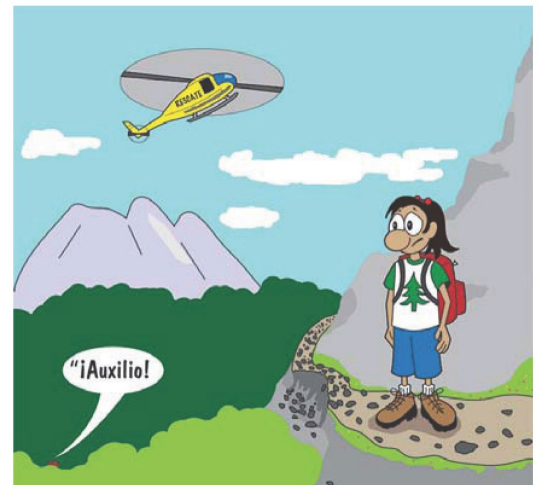
What's new?

Why would a pigeon racer phone the Space Weather Prediction Center in Boulder, Colorado, for a report before entering a prized pigeon into a big race?



It's surprising how many ways the Sun affects Earth and its living things. Solar storms can cause "bad space weather" on Earth. Bad space weather can damage communication and navigation satellites, power grids, and hurt astronauts on the Space Station. But that's not all. Read this new article on *The Space Place* to find out why homing pigeons and their human handlers might care about space weather. Go to spaceplace.nasa.gov/pigeons.

Un rescate en español



We have all heard stories in which it took many days and a lot of trouble and expense to rescue or find people who were lost in the wilderness or at sea. Sometimes, the rescue comes too late. Here's a story with a much happier ending, thanks to advance planning and the help of a well-designed and managed system involving weather satellites and a ground support system. This new feature on *Space Place* is in both English and Spanish, with Spanish perhaps being the story's original form. Go to spaceplace.nasa.gov/sarsat/sp.

Spotlight on a dream career

A Mars mission is good example to show how different scientists and engineers can be. The engineers build and operate the spacecraft, and the scientists determine what information the it will gather once it is on the ground or in orbit. Engineers and scientists have different priorities. So there is a special kind of engineer who designs and sets up tools that allow these two types of people to work smoothly together. That's

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

the job of our latest Mission Chronicles blogger. Sarah Milkovich gives a unique view of how a diverse mission operations and science team can work together even though they are spread all around the country. Check it out at spaceplace.nasa.gov/mission-chronicles/#milkovich.



For the classroom



No matter what kind of science lesson or activity you are doing with your class, the most important lesson is how to think like a scientist. Science isn't just a bunch of facts. And although there is a formal process known as the scientific method, it is not always necessary to follow it in order to "do science." So what is science? That is the weighty topic, dealt with lightly at spaceplace.nasa.gov/science. Along with this discussion is an introduction to doing a science fair project, spaceplace.nasa.gov/science-fair. Although it may be a bit late in the year to think about science fairs, such projects can also be encouraged just to satisfy students' ordinary curiosity—or, if that isn't enough—for extra credit!

For out-of-school time

A menu full of games will entertain kids all summer, while sneaking in a few informal science and technology lessons—but don't let them know about this latter advantage! See them all in one place at spaceplace.nasa.gov/menu/play.

Also, don't forget about our mobile apps over the summer. Space Place Prime updates daily with new images, videos and articles from The Space Place.

Games "Satellite Insight" and "Comet Quest" are also fun challenges. Find out more at spaceplace.nasa.gov/ios. (Sorry, so far they are only for iPhone and iPad.)



Make these days special

May 3: National Space Day.

Pick a beautiful space poster to download and print for the classroom at spaceplace.nasa.gov/posters/#stars.

May 7: National Teacher Day.

The students should be celebrating you today. On other days, our resources for Parents & Educators should help. Visit spaceplace.nasa.gov/menu/parents-and-educators.

May 12: Mother's Day.

Our tortilla spacecraft contest continues to inspire young engineers. Students can make Mom a spacecraft for lunch today, getting ideas from spaceplace.nasa.gov/tortilla-spacecraft.

June 8: World Oceans Day.

Pick from a diverse set of ocean-related pages and activities at spaceplace.nasa.gov/search/ocean.

June 16: Father's Day.

Any dad would love a Cloud Mobile or a Galactic Mobile. Check them out at spaceplace.nasa.gov/cloud-mobile or spaceplace.nasa.gov/galactic-mobile.

June 21: Summer Solstice, first day of summer.

There's a simple explanation of why we have seasons at spaceplace.nasa.gov/seasons.

We love feedback

Thanks to the many of you who have written to info@spaceplace.nasa.gov to tell us how you use our website in your teaching and informal work with kids. We are happy to be able to bring you this valuable resource to enhance and supplement your curriculum.



High-energy Spy

By Dr. Martin C. Weisskopf

The idea for the Chandra X-Ray Observatory was born only one year after Riccardo Giacconi discovered the first celestial X-ray source other than the Sun. In 1962, he used a sounding rocket to place the experiment above the atmosphere for a few minutes. The sounding rocket was necessary because the atmosphere blocks X-rays. If you want to look at X-ray emissions from objects like stars, galaxies, and clusters of galaxies, your instrument must get above the atmosphere.

Giacconi's idea was to launch a large diameter (about 1 meter) telescope to bring X-rays to a focus. He wanted to investigate the hazy glow of X-rays that could be seen from all directions throughout the sounding rocket flight. He wanted to find out whether this glow was, in fact, made up of many point-like objects. That is, was the glow actually from millions of X-ray sources in the Universe. Except for the brightest sources from nearby neighbors, the rocket instrument could not distinguish objects within the glow.

Giacconi's vision and the promise and importance of X-ray astronomy was borne out by many sounding rocket flights and, later satellite experiments, all of which provided years-, as opposed to minutes-, worth of data.

By 1980, we knew that X-ray sources exist within all classes of astronomical objects. In many cases, this discovery was completely unexpected. For example, that first source turned out to be a very small star in a binary system with a more normal star. The vast amount of energy needed to produce the X-rays was provided by gravity, which, because of the small star's mass (about equal to the Sun's) and compactness (about 10 km in diameter) would accelerate particles transferred from the normal star to X-ray emitting energies. In 1962, who knew such compact stars (in this case a neutron star) even existed, much less this energy transfer mechanism?

X-ray astronomy grew in importance to the fields of astronomy and astrophysics. The National Academy of Sciences, as part of its "Decadal Survey" released in 1981, recommended as its number one priority for large missions an X-ray observatory along the lines that Giacconi outlined in 1963. This observatory was eventually realized as the Chandra X-Ray Observatory, which launched in 1999.

The Chandra Project is built around a high-resolution X-ray telescope capable of sharply focusing X-rays onto two different X-ray-sensitive cameras. The focusing ability is of the caliber such that one could resolve an X-ray emitting dime at a distance of about 5 kilometers! The building of this major scientific observatory has many stories.

Learn more about Chandra at www.science.nasa.gov/missions/chandra. Take kids on a "Trip to the Land of the Magic Windows" and see the universe in X-rays and other invisible wavelengths of light at spaceplace.nasa.gov/magic-windows.

Dr. Weisskopf is project scientist for NASA's Chandra X-ray Observatory. This article was provided by the Jet Propulsion Laboratory, California Institute of Technology, under a contract with the National Aeronautics and Space Administration.



Caption:

Composite image of DEM L 50, a so-called superbubble found in the Large Magellanic Cloud. X-ray data from Chandra is pink, while optical data is red, green, and blue. Superbubbles are created by winds from massive stars and the shock waves produced when the stars explode as supernovas.



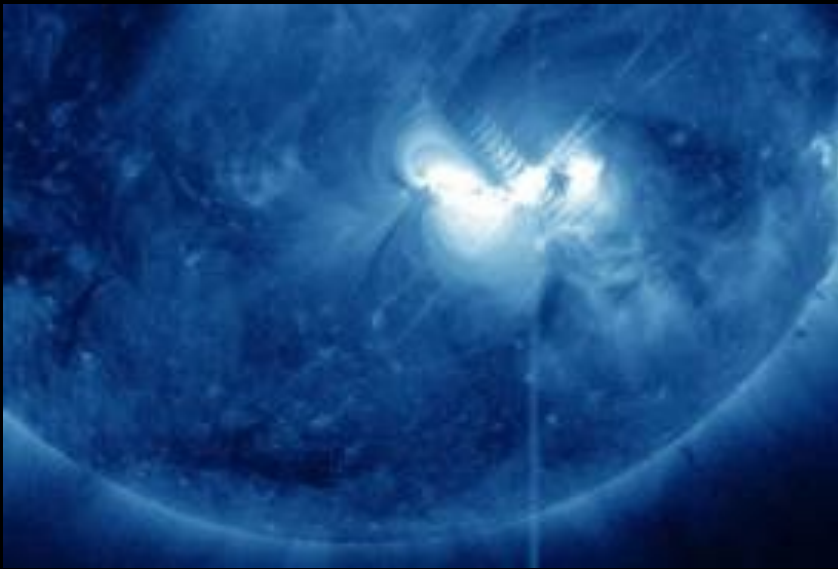
And For The Young Stargazers:
Check out these fun websites from
NASA!

<http://climate.nasa.gov/kids>

<http://scijinks.gov>

<http://spaceplace.nasa.gov>





Wishing you and yours a safe and happy Independence Day!



Where We Meet:

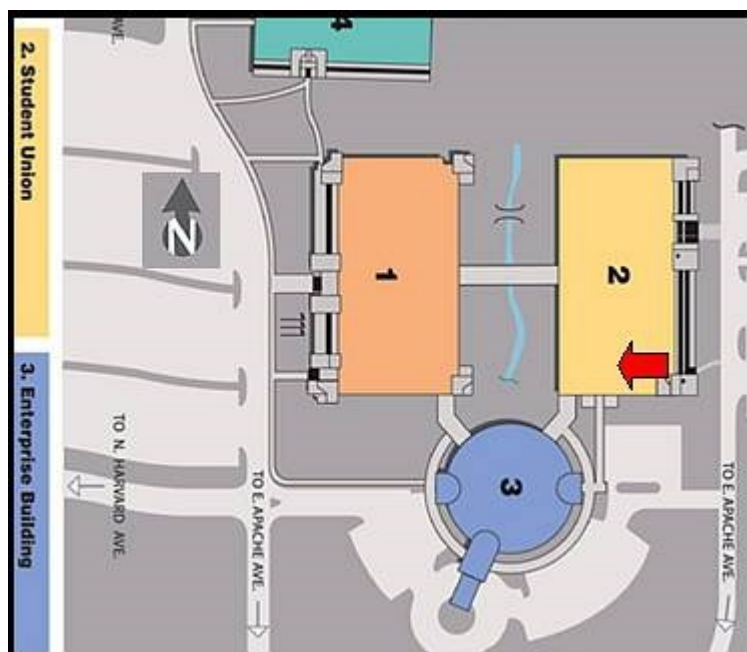
TCC Northeast Campus, 3727 E. Apache St., Student Union Bldg. 2, Room 1603

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/>

We hope to see you there!



Our next General Meeting will be on Friday, September 20 at 7:00 PM.

Please note that we do not have General Meetings during the months of June through August. Please join us at our observatory for our Public Summer Star Parties!

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MEMBERSHIP INFORMATION

MEMBERSHIP RATES FOR 2012 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

Sky & Telescope is \$33 per year.

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. At this time we do not have an option for credit card payment, but we may explore that at a later time.

Link: <http://www.astrotulsa.com/Club/join.asp>



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.

