

Membership Meeting

TAAA's next general member meeting will be held on Friday, June 4, 2021, and available online. The Main Presentation starts at 6:30 PM and is open to the public. A Members Only Meeting will follow. Non-members may attend the Main Presentation via Facebook at <u>https://www.facebook.com/</u> <u>TucsonAstronomy/</u>. Members should attend the meeting via Zoom. The Zoom link will be sent to members via email before the meeting.

Main Presentation at 6:30

Title: Ivory Towers in Backyards

Presentation: Many astronomers dream of their own personal observatory in their backyard. What are some of the options out there for individuals to have a small observatory only feet away from family and a soft, warm bed? Joseph Wright uses anecdotes and a lifetime of talking to a wide variety of audiences, including youth, to inspire people to become involved or more involved in astronomy.



June 4 @ 6:30 pm - 9:00 pm



Presenter: Joseph Wright's interest in astronomy started when he was a teen Boy Scout working on the astronomy Merit Badge at the H. Roe Bartle Scout Reservation in Osceola, MO. Joe continued his interest as a member of the Astronomical Society of Kansas City, and by studying Architecture and Architectural Engineering at the University of Kansas. He has created construction for several small observatories. He is now employed by UA and Steward Observatory as an Instructional Specialist, as well as a high school teacher in Architectural Design, CAD/Drafting and Robotics. The winner of many honors and awards in his field, Joe is Solar System Ambassador with Jet Propulsion Lab (JPL), an Airborne Astronomy Ambassador with The Search for Extraterrestrial Intelligence (SETI) and the Sofia aircraft. And still more! He's president of the National Sharing The Sky Foundation, and in his 17th year as Operations Manager of the Warkoczewski Observatory at the University of Missouri-Kansas City. He resides near Excelsior, MO, and considers Tucson his second home.

Members-Only Meeting: We will "break out" into seperate Zoom rooms for specialized discussion.

It is always exciting to experience the evolution to the new TAAA Board for an upcoming year. In accordance with a newly elected TAAA Board beginning to serve June 1st every year, the election of the 2021-22 TAAA Board was finalized at the May First Friday Member meeting. The TAAA 2021-22 Board consists of: Mae Smith, President; Ed Foley, Vice President; Bob Reynolds, Secretary; Mike McDowell, Treasurer; Gus Gomez, Ralph Means and Doug Smith serving as Members at Large. We owe thanks to Carter Smith who ran for Member At Large, but did not win this year. We always expect a leader who runs for the Board the first time and doesn't make it, to run again in the future. Many of us started in and continued in TAAA by waiting our turn to serve. Also, anyone who thought about running this year, but didn't, we encourage you to hang on to those thoughts for another year, as Board members are needed each year.

Our gratitude goes to John Mead, former Vice President, and Chuck Hendricks, former Secretary. who provided years of service to the TAAA Board before deciding not to re-run this year. All elected and appointed volunteer jobs within TAAA and everywhere are temporary and last for a limited span of service. However, each person in each of those jobs leaves their lasting impressions on and legacies to the TAAA circle of contributors. They each help shape TAAA in an ongoing way with their current and forever-lasting individual imprint.

Some actions of the TAAA Board at the May 12th meeting included:

- Reviewing leader requests for funding for the upcoming year.
- Extensions of the COVID 19 opening of sites which already included open pads to increasing the availability of pads at TIMPA and opening the

by Mae Smith

RMO at CAC for warming as well as sleeping of 4 vaccinated persons (food and beverages are not currently served in the RMO).

- Possible Member Observatory and Dob plans at CAC for the future are still in development and will be until at least after the upcoming publication of the CAC article in <u>Astronomy</u> <u>Magazine</u>. The article has been completed and submitted.
- The Board approved the idea of a member bus trip to CAC after further development of the site, perhaps by mid 2022.
- The Board accepted the recommendations of the Publications Working Group, permitting the change of the current TAAA publication back to the former Desert Skies name and approval of a basic philosophy similar to that of the former Desert Skies allowing for a wide array of TAAA interests and activities being expressed in the publication as well as a possible Tribute section (as space and time allow).

Remember the June Special is the Virtual Grand Canyon Star Party Saturday June 5 – Saturday 12th. Watch the great Star Party videos and presentations as well as special National Park Service activities on You Tube and Facebook. Our TAAA volunteers (Jim Knoll, Jim O'Connor, Bernie Stinger and Rick Paul) as well as other astronomers put together interesting star parties and Jim O'Connor did an additional walk through the sky. Rader Lane's Rangers and NPS virtual personnel worked really hard for months and our own TAAA GCSP Committee did its usual problem-solving. We learned some things last year and so this year's virtual GCSP will be even better than last years. Let us know what you think!!

TAAA Trivia: Pre-COVID TAAA Activities

If you have questions or wish to discuss something in the Trivia, contact <u>Mae Smith</u>. It has seemed difficult for me sometimes during COVID to put a perspective on things and have a sense of what was happening when in the past. I don't seem to have the same time perspective that I had prior to COVID. So, I decided to look back a bit and see what we were doing prior to COVID, in the summer of 2018, three years ago. So, my question is what were some things happening in TAAA, three years ago, summer of 2018, in the following areas:

Astro Imaging Special interest Group (AISIG)? Grand Canyon Star Party (GCSP)? Chiricahua Astronomy Complex (CAC)? Tucson Stargazing Adventures (TSA)? Awards? Answers later in this Bulletin

School/Public Star Party Requests

Let us <u>know</u> if you can support any of these events. If you are new to Star Party outreach, let us know and we'll be sure to help you get started. It is important you sign up for star parties if you plan to attend, whether you bring a scope or help in other ways, so we can manage who from TAAA will be on-site and for you to be included in any reminder or weather emails.

The Astronomy Events are listed on the <u>TAAA</u> and <u>Night Sky Network</u> (NSN) calendars. You do not need to log in to see any PUBLIC events. You need to LOG IN to see the school/non-profit non-public star party listings. Also, all PUBLIC star parties will be listed on the <u>TAAA Facebook events page</u> and will be updated based on weather, etc. in real-time. You can follow any of those events and get a notification when I update the event. Again, this is only for PUBLIC star parties listed on Facebook.

SOUTHWEST TUCSON - St Gianna Oratory @ Boy Scout Double V Ranch Saturday June 5 - Setup 6:45; 7:30 - 9:00 In Person - # Participants 70; All ages. 3801 S Kinney Road **Grand Canyon Star Party**

by Jim Knoll

Saturday June 5 - 12 -- Virtual This year the Grand Canyon Star Party will be virtual. There will be Talks and Star Parties each evening. TAAA will do three of the eight star parties. For a schedule of events, links to the videos, and additional information: <u>https://www.nps.gov/grca/</u> <u>planyourvisit/grand-canyon-star-party.htm</u>.

Special Interests Groups

Starry Messengers

by Terri Lappin

With an increase in face-to-face events, the Starry Messenger SIG wants to reconnect with volunteers who want to support our outreach events through non-telescope means. We have around 100 activities, presentations, and projects to choose from spanning the entire range of astronomy topics. If you're interested in activities such as determining meteorites from Earth rocks, demonstrating eclipses, or talking about black holes, please consider volunteering for our Night Sky Network (NSN) Toolkit program. Best of all, most don't depend on the weather, which means we don't need to cancel outreach events due to clouds! To see a list of these projects (and download them), visit https://nightsky.jpl.nasa.gov/download-list.cfm. The TAAA has nearly all the materials to support these projects. We can train you or you can train yourself using videos from the NSN. Generally, we work in pairs so you can ease into the role of outreach volunteer by shadowing someone with more experience. For more information about the Night Sky Network Toolkit Program, contact Terri Lappin.

SMSIG on the Web



The next meeting is Monday, June 21st at 7:00.

Check out AISIG On the Web or contact Greg Ruppel for the latest information and Zoom links

Gregg and the AISIG folks are very active on the <u>TAAA groups.io</u> forum. Check out all the helpful advice and amazing images, there. For more information or instructions on how to join the forum, check out the <u>TAAA</u> <u>Forum</u> web page.

Observing Sites

Effective May 1, 2021, CAC & TIMPA will be open at full capacity (all pads are open).

The COVID Rules are posted on the TAAA Website (<u>http://tucsonastronomy.org</u>) under the respective Observing Site (TAAA Resources, Observing Sites) and contain additional information.

TIMPA

by Ralph Means

TIMPA (Tucson International Modelplex Park Association), Dark Sky site west of the Tucson Mountains. <u>TIMPA on the Web</u>

Location: The TIMPA observing site is located a few miles beyond the Desert Museum. TIMPA Director: <u>Ralph Means</u>

This is a list Timpa Star Party nights for the rest of calendar year 2021 along with the dates of the new moon.

June 11, Friday June 12, Saturday	new moon 10th
July 9, Friday July 10, Saturday	new moon 9th
August 7, Saturday August 13 Friday	new moon 8th moon observing
September 4, Saturday September 10, Friday	new moon 6th
October 2, Saturday October 8, Friday October 30, Saturday	new moon 6th
November 6, Saturday November 27, Saturday	new moon 4th
December 4, Saturday December 10, Friday	new moon 4th moon observing



Chirichaua Astronomy Complex

by Jim Knoll

Chiricahua Astronomy Complex (CAC) is the club's dark observing site, located in Cochise County approximately 100 miles southeast of the center of Tucson. If you would like to attend, you must make a reservation (see below). Reservations are on a first come – first serve basis. You need to reserve for both nights if observing both nights. <u>CAC on the Web</u>

Unless you are qualified to open and close the site, dates will be limited to those around the New Moon and are listed on the CAC webpage. Restrooms will be open. The RMO will be closed and NO access to the refrigerator in May (June status will be evaluated by the board in May).

We are implementing a <u>reservation form</u> on the website for all CAC reservations. Click <u>here</u> or click on the TAAA Web Site (<u>https://tucsonastronomy.org</u>), then the TAAA Resources tab, CHIRICAHUA ASTRONOMY COMPLEX (CAC) tab, CAC DARK SITE RESERVATIONS tab, and complete the form to make a reservation. I request you start using it to make your reservation. After the initial reservation then we can coordinate any changes via email.

CAC Director: Jim Knoll

CAC 2021 Events Calendar

Star Party Dates

June	11-12
July	9-10
August	6-7
September	3-4
October	1-2
November	5-6
December	3-4
Star-B-Q	
October	2



Committee Reports

Nominations and Volunteer Resource Committee

by David Rossetter

As previously announced, the NVRC ran a completely online 2021 TAAA leadership election. We are very pleased with the performance of the online election service and appreciate the hard work of the committee and everyone who helped ensure a smooth and secure operation. For the record, below are the results of the election:

President - Mae Smith Vice President - Ed Foley Secretary - Bob Reynolds Treasurer - Mike McDowell Members At Large Doug Smith Ralph Means Gus Gomez NVRC (2-year term) David Rossetter Allen Force

The NVRC would like to thank all who ran for elected positions. This club does not run without enthusiastic and skilled leaders – both elected and other hard-working volunteers.

In other NVRC news, we are looking for a new Membership Manager. This person will be involved in redefining the position as it moves more online. However, the job still entails signing up new and renewal members and answering membership questions at in-person meetings once they start up again. Please contact the committee if you are interested.

nvrc@tucsonastronomy.org

David Rossetter – Chair John Christensen Ken Bertschy Allen Force

Notes From The Editors

As you may have noticed, the Events Bulletin has been renamed the "Desert Skies Bulletin". This partially reflects the history of TAAA publications. Going forward, this publication will include club events as well as more creative content. You may notice some of those changes in this issue.

If you have a contribution, please send it to Co-Editor, David Rossetter. We would love in-person reports of club events, non-club events, and other creative articles. If you have astro-images you would like to share, we would appreciate it if you would coordinate with the Astro-Imaging SIG.

Finally, we have had comments that after downloading the bulletin and viewing on a browser, clicking on link takes you out of the bulletin. I have not figured out how to resolve this with our publishing software (Adobe InDesign). To fix this, select to open in a PDF viewer (different location in each browser) or save the file as a PDF to your computer and view it with a PDF viewer.

<u>David Rossetter</u> – Co-Editor Ken Bertschy – Co-Editor

Other TAAA News

Donation Could Double the Size of CAC

The TAAA board received and approved a proposal which could add 20 acres to their already 16 acre Chiricahua Astronomy Complex dark site. The Heritage Living Trust recently purchased the acreage from a developer who had owned the property southwest of CAC since 2006. Current TAAA members Erich Karkoschka and Robert Crawford, who each own adjacent parcels, have granted a deed of easement to TAAA, connecting the current CAC octagonal shaped parcel to this proposed addition. The Trust proposed a donation of the acres to TAAA if TAAA reviews the current CAC Master Plan and develops a proposal for Cochise County that results in a Special Use Permit to convert the classification of the new land's use from Residential to an Educational use suitable for TAAA activities.

In 2008 when TAAA first sought to develop CAC, it went through a county zoning/planning process in order to establish CAC via a county Special Use Permit. The Cochise County Planning and Zoning office has already expressed openness to expanding the site beyond 16 acres based on the good experience the county has had with TAAA. The current TAAA plan to build member observatories on the south side of CAC will use most of the remaining acreage TAAA has available to develop. In its application for the Special Use Permit TAAA agreed to leave 5.3 acres of the original 16 acre grant undeveloped.



by Doug Smith What's Up list for June 2021 – July 2021

Fellow amateur astronomers. Many of the Astronomical League observing programs can be done from our backyards. The following is a list of objects visible during May and June for the more common observing programs.

Constellation Hunter Program – Northern Sky

The following constellations are well placed for observing for June and July: Bootes, Canes Venatici, Coma Berenices, Corona Borealis, Draco, Hercules, Serpens Caput, Serpens Cauda, Ursa Minor

Messier Observing Program

The following Messier Objects are well placed for observation during June and July (listed in ascending RA): M53, M63, M51, M83, M3, M83, M101, M102, M5

Lunar and Binocular Lunar Observing Program

The following is a list of the dates for the lunar phase when observations should be made during June and July:

New Moon: June 10, July 10 40 Hours waxing: June 12, July 12 72 hours waxing: June 13, July 13 4 days old: June 14, July 14 7 days old: June 17, July 17 10 days old: June 20, July 17 Full (14 days old): June 24, July 24 Gibbous: June 2, July 1 72 hours waning: June 6, July 7 40 hours waning: June 7, July 8

Solar System Observing Program

The following list describes the various solar system objects and their visibility during June and July:

Mercury disappears behind the Sun in the first week of June. It becomes an early morning object for the rest of June and July. Greatest elongation is on the 4th of July.

Venus is an evening object during June and July. Close conjunction with Mars (1/2 degree) on June 12. Jupiter and Saturn are late evening objects in June and July, rising earlier each day.

Mars is getting very low in the evening sky during June and July and setting earlier each day. Close conjunction with Venus (1/2 degree) on June 12.

Uranus is an early morning object in June and July.

Neptune is a late evening object in June and July, rising earlier each day.

Urban Observing Program

The following deep sky objects are well placed for observing during June and July: M3, M5

The following Double Stars are well placed for observation during June and July: Zeta Ursa Major

Grand Canyon National Park Astronomer-in-Residence Program

From Rader Lane:

"The Astronomer-in-Residence (ASTiR) Program at Grand Canyon National Park offers astronomers, both amateur and professional; educators, scientists, visual and performing artists, and writers, the opportunity to practice and share their discipline under one of the most pristine night skies in the United States. Through artwork and educational outreach, the ASTiR inspires Grand Canyon National Park visitors about the values of dark night skies, spreads awareness to visitors about the threats of light pollution, and explores society's complex relationships with natural darkness.

The program is similar to the Artist-in-Residence program hosted by various national parks. The park hosts the chosen applicant on-site for a short-term residency. The difference is that the primary focus is on night skies, astronomy, and the various disciplines studying natural darkness. Not only are artists encouraged to apply, ASTiR also invites educators, advocates, scientists, and other outreach disciplines to share their expert knowledge, inspiration, and equipment with park visitors."

For more information, see our webpages: <u>Astronomer in Residence (NPS)</u> <u>Astronomer in Residence (GCC)</u>

This is a really exciting opportunity! The chosen applicant gets to stay between 3-6 weeks at the historic Verkamps Residence, overlooking an incredible view from the South Rim! Let me know if you'd like to discuss this more. But I hope to spread the word through our community because I can think of about 100 people who would be great for this from TAAA!

Rader Lane Park Ranger (I) - Night Sky Lead Grand Canyon Star Party Coordinator Division of Interpretation and Resource Education Grand Canyon National Park

Office: 928-638-7641, Cell: 928-300-4244



For those who want even more online astronomy presentaions and streaming, Check out Explore Scientific's <u>Live Event Calendar</u>.

They have almost daily events. Check out the regular Global Star Parties (they have featured David Levy and other club members in the past). They have events with the Texas Star Party and Spacefest coming up.

by Mae Smith

In the summer of 2018, three years ago what was happening in the following TAAA areas:

Astro Imaging Special interest Group (AISIG) - AISIG disbanded. Tom Rolfsmeyer spent part of his summer putting together a proposal to the TAAA Board to request that AISIG be re-instituted and a plan for its future goals and operation.

Grand Canyon Star Party (GCSP) – It was definitely a successful event in spite of the variable temperatures that year, ranging in one day from 38 degrees to 91 degrees, also with rain and several cloudy days. Not only was it hard on the telescope field, the campers had some miserable weather experiences in spite of the great astronomy star party experiences.

Chiricahua Astronomy Complex (CAC) - The Addition to the Reynolds Mitchell Observatory of the 9" folded refractor pier area and telescope storage was completed in August of 2018 and the Gateway to the Galaxy Fundraising Campaign for a classroom and sleeping area had been going strong. Meetings were held that summer to obtain the necessary permits for the building of the classroom and sleeping room buildings.

Tucson Stargazing Adventures (TSA) – in summer of 2018, the old Tucson Astronomy Services program which had been the name for the TAAA paid star parties was changed to Tucson Stargazing Adventures and red t-shirts, a dress code, brochures and a strong marketing program were established to accompany the new name and institute a new level of professionalism to the program.

Astronomical League – Doug Smith started his first class for Astronomical League Award Candidates.

Awards - Jim O'Connor received the TAAA Bart and Priscilla Bok Award, TAAA's highest award, for his outstanding contributions to the development of the Grand Canyon Star Party but also for his exceptional record of star party support and his creative, diligent work with individuals and organizations in promoting astronomy education efforts and ideas.

Mike Weasner Publishes His Autobiography

Long-time TAAA member, Mike Weasner has published "Finding my Way to the Stars". From his forum post: A "very personal story of my journey through the Universe. It discusses growing up in southern Indiana, how I got started with astronomy and computers, my experiences as an Air Force jet fighter pilot, manager on the USAF Space Shuttle Program, my civilian aerospace career, my dark sky preservation efforts, and much more."

A detailed description is here: http://www.weasner.com/bio

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Skyward

By David H Levy

July, 2021

Faint Fuzzies

The night before last, a comet named Palomar (actually known as C (for comet)/ 2020 T2 Palomar) was gliding near one of the most beautiful clusters of stars in the entire sky. It was parading about at about magnitude 11, which means that for my oldish eyes, it would be too faint to see. In fact, just a few weeks ago I spotted a second comet, named ATLAS. That comet, at ninth magnitude, was so diffuse that I barely spotted it. So I was not going to try for this other comet.

However, this other comet was named Palomar after one of my favorite observatories! The mighty 200-inch telescope was opened in 1948, just a couple of weeks before I was born, and the big telescope has been sighting stars for more than 70 years. In 1994, I was allowed to sit in the prime focus cage, that beautiful place where light from what the telescope is seeing comes to a perfect focus. So sighting a comet with that hallowed name would be special. The comet was discovered by Dmitry A. Duev on images taken using Palomar's Oschin Schmidt telescope last October. As the comet was brightening slowly, I learned that on Friday evening, May 14, the comet was planning to glide past Messier 3, one of the brightest globular star clusters in the whole sky.

That was just too much to resist. Clusters of stars are scattered all over the sky, and our own galaxy has more than a hundred of them. Globular clusters consist of hundreds of thousands of stars. Messier 3 was discovered by Charles Messier, the famous Parisian discoverer of comets; it consists of some half a million stars and is more than 32,000 light years away. At about 11.4 billion years old, it is also one of the oldest things in the universe.

With the onset of darkness that Friday evening, I set up my telescope in my backyard observatory and pointed it toward Messier 3. The exquisite star cluster made its appearance. Then I nudged the telescope just a little bit to a nearby field of stars. Suddenly I spotted a faint fuzzy spot precisely where Comet Palomar was supposed to be. As I looked around, a meteor scratched the sky to the north. It was a bright and unusual member of the May Ophiuchid meteor shower, a bonus on this unforgettable night.

Comet Palomar is the 219th comet I have seen during my lifetime. Most of these comets have also been faint, barely visible spots of haze. But some have been wondrous. My first comet, Ikeya-Seki, was the great comet of 1965. Whether a comet is a faint fuzzy of a magnificent comet with a long tail, they are always welcome visitors to the Earth's region of the solar system, each one signing, as comet finder Leslie Pel-tier loved to write, "its sweeping flourish in the guest book of the Sun."



This is the dome of the 18-inch Schmiddt camera. It was the first telescope built at Palomar Observatory.. This is the telescope used for all of the Shoemaker-Levy comet discoveries, including Cometr Shoemaker-Levy 9. Photo by David H. Levy.

Dr. David Levy is a long-time member and former President of the TAAA. He is a well know astronomy writer and discoverer of comets. He writes this monthly "Skyward" column for the Vail Voice and has generously agreed to allow us to publish it here.

Below is a slightly modified reprint of a recent blog entry for the Arizona-Sonora Desert Museum Docent Group.

Lighting and Wildlife

by David Rossetter



Last month, my wife Pam and I attended the Chiricahua National Monument star party. One of the purposes of the event was to celebrate the recent designation of the Monument as the 104th Dark Sky Park by the International Dark-Sky Association (IDA). I must say, their designation is a good choice. It is really dark out there! The event was well-run by the rangers. Thanks to Jim Knoll for organizing, Jim O'Connor for his "Walk Around the Night Sky", and Bernie Stinger and Bryan Betcher for their telescope sharing (via monitors).

The IDA is dedicated "To preserve and protect the nighttime environment and our heritage of dark skies through environmentally responsible outdoor lighting." It is important to note that their mission statement doesn't just refer to preserving the night skies for their astronomical beauty, but also for protecting the nighttime environment. That includes the effects of artificial light on the wildlife and plant life of natural ecosystems.₁

Pam and I recently participated in a study of lighting influences on wildlife behavior and migration in the border regions of Arizona and Sonora. This is a joint project between two of our favorite non-profits, the IDA and the Sky Island Alliance (SIA).₂ Conveniently, the Executive Director of the IDA (Ruskin Hartley) is married to the SIA's Program Director (Dr. Emily Burns). The nighttime lighting study is part of the SIA's

binational "Border Wildlife Study" which "documents the remarkable diversity of wildlife species under imminent threat from active border wall construction between Arizona and Mexico."₃

One evening we drove down to the border just west of Douglas. After a quick conversation with Border Patrol, we drove along the wall stopping at four points, a mile apart each. We used a supplied meter to measure the quality of the sky above us. While clouds complicated our measurements, we were able to show how much local lights affected the sky. In general, the lights in Douglass are very bright and not night friendly at all. Things got better as we moved away from the city. Part of our area had the new wall. There are large light fixtures on that section but they were not turned on.



The overall purpose of the Border Wildlife Study is to document any changes in behavior of wildlife before and after installation of the new wall (now halted). The nighttime study expands the goals to document behavior influenced by artificial lighting. While the study is only about a year in, they have noted that many of the species are active at night. Predators use night as cover and many species use the dark for protection. Much migration also occurs at night. It is very important to "advocate to turn off border wall lights now and resist the installation of more border lights that will disrupt the natural migration and ecology of numerous species in the region."₂ However, migration is tricky. Bird migration is a bit different from terrestrial mammals.

Other studies document the effect of artificial light on insects. Male fireflies (not found in southern Arizona but abundant where I grew up the Midwest,) use flashes from their bellies to signal to potential mates. While all extraneous light interferes with this behavior, amber light has recently been shown to be the worst. Up until now, amber light has thought to be the least disruptive on wildlife. Most of us read of the recent grasshopper infestation in Las Vegas in 2019. It was learned that they were attracted to the brightest areas of the city (regardless of color – bright is bright!).₄

Many birds migrate long distances every year (not news to docents). What was new to me was that most migrate at night. The air is calmer, cooler, and there are fewer predators at night. As one might expect, artificial light can significantly affect their behavior during the migration. Many birds are attracted to lighted buildings and studies show that collisions with structures increase with bright buildings. In addition, city lights can confuse their navigation. This is especially dangerous for birds that migrate over water. If lights on the horizon cause them to change course, the total distance of their over-water migration increases and may cause them to not have enough energy to complete the journey. Finally, birds that spend time in highly light-polluted areas have challenges with disrupted circadian rhythms and ability to determine when to begin migrations.⁵

Predictably, the best way to reduce bird mortality due to light pollution is to turn off lights. Several organizations and cities have implemented policies to reduce city lights during migration seasons. Most of these are now organized under the Audubon Society's "Lights Out" program. This is an effort to provide a national effort to coordinate all the local programs.₆

There are many more effects of light pollution on wildlife:

- Bats many of the same issues as birds
- Horseshoe crabs they come ashore to lay eggs at full moon, spawn at new moon. Light confuses them.
- Sea turtles artificial lights discourage them from nesting, lead nestlings away from the water.
- Amphibians7
- Salamander's foraging and reproduction decrease
- Toads metamorphosis and growth reduced
- Frogs calling and mating reduced.
- Many others.

As astronomers, we want to protect our overhead, astronomical environment. But remember, there is a lot more going on at night than what we see in our telescopes. Please check out the IDA web site for the best ways to reduce our inappropriate light.

1. <u>https://www.darksky.org, https://www.darksky.org/wp-content/uploads/2021/03/IDA-General</u> Brochure_2020.pdf

- 2. https://skyislandalliance.org/2021/05/border-wildlife-study-nighttime-habitat/
- 3. <u>https://skyislandalliance.org/our-work/wildlife-program/borderwildlife/</u>

4. <u>https://www.nbcnews.com/science/environment/fireflies-dont-respond-well-light-pollution-not-alone-rcna569?eType=EmailBlastContent&eId=f41e4ebd-8a04-4d11-b20e-524e83221b71</u>

5. <u>https://www.darksky.org/light-pollution-poses-threat-to-migrating-birds/</u> Includes links to many scientific articles.

- 6. <u>https://www.audubon.org/lights-out-program</u>
- 7. <u>https://www.froglife.org/tag/light-pollution/</u>

David Rossetter is a docent at the Arizona-Sonora Desert Museum, five-year member of the TAAA, and a 25-year amateur astronomer.