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TCAA HISTORY UPDATES

Both Lee Green and Carl Wenning have been working hard on different aspects of the TCAA history since earlier this year. Lee has scanned and put online issues of *The Observer* from 1975 to date – a Herculean task covering some 400 editions – many of them 16 pages in length! He's continuing this work, and hopes to have all available issues dating back to the early 1960s before the summer is out. Scanned files are now available through the www.tcaa.us website.

Carl has been putting finishing touches on the 102-page historical volume he has been working on for 25 years, and will soon be incorporating a limited number of pictures within the history itself. The remaining pictures, possibly over 200, will be scanned and prepared for inclusion in a DVD. This DVD will include the *History of the Twin City Amateur Astronomers 1960-2010* as well.

The history will be printed and bound. A very limited number of copies will be available for purchase at cost. The cost is expected to be on the order of \$40 each. A copy or two will be placed in the TCAA library, and other copies will be distributed to members who have requested them (2), and to the McLean County Historical Society. It is expected that both the printed volume and DVD will be available in late summer or early autumn. An electronic copy of the club history will also be available on the club's website.

MY VISIT TO NRAO By Carl J. Wenning



On June 14th I spent the day at the National Radio Astronomy Observatory in Green Bank, West Virginia. After comments following Dan Miller's trip there last year, I decided to take some time during my 10-day trip to the Virginias and Carolinas to see the 110m x 100m off-axis Green Bank (radio) Telescope (GBT). Weighing in at 17 million pounds and large enough to hold three football fields side by side, this is one impressive instrument. The site also is home to the 140ft diameter equatorially-mounted radio telescope, and a number of 25ft to 40ft instruments, three of which constituted the very first radio interferometer – each spaced a mile from the next in a linear array. A 40ft radio telescope is available for use free of charge to local groups such as school groups and scouts, and might even be used by groups of

amateur astronomers under the proper conditions.

The visitor center is exceptional, with lots of great displays – many of them interactive. As one who is rather jaded when it comes to science displays (I've seen more than my fair share), I have to say that this set of displays was exceptional. Without a doubt, the most interesting things for me were the various displays dealing with black body radiation. The center used Ocean Optics Spectrometers and software to show graphically the intensity of spectral lines by wavelength. A 3000-channel spectral analyzer connects to a computer through a USB port giving an amazing display. (See the this URL for information <http://www.oceanoptics.com/Products/usb4000uvvis.asp>.)

While at the Center, I took the time to purchase the book *But it was Fun* that details the history of the NRAO. I'll be donating the book to the TCAA library after I finish reading it, so look for it among the collection at SGO later this summer.

If you don't know much about NRAO, be certain to check it out online and visit it when you get a chance. What a wonderful summer experience! I'm now more interested than ever in following Dan Miller's lead in completing my own Itty Bitty Radio Telescope so I can observe the heavens in yet another wavelength.

The *OBSERVER* is a monthly publication of the Twin City Amateur Astronomers, Inc., a registered 501 (c)(3) non-profit educational organization of amateur astronomers interested in studying astronomy and sharing their hobby with the public.

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Membership Dues

Individual Adult/Family \$40
Full-time Student/Senior \$25
Electronic Newsletter \$25

To join the TCAA, send your name, contact info and dues payment to

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BACK FROM ALASKA

By Carl J. Wenning

Carolyn and I traveled to Alaska from May 21 through June 1. We started with a cruise that originated in Vancouver, BC. We traveled north along the inner passage of western Canada and Alaska for a week, visiting such sites at Ketchikan, Juneau, Skagway, Glacier Bay, Prince William Sound, and College Fjord before arriving in Whittier just outside of Anchorage. We then boarded a train for Denali National Park 400 miles north in the Alaskan interior. During this time we saw lots of wildlife, glaciers, waterfalls, boreal forests, and snow-capped mountains – including Mt. McKinley three days running!

While at the McKinley-Princess Lodge southeast of Denali National Park, we had the opportunity to view a very



unique and impressive aurora program by LeRoy Zimmerman. His work was unique in that it was created with three panoramic still cameras working in rapid-fire unison and sequenced into a 38-minute movie that has a wonderful musical background. The effect of the wide-angle program was nothing less than spectacular!

The Northern Lights and stars of Orion, the hunter, shine above polar landscape, not far from the city lights of Fairbanks, Alaska. LeRoy Zimmerman. See more at photosymphony.com.

After seeing that show, the next morning I visited the Lodge's gift shop and purchased a copy of the book *The Northern Lights* by Lucy Jago. The book details the life work of Norwegian scientist Kristian Birkeland who unlocked the secrets of the aurora borealis. The story of his work is both inspiring and disappointing. Using magnetometers and Maxwell's equations, Birkeland was able to explain that aurora displays result from negatively charged current sheaths interacting with the Earth's magnetic field. Unfortunately, the importance and correctness of Birkeland's work wasn't recognized during his lifetime.

Following the reading of this book, I have a greater understanding of science as both a product and a process. As the sun becomes more active in the current solar cycle, I do hope that the TCAA will spend a bit of time focusing both public and private attention on this very interesting phenomenon. Should anyone wish to read the Jago book, you will soon find it in the club library at SGO.

CLEAN THOSE OPTICS!

It has been reported that Carl Wenning has been a bit concerned about his vision lately. He was most concerned about his ability to detect faint telescopic objects and to see things clearly. Things just haven't seemed as bright lately, and images viewed through his CPC1100 have been a bit blurry – even off color.

Carl reports that at the start of his June 30th observing session, he found out why, and he is no longer concerned about losing his vision! A skyglow filter he had "permanently" placed in the optical train of his telescope was completely fogged with a thin, hazy film – the origin of which was not entirely clear but probably stems from within the sealed telescope itself. LOL!

The next morning Carl was found cleaning all exposed optical surfaces on his telescope. He will now be able to see much more clearly. Carl has a word to the wise, "Clean those optics!"

AL OBSERVING PROGRAM STANDINGS—QUARTERLY REPORT

Below is a listing of the status of observers pursuing AL observing programs reported as of June 30th. If you would like to have your information included in next October's listing, be certain to forward your observing totals to Carl Wenning by the end of September. Be certain to get your completed observing records to our ALCor, Duane Yockey, as soon as the observing program is complete so that you might be appropriately recognized on a timely basis. Our next award presentation will be at the Annual Meeting in February.

AL Award	Brian Barling	William Carney	Lee Green	David Hahn	Chuck Mosier	Dave Osenga	Carl J. Wenning	Duane Yockey
S. Skies Binocular 50							(50)	(50)
S. Sky Telescope 50							(52)	(50)
Telescope Messier Prov70/ Hon110	(110)	(110)	108*	(110)		70*	(110)	31
Binocular Messier 50		(100)	72*	22	8		(78)	49
Deep Sky Binocular 60		60*						
Herschel 400 Club	268	(400)	(400)				(400)	
Urban Club 100		(100)	100*				(100)	
Comet Club Silver12/ Gold30		(31**)					4	
Double Star Club 100	17		51				(100)	
Planetary Neb Club Ba- sic60/Adv110		1					(72*)	
Globular Cluster Club 50			33				65*	
Lunar Club 100	(100)	(100)	(100)			(100)	(100)	
Lunar II Club 100		34						
Asteroid Club Reg25/ Gold100		(52)						
Earth Orbiting Satellite 28		5		13			3	
Outreach Award Basic10/ Stellar60/Master160			(*, **)				31 ^h -'06* 26 ^h -'07 44 ^h -08** 43 ^h -'09 2.5-'10	

- Program or first award level now complete. ** Second award level now complete. *** Third award level now complete. AL recognition (certificate and pin) will be given at the next general membership meeting if available. Numbers in parentheses (#) indicate that the associated pin and/or certificate has been received.

JULY SKY GUIDE

- 03** The Moon passes 7° north of Uranus, 3 P.M. 
- The Moon passes 7° north of Jupiter, 8 P.M. 
- 08** Asteroid Juno is in conjunction with the Sun, 11 P.M.
- 09** Venus passes 1.1° north of Regulus, 10 P.M. 
- 11** Total solar eclipse, 3 P.M. 
- 12** The Moon passes 4° south of Mercury, 8 P.M. 
- 14** The Moon passes 6° south of Venus, 8 P.M. 
- 16** The Moon passes 6° south of Mars, midnight 
- The Moon passes 8° south of Saturn, 2 P.M. 
- 27** Mercury passes 0.3° south of Regulus, 6 P.M. 
- 28** The Moon passes 5° south of Neptune, 2 A.M. 
- 30** The Moon passes 6° north of Uranus, 10 P.M. 
- 31** The Moon passes 7° north of Jupiter, 4 A.M. 

JUNE OUTREACH

On Friday, June 11, Lee gave a presentation to the Danvers Public Library's Summer Reading Group which primarily included elementary students. His presentation covered an introduction to astronomy and the Solar System. He highlighted several NASA missions and showed his telescope to the 60 people who attended.

The June members-only meeting and summer picnic was held June 12 at the home of Dan Miller. The skies were mostly cloudy, so we didn't do any observing, but Dan and his family were gracious hosts a few members including Duane, Jetty and Chris and Lee. We ate well and often and were entertained by all the stimulating conversations.

Sunday, July 20 saw the club highlighted in a feature article in the Pantagraph written by Scott Richardson. The article reviewed our activities associated with our 50 year anniversary and posted our calendar for the rest of the year. President Dave Osenga was quoted as he spoke about "the awe factor" and the article showed several astro-photos by Lee Green.

Our June 19 Public Observing Session was very successful. Duane Yockey gave a great presentation on the Virgo Cluster of Galaxies and Dave Osenga pointed out the constellations during the laser-guided sky tour. Eight members were present and we had six telescopes set up for the 30 guests to observe.

On Saturday June 26, we assisted with the 6th annual Great American Backyard Campout held at the Sugar Grove Nature Center. Carl, Dan, Lee and William set up scopes for the campers to view a variety of objects including Venus, Mars, Saturn and the ever popular Full Moon. There were 71 campers including a bunch of young kids, so we were glad to get a chance to show them the sky and were greatly rewarded with many oohs and aahs. I think they were happy to have us there, and that is good since we like happy campers.

Upcoming Events

The July Public Observing Session will be held on Saturday July 17. The featured subject is Globular Star Clusters, many of which will high in the sky during that evening.

The Sugar Grove Nature Center is hosting some of the Ecology Action Center summer nature camps on July 29. We did a program about the Moon and an abbreviated observing session for them last year and we have been invited back this year.

JUNE 26 OBSERVING SESSION FOR MUSEUM

On Saturday, June 26, Lee Green, William Carney, Dan Miller, and Carl Wenning held an observing session at SGNC for 71 campers from Children's Discovery Museum in Normal. Despite the full moon, our observers meritoriously tried to show what the sky obtained to mostly pre-school children and their parents. Unfortunately, the full moon was the least of our problems.

Following after a day that reached 92 degrees with high humidity, the evening sky was milky and bright to say the least. Dew formed almost immediately on the corrector plates of some telescopes despite the presence of dew shields, and fog was observed gathering in the ravine just north of SGO.

Venus, Mars, and Saturn showed nicely, but the just risen moon was ruddy and nearly featureless as a result of the dew settling on optical surfaces. Views of some of the brighter M objects were difficult, though a few double stars showed nicely.

Despite these problems, many young viewers were very happy with a chance to take a peek at the heavens. Parents were happy to learn about the upcoming public observing session that holds much greater promise for good viewing. Shortly after 9:30 p.m., the International Space Station passed nearly overhead at a magnitude of -3.4, and observers viewed it. Observing continued to around 10:30 p.m. at which time clouds moved in from the northwest.

From March through October each year, the TCAA holds monthly public observing sessions on the Saturday typically nearest the first quarter moon. All programs are free of charge and open to the public. The sessions are held at Sugar Grove Nature Center. In 2010, we will hold the observing sessions on the dates and time listed below. Each session will focus on a particular celestial phenomenon, though additional prominent sky objects such as planets, nebulae, star clusters, and galaxies are viewed when visible. A typical public observing session includes the following components:

- ☆ *Lecture about the featured object.* This 20-30 min. presentation, held in the SGNC picnic shelter, includes images of and details about the featured sky object as well as information on other interesting celestial objects that might be viewed that evening.
- ☆ *Sky tour using a laser pointer.* We step out under the stars to point out the major constellations and planets, and to designate the location of the featured celestial object for the evening.
- ☆ *Telescope observing session.* We use telescopes at ground level to observe the featured objects and other wonders of the heavens.

Date	Featured Object	Time	Coordinator(s)
July 17	Globular Star Clusters	9:00pm - 11:00pm	Duane Yockey & David Osenga (?)
August 14	Planets and the Zodiac	8:30pm - 10:30pm	Carl Wenning
September 11	Stars of Red, White and Blue	7:30pm - 9:30pm	Dan Miller
October 16	Perseus double	7:00pm - 9:00pm	John Werner

A detailed brochure dealing with the 2010 public observing sessions can be downloaded from the TCAA website at www.tcaa.us.

Members-only observing sessions usually are held on the Saturday nearest the full moon and are typically held one week prior to public sky viewings. MOOS programs are held throughout the year, but only if the temperature isn't too low and the wind too high during the winter. Because the TCAA Board has agreed to dispense with coordinators for the members-only events, TCAAs should pay attention to monthly reminders that will be distributed electronically through the club's listserv.

BIG BINOCULARS By Carl J. Wenning

I have often followed William Carney's example when it comes to completing AL observing programs. While his pursuit of faint comets and near-Earth asteroids is inspiring, it has been his dedication to binocular observing that has influenced me most recently.

On June 11-12 I attended the 40th annual Apollo Rendezvous hosted by the Miami Valley Astronomical Society of Dayton, OH. While there, I visited a display by Oberwork – purveyor of big binoculars from Beaver Creek, OH, just east of Dayton. After an overnight reflection, I decided to purchase a used set of 22x100 Oberwork binoculars in excellent condition.

Ten days later, I was able to get a good view of the moon and verify that these were the binoculars for which I was looking. A day after that, I went to the Oberwork showroom to purchase an "extended" Jarrah tripod and a Universal Astronomics T-Mount Light to assist with my observations. (After all, the binoculars weigh 8.8 pounds.) I have not been disappointed.

I completed the AL's Binocular Messier program last year and was quite pleased with the 15x70 Celestron Binoculars I had used. Still, I wanted more power than 15 and didn't want to reduce the surface brightness of extended objects (nebulae, galaxies, SNRs, etc.) that higher power would entail; hence, the larger aperture. The 22x100 provides a 50% boost in

magnification and retains 95% of the surface brightness of extended objects. The field of view in the 22x100 is 2.8 degrees as compared to my 15x70's 4.4 degrees. While the smaller field of view will make things more difficult to find, they will be easier to observe. This is an acceptable offset as I see it.

So, as soon as the moon gets out of the way, I'll be viewing deep sky objects with my new pair of binoculars. Early next month I'm heading for the dark skies of Padoka Lake in southern Indiana to view with a friend in the Evansville Astronomical Society. I'll report back when I return.

By the way, I was lucky enough to win the book *David Levy's Guide to Variable Stars* as a door prize. When I finish with it, I'll add it to the club's library at SGO.



WEB BASED ROBOTIC TELESCOPES

By John Werner

Most humankind has lost its intimacy with the night sky, because 70% of us reside in light-polluted skies. Ancients marveled at the wonders of the dark night sky and created their unique cultural-based mythology around constellations, wandering stars (planets), hairy stars (comets), falling stars (meteors), and the turning of the Moon a fiery red (Lunar eclipse).

Just as Lick Observatory was the first professional observatory to be located in dark skies, away from a city-located university center, amateur astronomers since the early 2000's can photograph their favorite celestial objects over the web from observatories located in the dark skies of New Mexico and Australia (Global Rent-a-Scope.com); the Canary islands, Chile, and Australia (Slooh.com); Lightbuckets.com (New Mexico), and Cherrymountainobservatory.com (Texas) - to name the best-known.

The author has experience with Slooh (a resource used for my Millikin Astronomy Lab course) and Global-Rent-a-Scope (user since January 2009). Please see the March 2010 S & T's "Observatories on the Web" article written by Andy Macica for a good overview of web based observatories, which provides more detail than I can cover here. My purpose is to give a user's perspective and some sample images.

Slooh, founded in 2002, is designed to be easy to use, is affordable, and is a great option for the beginning astro-photographer. The equipment is a combination of SCT's and moderate-size refractors, with one very impressive 20" instrument located in the Canary Islands. An easy-to-use reservation system allows you take astro-photos in five minute increments. CCD camera sensitivity provides good images that you can store and send to friends through the popular social networks, such as Facebook. Or, you can follow along to view the results of other reservation plans. I used Slooh to highlight objects that were aligned with the astronomy lab topic and I timed viewing to sync up with evening class time – very impressive for students to view live-projected images from a telescope thousands of miles away. Other features of Slooh are Slooh Kids "Mission Packs" run by Otto the night watchdog – super learning experiences for the young astronomer (and old!) and regular online "live" tutorials by well-known astronomers.

Slooh does not provide personal access to control a telescope, but the price is right and you will enjoy the experience. Where else can you get quick and easy access to the Southern sky!

If you are looking for the complete remote control telescope imaging experience, at a cost, then I suggest Global Rent-a-Scope. The following image of NGC5139 cost me 51 points at 161 points per hour and one dollar per point. Nineteen minutes total to setup the focus, guiding, and the five luminous "filter" exposures. You can do the math. The cost per hour is higher for moonless nights and larger telescopes. In this case I used the ASA 16" astrograph with an STL-11000 CCD camera, on a moonless night, at 9:30pm local time, from Australia. Yes, you can tell from the full image shown here that the field of view is small and captures the full extent of famous Omega Centauri - the largest and brightest globular cluster viewed best from the Southern skies. You have options to control object selection, the focusing, the guiding, filter combinations, and exposure times.



And you can also do narrowband imaging, just like the Hubble telescope. Follows is NGC3372 (The Keyhole Nebula) taken with OIII (as red), H α (as blue) and SII (as green) emission lines. Although you do not see the color, you can get an idea of the detail one can achieve.

WEB BASED ROBOTIC TELESCOPES

(Continued from page 6)



I imaged for 35 minutes, at a cost of 29 points, with 68% moon illumination. Only five-five minute exposures with a TAK FSQ 106mm refractor and SBIG 11000 CCD camera to achieve this result. Narrowband imaging is not affected by bright moonlight, because you are limiting you captured photon wavelengths to very narrow portions of the spectrum - unique to emission nebula. I have read that one cannot set up their own remote observatory for less than \$60,000. A pretty good argument for renting, where you have access to the finest equipment and locations.

Another great feature is that you can monitor image-by-image results and if needed you can abort the sequence at any time.

OK, besides cost, what are the downsides?

1. You lose a sense of overall personal accomplishment that is inherent with setting up your own equipment and enjoying the results of the complete imaging process.

2. You have control of the all of the equipment, ensuring you have clean optics and filters.

I have found that the flats and darks taken with rented equipment may not be as "clean" as you would like. Fortunately, with image processing, you can get the unwanted lack of quality out of the final image. This goes for bad pixel lines in some of the CCD cameras.

3. I found the weather at the near-coastal location in Australia to be imperfect – unlike the high desert one finds in New Mexico or Nevada, although I have seen quite a bit of overcast weather at the New Mexico location.

Overall, I can recommend Global Telescopes as an option, as Global offers the whole telescope control package. You can be very selective with your use of points, and in my case, I am imaging objects that I would not be able to without travel and significant upgrades in equipment. Look at their trial membership offer.

Now that I may have piqued your interest, I leave it to you to investigate the other web sites mentioned. My brief review of these sites indicates less ability to control your imaging experience, but that may be attractive to you. If you have questions, do not hesitate to contact me.

CONSTELLATION OF THE MONTH: CORONA BOREALIS—THE NORTHERN CROWN

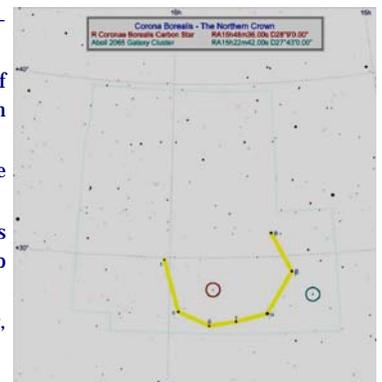
The Northern Crown is a small constellation best seen in the summer months. The constellation lies between Bootes and Hercules.

In mythology, the jeweled crown is said to be the wedding gift from Bacchus to his wife Ariadne, daughter of the king of Minos. When she died, Bacchus threw the crown into the heavens where the gems became a crown of stars.

Astronomically, Corona Borealis is the 73rd largest constellation covering just 179 square degrees and is the 50th brightest constellation. It reaches opposition on May 19th.

Corona Borealis has one named star, Alphecca, the Bright One of the Dish, which is sometimes known as Gemma, the Gem Star. One interesting variable star is R Coronae Borealis which is a carbon star with a deep red color.

There are few prominent deep-space objects in Corona Borealis. Most galaxies are rather dim. However, Abell 2065 is a cluster of ten faint galaxies.



GOING DEEP

By Lee Green

During a few of my recent imaging sessions, I took a series of test images using a quick set of exposures. One of these was the Whirlpool Galaxy, M51. The results were interesting because, while I was pleased with the image, it clearly showed the limitations of having a small signal-to-noise ratio (SNR).

With astrophotography, the exercise is always to maximize the SNR. Noise shows up in a variety of ways including light pollution, thermal noise from the electronics and other sources. In order to achieve any image, it is necessary to have a signal that is larger than the noise. If the signal is only as large as the noise, it is impossible to distinguish between the celestial source and the background. In order to achieve a good image, we need to make the SNR as large as we can.

One way to increase the SNR is to decrease the noise. There are a couple of easy and practical ways to do this. To minimize light pollution, this means imaging from a dark sky site. I often image from my back yard in Normal for convenience. If I travel to Sugar Grove, the light pollution is much less. If I were to travel to some site in New Mexico at a higher elevation, I get the darkest possible skies and lower atmospheric distortion, but that quickly becomes impractical.

We can get a pretty good model of the thermal noise by taking images where the shutter is closed. These are called "dark frames" and they can be subtracted from an image to further reduce noise through a process called calibration. To minimize thermal noise, we can also cool the camera. Several CCD cameras have built-in coolers that reduce the temperature of the imaging electronics using a thermocouple. My SBIG camera can reduce the temperature by 20°C which sounds like a lot. But since the thermal noise is related to the temperature in degrees Kelvin, the actual reduction in thermal noise is only 5-7%. For the best possible images, this technique should be employed.

The other choice to increase the SNR is to increase the signal so it is much larger than the noise. The simplest way to do this is to increase the length of the exposures. In practice, there is a limit about how long a single exposure can go. All CCD chips have a limited capacity for digitizing incident light. Once a cell is saturated, additional light will not increase the signal, and in some cases will cause the excess signal to spill over to adjacent cells – a process called "blooming."

The other technique to maximize the signal is to increase the number of exposures. Since noise is random by definition, we can reduce the noise by "stacking" a series of images together. The celestial signal will add since the object is relatively constant, but the noise will tend to cancel.

The image demonstrates all this. In the first image, I took a set of 5 exposures of 10 seconds each. When I "stretched" the dynamic range of the image, the noise became clearly visible. In the second image, I took 12 sets of exposures at 100 seconds each, so the signal was much larger. The noise was larger too, but the SNR was greatly increased and the quality of the image was clearly improved.



TCAA Treasurer's Report – June 2010

OPERATING FUND BALANCE – May 31, 2010 - \$ 2,219.46

Income

Sean Christian (dues) - \$ 40.00
Mark Cabaj (dues) - \$ 40.00
Josh Lindsey (dues) - \$ 40.00
Gerry Schroeder (dues) - \$ 25.00
Randall Byland (dues) - \$ 40.00

Expenses

LYB Inc. (June Observer) - \$ 28.92
Carl Wenning (NASA per diem NCRAL) - \$ 73.14
Secretary of State (annual report) - \$ 13.00
William Carney (SGO repairs) - \$ 168.63
Astronomical League (annual dues) - \$ 220.00

OPERATING FUND BALANCE – June 30, 2010 - \$ 1,900.77

OBSERVATORY FUND BALANCE – May 31, 2010 - \$ 3,060.61

Income

Donation (Mark Cabaj) - \$ 60.00
Donation (Danvers summer reading) - \$ 50.00
Keyholder Fee (Josh Lindsey) - \$ 5.00

Expenses

None - \$ 0.00

OBSERVATORY FUND BALANCE – June 30, 2010 - \$ 3,175.61

TOTAL TCAA FUNDS – June 30, 2010 - \$ 5,076.38

Respectfully submitted, L. Duane Yockey, Treasurer

Sugar Grove Observatory

Listing of Official Keyholders (Paid \$10 deposit/\$5 renewal)

Duane Yockey (renewed through 2009)
William Carney (renewed through 2010)
Carl Wenning (renewed through 2009)
Brian Barling (renewed through 2010)
David Osenga (renewed through 2010)
Josh Lindsey (renewed through 2010)
Dan Miller (renewed through 2009)
Lee Green (renewed through 2009)

MISSING OUT ON TCAA ACTIVITIES & EVENTS?

If you are missing out on club activities or celestial events, be certain to join the TCAA listserv. Many activities are planned at the last minute, and announced only hours in advance through the club's listserv. Reminders about celestial events are also broadcast to the membership through the club's listserv. To join this free service by Yahoo, send a blank email to TCAA-subscribe@yahoogroups.com. Unsubscribing is just as easy. To unsubscribe, just send a blank email to TCAA-unsubscribe@yahoogroups.com.

To keep up to date on celestial events not described in *The OBSERVER* or addressed in the listserv, visit Carl Wenning's observing page at www.phy.ilstu.edu/~wenning/observing_page.htm. It has been recently updated to include an extended sky calendar of events as well as additional space weather and satellite viewing links.

The OBSERVER

Newsletter of the TCAA, Inc.

Erin Estabrook, Editor
314 Covey Court
Normal, IL 61761

Are your dues due?



The Dues Blues?

If you see a check in the box above, it means your dues are due. To retain membership, please send your dues renewal to our esteemed Treasurer:

**Duane Yockey
508 Normal Avenue
Normal, IL 61761**