Volume 35 Issue 8

August 2021

# The Observer

NGC 6814 APOD August 16, 2020
Image Credit & Copyright: NASA, ESA, Hubble

## Upcoming Events:

***All meetings will be held online.***

***EVAC Meeting via Zoom - August 20th.***

***Alan Friedman - "Minimum to the Max".***

## Inside this Issue:



## From the Desk of the President
*by Gordon Rosner*

Greetings from your President.

As always, I sure hope everyone is well and keeping healthy during these changing and challenging times. The club's Board of Directors was optimistic about possibly opening up to club in-person events in the next couple months but the current concerns with the Covid variant has pushed us back to not knowing when we can get back to any public events. The club's Board of Directors discusses the situation and activity status every month, or as needed to assure we support the club's safety. All public events remain cancelled with no accurate prediction of when we can reopen any of them. Keep updated via these newsletters and by visiting the club's website.

Our club's observatory, GRCO, currently remains open to small private viewing requests via the GRCO page on our website. It remains closed to our normal public viewing events on Friday and Saturday evenings.

During breaks in Arizona's Monsoon rains, be sure to check out the Perseid Meteor Shower that peaks on 11 and 12 August but has been going on since mid July. Also, two gems, Saturn and Jupiter, now rise in the evening sky and continue to

# From the Desk of the President

## *by Gordon Rosner*

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to be any backyard telescope's easy targets through the night. It's always easy and fun to track Jupiter's four Galilean moons night to night: Io, Europa, Ganymede and Calisto (remember them by: "I Eat Green Carrots"). Our school age future scientists can be like Galileo over 400 years ago and sketch the positions of the four moons as they move over a few nights. They can do some research on Galileo and will have the makings of a nice school science report.

This month we have a member article by high school student Adriana Baniecki. Adriana is certainly one of our rising amateur astronomers who is sharing one of her activities at an astronomy camp using University of Arizona's telescopes. Her article is an excellent example of a member article and we may see more of them from her as her enthusiasm grows. As I mention every month, we are accepting a one page or so article on any astronomy related topic from our membership. Tell us about your equipment, how you got started in astronomy, your road to astrophotography, outreach programs you have done, any observatories you have visited, or any other astronomy related subject. Remember this is YOUR club. If it was interesting to you, it will be interesting to all of us. So, become a published astronomer and submit a member article to me via the 'Contact President' link on our website.

It's getting time to start thinking about the elections for next year's club officers. The process is for nominations to be opened at the October General Membership Meeting on 15 October of this year. Nominations of anyone who is interested in one of the positions is to let one of the club officers know at that time or within a few days after. You can also let me know directly during that time via the President's link on our club's website. We need to know all of the candidates by a few days after the October meeting so we can include them in the November newsletter. Voting on each position's candidate is by the club membership held during the November General Membership Meeting. All nine Board of Directors positions will be open for nominations. This includes President, Vice President, Treasurer, Secretary and all five Board of Directors at Large. Descriptions and duties of each position is in the club's Constitution and Bylaws via the Bylaws link at the bottom of our website's main page. Being a part of the club's Leadership Team is a rewarding experience and honored activity in one of the country's premier astronomy clubs.

Remember that our Properties Director position remains open and I encourage anyone interested to let me know via the President's link in our website. This position receives notices from private individuals and organizations of their offers to donate astronomy equipment to the club. This position evaluates the equipment which usually requires local travel, decides on its suitability, and if so, transports the equipment to the club's equipment shed. This is a great position to learn about and actually review different types of astronomy equipment. This equipment is subsequently either donated to schools or included in our club auctions to support our local astronomy community. The Properties Director is an appointed position with no term limit filled by a volunteer that does not require to be voted on by the general membership.

And again, as I also mention every month, everyone should remember that live member presentations are always a fun and valuable part of our monthly online Zoom meetings. These are about ten minutes or so long regarding any astronomy related subject you would like to share with the club. I encourage you to do one of these. Just let me know if you would like to do one by using the 'Contact President' link near the bottom of the main page of our EVAC website. I'll then get back with you and we can discuss. If needed, we can also do a dry run sometime before the actual meeting.

Our next online Zoom Monthly General Meeting will be on Friday, 20 August starting at the usual 7:30 pm. The main presentation will be by Alan Friedman titled "Minimum to the Max" regarding the Sun's climb into its maximum solar cycle. Don't miss this presentation to learn about the coming buzz you will hear of the Sun's 25th Solar Cycle maximum.

As always, a reminder that there are three ways to receive a notification link via an email to register for the next online monthly General Meeting. You only need to do one of the following and only once to continue to receive the email on how to register for the upcoming meetings:

1. Send a one-time email request to vp@evaconline.org.
2. Sign up for the evac-announce@freelists.org mailing list.

Directions on how to do this and the link are included later in the 'Find Out What's Happening' section of this newsletter.

# From the Desk of the President
## *by Gordon Rosner*

*Continued from page 2*

3. Sign up for the AZ-observing@groups.io mailing list. Also here, directions on how to do this and the link are included later in the 'Find Out What's Happening' section of this newsletter.

A way to get notifications of any special online events and how to register, is to join the EVAC Facebook page and occasionally check for special event announcements. The link to join is provided in the 'Find Out What's Happening' section of this newsletter. These events will also be announced during our monthly General Meetings.

I'll 'see you' at our 20 August meeting.

"Keep your feet on the ground and keep reaching for the stars."

Your President,
Gordon Rosner

# EVAC Zoom Meeting Notes for 2021 July 16th, at 07:30 P.M. AZ Time
## *by Wayne Thomas*

Here are the Meeting minutes including details of the presentations. (The recorded video of the meeting can be viewed at: July Zoom Meeting).

President Gordon Rosner welcomed those in the "audience" to the virtual meeting shortly after 7:30 p.m. His first slide displayed the meeting agenda:

- Welcome
- Introductions
- Club News
- Member Presentation: Sid Frede"Image Calibration Demystified".
- Main Presentation: Felipe MacAuliffe - "The History and Milestones of Radio-Astronomy in Chile".

Gordon welcomed everyone in the virtual audience with his "Live Long and Prosper" slide. He then shared the slide listing the club officers.

Under club news, he reminded us that all club sponsored events with personal contact are still cancelled with the exception of private star parties at GRCO. These consist of a few participants following guidelines for preventing the spread of the Corona Virus. A private meeting at GRCO can be requested using the schedule request form on the EVAC website.

Our next regular club meeting will again be a virtual Zoom meeting at 7:30 p.m. on Friday August 20. Alan Friedman will present "Minimum to the Max," on the 11 year solar cycle. Register for the meeting in the usual way by the link in the invitation email.

Gordon next introduced Sid Frede, an amateur astrophotographer who has been photographing the night sky for the past couple of years. His presentation, "Calibration Demystified," described the techniques he has developed for calibrating his deep sky images. The focus of his presentation is what he does after capturing his data and before using image processing software to create the final image. He addressed image flats, dark frames, and dark-flats (or flat-darks); and how they depend on the telescope aperture and focal length, air temperature, and exposure time.

Tom Mozdzen then introduced the featured speaker, Felipe MacAuliffe, who spoke on "The History and Milestones of Radio Astronomy in Chile."

Felipe covered the history of radio astronomy beginning with the first detection of "noise" coming from the center of the Milky Way galaxy. Karl Jansky constructed and used the Merry-go-round radio telescope (1929 to 1933) to determine the source of noise interfering with radio communications across the Atlantic Ocean. This early work determined the noise repeated at the sidereal rate and in fact was coming from the center of our galaxy. Felipe continued through the various telescopes and dis-coveries up to the current time by describing ALMA and APEX, radio telescopes located on the high Chajnantor Plateau (Atacama Plateau) of Chile.

Felipe explained that while visible light is obstructed by dust, radio waves can see radiation originating from beyond the dust. His experience has been with observing

# EVAC Zoom Meeting Notes for 2021 July 16th, at 07:30 P.M. AZ Time

*by Wayne Thomas*

*Continued from page 3*

at millimeter and sub-millimeter wavelengths. He then explained that water vapor in the atmosphere is the enemy to being able to observe at these wavelengths from the surface of the earth. The amount of water vapor between the observer and the sky is less at higher elevations and is least at a few special locations. The plateau regions of Chile are some of the best in the world.

Some of the early work included mapping the Milky Way galaxy at various radio frequencies / wavelengths. Then various elements and molecules were detected including atomic hydrogen, carbon monoxide (a marker for molecular hydrogen which is difficult to detect), water and ammonia. Methanol and hydrogen cyanide were detected coming from comet Hale-Bopp.

To increase the resolution of the images, interferometry is used. This involves two or more telescopes separated by a distance called the baseline. This gives a resolution as if a telescope had a diameter equivalent to the baseline of these telescopes.

Felipe then covered the various locations of observatories in Chile, six in all. The one with the least amount of precipitable water vapor and the steadiest seeing is located on the Atacama plateau in northern Chile. The APEX (Atacama Pathfinder EXperiment telescope) and ALMA (Atacama Large Millimeter Array) radio telescopes are located at an elevation of 5100 meters. This location is near the borders of Chile, Bolivia and Argentina and is approximately 50 km east of San Pedro de Atacama.

In order to have the largest possible baseline on Earth, a coordinated effort involving observatories located far apart on Earth's surface produced the Event Horizon Telescope. Its goal is to observe the massive black hole at the center of our galaxy. This requires the coordinated effort between observatories in Chile (2), the South Pole, Hawaii (2), Mexico, Arizona and Spain. This telescope recently produced the first image of the shadow of the supermassive black hole in the center of galaxy M87 (the galaxy producing the visible jet).

Felipe finished his talk by describing new telescopes either being built or in the planning stage.

For questions, Felipe fielded the following:

1. For optical telescopes, when it is first used successfully, it is called "first light." What terminology is used for radio telescopes? The same – radio waves are also electromagnetic waves just like visible light.
2. What impact does the current political moment have on radio astronomy? Radio astronomy involves international cooperation. The pandemic may impact funding.
3. What is your favorite Pink Floyd song to listen to while observing? Anything really. But the Dark Side of the Moon would be a good one.
4. Would China and Russia be welcome to participate in the Very Long Baseline Array? Unfortunately, they are on the opposite side of the earh and could not observe at the same time we observe.
5. What observations could amateurs make with a 1.2 meter radio telescope which would be useful to professional astronomers? Low resolution surveys are still needed. Currently students train on 1.2 meter radio telescopes. However, the instruments for millimeter observing are very expensive.
6. The VLA in New Mexico has a baseline up to an 18 kilometer. How does the wavelength ratio of ALMA compare to the VLA? Felipe does not know the wavelength of the VLA.
7. Would the ultimate baseline be between Earth and the Moon? Yes, but there may be significant environmental issues with a radio telescope on the Moon.
8. Why is APEX called an experimental telescope? We are always experimenting with something – for example it is a test lab for new receivers and etc. The experimenting never ends.

Our next meeting will be on Friday, August 20, at 7:30 p.m. via Zoom. Alan Friedman will present on "Minimum to the Max."

Gordon adjourned the meeting at 9:19 p.m. Attendance was at least 67

Wayne Thomas

Secretary EVAC

# The Backyard Astronomer
*by Bill Dellinges*

**Are You Dizzy Yet?**

You're sitting at your computer checking your email. Everything seems peaceful and stable. Not so. The planet you reside on is rotating on its axis once a day in 23 hours, 56 minutes and 4 seconds relative to the stars, which translates to a rotational rate of 1,037 miles per hour at its equator. That speed goes down as you increase your distance from the equator heading north or south reaching zero at the poles. At the latitude of Phoenix, about 33.5 degrees north, the rotational rate is about 865 miles per hour. Fortunately, the atmosphere is being carrying along as well.

At the same time, Earth is revolving around the Sun at an average orbital speed of 18.5 miles per second making one revolution in 365.2564 days, defining our sidereal year relative to the stars. So how many solar revolutions old are you?

But wait, there's more. While all this is going on, the Sun and its retinue of planets and miscellaneous detritus of our Solar System (moons, asteroids, meteoroids, Kuiper-belt objects, Oort Cloud comets) are in orbit around the center of the Milky Way Galaxy. Our solar System is located about 27,000 light years from the center of our Galaxy, putting it about halfway out from the center to the edge of the Galaxy. The plane of the Solar system is tilted about 60 degrees to the plane of the Milky Way and is speeding along its orbit at 143 miles per second completing one revolution in about 225 million years. Its orbit is not exactly flat, it bobs up and down through the galactic arms akin to the inanimate creatures on a rotating merry-go-round. It has completed 20 revolutions since the Solar System formed.

Finally, in the expanding universe we live in, astronomers have calculated that relative to the 2.7K Cosmic Background Radiation left over from the Big Bang creation of our current universe, the Milky Way Galaxy is moving at 372 miles per second. Who said there's no free lunch? Spaceship Earth is providing us quite a ride, free of charge.

# The Chemical Composition of Planetary Nebula
*by Adriana Baniecki*

What if I told you that over this summer I used a 10-meter and 12-meter radio telescope to analyze the chemical composition of planetary nebulae? Hi, my name is Adriana Baniecki. I'm a rising high school senior who lives in the East Valley and—unfortunately—I do not own these wonderful radio telescopes. From June 12 to June 19, 2021, I participated in the University of Arizona's virtual Advanced Astronomy Camp with 32 other high school students. During the day, we listened to scientific lectures given by current and former University of Arizona graduate students. These lectures covered many different topics including the stellar lifecycle, black holes and gravitational radiation, different features of our sun, analyzing radio wave sources from stellar nurseries, and binary stars. During the nighttime, however, we had the opportunity to conduct an original research project using the university's 24-inch optical telescope, 32-inch optical telescope, 10-meter radio telescope, and 12-meter radio telescope. Three other friends and I chose to investigate the chemical composition of the Ring Nebula and Helix Nebula.

First, we observed the Ring Nebula (Messier 57). We imaged the Ring Nebula using the 24-inch optical telescope and its hydrogen alpha filter in order to map its hydrogen and oxygen content. As shown in the image below, we discovered that the outer rings were largely hydrogen (red) while the rings closer to the center were largely oxygen (turquoise).

# The Chemical Composition of Planetary Nebula

*by Adriana Baniecki*

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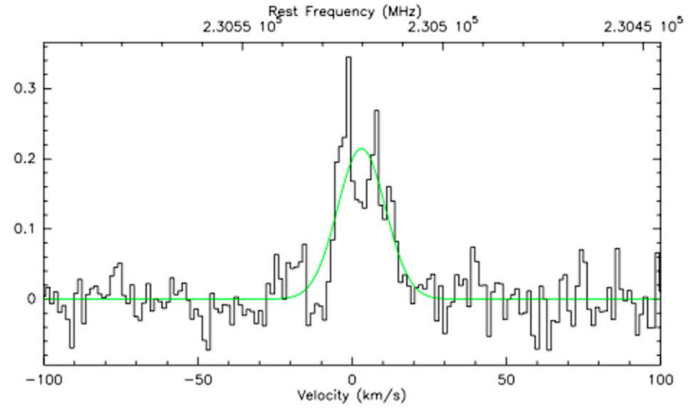
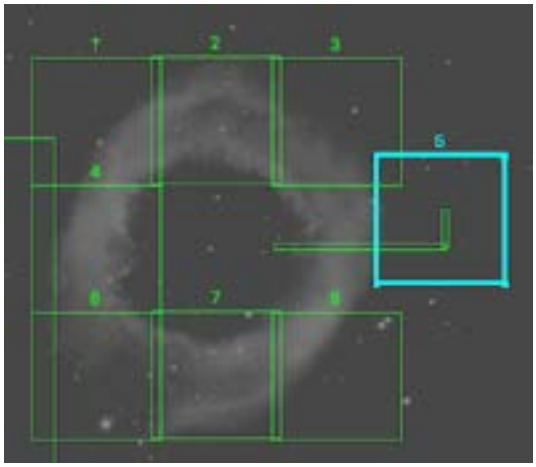
This confirms that the Ring Nebula is a planetary nebula, as a planetary nebula is formed when a red supergiant blows off its outer hydrogen layers and leaves its carbon core exposed. We also imaged the Ring Nebula using the 10-meter radio telescope in order to map its CO content. In order to image the entirety of this extremely large nebula, we had to split the Ring Nebula into a 3x3 grid system. We imaged the spectra of each individual grid, and the spectra from the central grid is shown below.



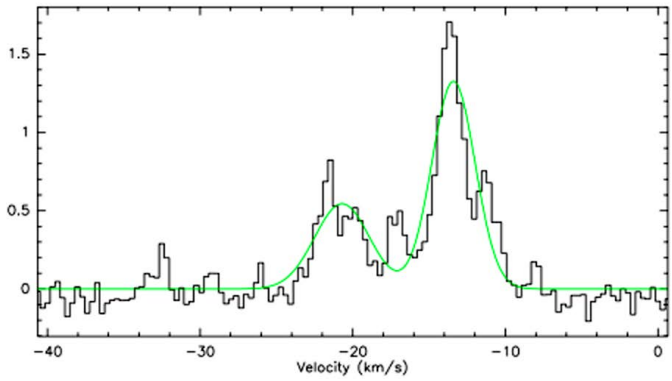

The green line is the spectra's line of best fit, and it has a peak intensity value of 0.28 Kelvin, clearly indicating the presence of CO in the central grid. This data further confirms that the Ring Nebula is a planetary nebula, as planetary nebulae have white dwarfs—or solid carbon spheres—at their centers.

Second, we observed the Helix Nebula (NGC 7293). We imaged the Helix Nebula using the 24-inch optical telescope and hydrogen alpha filter as well. As shown in the image below, we discovered the same hydrogen and oxygen grouping pattern as in the Ring Nebula.

The hydrogen was concentrated mostly in the outer rings while the oxygen was largely concentrated towards the center of the Helix, firmly categorizing the Helix Nebula as a planetary nebula. We then imaged the Helix Nebula using the 10-meter radio telescope using the same 3x3 grid system.




The spectra below is from the blue highlighted square in the image above, which is the central grid of the Helix Nebula.




This time, however, the green line of best fit has two peak intensity values: one at 0.5 Kelvin and one at 1.3 Kelvin. This means that, even though there is no visible gas and dust in the blue central box, there is an even higher concentration of CO in the Helix Nebula than in the Ring Nebula. This data suggests that perhaps there is a white dwarf at the center of the Helix Nebula but it is simply not visible. Our team stayed up every night, often until three or four in the morning, in order to understand these telescopes, collect and analyze data, and construct a PowerPoint presentation which we gave on the last day of the Advanced Astronomy Camp. This experience taught me not only the nuances of analyzing radio data but also how truly necessary it is to work with a great team.

# EVAC Outreach Events

*by Gordon Rosner*

Again, unfortunately another very short column this month. All outreach events remain cancelled due to supporting the public health concerns. For more information, see the President's column at the beginning of this newsletter or at the top of the EVAC website.

As always, still looking very forward to our outreach program getting back and to hearing all those "OH WOW's" we so love to hear.

Gordon Rosner
EVAC Outreach Events Coordinator

## Find Out What's Happening – Join EVAC-Announce List

If you would like to receive email announcements about EVAC meetings and activities, please join the EVAC–Announce mailing list. Click on the link below to subscribe. Enter your full email address in the box titled User Options and press OK. You will receive a confirmation email. Your privacy is respected by EVAC and we will never sell your email address, or use it for non-club relevant solicitations. This mailing list is designed for communication from EVAC, and does not enable users to respond to the message. If you wish to contact club officers, please use the list in the Contact-Us area on the Home page of our EVAC website. To subscribe to the EVAC–Announce mail group click: http://www.freelists.org/list/evac-announce. To unsubscribe use the same link, enter your email address and select Unsubscribe from the "Choose An Action" list. Another list to consder is AZ-Observing@groups.io, simply click on this link https://groups.io/g/AZ-Observing and follow the instructions on the page. EVAC also has a Facebook Group where members may share ideas, photos, and Astronomy related information. To join: EVAC Facebook Group.

The Gilbert Rotary Centennial Observatory (GRCO) also has a Facebook Group where members may share ideas, photos, and Astronomy related information. To visit, please click on Gilbert Rotary Centennial Observatory - GRCO.

**New Moon on August 8 at 06:50**

**First Quarter Moon on August 15 at 08:19**

**Full Moon on August 22 at 05:01**

**Last Quarter Moon on August 30 at 12:13**


SkyPi Remote Observatory

**The darkest, most Pristine, sky in the continental U.S. !**

**At the site: Bathroom facilities, running water, 5 pads w110v, wifi, acres of grassy camp sites.**

**From the site: Very Large Array 42mi E, The Astronomical Lyceum 55mi E, MRO Observatory 80mi E**

Monthly Meetings will be presented live online using Zoom. See the EVAC Website for updates. All other events are on hold until health concerns are resolved.

The monthly general meeting is your chance to find out what other club members are up to, learn about upcoming club events and listen to presentations by professional and well-known amateur astronomers.

**Our normal in-person monthly meetings have temporarily been cancelled. and are replaced with an online Zoom meeting.**

Our meetings are held on the third Friday of each month at the Southeast Regional Library in Gilbert. The library is located at 775 N. Greenfield Road; on the southeast corner of Greenfield and Guadalupe Roads. Meetings begin at 7:30 pm.

***Visitors are always welcome!***


**Southeast Regional Library**
**775 N. Greenfield Road**
**Gilbert, Az. 85234**

# August 2021

| Sunday | Monday | Tuesday | Wednesday | Thursday | Friday | Saturday |
|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 8 | 9 | 10 | 11 | 12 | 13 | 14 |
| 15 | 16 | 17 | 18 | 19 | **20** | 21 |
| 22 | 23 | 24 | 25 | 26 | 27 | 28 |
| 29 | 30 | 31 | | | | |

**August 20** - EVAC Monthly Meeting Live Online via Zoom.

**The EVAC Monthly Meeting will be held live online via Zoom. All other meetings and events have been cancelled until further notice.**

# September 2021

| Sunday | Monday | Tuesday | Wednesday | Thursday | Friday | Saturday |
|---|---|---|---|---|---|---|
| | | | 1 | 2 | 3 | 4 |
| 5 | 6 | 7 | 8 | 9 | 10 | 11 |
| 12 | 13 | 14 | 15 | 16 | **17** | 18 |
| 19 | 20 | 21 | 22 | 23 | 24 | 25 |
| 26 | 27 | 28 | 29 | 30 | | |

**September 17** - EVAC Monthly Meeting Live Online via Zoom.

**The EVAC Monthly Meeting will be held live online via Zoom. All other meetings and events have been cancelled until further notice.**

# East Valley Astronomy Club -- 2021 Membership Form.

IMPORTANT: All memberships expire on December 31 of each year

**New Member Dues** ( select according to the month you are joining the club)

| | Individual | Family | |
|---|---|---|---|
| January, Feburary & March | **$30.00** | **$35.00** | |
| April, May & June | **$22.50** | **$26.25** | |
| July, August & September | **$15.00** | **$17.50** | |
| October, November & December | **$37.50** | **$43.75** | (*Includes following year)* |

**Renewal** (current members only):
☐ **$30.00 Individual** ☐ **$35.00 Family**

☐ **Astronomical League:** $7.50 Annually (per person)

**Name Badges:** Quantity: _____
☐ **$10.00** Each
Name to imprint: _____

**Total amount enclosed:**

Please make check or money order payable to EVAC
Payment will be made using PayPal ☐

Name: | Phone:

Address: | Email:

City
State
Zip | URL
For website

Would you be interested in our outreach program? ☐ Yes ☐ No

How did you discover East Valley Astronomy Club?

## Liability Release Form

In consideration of attending any publicized Star Party hosted by the East Valley Astronomy Club (hereinafter referred to as "EVAC"), the receipt and sufficiency of which is hereby acknowledged, I hereby affirm that I and any related entities, predecessors, successors, affiliates, attorneys, guarantors, insurers, transferees, assigns, parents, spouses, children, subsidiaries, accountants, officers, directors, employees, agents, shareholders, members, and trustees, past and present, hereby forever release, acquit and discharge to hold EVAC and its related entities, predecessors, successors, affiliates, attorneys, guarantors, insurers, transferees, assigns, parents, spouses, subsidiaries, accountants, officers, directors, employees, agents, shareholders, members, and trustees, past and present, from any and all causes of action, claims, losses, damages, liabilities, expenses (including attorneys' fees) and demands of any nature whatsoever, known or unknown, that in any way relate to, arise out of, or concern EVAC and/or my presence on the premises of any EVAC Star Party and related areas, whether or not those causes of action, claims, damages, liabilities, and demands are part of the specific subject matter of EVAC or any EVAC Star Party. This release is intended to and does cover all injuries and damages, and the consequences thereof, whether known or unknown at the time of the execution of this release, which have occurred or may hereafter occur or which may hereafter be discovered, and which may have been caused or may be claimed to have been caused by the said incident, and specifically includes, but is not limited to, bodily injuries, mental and emotional injury, pain and suffering, medical treatments, and loss of earnings or income.

My signature upon this form also indicates agreement and acceptance on behalf of all minor children (under 18 years of age) under my care in attendance. EVAC only recognizes those who are members or invitees and who also have a signed Liability Release Form on file as participants at an EVAC Star Party.

Signature _____ Date _____

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*The East Valley Astronomy Club is a 501(c)(3) nonprofit charitable organization.*

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