Desert Skies

Tucson Amateur Astronomy Association

Observing our Desert Skies since 1954

Fall 2015 Volume LXI, Issue 3

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Area Surrounding Deneb

TAAA member Christian Weis took this image of the area surrounding Deneb in Cygnus using a modified Canon Digital Rebel XS (EOS 1000 D). This is a 75 second exposure with manual tracking, ISO 800, 50 mm focal length, f / 2.5, 31.7.2013, 21:44 BST. The lens was attached piggyback on his 4.5" Newtonian telescope. He used Gimp (a freeware image manipulation program) to adjust the hue balance. No flats or darks were used in the processing. The camera modification was the replacement of the IR blocking filter to allow more red transmission. © Christian Weis. Used by permission.

Deneb, also known as Alpha Cygni, is the bright star near the center of the image. It marks the tail of Cygnus, the swan. It's one vertex of the Summer Triangle (Altair and Vega are the other two vertices). Deneb is located about 2,600 light years away, although there's a lot of uncertainty in this distance. While not particularly bright in our sky, it's intrinsic brightness is around 200,000 times that of the Sun, making it one of the brightest stars in this region of the Milky Way. It's classed as a blue-white supergiant star.

To the left of Deneb is the familiar North American Nebula (NGC 7000). To give some scale to this photo, it would take four Moons to cover up the North American Nebula. Stars are forming in the area that one would think of as the Mexico and Central America area. The North American Nebula was discovered by William Herschel in 1786. Considerably fainter is the Pelican Nebula (IC 5070) located slightly below a line connecting the North American Nebula to Deneb.

The Butterfly Nebula (IC 1318) is towards the bottom of the image, just left of the star Sadr (aka Gamma Cygni). Sadr is another supergiant star.

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

Desert Skies is published quarterly by the Tucson Amateur Astronomy Association, PO Box 41254, Tucson, AZ 85717.

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.

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From Our President

As I look at the currently cloudy skies, I can't help but begin to anticipate the coming end of the Monsoon and the return to the beautiful Southern Arizona nights we love. The Fall Constellations will soon be rising at a convenient hour and we still have the magnificent Summer Constellations to view as well. I hope that the viewing season ahead finds you all ready to enjoy the excellent observing opportunities to come.

I encourage everyone to ready your equipment and give serious consideration to taking advantage of the TAAA's two excellent observing sites, TIMPA and CAC. The TAAA provides these sites for our club members' use and enjoyment. They are two major benefits of belonging to the TAAA.

TIMPA is the closer site to Tucson, easier to get to, but still has moderately dark skies. It boasts a roll-away observatory housing a 14" Meade SCT, six concrete pads with electricity, and on site rest room facilities. The Astronomy Fundamentals Special Interest Group (AFSIG) led by Dennis McMacken opens TIMPA twice a month for TAAA members and guests to come and observe the stars as well as enjoy the company of other amateur astronomers. TIMPA dates can be found on the TAAA Calendar and on the Night Sky Network. Fall sessions at TIMPA are very enjoyable and rewarding.

Chiricahua Astronomy Complex (CAC) is a truly dark site, located in Cochise County, about a 90 minute drive from the TTT truck stop at I-10 and Craycroft. Although a longer journey is required to get to CAC, TAAA members making the drive are treated to spectacular views of the heavens. CAC is currently the focus of TAAA development efforts and now has a roll off roof observatory with a pier mounted Celestron C14 SCT; 10 concrete member pads, fully electrified; along with a bathroom, including showers for observers use. The main drives on the site are fully graveled and there is plenty of parking. John Kalas (CAC Director) opens the site to members once a month on a weekend. See the TAAA Calendar or the Night Sky Network for dates. CAC access must be controlled, please coordinate with John Kalas who will be glad to assist you. Find John's contact information on page 17.

Recent CAC improvements include a paved ramada area with picnic tables and two gas grills. Plans are in place to begin having Star-B-Ques there this fall. Work is currently underway for member pads and observatories and fund raising has begun for a large roll off roof observatory, which will house several telescopes. CAC is shaping up to be one of the jewels of any astronomy club anywhere and is well worth the trip.

If you enjoy sharing your observing experiences with others, I suggest signing up to support the TAAA School Star Party program led by Jim Knoll. Jim announces School Star Party opportunities on the TAAA Announcement email list and provides signup sheets at the General Meetings. You get a very deep sense of satisfaction when a student gasps "Oh Wow" when seeing the rings of Saturn or craters on the Moon through a telescope for the first time.

Whether you observe at TIMPA, CAC, a School Star Party, or at a place of your own choosing, I wish you all clear skies and let's make fall 2015 a banner time for TAAA observing!

Ben Bailey

Members' News

Introduction to the Fundamentals of Astronomy - Fall 2015

Contact Dennis McMacken (fundamentals[at]tucsonastronomy.org)

There are some aspects of amateur astronomy that might not come naturally to someone new to the hobby. Finding planets in the sky—well, that's not too difficult. Finding and identifying something like a galaxy—well, that takes some knowledge and a bit of experience. The TAAA Astronomy Fundamentals Special Interest Group's has just the thing for newbies. They are offering their highly acclaimed "Introduction to the Fundamentals of Astronomy" class this fall. It's aim is to give the beginning amateur astronomer a good start in the hobby. Topics covered including the basics of getting around in the night sky, equipment used by the amateur, and some helpful observing techniques.

This class isn't like taking a semester course at Pima College. It's just three Saturdays and no homework or tests! But, you'll want to use what you learn, so the last Saturday ends with a star party at our TIMPA site, complete with dinner and guided observing. That means, you're not left under a sky full of stars with no idea what to do next. The learning continues as the teachers help you become familiar with your telescope or one of those owned by the TAAA.

The class is free to TAAA members. Not a member? You'll have to first join the TAAA (dues are only $25/year for individuals). If you are interested, send an e-mail to Dennis McMacken at fundamentals[at] tucsonastronomy.org.

The Introduction to the Fundamentals of Astronomy class is a three-Saturday long, general overview of amateur astronomy.

Members!

Check the Monthly Events Bulletin for dates and times.

Classes will be held at the USGS Building, Room 253

520 North Park Ave (Park and 6th St)

Kitt Peak Star-B-Que

Contact Dean Ketelsen (ketelsen[at]email.arizona.edu)

On a cool October evening, with the 82-foot diameter dish of the Very Long Base Array radio telescope scanning the skies, the TAAA will gather with their amateur optical scopes at the Kitt Peak Picnic Grounds for a night of socializing and observing. It all starts at 4PM, just as the observatory officially closes to the public. We have permission to use the group picnic area for a potluck dinner followed by observing under a pristine dark sky. This event is only open to TAAA members and their guests. Watch the Montlhly Events Bulletin for details. To attend, contact Dean Ketelsen(see above). Photos taken by Dean Ketelsen during a past Star-B-Que.

Members' News

Solar Filter Workshop

Contact Robert Gilroy (bobgilroy[at]tucsonastronomy.org)

Want a solar filter for your scope? The TAAA Astronomy Fundamentals Special Interest Group will be holding a solar filter workshop in November. At the end of the 3.5 hour workshop you'll leave with a white-light solar filter for your telescope. A modest fee will be collected to cover the costs of materials. You'll be given the choice between two types of film. The Baader Film produces a white image of the sun. The Seymour Film produces a yellow-orange image. Both are considered "white-light" filters, producing an image of the Sun's photosphere. Sunspots will appear dark.

At far left, a completed white light solar filter. At left, Cathy and Paul Anderson measure the circumference of their telescope. Below, Mary and Dennis McMacken work on a white light solar filter for their telescope. Photos provided by Robert Gilroy.

After the workshop, members are invited to observe the sun through their new white light solar filter.

Details about this workshop will appear in the monthly evetns bulletin. You can sign up at the next TAAA General Meeting or contact Robert Gilroy.

Fall TAAA General Meetings

TAAA Meetings
Location:
Steward Observatory
(933 N Cherry Ave)

Open to the public.

Date	Introductory Presentation (6:30 PM)	Invited Lecture (7:30 PM)
Oct 2	Mary Turner (TAAA) Seasonal Objects	Kathryn Volk, UA LPL Consolidating and Crushing Exoplanets
Nov 6	Bill Lofquist & Jim Knoll (TAAA) TAAA Star Parties	Melissa Halford, UA LPL TBA
Dec 4	Vern Dunlop (TAAA) Total Solar Eclipse, Only in the USA	Brother Guy Consolmagno (Vatican Observatory) Vesta and the Chaotic Formation of Planets

GLOBE AT NIGHT

2015 Globe at Night Campaigns

October 3 - 12

November 2 - 11

December 2 - 11

http://www.globeatnight.org/

Members' News

Service Award Presented to Past President Bill Lofquist

By John Kalas (mal3[at]tucsonastronomy.org)

> *"Without Bill's enthusiasm and drive, the CAC Site would not be a reality today. - John Kalas*

At the July 3, 2015 TAAA General Meeting, long time member and Past President Bill Lofquist was presented with a TAAA Service Award. While researching the details of Bill's service and accomplishments, I was amazed at what I found. I realized that this award was long overdue.

Bill joined the TAAA in June 1997. Before long, he began his dedicated service to the TAAA.

Bill's Service History

- Member-at-Large (7 years): June 1998 - May 2005
- Vice President (1 year): June 2005 - May 2006
- President (2 years): June 2006 - May 2008
- Beginners SIG Chairman (2 years): June 2005 - May 2007
- Vice President (2 years): June 2010 - May 2012
- Member-at-Large (3 years & counting): June 2012 - Present
- School Star Party Scheduler/Volunteer Coordinator (~2 years): Feb. 2011 - Dec. 2013
- CAC Site Strategic Planning Group Chairman (8 years?): 2007(?) - Present

During his two years as President of the TAAA, Bill led us through a number of important accomplishments.

Major Projects during Bill's Presidency

- Initiated significant Website redesign
- Bill & Mary generously offered their residence & became hosts for annual TAAA Holiday Party (9 years): Dec. 2006 - Dec. 2014

Continuous service to the TAAA 17 years and counting!

Bill Lofquist, center, with his wife, Mary. John Kalas, left, presented the TAAA Service Award at the July 3,2015 meeting.

- TIMPA Improvements including Gila Monster Observatory construction, steel storage container, road and concrete telescope pads construction
- Chiricahua Astronomy Complex including initiated search effort for a club dark observing site. Bill was personally involved with evaluating several Cochise County properties, including the CAC Site. He coordinated member brain-storming meetings to establish the desired features for the club's astronomy complex. He also helped to develop the paperwork for our Special Use Permit.

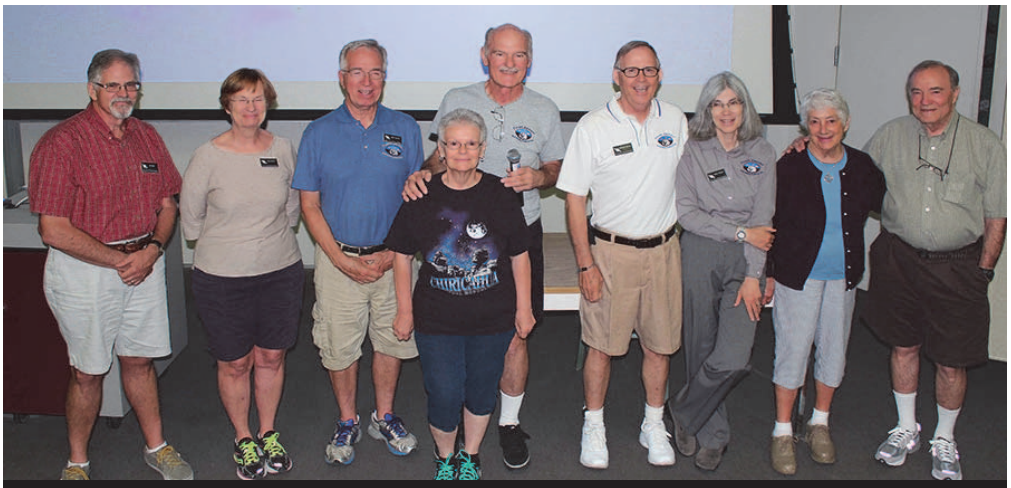
Without Bill's enthusiasm and drive, the CAC Site would not be a reality today.

Congratulations, Bill!

Chiricahua Astronomy Complex News

Inaugural CAC Star-B-Cue, Member Pad Construction Planned

By John Kalas (mal3[at]tucsonastronomy.org)



TAAA members have this group to thank for donating funds for the picnic tables at the Chiricahua Astronomy Complex. Left to right: Ed Foley, Sue and Ralph Jensen, Liz and John Kalas, Michael and Mary Turner, and Mary and Bill Lofquist. Not pictured is Don Cain. The ramada is pictured below.

The Ramada project has progressed very nicely. Shortly after presenting an update at the TAAA June monthly meeting showing the completed Ramada with one picnic table, several TAAA Members stepped forward to donate funds for the remaining three picnic tables. Michael and Mary Turner and Bill and Mary Lofquist, who have made previous significant donations to the CAC Site, offered to buy two more tables. Ralph and Sue Jensen, Don Cain and Ed Foley donated funds for the purchase of the fourth table. All donors were recognized at the July TAAA General Meeting.

The tables were purchased and arrived at CAC on 7/23. On 7/26, Ed Foley, Joe Jakoby, Michael Turner and I assembled the three additional tables and placed them under the Ramada.

Wally Rogers, who has also made many significant donations to the CAC Site, offered to donate the funds necessary for a very nice, large stainless steel gas grill. Wally and I went grill shopping on 8/5 and purchased the unit together with many accessories. I assembled the grill and I am working on fabricating a custom cart to transport the grill from the storage container to the Ramada and back. Together with a smaller grill donated by Bill Lofquist, we will have ample cooking capacity at the Ramada. The grill cart should be completed before the October CAC star parties as we are planning the inaugural CAC Star-B-Cue under the completed Ramada on Saturday, 10/10. Be sure to mark your calendar for this exciting event.

The next development project will be the Member Pads Area. Nine TAAA Members have donated the funds for member telescope pads

and have been waiting patiently for construction to commence. On 8/31, I finally received the approved building permit for the project following several permit department delays. The costs for construction are being reviewed and construction should begin soon. A final pre-construction meeting with all of the participants will be scheduled for mid-September to finalize all details.

The weed issues at the site have continued to be a problem, but a solution has finally been identified. The decision was made to make two applications of pre-emergent at the site; one in early June to counter the monsoons and another in early December to address the probability of a wet winter. Most of the site has been cleared of weeds and the balance has been mowed. Weed killer needs to be sprayed on the mowed perennial grasses in the loop drive in order to reclaim the road from the weeds and make future pre-emergent applications effective. This should yield year-round weed control at the CAC Site. It's a little expensive, but necessary.

A Thank You Letter from the Grand Canyon National Park

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

August 30, 2015

2015 GCSP Participants
c/o Jim O'Connor of TAAA

Dear Grand Canyon Star Party (South Rim) 2015 Participants:

THANK YOU ALL for making the 25th annual Grand Canyon Star Party another smashing success!

Sorry it's taken me so long to get stats compiled and this letter out; I know Jim has long been ready & waiting for this addition to his own note.

A lot of estimation and extrapolation goes into both reporting and compiling Star Party stats. This year, poor performance from my automated traffic counters made me very grateful to those of you who included nighttime contact numbers! Here is the final tally (with new records in blue):

- Night and day astronomer-visitor contacts: 75,886 (vs. 70,852 in 2014); 69,155 by night and 6,731 during the day.
- Total nighttime attendance: 9,333 (vs. 8,757 in 2014 and 9,542 in 2012). That's an average of 1,166 visitors per night looking through about 7-8 telescopes apiece.
- Total slide show attendance: 1,863 (full or over-full every night). Thank you Bryan Bates, Jim O'Connor, John Anderson, Marilyn Unruh, Andy Odell, John Barentine & Dennis Young for presenting those.
- Constellation Tour attendance (at 9:00, 9:30 & 10:00 pm nightly): 1,329. Thank you Chap Percival, Jim O'Connor, Alan Delman, Andy Odell, John Barentine, Robert Victor, and Mary Turner for conducting those.
- 99 registered volunteer astronomers donated 2,598 volunteer hours with 40-55 telescopes set up each night.
- Highest single night count: 1,460 on the final Saturday (1,050 on Wednesday). Thanks to Stephen O'Connor and Jan Cossette for helping with those actual counts of arriving visitors.

Jan recorded my favorite visitor comment of the week, from parents of two young daughters: "THEY [the girls] insisted we come back. It's a wonderful, wonderful thing!" I also enjoyed the enthusiasm of a middle-aged paraplegic woman who had just looked through a telescope for the first time with John Anderson's help.

Special thanks to those who set up by day AND night: 169 hours were logged by day at various locations, which is great. I actually observed Dennis Young by Yavapai Geology Museum one day operating FOUR telescopes at once! Dennis clocked the most telescope hours once again: 67 ½ despite an unplanned trip to Flagstaff. Of course Jim O'Connor deserves HUGE thanks as usual for his many, many hours coordinating this event throughout the year.

Thank you Chap Percival for inspiring us all to "Go See the Eclipse--and Take a Kid With You" in 2017. (Details at www.goseetheeclipse.com) And to Gary Fix for educating astronomers AND visitors on a range of special topics.

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A big thanks to everyone who supported the event by running the shirt shop AND the campground (Mae Smith), serving as social coordinator (Ginger Applegarth), organizing social events (Susan & Jim O'Connor, Ginger, George Barber, treating us to pizza (TAAA), donating EIGHT Celestron Firstscopes for giving away to eight happy kids (Kevin LeGore of Focus Astronomy, with assistance from Susan and Andrew O'Connor) and helping out in so many other ways.

Thanks to ALL of you for traveling so far to share your time, telescopes and knowledge so patiently and enthusiastically with so many park visitors from around the globe. Your efforts were well spent in touching lives and making new converts to amateur astronomy, science, and the preservation of dark night skies.

Mark your calendars for June 4-11, 2016 – the 26th Annual Grand Canyon Star Party! I wish you the best between now and then.

Sincerely,

Ms. Marker Marshall , Park Ranger—Interpretation
Grand Canyon National Park

Excerpts from Jim O'Connor's Thank You to 2015 Grand Canyon Star Party Volunteers

I have to thank the NPS for all of the support before and during the event; Marker's exceptional coordination and behind the scenes arrangements and patience with my fumbling efforts, Rangers Mike Weaver, Ty Korlovetz and Rader Lane for their great assistance, and especially my army of grandkids who always looked for more to do, to help move things along.

The numbers Marker shows are once again stunning, with over 75,000 contacts for the week! Once again, I left GCSP absolutely stunned at the A-Team of outreach practitioners we brought in from around North America. You made a whole lot of people happy, and once again touched a lot of people's lives. Special thanks to Kevin LeGore, founder and director of Focus Astronomy who arranged the donations of eight Celestron First Scopes to the Grand Canyon Association, which we awarded to eight young visitors at a drawing at the end of each night theater talk.

I will add to Marker's thanks to our night talk speakers. Each talk was a unique look at the night sky, from migratory Hopi clans' unique approaches to astral applications, wise lighting and light use, the inner workings of stars and their signatures, the nature of galaxies, personal interaction with the night skies, the starry nights of the Grand Canyon, and the unification of astral and geological effects and using several forms of light to compose striking images.

Thanks to Gary Fix (www.garytheastronomer.com) from Massachusetts, international science and cultural outreach practitioner, who once again presented his daily sextant lessons at the visitor center, then nightly set up with us out back and presented his study of Italian cathedrals their architectural demonstration of True North.

Thanks also to Ginger Applegarth for giving us social opportunities away from the life with telescopes and visitors, and George Barber and helpers for the Thursday huevos breakfast!

Finally, special gratitude to Mae Smith, who not only arranged the design, inventory purchase, and sales of this year's GCSP T-Shirts and simplified the contest to design next year's shirts, but also volunteered to be our point of contact in Mather Campground. We actually were at maximum capacity until seven campers cancelled in the last two weeks. Some campers come solo, while some bring families for a vacation in Grand Canyon National Park, a great way to spend quality time as long as we're aware in advance so that we can make the appropriate arrangements to keep within the two vehicles (all wheels on pavement), three tents, and six person limits in any site. Those of you who are sharing spaces please remember that the camp site needs to be fairly shared. Thanks VERY much, Mae!

Once again, we left the Grand Canyon charged up for next year, June 4-11, 2016. THANK YOU ALL!!

Jim and Susan O'Connor (gcsp[at]ucsonastronomy.org)

View Grand Canyon Star Party 2015 Photos
https://www.dropbox.com/sh/53hs5rnuqhznxra/AAA5hDQQBj1AiWzftZTIwayma?dl=0

Featured Article

Smart Phone Astronomy Apps

By Jim Knoll (school-star-party@tucsonastronomy.org)

Where would we be without all the information we currently have at our fingertips with Smartphone and Tablet Apps? They certainly make our life easier, but they need to be used responsibly in the field to minimize disruption to our night vision and distraction to other observers. I listed most of the Astronomy Apps I use during my Star Party presentation last May, but I thought I'd recap my top 10 in the Newsletter. Some of my favorites are biased toward planning and preparing for Star Parties, but several are also great for general observing. I have an IPhone, so mine are focused on the IPhone, but most are probably also available for an Android. I imagine we all have favorites, so feel free to share those from time to time in the Desert Skies Newsletter or via the TAAA Forum.

Star Walk - Interactive astronomy guide to the night sky. Point and the program slews to your compass direction or you can manually move to the portion of the sky you are interested in. You can search by Constellation, Solar system objects, Deep Space, Stars, and Satellites. It will indicate which objects are visible at the current time.

Sky Safari 4 Pro - Similar to Star Walk. More of a full function planetarium program. You can access information about any object by selecting it and requesting info. You can also add it to an "Observation" list once you observe it.

Gas Giants - Real-time moon positions for Jupiter, Saturn, Uranus, and Neptune. You can mirror-flip the positions to match your telescope if required. Two similar Apps are JupiterMoons and SaturnMoons. You can mirror-flip their displays as well.

ISS Spotter - An App to let you know when the International Space Station (ISS) is transiting your position. It shows the forecasted transit (next 10 days) for your current position, and other basic adjustable settings.

iCSC - Clear Sky Chart. Weather forecasting aid similar to what is also available on the Web. It shows the projected sky for the next 48 hours, showing color codes for Cloud Cover, Transparency, Seeing, Darkness, Wind, Humidity, and Temperature. You can set the closest forecasting location (Tucson is available). A similar App worth checking out is Scope Nights. It shows the forecast in three hour increments as green (Good), Yellow (Fair), and Red (Poor). You also get sunrise & sunset times, percent of clouds, estimated temperature during observing period, and other settings that are user adjusted.

Satellite Safari - View and search for visible satellite passes.

Deluxe Moon - View Moon phase, time to Moonrise and Set, plus lots of user defined functions. Other good Apps include MoonPhase, MoonCalendar, MoonMapPro (detailed views of the Moon's surface to use as an observing aid).

DSM Pro - Dark Sky Meter Pro. Uses phone camera to determine sky darkness similar to the Unihedron Sky Quality Meter. The few times I have used it has been pretty accurate as compared to my Sky Quality Meter.

Sunset & Rise - An App that lists Sunset and Sunrise times. Lists Sunset, Last Light, First Light, Sunrise for current or future days. Lists upcoming Solstices and Equinoxes.

APOD - Astronomy Picture of the Day.

Other good Apps that I use include: Distant Suns (planetarium), DS Browser (Object Catalog), Star Charts (electronic chart), MessierList (Messier Objects), Double Stars (Catalog of double stars), Sky Live (Observing conditions), SoHO (images from SoHo Telescope), and Exoplanet (lists Exoplanet candidates)

If you don't have some of these apps, check them out. If you have a favorite, let everyone know via the TAAA Forum or the Newsletter. Happy Observing and Clear Skies!

Classified Ad

New Item! For Sale: Celestron Wedge. Used with a Celestron CPC-800. Will work with scopes up to the CPC-1100. $100.00 Call Jim or Elaine Miller at 520-977-9425.

Featured Article

An Observing Session to Remember

Text by Julian Grajewski (julian magpie[at]gmail.com) Photos by Alistair Symon

It was Sunday evening, May 20, 1989, the night of the full moon, and my twin brother Stash and I were in Ehrets Field, a lovely sloping green expanse surrounded by the deep woods of Forestburgh, New York, in the lower Catskill Mountains. My wife Elisabeth, our toddler Janusz Antares (on the early morning of his birth Antares was prominent in the South!) and I were flying to Hamburg to spend the summer with Elisabeth's mom Wera. We made a pit stop in upstate New York to visit my mother Santina, and Stash and his English wife Sheila. Prior to leaving Tucson, I had shipped my 8-inch Coulter Dobsonian for Stash. It had arrived that Saturday before.

I wanted to show Stash a few deep sky objects, but we were racing the moon rise. Additionally I had not counted on the long northern twilight of the gods that blanked out the stars; I was accustomed to the shorter "equatorial" onset of darkness at Tucson's 31 degree north latitude. Instead of observing globular clusters, open clusters, nebulae and galaxies, we saw a spectacular Moon rising red above the moist field. After the 1 % humidity and brutal 117 degree Fahrenheit temperatures of Sonoran desert summers, I reveled in the gentle mystery and balminess of the deciduous forest around us.

We were looking down at the rising moon, and we felt as if we would fall into it. We detected the moon's glow with binoculars many minutes before it rose, adding to the suspense. The first sight of the moon was a crimson point of light that momentarily looked like an aircraft navigation light. Quickly a red dome became evident. The deep red hemisphere seen through my East German binoculars (when there was an East Germany!) reminded me of hydrogen bombs going off the micro-second after detonation and before the familiar mushroom cloud. As the moon rose, it became orange and then yellow, its rising color in Tucson's drier atmosphere. We could almost feel the earth under our feet rotating towards it.

The next night, Monday, May 21, we expected a 42-minute window of opportunity before the next rising of the now gibbous moon (no twilight, no moonlight). We set up the 8-inch in the garden well before dark, lots of time for the tube to cool to ambient temperature. We checked star charts while waiting. I thought we should try for the triplet of galaxies in Leo, M-65, M-66 and NGC 3678 first, because they are easy to find in a low power field below Delta Leonis, in the hindquarters of the Lion. Stash's previous instrument was a 4.1-inch Edmunds' Astroscan and, except for a naked eye object like M-31, the Andromeda galaxy, he had never seen a galaxy. This was not because of the smaller aperture but it had never occurred to him that he could.

Stash was impressed by now seeing three galaxies in one field of view, seeming to float around each other inside a large circle. M-65 and M-66

The Leo Triplet (M65, M66, and NGC3628). Photo by Alistair Symon, used by permission. Photo details: Takahashi TAO-130 @ f/6, STL-11000M/AO-L camera, total exposure time is 11 hours 30 minutes. (woodlandsobservatory.com) © Alistair Symon

stood out clearly as oval patches of gray light, with NGC 3628's gray streak becoming more obvious as twilight deepened into night. M-65 was where the latest supernova had been discovered; we were happy just to see the galaxies themselves. I clearly remember the feeling of calm and satisfaction that welled within me as I gazed quietly upon these three marvelous heavenly bodies. My brother had similarly feelings.

By now I thought it might be dark enough to zero in on the Virgo Cluster. With that same Coulter 8-inch I had seen nine multi-billion star galaxies in one field of view from the top of Mount Lemmon in Tucson, and I was hoping to replicate the feat here for Stash. The Telrad was very handy, and when I put the red concentric circles on a bit of sky half-way between Denebola in Leo and Vindemiatrix in Virgo, there was already one dim galaxy in the field of the 32mm eyepiece. No time to check a star chart to determine which it might be. Instead I slewed around a curved line of faint stars I had memorized from previous observations, and there were the twin M-84 and M-86 galaxies, large and relatively bright. Stash looked through the Telrad so he could locate the field again before putting his eye to the eyepiece. I told him to move the tube around gently, and he was amazed as faint galaxy after faint galaxy of Markarian's chain, each a separate universe millions of light years away, swung into view to be replaced by others.

(Continued on page 11)

(Continued from page 10)

Stash thought he could detect the glow of the rising moon in the southeast, so we raced on to M -81 and M-82, which I easily found by sighting diagonally across the bowl of the Big Dipper and extending the line by one width. After the faint fuzzies of the Virgo Cluster, M-81 and M-82 were bright in the 8-inch mirror. Even in the low power eyepiece, we could gauge the thickness of M-82's disrupted streak. We could detect the dust clouds resulting from a spectacular explosion whose light left the parent galaxy millions of years ago. This explosion started tearing the galaxy apart. We wondered what it might look like now. Today, cosmologists explain M-82's disrupted appearance as caused by stellar winds set in motion by a period of star formation, not a singular explosion.

Part of the Virgo Galaxy Cluster including M84 and M86 (prominent galaxies on the left) and the line of galaxies known as Markarian's Chain. M87 is at the top-tight. Photo by Alistair Symon, used by permission. Photo details: Takahashi TAO-130 @ f/6, STL-110000M/AO-L camera, total exposure 10 hours 20 minutes .(woodlandsobservatory.com) © Alistair Symon

We felt we could only give seconds to such speculations because Stash wanted to see at least one globular cluster. They are our favorite deep sky objects. We had no difficulty slewing around to the top of the keystone in Hercules, rising above the blue star Vega (a fancy Arabic capital letter "H" is what the Hercules constellation looks like to us) and there was M-13.

"Wow!" gasped Stash, as he spotted the silver-gray sphere with many starpoints in it; a far better view than he had ever had with the 4.1-inch Astroscan (and at lower cost, I might add).

Stash wanted to see what it looked like at higher powers, so we switched to a 4mm eyepiece. At such higher power the view was fuzzy and jumpy as the globular cluster raced away from the tiny field of view of the 4 mm ocular. But after a while we noticed that for split seconds the seeing would improve and suddenly the dazzle of M-13's thousands of stars would pop into view only to be obliterated again. The star chains were apparent and this made us think that globular clusters are not globular but rather three-dimensional pinwheels.

That was our last object, as by now the moon was rising, blotting out the deep sky. We did not catch it rising because it would be a while before it cleared the pines, maples and oaks. I suggested we look at Arcturus before turning in. The 8-inch mirror gathers a massive amount of light, and zero magnitude Arcturus was an almost blinding, yellow pinpoint of light, shining pure and steady over the dim shapes of the northern forest.

Featured Article

Physical Astronomy

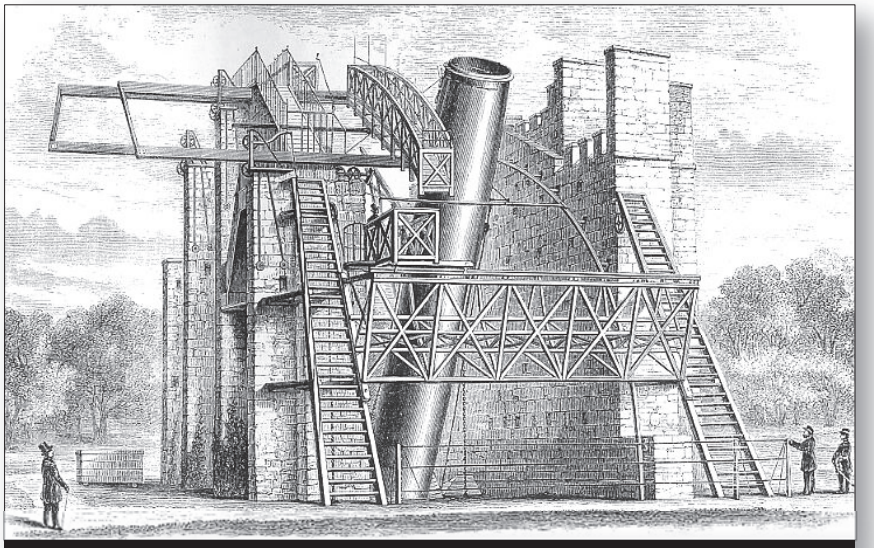
Text by Wayne Johnson (aka Mr. Galaxy) (mrgalaxy[at]juno.com)

Editor's Note: This originally appear on the TAAA Forum and appears with Wayne Johnson's permission

Most of us have heard of the terms "physical anthropology" (anthropology concerned with the comparative study of human evolution, variation, and classification especially through measurement and observation) and "physical chemistry" (the branch of chemistry dealing with the relations between the physical properties of substances and their chemical composition and transformations). I thought I had come up with a new term: "physical astronomy" but found that it, according to some sources, had its origins with Kepler and his celestial mechanics (that part of astronomy which treats the causes of the celestial motions; specifically, the motions resulting from universal gravitation).

However, I have come up with a new definition of "physical astronomy" especially for those of us amateur astronomers, who, as an example, spend many of our nights climbing up and down ladders to view through our instruments. It is the effort (physical and mental) that goes into using a telescope to make astronomical observations. The physical effort is less for those who have smaller telescopes with an eyepiece that doesn't require climbing up and down ladders but the mental effort is still about equal. I have always wondered why I was so exhausted the day following a wonderful night of *leisurely* scanning the skies.

I thoroughly enjoy the experience of visual astronomy and don't really consider observing through my telescope to be an arduous, physically trying effort. My sessions under the night sky usually last around four to eight hours depending on the time of year (shorter in summer, longer in winter). I have been fortunate for most of my adult life to have lived in areas where the weather conditions at night were moderate, compared to other places like Buffalo, NY (my home town), where temperatures can be brutal at best.



The ultimate observing workout. This is the 72" reflecting telescope known as the Leviathan of Partsontown or more properly as the "Rosse six-foot telescope." It's located at Birr Castle in what is now Birr, County Offaly, Ireland. It was built by William Parsons, 3rd Earl of Rosse. The original mirror weighed 3 tons. The tube and mirror box is 54 feet long. In addition to its up and down mostion, the telescope can move sideways a small amount. The eyepiece is on the west side of the telescope. When observing at low elevation, observers use a wooden gallery between the two walls. At higher elevations, the observers use a curved gallery which can move sideways. Credit: Public Domain.

Packing and unpacking the telescope (of any size) and related supplies is another physical effort and was something I never enjoyed but needed to do when I lived in southern California for about twenty years. Fortunately, I seldom packed my own telescope because I had the pleasure, after a nearly two hour drive, of using the Orange County Astronomers' very nice 22-inch club telescope at their Anza observing site. I used it both visually and for short exposure CCD images. The past sixteen or so years I have had the luxury of living under the rural dark skies of southern Arizona so that I usually don't have to bundle up my telescope and drive an hour or so to a good observing spot; I have that in my own backyard.

As I'm getting on in years (I just retired at the age of 62) the body is slowly letting me know that it's a good idea to get adequate rest before going out to observe and it doesn't hurt to take occasional breaks to rest the eyes which may feel somewhat strained when trying to view faint objects and read star charts under a dim red light. I try to alternate the eye that I use for observing but I notice that I am definitely right-

(Continued on page 15 Physical Astronomy)

Featured Article

Outreach While Traveling, and Chasing The Lunar-X

Text and photo provided by Jim O'Connor (gcsp[at]tucsonastronomy.org)

My wife Susan's family has a reunion picnic every summer in Northern Ohio, Lake County east of Cleveland. All but two times in the last 13 years I've ducked the trip due to work, but now that I'm retired, no excuses. Susan travels back three or four times a year to help her 95-year old mother, all but one by air but the reunion trip is usually driving, as this would be. With the large number of tasks that have built up, it looked like a six week journey.

Susan's mother had 17 brothers and sisters, and Susan has 55 first cousins, so getting together is a big event!) When the familyfound I was going to attend as well, there was a demand that I bring a telescope. Then my wife's sister, who lives down in Columbus, OH, mentioned to some friends that I was bringing a telescope to Northern Ohio, and about 25 of her fellow working dog agility test folks and coworkers wanted a star party! We made plans to take along my 10" SCT, Atlas EQ-G mount, several Mallincam cameras, and a 19" monitor. We needed to take our Mazda 6 station wagon—which is a lot more cramped than our pickup truck—so Susan's mother could more easily get in and out. But we made it work. It was a chance to escape monsoon season in the Southwest when sky time would be at a minimum for two months anyway. I might get to beat the odds as well as try the Great Lake area where I grew up.

During our first week and a half of our trip, we had one good night, then one mediocre night due to lights and clouds, but it's been pretty much clouds, overcast, moon, and urban lights preventing any other work; two attempted outreach parties were a bust; even without the cumulus clouds. High humidity right at the dew point gave horrible images with the urban light reflections. Even with an Orion blocking filter, viewing was impossible.

Two nights of cloudy sky broke, so I thought I would do a practice run at this new northern urban location. Daylight Savings Time is a real curse! Sunset wasn't until 9 PM, and astronomical twilight didn't set in until almost 10 PM. Mighty late! I set up in the back yard of Susan's mother's house, which we keep available even though her mother is in a senior apartment complex. Better than a motel.

I had a view of Polaris so I set up and waited for dark. I commanded a GOTO over to the first quarter moon to check alignment, and found my first mistake. Being accustomed to Arizona and no Daylight Savings Time, I had set up the mount with the local clock difference from UTC but DST set to Yes. So, I was an hour off in the sky. When I set the actual offset to UTC, Local Time, and DST = Yes, a new GOTO missed by only half a degree. I played with the moon for a while, all the electronics worked perfectly, but as the sky was darkening my shorts and sandals and no chemical defense against them forced me to go indoors to avoid an attack squadron of mosquitoes. It was a tasty night for the buggers.

As I was watching the Moon, I heard my wife get a call from her brother nearby, who wanted to know if we had the scope set up. Oh Boy, a Star Party! My brother-in-law Bill, his wife Ola and her daughter Icey (they are originally from Thailand), and Bill's friend Chuck and Chuck's wife and daughter came over just as it was dark enough to do things. I was looking at the Eastern sky, and the screen display on the fireworks from the local minor league baseball stadium was quite psychedelic. At the end of the game, the home team won so there was about ten minutes of pyrotechnics. I went to the Moon first, and pointed out the Lunar Poodle (Seas of Serenity, Tranquility, fecundity, and Crises with the Apollo 11 landing site in Tranquility). The Summer Triangle was nice and high, so I did a one-star alignment on Vega and showed off M57, the Ring Nebula and did the whole stellar evolution story. All night I did the show as though it were a high school outreach. Showing items, and throwing in cultural education. The Ring was spectacular at about 4 seconds of integration, and we stayed on it for a while. Then I went over to The Dumbbell, and had to increase the integration time. But anything over about 8 seconds was giving a white-out screen due to the light pollution and residual moisture. I stopped and added an Astronomik UHC filter, and the view turned black except for the gorgeous nebula about 1/3 of the screen, and awesome Milky Way stars. That one we kept for quite a while. The only glob really visible with the southern/western sky blocked by houses, trees, and street lights was M13, but the city lights, Moon, and high humidity killed any chance to find it. I went over to Albireo, and it put on quite a show. With zero integration time, all that was visible was the yellow and blue pair. Then I started to increase the integration time, and more and more of the Milky Way started jumping out. I ended up unfiltered and about 0.79 seconds integration time, and the color of the double star maintained itself but the yellow star grew huge, the blue one half the size, with the Milky Way star field in the background. More teaching opportunities to be had.

Last stop was to align on Alkaid and try for M51, The Whirlpool galaxy. Unfortunately, I didn't have my Deep Sky filter at the scope, and any attempt to up the integration time to a suitable level left a whitish cover over the view, although we could see the structure of the galaxies at 12 seconds integration. Usually I'd be up in the high 20s, but the humidity and light pollution made that impossible.

By now, it was after 11:30 PM, time to shut down. It ended up as a pretty good night considering the small back yard, fireworks,

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humidity, and urban lighting. I was able to get in a bit of Greek and Native American culture as well as the night sky.

Weather reports kept predicting the next night would be clear. Bad joke. But we had scheduled this to take place about 30 miles to the southwest, and Susan's cousin had found an unlighted neighborhood association park with the usual 60 foot trees not in the way, so although the sky was high stratus all day, we crossed our fingers and went over.

This time, the audience was one of Susan's cousins, her 7 sons, and various spouses and children. Probably close to 15, maybe more. Set up went perfectly, virtually everyone was in place before the end of astronomical twilight, so I went over to the Moon again and did the Lunar Poodle. I also did a Yaqui Indian legend about the Sun wanting the Moon for a girlfriend, but he never satisfies the Moon's simple request. There were probably a half dozen elementary school aged children in the group, and after seeing the poodle on the monitor, they could pick it up naked eye. We also talked about the Navajo legend of the creation of the Sun and Moon. Then I went over to Saturn, which was quite beautiful and we stayed there a bit. Just as the day before, I aligned on Vega and showed off the Ring and the Dumbbell, this time starting with the UHC filter installed. After getting the focus corrected, it was again a beautiful tale of stellar evolution. I tried going to other objects, but the overcast was really rolling in and even Albireo and M82, alternatively called Bode's Galaxy or The Cigar, were not visible in the monitor, despite using a Lumicon Deep Sky filter.

We also talked some cultural lore, like Mizar/ Alcor being vision tests, and how the Plains Indians' cue for hunting buffalo was when Alcor, the rider, appears to ride Mizar the horse.

On neither night was any hint of the Milky Way visible to the naked eye. Even Cassiopeia was wiped out. Arcturus and Spica were up, but no constellations detectable. Quite a change from Arizona! But the local population was happy to hear the cultural stories and see what the sky had available.

Two weekends later, during late rising 3rd quarter moon, we headed south to a rural section outside Columbus, Ohio, to Susan's sister's home, where the weather was promised to be clear after 6 PM, but didn't start to break until after 10 PM. We set up twice in the late afternoon and evening, and put everything away when the sky became fully covered. The 25 guests that my sister-in-law had invited were content to sit around a huge bonfire. When we noticed the sky start to show patches of stars after 10 PM, we were able to do walks around the sky with various cultural myths and lore so it ended up an enjoyable event without the scope. The sky finally cleared at 1 AM, well after everyone departed.

But the next night was awesome. Clear sky, dew point over 20 degrees below ambient, and no haze. Urban lights were no problem. I set up in twilight, and dark sky finally set in around 10 PM. (doggone Daylight Saving Time - we don't do that in Arizona) and after fighting focus issues and finder collimation troubles for about thirty minutes, the next hour and a half were incredible. Where we are staying, Susan's mother's house in the middle of a densely populated city, has a very limited viewing area, so no Scorpius or Sagittarius eye candy, but the small area available was great. I bounced all over, and The Ring looked so good at 7 seconds that I made some pixel control changes to the camera, boosting the processing. The color boundaries were fantastic. The beauty in The Whirlpool was striking but M82 was unbelievable. So much detail in the 10" SCT with focal reduction down to f/5, star forming regions and the heavy influence of the supergiant stars were quite a treat. And NO influence from the heavy urban lighting, integration time was around 40 seconds but looked like 30 would have been fine. I then went to M13, which filled the screen with multiple layers of stars. I also did M3, whose size in the 19" monitor surprised me. It is interesting to play with globs and integration times; to get the full deep glob experience forces the image to be white diamonds on dark velvet, but reduce the time down below two seconds, and the stars that survive the short timing pick up their natural reddish hue as they should, considering their age. But still, upping the integration time was nearly filling the FOV with the white diamonds. I also tried several multiple stars, and got the color of Albireo nicely, and by altering the shutter speed and then longer integration times, it is possible to get a lonely blue-yellow pair, or at longer times, the whole Milky Way behind them although the double star becomes huge star images. Same with Mizar. At lower exposure times, just the visible double of Mizar and its companion Alcor are present on opposite corners of the FOV, but if the times are jacked up, the blue star Sidus Ludovicus (Ludwig's Star) becomes visible and it is striking that while with the naked eye we see Mizar, with Alcor if we concentrate, if Ludwig's Star is added to the monitor view it makes 7 stars present although only three are apparent, since Mizar is really a spectrographic double-double, and Alcor is a spectrographic double as well.

I finished up on the open clusters, M39 and NGC457 (The Owl Cluster), and played a bit with both of them. By now, though, almost midnight, the mosquitos shrugged off the repellant and drove me to shut down and run indoors.

I learned quite a bit that night on using blocking filters and it made viewing possible, but that was the last useable night for weeks. Then I checked on the predicted time for Lunar-X, the artifact of a pair of intersecting ridges on the moon that are only visible for a few hours in terminator each month, on the website http://www.eyesonthesky.com/Moon/LunarX.aspx, and saw that on the last clear night we would have before leaving, Aug 21, it was scheduled for 20:30 EST, a good time. But I forgot to add Daylight Saving Time, and it was really going to begin its appearance at 9:30 PM, so I spent an hour in the cold and bugs with nothing happening. It was 49 F, when usually in August it would be low 70s, and I hadn't brought a jacket! But I was seeing the X start to become visible at 9:30 PM, so I waited a bit more and took the final images (three frame stack at 1/4000 sec) at 9:45 PM. It would have been much better at 10:45 PM, but I was freezing and the mosquitos were still active (they laughed at insect repellent; they used it for

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eyed. I use a black eye-patch to cover my non-observing eye to keep eye-strain to a minimum and stray light from being too bothersome.

I have a good-sized 25-inch f/5 Dobsonian-style telescope that requires me to roll the awkward, hundred pound beast fifty feet out of my garage, wheel-barrow style, and set it up on a slight mound to keep its wheels from dragging on the ground. I sit on top of an 8-foot ladder to view through its eyepiece when objects are near the zenith. This is a fairly unstable observing situation; the telescope becomes more difficult to move and the ladder sways a little when I'm near the top, too, but it's a view I would not trade for anything in the world, except maybe a bigger telescope. I am thinking about getting an 8-inch flat (folding mirror) to bring the eyepiece down closer to the ground but that's a work in progress. Meanwhile, in the telescope's current configuration, during the four or so hours I observe I probably go up and down the ladder several dozen times (in the dark, but my eyes are dark-adapted) so my legs get a lot of exercise and it's good for the heart, too. Luckily I'm in fairly good physical shape and I don't suffer from fear of heights, though I have a healthy respect for them.

I have to get down and move the unwieldy ladder many times during an observing session. This takes a bit of physical exertion but it is important to maintain a good posture when observing, which can at times be a difficult task with the ladder. Sometimes the eyepiece is just a little too high (causing craning of the neck or standing on tip-toes) to attempt to reach it or sometimes the eyepiece is a little too low causing you to stoop down into an uncomfortable position. These stances are both inconvenient, distracting and energy-wasting. There are ladders with half-steps that help immensely and moving the ladder to properly position your eye height works in a pinch. Of course, my favorite height adjuster is the pneumatic Hyster that Stony Ridge amateur observatory in the mountains outside Los Angeles uses for their 30-inch f/6 reflector!

I try to keep my body temperature regulated, maybe a little to the cool side, with layered clothing. Keeping your head covered is very important on cold nights since more than 80% of your body heat is lost through your chrome dome and keeping your extremities (hands and feet) properly protected helps maintain the comfort level and keeps you from being distracted and becoming tired. Staying comfortable takes a tremendous amount of energy and can divert from your enjoyment of the night. If you're too hot you work up a sweat and there's the possibility of fogging up the eyepiece. It's a good idea to keep a portable hair dryer nearby on humid nights. Yes, we occasionally *don't* have dry nights here in Arizona. I also try to eat reasonable snacks (I like dark chocolate peanut M&Ms and peanut butter cups!) and drink some sort of tea or soft-drink. Water might be better to keep the energy level up through the night.

We're not automatons and we will have our fades and challenges during the night but I hope that some of the suggestions I have made will help you cope with the physical challenges that amateurs face. You probably have your own ways of coping and it would be interesting to hear how you do it.

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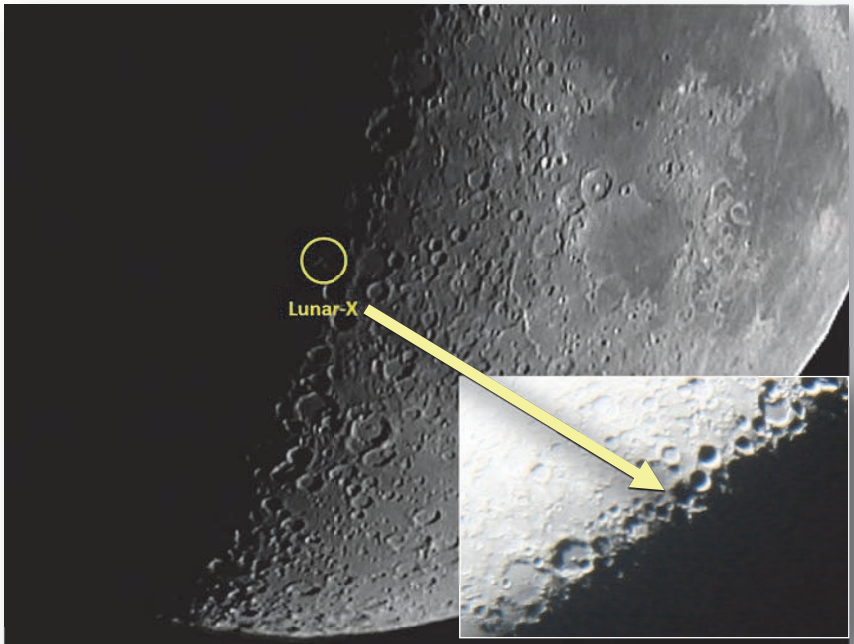
dessert) so I packed it up for good, loading the setup into the car for our departure in two days. Next try will be Sept. 20, around 6 PM Tucson time.

It's always great to see the awakening on friends' and relatives' faces as they understand the calling. Then it gets dark enough to show eye candy, and they're hooked. The comment I've often heard is that mixing the eye candy with the sky lore of many cultures makes the sky seem more personal. We all have a bit of ourselves to share, and you never know what one life you'll touch.



Position of Lunar X. Inset: Lunar X formation created by sunlight during the few hours before 1st Quarter, taken Jan 31, 2012. Inset photo provided by Wikimedia user RadioFan.

Featured Article

Measure the moon's size and distance during the next lunar eclipse

By Dr. Ethan Siegel

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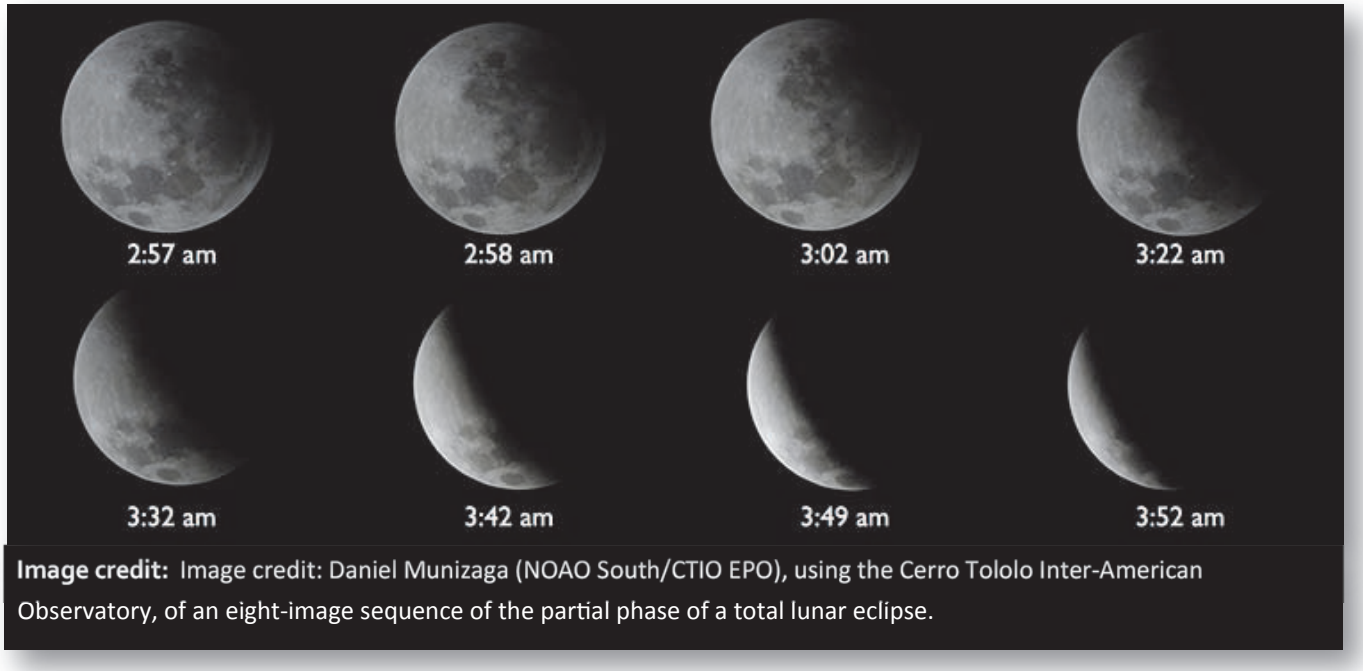


Image credit: Image credit: Daniel Munizaga (NOAO South/CTIO EPO), using the Cerro Tololo Inter-American Observatory, of an eight-image sequence of the partial phase of a total lunar eclipse.

The moon represents perhaps the first great paradox of the night sky in all of human history. While its angular size is easy to measure with the unaided eye from any location on Earth, ranging from 29.38 arc-minutes (0.4897°) to 33.53 arc-minutes (0.5588°) as it orbits our world in an ellipse, that doesn't tell us its physical size. From its angular size alone, the moon could just as easily be close and small as it could be distant and enormous.

But we know a few other things, even relying only on naked-eye observations. We know its phases are caused by its geometric configuration with the sun and Earth. We know that the sun must be farther away (and hence, larger) than the moon from the phenomenon of solar eclipses, where the moon passes in front of the sun, blocking its disk as seen from Earth. And we know it undergoes lunar eclipses, where the sun's light is blocked from the moon by Earth.

Lunar eclipses provided the first evidence that Earth was round; the shape of the portion of the shadow that falls on the moon during its partial phase is an arc of a circle. In fact, once we measured the radius of Earth (first accomplished in the 3rd century B.C.E.), now known to be 6,371 km, all it takes is one assumption—that the physical size of Earth's shadow as it falls on the moon is approximately the physical size of Earth—and we can use lunar eclipses to measure both the size of and the distance to the moon!

Simply by knowing Earth's physical size and measuring the ratios of the angular size of its shadow and the angular size of the moon, we can determine the moon's physical size relative to Earth. During a lunar eclipse, Earth's shadow is about 3.5 times larger than the moon, with some slight variations dependent on the moon's point in its orbit. Simply divide Earth's radius by your measurement to figure out the moon's radius!

Even with this primitive method, it's straightforward to get a measurement for the moon's radius that's accurate to within 15% of the actual value: 1,738 km. Now that you've determined its physical size and its angular size, geometry alone enables you to determine how far away it is from Earth. A lunar eclipse is coming up on September 28th, and this supermoon eclipse will last for hours. Use the partial phases to measure the size of and distance to the moon, and see how close you can get!

NASA's Space Place

Observing and Imaging

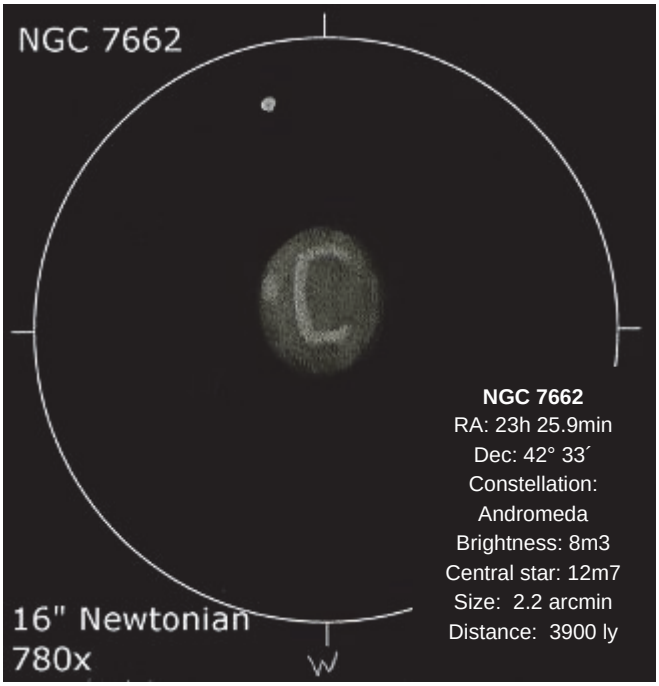
Planetary Nebulae of the Quarter – Fall 2015

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.

Without any doubt, M31, the grand Andromeda galaxy, is the best known object that can be observed in Andromeda. However, our neighboring galaxy is not the only wonderful celestial object in this constellation. NGC 891 – a nice edge-on galaxy – and NGC 752 – a beautiful open cluster – come to my mind…and NGC 7662, a fascinating planetary nebula.

NGC 7662 is often referred to as the Blue Snowball. Since this object is pretty bright (surface brightness that is), it's possible for the photons from the nebula to stimulate the cones in your eyes. Those are responsible for color vision and have a responsivity maximum of some 505 nm at night – which is blue or cyan. Actually, this is a rather unemotional explanation of an interesting effect that visual observers can witness.



NGC 7662 was discovered by William Herschel in 1784 and is rather small. Data I found differ between 0.5 arcminutes and 2 arcminutes in diameter. Regardless of what value may be correct – you'll definitely have to magnify a lot. When doing so, you will be rewarded with a stunning view of an anything but boring PN. Look out for structures inside the bright area. Even though they are kind of subtle, they are there! I am confident in saying that one can see some structure with apertures as small as 8-inches in diameter (maybe even less when having extraordinary observing conditions). I observed the Blue Snowball in October 2010 with a 16" Dobsonian from a location close to Sky Village having superb conditions and noted: Bright, hook can be seen with higher magnifications, there is a brighter spot in the south which is not as bright as the hook, no central star seen; fst 7m4, 780x

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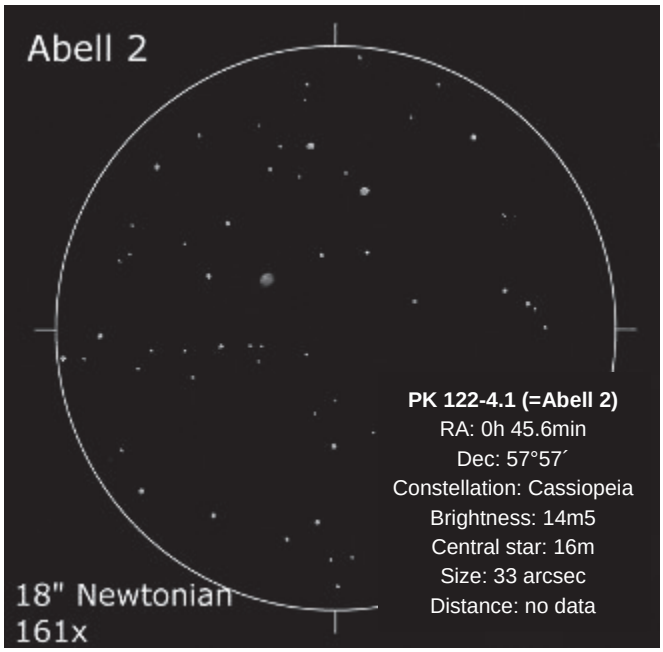
Cassiopeia, a rather medium sized constellation, is crammed full of deep sky objects. Beside innumerous open clusters, there are lots of planetary nebulae waiting for you. A thorough catalog compiled by Kent Wallace lists 26 PNs! Cassiopeia is the constellation with the second most number of Abell PNs (after Aquila), hosting six of them. Abell's second entry in his famous list from 1966 is the object discussed now. PK 122-4.1 or Abell 2 is one of the "easy-to-observe"-Abells. Even though it cannot be considered a beacon, I was surprised that I was able to see this object without any filter at all. There are observers that have seen Abell 2 with 8-inch telescopes, so give it a try. I observed this PN in September 2014 with an 18" Dobsonian reflector and noted: Without filter faintly visible with 161x, with the help of a filter quite conspicuous; circular uniformly bright disk, not getting any better with higher magnifications, [OIII]-filter helps most, no central star seen; fst 6m8, 161x



Observing and Imaging

Constellation of the Season: Pisces - The Fish

Text and artwork provided by Chris Lancaster

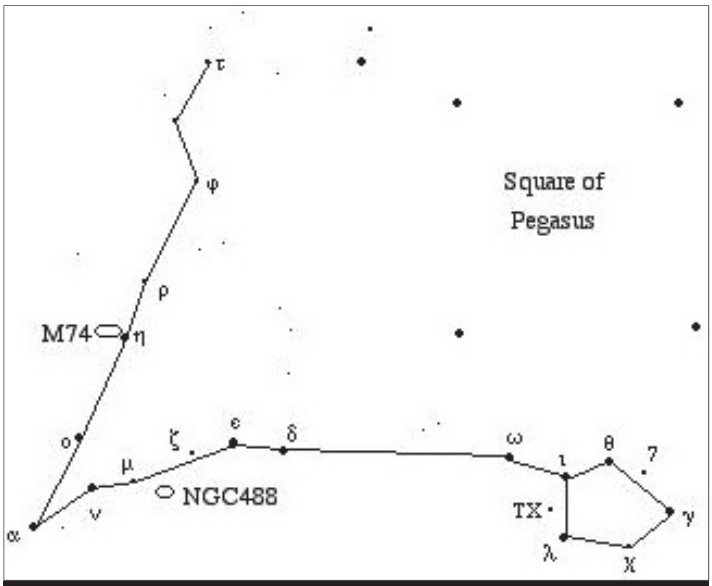
The Constellation of the Season was written by Chris Lancaster and is the basis of his book, "Under Dark Skies - A Guide to the Constellations, Trafford Publishing (http://bookstore.trafford.com/Products/SKU-000158114/Under-Dark-Skies.aspx). While the information was accurate at the time of the original writing, the reader should be aware that the sky does change over time. In particular, separation and position angles of double stars may have increased or decreased. This article is presented as originally written. Consult current observing resources for correct separations and position angles.

Although this constellation is one of the prominent ones of the zodiac, it can be easily over- looked because it has no star brighter than 3rd magnitude. It represents two fish, one beneath Andromeda, and the other below Pegasus. They are joined to each other at Alpha Piscium and thus form a skinny "V" pattern pointing toward the southeast. Currently, the easiest way to find Pisces is to look to Jupiter high in the south during the mid-evening hours. The planet starts off just east of Pisces at the beginning of the month, moves into the "V" on November 9th when it will be 8.5 arc minutes from Omicron Piscium, and continues its retrograde motion deeper into the constellation throughout the month. *(Ed Note: Correct when this article was originally written. Jupiter is currently in Leo.)*

The ancient Babylonians, Persians, Romans, Greeks, and Turks all saw fish in this group of stars. One story depicts Aphrodite and her son Eros who jumped into a river to escape a giant named Typhon. They turned into fish and swam away. So that they wouldn't be separated, they tied their tails together with a cord. In fact, the Alpha star mentioned above is named Alrisha, Arabic for "knot" or "cord."

South of the Great Square of Pegasus is the circlet of stars marking the head of the western fish. Seven stars make up the circlet, and the one which stands out from the others is the variable star TX Piscium (also designated 19 Piscium), the eastern most star of this group. It varies slightly from magnitude 5.5 to 6.0, but one look at it will show that what makes it special is its color. Although it doesn't have a catchy nickname like the Crimson Star in Lepus or the Garnet Star in Cepheus, its red color is no less striking. Try using the different color sensitivities of your retina by looking directly at it, and then to the side. You should notice that its color is rich when in the center of your vision, and then fades to a lighter pink or almost white as you move your gaze away from it.

Pisces is home to a decent number of galaxies, but the only one big and bright enough for Charles Messier to add to his catalog is M74. Its magnitude 11.0 glow and 9'X 9' size can be spotted 5' in RA east and 0.5 degrees north of Eta Piscium (or RA 1h 36.7m Dec +15d 47'). This face-on spiral should appear as a faint, circular glow lacking much detail. In fact, early astronomers found it to be so elusive that after its discovery in 1780, there were differing opinions as to what type of object it really was. John Herschel decided that it was a globular cluster in his General



Pisces

Catalogue in 1864 when others thought it was a galaxy, and it wasn't until 1893 that the first detailed photograph showed its spiral arms.

Another spiral galaxy within range of amateur instruments is NGC488. It is almost as bright as M74 at magnitude 11.2 but much smaller, measuring roughly 3'X 3.5'. This is a compact spiral with tight arms which more evenly distribute its light across its face. Here are a few ways to find NGC488--look about 2/3 the distance between Alpha and Epsilon and one degree south of this line; or starting at Epsilon, drop down 2.5 degrees and move east 19' in RA; or dial up coordinates RA 1h 21.8' Dec +5d 15.4'. Once you find it, go to a high power eyepiece to bring it into better view.

An easy double star to view in any telescope is Zeta Piscium. This pair of magnitude 4.2 and 5.3 stars sits less than 1/4 degree south of the ecliptic and is separated by 23.5". They are of neighboring spectral types (A5 and F6) so the color contrast between the two may be too slight to detect. I see only shades of gray-white, but since individuals' eyes are different, some may see a subtle yellow or blue tint between them.

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