Desert Skies

Tucson Amateur Astronomy Association

Observing our Desert Skies since 1954

Fall 2014 Volume LX, Issue 3

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Take Note!

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The California Nebula

The California Nebula (NGC1499) lies relatively close to us at a distance of only 1500 light years. That places it within the same galactic arm, called the Orion Arm, as the Sun. This emission nebula is about 100 light years long. It can be found in the constellation Perseus. It extends for almost 2.5 degrees, so about 5 moon diameters. The bright star in the image is Xi Persei which is a 4th magnitude star. Use this star to help find the nebula. Low surface brightness makes this a difficult object to observe visually, but a fine one to photograph.

TAAA member Howard Bower photographed the California Nebula using his Takahashi FSQ106ED and Finger Lakes Instrumentation ML16803 CCD on a Astrophysics Mach1 GTO mount. Tracking was accomplished with a converted Takahashi 50 mm finder scope and a Lodestar autoguider. Astrodon 5nm filters were used to create this image which is composed of 38 exposures in H-α (each 30 minutes long), 36 exposures in OIII (each 15 minutes long, binned 2x2), and 35 exposures in SII (each 15 minutes long, binned 2x2). Used by permission.

Our mission is to provide opportunities for members and the public to share the joy and excitement of astronomy through observing, education and fun. We fulfill this by providing Astronomy Services to schools, church groups, scout troops, and convention organizers. We support many organizations in the Tucson area that are involved in Science, Technology, Engineering and Mathematics (STEM) programs. Our members enjoy observing the night sky under the dark skies that our observing sites offer. We are an all-volunteer, tax-exempt, non-profit, 501(c)(3) organization.

Frequency

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Publishing Guidelines

Desert Skies is published quarterly, near the dates of solstice and equinox. The deadlines for publication are March 1st, June 1st, Sept 1st, and Dec 1st. Submissions should be emailed to the editor at taaa-newsletter[at]tucsonastronomy.org. Submissions should be in the form of a text or Microsoft Word compatible file. Photos and artwork are encouraged. Please send these as separate attachments with resolution of at least 200 dpi (higher is preferred). Submissions are retained by the editor unless prior arrangements have been made. Copyrighted materials will not be accepted unless permission to use is clearly stated. We will not publish slanderous or libelous material. All copyrights retained by Tucson Amateur Astronomy Association, Inc. or the original author.

Contacting the TAAA

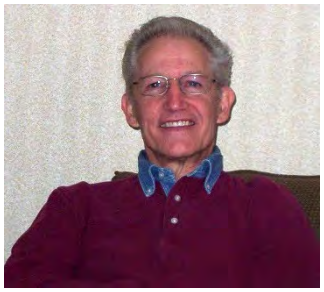
Editor: taaa-newsletter[at]tucsonastronomy.org

TAAA Board of Directors: taaabod[at]tucsonastronomy.org

www.tucsonastronomy.org

520-792-6414

PO Box 41254, Tucson AZ 85717



From Our President

I hope everyone had a great summer…and welcome back to our winter residents and to those who went away for the summer. With the passing of our monsoon season it is time to welcome a new observing season.

I would like to bring everyone up to date on what has been happening over the last several months and share a few thoughts with you.

As many of you are aware, we have reestablished our practice of having a social period with refreshments after our monthly meetings. This offers us the opportunity to meet, greet and have discussions with friends and associates in a relaxed and friendly manner.

Earlier this year we instituted online membership renewals to make that process easier for our members. Many of our members are taking advantage of this convenience. Also, we are encouraging new members to sign up on the website.

In a related development, our Treasurer, Ed Foley, has been working hard to set up a process whereby we will be able to accept credit cards. I am happy to inform you that effective September 1st, we will begin accepting payment via credit cards at our monthly meetings and at special events. This will be a great convenience to our members, our treasurer and the community at large.

A few years ago, we used to have door prizes at the end of every meeting. However, due to lack of vendor interest, door prizes were discontinued. For the last several months, our Door Prize Coordinator, Cheryl Kelli (with the assistance of Bill Lofquist and Chuck Hendricks), has been diligently working to reestablish this time-honored tradition. Those attending our September general meeting were pleasantly surprised by a variety of very nice gifts from our supporting vendors. In addition to our long time sponsors – Starizona and Stellar Vision – Orion telescopes and Astronomy Magazine have donated some very nice items. Initially, the door prize program will be run on a quarterly basis – the next one will be at our Holiday Party in December. If we get more donor interest, it will be possible to have door prizes more often. (Stop by Stellar Vision and/or Starizona for all your astronomy needs and be sure to thank Frank Lopez at Stellar Vision and Dean Koenig at Starizona for their support of TAAA.)

Finally, your interest, your support and your viewpoints are very important. We are working very hard to establish lines of communication and to create avenues for free and open interaction.

- Earlier this year we set up a suggestion box that would allow you make suggestions and offer feedback. The suggestion box is at each meeting.
- More recently, we instituted a survey program. We will use this program to invite you personally to give your comments and feedback on particular courses of action that we are planning. The Dark Site Survey earlier this month is an example.
- From time to time we need a volunteer to fulfill a particular position or to help out at a particular event. Sara Liberty-Laylin (our Volunteer Coordinator) will be contacting you in a quest to fulfill those requests.

(Continued on page 3)

Program

Chiricahua Astronomy Complex Director's Report

Text by John Kalas (cac-director[at]tucsonastronomy.org)

With the complex approaching its fifth anniversary, some of the facilities are showing signs of requiring some maintenance. Of course, fighting Mother Nature with the weed issues is an annual effort. As we expand the site and develop more facilities, the maintenance considerations will continue to increase. Currently, there are a number of maintenance tasks that require attention before the end of the year. Painting, spreading gravel and addressing the weed issues are some of the items which need to be addressed. We would like to form a maintenance committee, so we are looking for volunteers who would be willing to periodically work at the site. If you would like to support the complex through offering to help out with the maintenance requirements, please contact me at cac-director[at]tucsonastronomy.org. Thank you.

The CAC Site has been open since February 2010 and has expanded its facilities since then. There are several projects in the works to improve the complex even further. One of those projects, which is well-along in its progress, is the ramada. This facility will add much-needed shade to the site, as well as provide a great place to socialize with the addition of picnic tables and a gas grill. The ability to cook your own hot meal before a star party would be fantastic!

The ramada is being funded by the Engraved Brick Program whereby members "purchase" either a 4"x8" or 8"x8" brick engraved with their own information. The brick(s) will be placed into the recently constructed Engraved Brick Patio adjacent to the ramada. As our treasurer, Ed Foley, stated at the September monthly meeting, we only need about $3,800 more to erect the steel roof. This equates to about 30 - 38 more bricks depending on which size brick is ordered. If you haven't yet participated in this fundraising program, please consider joining us to complete the project. Details can be found in Bill Lofquist's article following.

(Continued from page 2), President's Message

- We are proceeding with tests to provide live streaming of our general meetings so members who cannot attend them in person, can do so online. I will have more on this in the near future.
- Most people have fun and enjoy astronomy more when they volunteer. Are you one of those people? Tell us how you can help us to make the TAAA a better organization and reach our outreach potential. Can you volunteer an hour or two (or more) per month? What are your areas of interest? If you want to help, but not sure how, contact Sara – she can help you. Let us know.

As always, your suggestions are valued and taken seriously. You may contact me, or any member of the board, or submit them anonymously through the suggestion box.

Please remember, through understanding, cooperation, enthusiasm and dedication, we can accomplish great things.

Bob Gilroy, TAAA President
President[at]tucsonastronomy.org

Chiricahua Astronomy Complex Outdoor Education & Activity Center

Text and photos by Bill Lofquist
(cac-director[at]tucsonastronomy.org)

We are about to complete an important feature of our observing site at the Chiricahua Astronomy Complex (CAC) in Cochise County – the Outdoor Education/Activity Center. It is an open-sided ramada which will provide much-needed shade and a covered area to do training, have picnics, and share time with friends when we are not observing.

Patio detail.

As Ed Foley, our Treasurer, announced at the General Meeting of TAAA on September 5th, we are now in easy reach of having the funds for building the

(Continued on page 4)

The Chiricahua Astronomy Complex patio, with about 85 bricks purchased to support the development of the Outdoor Education & Activity Center. Bricks recognize individuals, programs, and events and are purchased by TAAA members, individuals in the community, or groups. Brick details are shown below.

(Continued from page 3), Chiricahua Astronomy Complex Outdoor Education & Activity Center

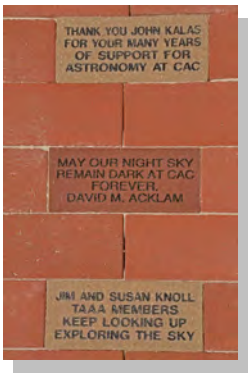
Ramada. We need only 38 to 40 more brick orders to do the building. As you may know, we are using an engraved brick approach to generating the funds for this facility.

We now have about 85 bricks in the patio. We hope our members will help us solicit more bricks to complete this important project. As you can see from the pictures below, we have a good variety of messages on the bricks that are already in place.

The bricks come in two sizes: 8" X 8" and 4" X 8". A contribution of $150 will purchase the larger brick, and $120 will purchase the smaller one.

The order form for the bricks can be found on the TAAA website.at http://tucsonastronomy.org/TAAA_CAC_Brick_Program.pdf. As the instructions indicate, you can send your order to the Treasurer, P. O. Box 41254, Tucson AZ 85717.

If you have not visited our great facility at CAC, we encourage you to do so.



Community Involvement & Outreach

Grand Canyon Staff Thanks Amateurs for Their Contribution

Contributed by Jim O'Connor (gcsp[at]tucsonastronomy.org)

The TAAA excels at raising the public's awareness of the night sky environment by providing scientific education and views of the wonders of the universe with our hands-on demonstrations and telescopes at locations around Pima, Pinal, and Cochise county. We also team with the National Park Service to perform this same experience to visitors to the Grand Canyon. Each June, for the past 24 years, we've enabled the gathering of astronomers from across the continent, and even the world, for the Grand Canyon Star Party (GCSP). This year at the GCSP, it was stunning in that we had 20% fewer astronomers than previous years, ninety-one, yet we serviced nearly 20% more visitors than ever before, nearly 71,000 visitor contacts over the week. Our instruments were set up around the park during the day for solar and planetary viewing and over 50 telescopes each night behind the Visitor Center for some tremendous dark sky viewing. Each night, a sunset theater presentation and three constellation tours were given. The theatre presentations were given by various people, but the constellation tours were given mostly by TAAA members Jim O'Connor and Dr. Alan Delman. In all, the TAAA was responsible for opening the universe to tens of thousands of visitors over this 10-day period. One of Jim O'Connor's tour members said it best. Jim was pointing out the claws of Scorpius that reside in Libra, Zubenelgenubi and Zubeneschemali, and he kidded that there would be a quiz in the morning before exiting the park. The visitor replied, "I'm not worried. I could stay here forever."

On the next two pages is a letter of thanks from the National Park Service for GCSP 2014. The TAAA can be very proud of what we have made possible.

Start Planning Now

25th Annual

Grand Canyon Star Party

June 13-20, 2015

Future Community Outreach Opportunities

TAAA has lots of opportunities for your to bring your passion for astronomy to others, young and old. Consider joining in the fun at one or more of these events. Contact Terri Lappin, Starry Messenger SIG Coordinator, at smsig[at]tucsonastronomy.org for information.

- Arizona Science and Astronomy Expo Nov 1 & 2 - Need 10 people
- Arizona STEM Adventure (formerly FunFest) Nov 14 - Need 2 people
- Southern Arizona Research, Science and Engineering Fair Judging, Mar 10 - Need 4 people
- Tucson Festival of Books/UA Science City Mar 14 & 15 - Need 15 people
- Astronomy Day/Astronomy Festival Apr 25 - Need 6 people

United States Department of the Interior
NATIONAL PARK SERVICE
Grand Canyon National Park
P.O. Box 129
Grand Canyon, Arizona 86023

August 17 2014

2014 GCSP Participants
c/o Jim O'Connor of TAAA

Dear Grand Canyon Star Party (South Rim) 2014 Participants:

THANK YOU ALL for making the 24th annual Grand Canyon Star Party a smashing success! Once again you all educated and inspired huge numbers of visitors from around the globe. They appreciate it and so does the National Park Service.

I have finally tallied the Contacts and Hours forms that were turned in (THANK YOU!), and I did some extrapolating to fill in the gaps. Thanks to the later dates this year (June 21-28 instead of June 8-15 last year) combined with fewer clouds, contact numbers were up a lot year to year. In fact, you hit **a new record for astronomer/visitor contacts: 70,852!** That compares to a "mere" 47,068 in 2013.

I was thrilled this year to have Will Golz arrive Thursday the 19th to help with set-up, in addition to helping with the nightly setup Saturday & Sunday. First time I've had advance help *& I like it*; thank you, Will! Thanks also to Bill & Annette Golz for getting him here early.

I was also delighted to see a full troop of O'Connors. Jim puts in endless hours before, during and after and wears all sorts of hats during the event; Susan helps organize us as well as putting in many hours at their videoscope; Karina & Stephen were my indispensable assistants during setup every night; Andrew made wonderful use of the phrase "Can I help you with anything?"; Thomas held my mini-Vox speaker for me and Gloria supported this support crew. Three cheers for the whole O'Connor clan!

Thanks to Ginger Applegarth, Andrew & Stephen O'Connor, & Jan Cossette for helping me get an actual visitor count on two nights (1,138 Wednesday and 1,403 on the final Saturday).

- **Total night and day astronomer-visitor contacts: 70,852** (vs. 47,062 in 2013); 64,648 by night and 6,204 during the day.
- **Estimated total nighttime attendance: 8,757** (vs. 5,871 in 2013). That's an average of 1,095 visitors per night looking through about 6-9 telescopes apiece. Another **4,963 looked through telescopes by day**, (assuming 1.25 scopes each), compared to 3,058 in 2013: good to have Sim Picheloup back!
- **Total slide show attendance: 1,813** (full every night except Thursday). Thank you Dr. Jim Rice, John Anderson, Marilyn Unruh, Jim O'Connor, Dr. Andy Odell & Dennis Young for presenting those!
- **Constellation Tour attendance (at 9:00, 9:30 & 10:00 pm nightly): 848**. Thank you Jim O'Connor, Alan Delman, Chuck Schroll & Andy Odell for doing most of those!
- **91 registered volunteer astronomers donated 2,157 volunteer hours with 33-51 telescopes set up each night.**

Looking specifically at your stat sheets:

- The amazing and indefatigable Dennis Young once again clocked the most hours: a staggering 111 ½ (67 ½ by night and 44 by day). I believe he also had the biggest scope, the

(Continued from page 6) Grand Canyon Thank You Letter

longest lines, and of those who made a serious effort at counting, the highest visitor contact count at 3,014—not counting the full house at his theater presentation.

- Others who logged over 2,000 visitor contacts include Craig Averell, Deborah Clauss, Jack Huerkamp, Sim Picheloup, & BreAnna Weber.
- Sim Picheloup got the most daytime contacts, at 2,096.
- I believer newcomer Gary Fix from Massachusetts got the Marco Polo award this year, and added a new element to the program with his sextant & navigation lessons.

A big thanks to everyone who supported the event by running the shirt shop and serving as social coordinator (Ginger Applegarth), organizing social events (Susan & Jim O'Connor, Ginger, Steve Ratts & George Barber, and the campsites (Bill & Mary Lofquist), donating two Celestron Firstscopes for giving away to two happy kids (Kevin LeGore) and assisting in all sorts of other ways (so many of you!).

Thanks also to those of you who made your telescopes easier to find by adding red lights. I was especially impressed by John Anderson's red battery-powered string of Christmas lights wrapped around his scope and attracting nearly double his usual number of visitors, and Mike Magras's converted solar-charged driveway lights covered by red Dixie cups! **If you DON'T have some sort of red lights for your scope or tripod, please work on that for next year. Also if you only have a high-powered laser pointer, please get a 5-mw one as I intend to start enforcing that rule except as necessary for Constellation Tours.**

And of course thanks to ALL of you for setting up your scopes and sharing them patiently and enthusiastically with visitors, not to mention getting yourselves here in the first place. Your time and energy was well spent in touching lives and making new converts to amateur astronomy and the preservation of dark night skies!

Nice going, everyone.

Mark your calendars for **June 13-20, 2015** – the 25th Annual Grand Canyon Star Party! I hope to see you all then.

Sincerely,

Marker

Ms. Marker Marshall
Park Ranger—Interpretation
Grand Canyon National Park
(928) 638-7830
marker_marshall@nps.gov

"Grand Canyon view from Pima Point 2010" by Chensiyuan - Own work. Licensed under Creative Commons Attribution-Share Alike 3.0-2.5-2.0-1.0 via Wikimedia Commons - http://commons.wikimedia.org/wiki/File:Grand_Canyon_view_from_Pima_Point_2010.jpg#mediaviewer/File:Grand_Canyon_view_from_Pima_Point_2010.jpg

Grand Canyon Star Party 2015

Deadline Sept 30th

t-shirt Design Contest

Purpose: To obtain original designs to be considered for use on the 2015 GCSP t-shirts. (Only one design will be selected for the 2015 t-shirt, but any submitted design may be used for a different year or for a different TAAA purpose.)

Theme: John Dobson. (The design will celebrate the life of John Dobson.)

Who may participate: Anyone. A person submitting a design is not required to be a TAAA member or a GCSP participant. THE WINNER RECEIVES TWO FREE T-SHIRTS.

Due date: All design entries must be submitted by 11:59p.m. (Tucson time) September 30, 2014.

Where Submitted: email the design, written information about the design, and information about the contributor to Mae Smith at ssmith[at]email.arizona.edu

Important Rules:

- The design and all of its parts must be original and copyright free.
- No material that may be considered advertising may appear anywhere in the design (This includes the TAAA name or logo.). This is a National Park requirement and exceptions cannot be made.
- Submission of a design gives rights of use of that design to TAAA for the 2015 t-shirts and/or for use at a later time on t-shirts, paper or electronically.
- One person may not submit more than three designs.
- A design may contain up to three colors.
- A design must be appropriate for t-shirt use.
- The 2015 GCSP t-shirt Committee and/or its designees will have sole responsibility for selection of the winning design; the determination of future use of all submitted designs; and the selection of 2015 t-shirts, including color.
- Any design submitted by a minor must be so indicated and accompanied by written parental permission.
- Submitted designs must meet the following silkscreening graphic requirement: vector format. (Preferred is vector format, spot color, fonts converted to outlines.) Two commonly used programs to produce vector format are Adobe Illustrator and CorelDraw. (Bitmap images are not acceptable.) Anyone who has a completed design and needs help with vector format may email Mae Smith no later than August 1st and Mae *will advertise for a TAAA volunteer to help*. Obtaining such volunteer assistance or the success of such assistance cannot be guaranteed and will not substitute for the vector format requirement.

Featured Article

Light Pollution Awareness Programs at Our National Observatory

Contributed by Connie Walker, Ph.D., National Optical Astronomy Observatory (NOAO)

The United Nations-sanctioned International Year of Light in 2015 (IYL2015) is going to provide an opportunity to increase public awareness of quality lighting and energy conservation. With the advent of IYL2015, NOAO has received a small grant through the International Astronomical Union to produce official IYL "Cosmic Light" cornerstone-themed "Quality Lighting Teaching Kits". These kits will emphasize the use of proper optical design in achieving quality lighting that promotes both energy efficiency and energy conservation of an endangered natural resource, our dark skies. The effort will leverage off of the preceding kit (the "Dark Skies and Energy Education" kit). The NOAO staff has extensive experience in creating education programs in optics, illumination engineering and dark skies awareness. We will seek to increase public awareness of quality lighting issues through online tutorials, teaching kits, and hands-on activities. NOAO staff members who are knowledgeable in the development of kits and curricula for school, museums, pubic, and after-school programs will lead the efforts.

NOAO staff also has considerable experience in kit design, dissemination, and professional development of educators. NOAO created and trained after-school leaders on six Hands-On Optics modules with partners, the International Society of Optics and Photonics (SPIE) and The Optical Society (OSA), by conducting nearly 30 two-day workshops for educators. NOAO has since created and tested an educationally-sound teaching kit on the effects of light pollution which is used across the United States and in Chile, Europe, and 12 countries in sub-Saharan Africa. We will use the experience gained with our "Dark Skies and Energy Education" kit in creating our quality lighting education kit for IYL 2015. We will explore the concepts and practice of "quality lighting" through demonstrations, hands-on/minds-on activities, formative assessment probes, and engineering design projects that explore basic principles of optics and the physics of light. The impact of the kits will be amplified by providing professional development using tutorial videos created in our NOAO studio and conducting training via Google+

Materials in the Quality Lighting Teaching Kits.

Hangouts for the outreach volunteers. This IYL2015 kit will contain materials for activities which help students identify and reduce wasteful/ inefficient lighting, thereby conserving energy and cost. Hence, the program will educate participants on how to solve a worldwide problem locally by learning how to light responsibly and thereby improve their quality of life, in "illuminating" ways.

Our network dissemination partners (helping us also with design concepts) will be the International Dark-Sky Association (IDA), SPIE, and the International Commission on Illumination CI)). If you might be interested in using a kit in 2015, here are a couple of steps to take: 1) Contact the IDA (or SPIE or CIE) chapter in your area, mentioning your interest in using the kit. 2) Then send their response and your contact information to Connie Walker at cwalker@noao.edu using the phrase in the Subject Line: "IYL2015 Quality Lighting Teaching Kits". Thanks!

Featured Article

Globe at Night

Contributed by Connie Walker, Ph.D., National Optical Astronomy Observatory

The Globe at Night program is an international citizen-science campaign to raise public awareness of the impact of light pollution by inviting citizen scientists to measure their night-sky brightness and submit their observations from a computer or smart phone. Students and scientists use the data to monitor levels of brightness or light pollution around the world. They also use the Globe at Night data to understand light pollution's effects on energy consumption, plants, wildlife and human health, as well as our ability to enjoy a starry night sky. Since its inception in 2006, ~115,000 measurements from 115 countries have been reported.

(Continued on page 11)

Examples of Dark Skies Rangers activities: light shielding demo, spectra and efficiency of lights, and the outdoor lighting audit.

Globe at Night observations in 2013 totaling 16,324 from 89 countries. The brighter the dot, the brighter the night sky. The darker the dot, the darker the night sky.

(Continued from page 10) Globe at Night

Globe at Night's 4 ways to measure night-sky brightness.

Globe at Night offers 4 ways to measure night-sky brightness: the traditional method of matching what you see in a constellation with star charts; use of a handheld digital device called a Sky Quality Meter (SQM); the use of the Loss of the Night app on Android phones, which asks you to find certain stars as a measure of star visibility; or the use of the Dark Sky Meter app on iPhone 4s/iPhone 5, which uses the phone's camera to measure night-sky brightness.

The easy steps to participating in the campaign are listed at www.globeatnight.org. The Globe at Night website is easy to use, comprehensive, and holds an abundance of background information. Included on the Globe at Night website are many helpful resources and tools from finding the constellations used in the campaign, to understanding concepts like light pollution, to games that test your expertise in choosing the faintest star visible or "limiting magnitude". "Dark Skies Rangers" activities used in grades 4-14 provide a foundational basis for and extensions to the Globe at Night campaign, if educators so choose (www.globeatnight.org/dsr/).

Globe at Night's 10-day campaign dates are chosen so the Moon will not be up during the 8pm to 10pm observing period. Get out there, make your observations, and report them online!

October 14-23
November 12-21
December 11-20

2015 dates

January 11-20
February 9-18
March 11-20
April 9-18
May 9-18
June 8-17
July 7-16
August 5-14
September 3-12
October 3-12
November 2-11
December 2-11

The report page accessible as a "web app" on any mobile smart device.

Be on the lookout for special events during the International Year of Light in 2015 (light2015.org). Flash Mob measurements for Globe at Night and the Loss of the Night will take place mid-March and mid-October. Globe at Night is involved with two IYL "Cosmic Light" themed projects 1) Cosmic Light Awareness and 2) the Quality Lighting Teaching Kit (being built from the Dark Skies Education Kits).

May your night skies continue to be starry!

A History Lesson

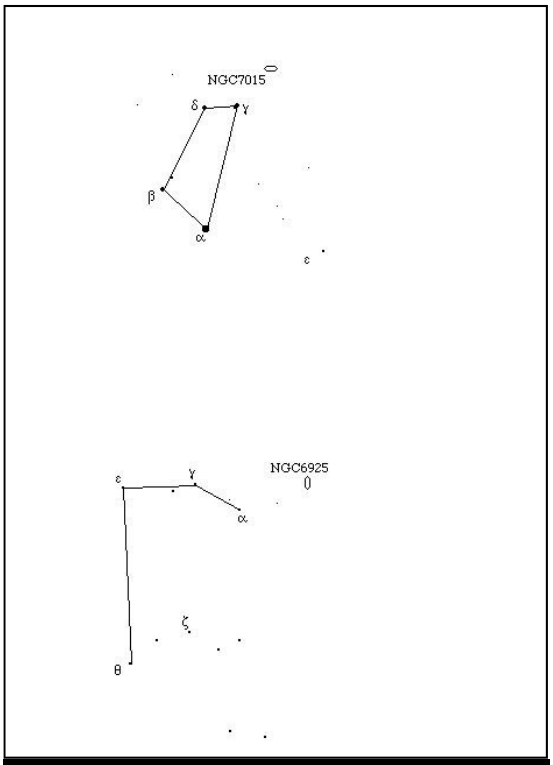
The official TAAA logo was selected by the membership sometime about 1984. It was one out of many logos submitted by members at the time. The winning logo was drawn by planetary observer Michael Sweetman. The original submission was a pencil drawing on typewriter paper. Pictured here are photos from March 1985 when Michael presented the membership with a colorized version of his logo design. He was awarded a certificate for his efforts. For a few years, Michael Sweetman also drew artwork for our newsletter cover and is an accomplished deep-sky artist.

Since that time, the logo has been digitized and several different colored versions of it have appeared.

Observing and Imaging

Constellation of the Season: Equuleus - The Little Horse Microscopium - The Microscope

Text and artwork provided by Chris Lancaster



Equuleus (at top) and Microscopium (below).

Equuleus: The little horse

This small, little known constellation lies between the nose of Pegasus and Delphinus and reaches its highest point in the sky at 11pm during middle to late August. Pegasus seems to be looking at his small counterpart which is just beyond his nose, and which is considered to be the invention of the Greek astronomer Hipparchus. Little mention of it is found in astronomical works since then, probably because it has only a few dim stars and virtually no interesting objects. Myth has it that Equuleus is the horse Celeris, which is the brother of Pegasus. Depending on which story you follow, Celeris was a gift to Castor (one of the twins of Gemini) from the god Hermes, or a gift to Pollux (the other twin) from Hera, the wife of Zeus. Another story contends that Celeris sprung from the earth when Poseidon's trident struck the ground in a contest with Athena.

Equuleus is a four-sided figure made up of stars no brighter than 4th magnitude. If you look toward Gamma Equulei, you'll see a visual binary star separated by 5.5 degrees *(Editors note: should be arc-minutes)*. The brighter star shines at magnitude 4.7, while the dimmer one is magnitude 6. The two are of spectral types A (for the brighter star) and F, so you'll see stars of white or yellowish white color.

For large telescopes, a dim galaxy, NGC7015, sits 1.7 degrees northwest of Gamma Equuleus. There are virtually no stars with which to star hop, so luckily it's not too far away from Gamma. Its position is 21h 5m 37s Dec +11d 24' 50". If you have enough aperture, you'll see a dim, 13th magnitude spiral galaxy measuring 1.8'x 1.6' with diffuse boundaries getting gradually brighter toward the center.

Although not generally observable through an average telescope, an interesting double star is Delta Equulei, which marks the northeast corner of the box shape of Equuleus. The semi-major axis of this star is a tiny .26" with maximum separation of about .35". What sets this star apart is that its period of rotation is a short 5.7 years.

Microscopium: The microscope

This is a more modern constellation created by Nicolas-Louis de Lacaille in or about the year 1750. He named it along with Telescopium to honor two instruments which revolutionized the study of science. To the ancient observers, the area occupied by Microscopium had no named figures and was known as a vast area called "the sea" rising in the sky above the horizon. Microscopium is made of very dim stars (4.7 and dimmer) south of Capricornus and between Sagittarius and Grus. Similar to Equuleus, it also passes through the meridian at around 11pm during the second half of August.

Making your way around Microscopium is difficult because there are no bright stars with which to navigate. One of the brighter stars of Microscopium, Alpha Microscopii, is an easy double star within the grasp of any telescope, and provides a good starting point. Individually, they shine with magnitudes 5 and 9.8, giving a naked eye integrated brightness of 4.9. Only 20 arc seconds separate the two, so low power is all that's necessary to split them. These two stars are very similar to the sun, having a spectral type of G8, compared to G2 for the sun.

There are a number of galaxies in Microscopium, but all are faint. One of the brightest that we find here is a fine example of a spiral galaxy--NGC6925. We can star hop from Alpha by going 2 degrees west to a star of 5.5 magnitudes, and then another two degrees northwest to NGC6925 (or go to RA 20h 34m 21s Dec -31d 58' 50".) This magnitude 12.1 galaxy is turned very close to edge on and measures 4.4'x 1.2', so you'll see a dim spear of light oriented almost straight north-south. In very large instruments or CCD images, some texture can be seen along the tightly packed spiral arms.

Observing and Imaging

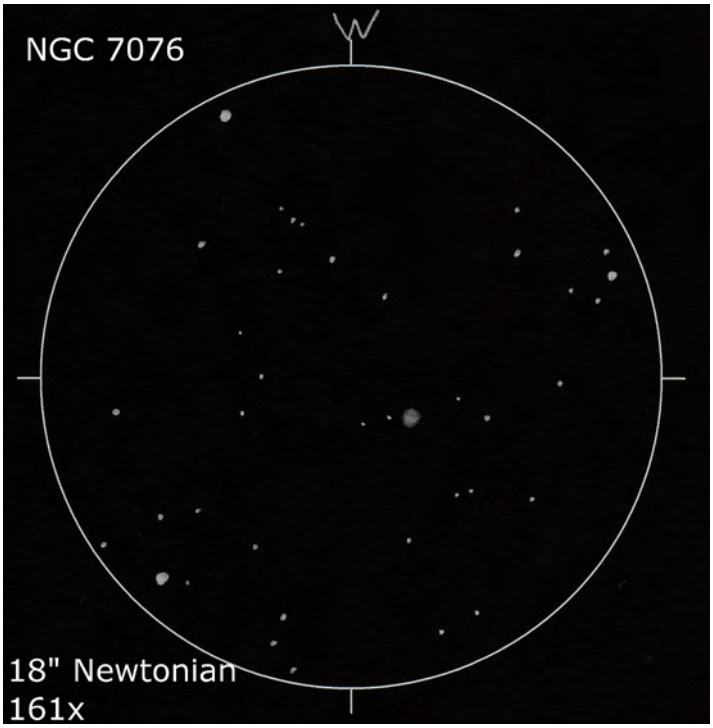
Planetary nebulae of the quarter – Fall 2014

Text and Drawings by Christian Weis (weis[at]astroweis.de)

Planetary nebulae (PN) are fascinating objects which come in numerous forms or appearances. Besides the well-known grand four Messiers (M27, M57, M76 and M97), there are hundreds more to explore. This article suggests two PNs, a pretty bright and easy-to-observe one, and a harder one for the more ambitious observer who is equipped with a bigger scope.

Although NGC 6894 is located in Cygnus, it can still be observed in fall. This object was discovered by William Herschel in July 1784 and is quite an interesting one. Even the NGC description points out that NGC 6894 is a remarkable annular nebula. And this is what the observer can expect to see. Its size is comparable to that one of the blue flash nebula NGC 6905 in Delphinus but it is a full magnitude fainter. I observed this PN in June 2012 from my home in southern Germany with an 18" Dobsonian and noted: Big and remarkably bright planetary nebula, easy to be seen as a disk at 94x; impressive at 452x, circular, ring structure unmistakably seen when using averted vision, northern part is brighter, no central star seen, good response to UHC and [OIII] with the help of which the ring structure can even be seen directly; beautiful object; fst 6m5 (Lyr), 452x

NGC 6894
RA: 20h 16.4min
Dec: 30° 34´
Constellation: Cygnus
Brightness: 12m
Central star: 18m3
Size: 44x39 arcsec
Distance: 4,600 ly



Ten years after discovering NGC 6894, the great astronomer William Herschel discovered NGC 7076 which is located in Cepheus. However, it was not until 1964 that another famous astronomer, George Abell, identified NGC 7076 as a planetary nebula. Therefore, NGC 7076 is also designated as Abell 75. There is different data on NGC 7076's brightness, ranging from some 13m5 to 14m5. If the latter value is the correct one, then this nebula is the second faintest NGC-PN. But even though this object is quite faint, I would rather tend to give it a 13m5. But do not despair: NGC 7076 can be seen with an 8" telescope (cf. Planetary Pages by Kent Wallace). I observed this object in July 2012 shortly before dawn having good observing conditions and noted: Surprisingly faint considering the fact that it is listed in the NGC, best seen with 161x and using an [OIII] filter, also good response to a UHC filter, small, diffuse, circular, no central star, quite faint without a filter, best when using averted vision, at 226x the eastern part seems to be a little brighter when viewing without any filter (unsure); fst 6m6 (Lyr), 161x

NGC 7076 (=Abell 75)
RA: 21h 26.4min
Dec: 62° 53´
Constellation: Cepheus
Brightness: 13m5
Central star: 11m3
Size: 67x47 arcsec
Distance: 6,200 ly

Featured Article - The Space Place

Twinkle, twinkle, variable star

By Dr. Ethan Siegel

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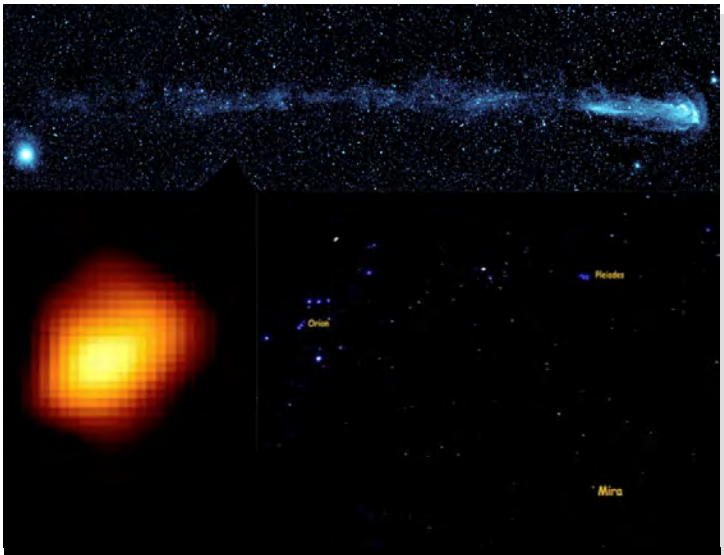
As bright and steady as they appear, the stars in our sky won't shine forever. The steady brilliance of these sources of light is powered by a tumultuous interior, where nuclear processes fuse light elements and isotopes into heavier ones. Because the heavier nuclei up to iron (Fe), have a greater binding energies-per-nucleon, each reaction results in a slight reduction of the star's mass, converting it into energy via Einstein's famous equation relating changes in mass and energy output, E = mc2. Over timescales of tens of thousands of years, that energy migrates to the star's photosphere, where it's emitted out into the universe as starlight.

There's only a finite amount of fuel in there, and when stars run out, the interior contracts and heats up, often enabling heavier elements to burn at even higher temperatures, and causing sun-like stars to grow into red giants. Even though the cores of both hydrogen-burning and helium-burning stars have consistent, steady energy outputs, our sun's overall brightness varies by just ~0.1%, while red giants can have their brightness's vary by factors of thousands or more over the course of a single year! In fact, the first periodic or pulsating variable star ever discovered—Mira (omicron Ceti)—behaves exactly in this way.

There are many types of variable stars, including Cepheids, RR Lyrae, cataclysmic variables and more, but it's the Mira-type variables that give us a glimpse into our Sun's likely future. In general, the cores of stars burn through their fuel in a very consistent fashion, but in the case of pulsating variable stars the outer layers of stellar atmospheres vary. Initially heating up and expanding, they overshoot equilibrium, reach a maximum size, cool, then often forming neutral molecules that behave as light-blocking dust, with the dust then falling back to the star, ionizing and starting the whole process over again. This temporarily neutral dust absorbs the visible light from the star and re-emits it, but as infrared radiation, which is invisible to our eyes. In the case of Mira (and many red giants), it's Titanium Monoxide (TiO) that causes it to dim so severely, from a maximum magnitude of +2 or +3 (clearly visible to the naked eye) to a minimum of +9 or +10, requiring a telescope (and an experienced observer) to find!

Visible in the constellation of Cetus during the fall-and-winter from the Northern Hemisphere, Mira is presently at magnitude +7 and headed towards its minimum, but will reach its maximum brightness again in May of next year and every 332 days thereafter. Shockingly, Mira contains a huge, 13 light-year-long tail -- visible only in the UV -- that it leaves as it rockets through the interstellar medium at 130 km/sec! Look for it in your skies all winter long, and contribute your results to the AAVSO (American Association of Variable Star Observers) International Database to help study its long-term behavior!



Images credit: NASA's Galaxy Evolution Explorer (GALEX) spacecraft, of Mira and its tail in UV light (top); Margarita Karovska (Harvard-Smithsonian CfA) / NASA's Hubble Space Telescope image of Mira, with the distortions revealing the presence of a binary companion (lower left); public domain image of Orion, the Pleiades and Mira (near maximum brightness) by Brocken Inaglory of Wikimedia Commons under CC-BY-SA-3.0 (lower right).

Check out some cool images and simulated animations of Mira here:
http://www.nasa.gov/mission_pages/galex/20070815/v.html

Kids can learn all about Mira at NASA's Space Place: http://spaceplace.nasa.gov/mira/en/

Astronomers Without Borders
ONE PEOPLE + ONE SKY

Telescopes to Tanzania

Our Indiegogo campaign was a great success, we made our goal thanks to some outstanding donations!

To thank all of our donors who are helping make this project possible we have created a Thank You Wall.

We now have enough to build *The Center for Science Education and Observatory* and will become a reality in 2015. It will become a Tanzanian hub that will have a long-lasting impact nationwide by training teachers, offering hands-on laboratories (including an astronomical observatory), and providing quality educational resources.

The gateway to the development of Tanzania's own STEM curriculum has been opened, and the groundwork has been laid to begin the next critical phase of our campaign.

While running our Indiegogo campaign, we received a 12" telescope from Bill Pothen of the Racine Astronomical Society. This mid-sized scope will now be rehabilitated to brand-new condition and then taken with Sue and Chuck on their next trip, some time fall 2014.

We are now looking forward to expanding our efforts in Tanzania. With our new Stretch Goals we would like to raise $17,000 more. This will enable us to DOUBLE the number of astronomy/science ambassadors who will:

- Visit schools throughout Tanzania
- Train teachers to teach hands-on, inquiry-based science
- Teach students
- Train government education officers in understanding science teaching and scientific concepts
- Bring more NEW science curricula to schools throughout Tanzania
- Provide science education resources to TWICE as many schools

This stretch goal will allow Telescopes to Tanzania to visit an ADDITIONAL 30 schools, train an ADDITIONAL 60 teachers, and directly reach an ADDITIONAL 2000 students.

The cost for each new ambassador includes a one-week hands-on training program, a resource package used for their training sessions including a telescope and teaching materials, 10 visits to schools through the year (including transportation), and resources to be left in each classroom that's visited.

This is the BEST way to build on this ongoing effort, to expand what has already created, and to share the gains to be made. The greater the reach, the more the government and other in-country stakeholders will take note and provide assistance. Early success will show it CAN and WILL happen.

Scope Restoration and Observatory for the Center for Science Education

Recently, A 12 inch Cave Cassegrain telescope made the first leg of its journey – traveling from Streamwood, IL to Racine, WI it logged 85 miles of its 8500 mile trip to Tanzania.

The Scope will be the main instrument in a roll-off observatory being built as part of a Center for Science Education in northern Tanzania. The Center will enable teachers and their students to participate in hands on science exploration and learning.

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Starry Messenger SIG	Terri Lappin	520-977-1290	smsig[at]tucsonastronomy.org
General Information	Bob Gilroy	520-743-0021	taaa-info[at]tucsonastronomy.org