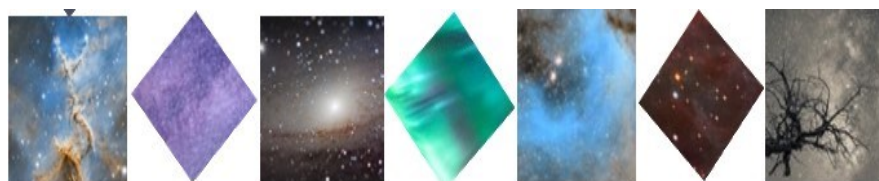




# THE LOS ANGELES ASTRONOMICAL SOCIETY

# THE BULLETIN

OCTOBER, 2021  
VOLUME 95, ISSUE 10



**Astrophotography Contest !!!**  
Go to Page 2 to learn more.



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*All members are encouraged to contribute articles of interest for publication in The Bulletin.*

### Upcoming Virtual Club Events

- Dark Sky Night: Oct. 2nd
- Board Meeting; Oct. 6th
- General Meeting; Oct. 18th

### News - The Garvey Ranch Park Observatory

Garvey Ranch Observatory will be open only to fully vaccinated members with proof of vaccination and masks are required at all times, indoors and outdoors. Public and visitors are not allowed.

This directive was approved by a majority of the LAAS Board of Directors in August 2021.

Curtis Byrom  
LAAS President



### Update Your Contact Information

Please send any contact info changes to the club secretary at

[secretary@laas.org](mailto:secretary@laas.org).

# LAAS Astrophotography Contest

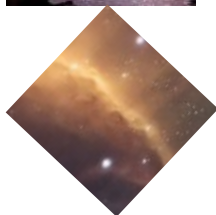
## October 1–20, 2021



The Los Angeles Astronomical Society would like to announce the LAAS Astrophotography Contest, which is open to the General Membership.

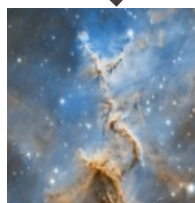


The contest is calling for LAAS members to submit their favorite astrophotography images in a choice of three categories: Single-Shot Astrophotography, Multiple Image Astrophotography, and Night Sky Photography. The contest will be accepting submissions from Oct. 1st - 20th.



The LAAS General Membership will vote on the images from Oct. 25th thru Nov. 3rd. The winners will be announced at the November 8th General Meeting.

The winners and runner-ups will receive the opportunity to attend a dedicated half-night of astro-imaging using the 60" telescope on Mt. Wilson.



The winning images will be used on new merchandise sold in the LAAS website store.

The submission form and voting ballots will be available to the membership soon.

Photo Credit: <https://images.nasa.gov/>

Below are links to view images of the night sky:

JPL Image Gallery: <https://www.jpl.nasa.gov/images>

APOD/NASA: <https://apod.nasa.gov/apod/astropix.html>

Hubble: <https://hubblesite.org/resource-gallery/images>

Chandra X-Ray Observatory: <https://chandra.harvard.edu/photo/>

# 60 Inch Nights Schedule

## Mt. Wilson Observatory



### Session Schedule—2021

**The following sessions are now filled!**

Saturday October 9th

Saturday November 6th

*The dates above are all scheduled on Saturday Nights and are all half-night events.*

### General Information:

Price per session, per person - \$60.00

There will be 20 people, per session.

-

### How to Make a Reservation?

Please contact Darrell Dooley **BEFORE** you pay for your reservation.

*Darrell is our Mt. Wilson Coordinator and the ONLY contact available.*

Darrell's Email Address:

[Mtwilsoncoordinator@laas.org](mailto:Mtwilsoncoordinator@laas.org)

*Darrell will answer all of your questions and concerns.*

Reserve your spot by paying by credit cards or PayPal using the following link:

<https://fs30.formsite.com/LAAS/MtWilson/index.html>



Learn more about the 60 Inch Night by visiting Mt. Wilson Observatory's website:

<https://www.mtwilson.edu/60-telescope/>

# International Observe The Moon Night (IOMN)

**Date:** Oct. 16, 2021

International Observe the Moon Night is a time to come together with fellow Moon enthusiasts and curious people worldwide. Everyone on Earth is invited to learn about lunar science and exploration, take part in celestial observations, and honor cultural and personal connections to the Moon. Note that we encourage you to [interpret “observe” broadly](#).

International Observe the Moon Night occurs annually in September or October, when the Moon is around first quarter — a great phase for evening observing. Furthermore, a first-quarter Moon offers excellent viewing opportunities along the terminator (the line between night and day), where shadows enhance the Moon’s cratered landscape.



You can join International Observe the Moon Night from wherever you are. [Attend](#) or [host](#) a virtual or in-person event, or observe the Moon [from home](#). Connect with fellow lunar enthusiasts around the world through our [Facebook](#) page, [#ObserveTheMoon](#) on your preferred social media platform, and join the International Observe the Moon Night [Flickr group](#). Outdoors, at home, online, or wherever you may be, we’re glad to have you with us. However you choose to observe, please follow local guidelines on health and safety.

## Goals of International Observe the Moon Night:

**Unite people across the globe** in a celebration of lunar observation, science, and exploration.

Provide information, a platform, and resources in order to:

**Raise awareness** of NASA’s lunar science and exploration programs.

**Empower people to learn more** about the Moon and space science and exploration, using Earth’s Moon as an accessible entry point.

**Facilitate sharing** of Moon-inspired stories, images, artwork, and more

**Inspire continued observation** of the Moon, the sky, and the world around us.

Learn more about this annual event at NASA’s official site:

<https://moon.nasa.gov/observe-the-moon-night/about/overview/>



Join other amateur astronomers and members of the Night Sky Network on Saturday, October 9 to kick off the International Observe the Moon Night week of observing with a **Global Moon Party**. There will be live streams of the Moon and cultural lunar stories from around the world, NASA scientists, and amazing images, plus much more.

**3-6pm PT/6-9pm ET**

Watch this event on Youtube here:

[https://www.youtube.com/watch?v=v61JyMG\\_zMs](https://www.youtube.com/watch?v=v61JyMG_zMs)

[Host](#) an event (virtual or in-person)

[Attend](#) an event (virtual or in-person)

[Register](#) as an individual participant

[Try this](#) at home! (Further resources)

# More about Mars

## By Evan Hilgemann

I'm a member of the operations team for the Curiosity Mars rover, and back in August I was invited to give a talk at the LAAS general meeting about the basics of Mars rover operations (you can watch the replay here: <https://www.youtube.com/watch?v=CR07v52pR-k>). We covered a lot of ground and I appreciated all the great questions in the Q&A session. However, there were a number that I didn't get to and others I didn't have great answers for at the time, so I did some research and am back with more on the Mars rovers. Enjoy!

### 1. How do you tell how old rocks are on Mars?

It turns out that we don't have a good way to directly measure the age of a rock on Mars. The gold standard for dating rocks is a method called radiometric dating. When rocks are formed they trap small amounts of radioactive elements within them. Those elements decay over time, so by measuring the ratio of various types of atoms (or isotopes if you prefer), scientists can back out a reasonably good estimate of the age of the rock. Unfortunately, that takes a bunch of laboratory equipment that is not easily transported to Mars. One of the major goals of the Mars Sample Return campaign is actually to bring Mars rocks back to Earth so they can be accurately dated.

That said, we are able to roughly estimate the age of planetary surfaces in the solar system by counting craters. Planetary geologists have models for how many craters a surface should have for a given age, with the general trend that the older a surface is, the more craters it will have. A great example of this is the moon where recently formed dark regions, the Mare, are significantly less cratered than the much older highlands. Rocks from the moon have actually been radiometrically dated thanks to Apollo, so scientists can compare cratering on the moon to that on Mars to estimate the surface's age.

### 2. How do you communicate with the rover?

First, let's define a couple terms. **Uplink** refers to data that is sent from Earth to Mars. This is generally low data volume since it just includes the commanding for the rover, basically text files. **Downlink** refers to data going from Mars to Earth. This includes all of images you see, science data, engineering telemetry, etc.

On the Earth side, both uplink and downlink are handled through a system of antennas called the Deep Space Network. The network consists of stations in California, Spain, and Australia. Each station has similar capabilities and they are spaced such that no matter where you are in the solar system, at least one station is visible at all times. Each station has a single 70 meters diameter antenna, a few 34 meter dishes, and more smaller than that. Mars isn't that far away in the grand scheme of things, so communications to the rovers generally occurs over a 34 meter dish.

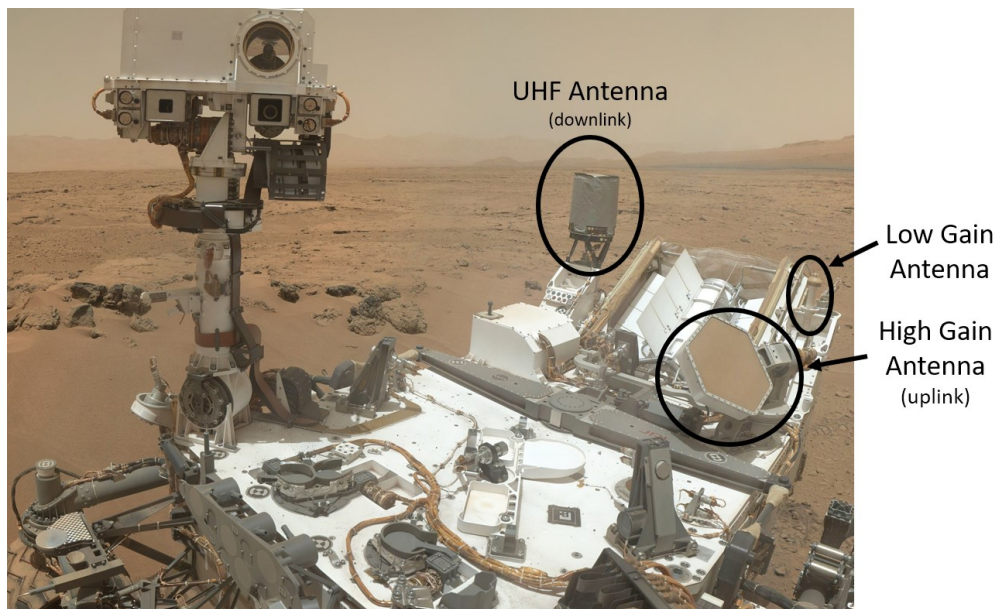
On the Mars side, the rover has 3 antennas to choose from. Uplink is done via the High Gain Antenna (HGA) over X-band. The HGA must be pointed at Earth to function so it is mounted on a steerable platform. Transmissions to the HGA are direct from Earth to the rover and typically happen at around 9 or 10am local time on Mars.

Downlink, on the other hand, is handled via various Mars orbiters which the rovers can transmit to via an omnidirectional UHF antenna, meaning that the antenna does not need to be pointed. Data is then stored on the orbiter and transmitted back to Earth normally within a few hours. Downlink opportunities are variable since an orbiter must be overhead, but there are generally a few on any given day. Depending on the orbiter, downlink sizes can vary anywhere from tens to hundreds of megabits per pass. This is significantly more than could be achieved if data was sent directly to Earth.

The third antenna is the Low Gain Antenna. It is a low bandwidth omni-directional antenna, also operates over X-band, and is not used regularly these days. If we're using the LGA something has probably gone wrong.

Continued on next page





### 3. Is the goal to supply enough instructions to keep the rover busy all day?

We account for every minute of the rover's time when generating day-to-day instructions, but all of the activities typically have margin built in as well. If an activity finishes before the margin ends, the rover basically waits for the next scheduled activity. Although that might sound like wasted time, many activities are required to be performed at a particular time of day (for example, to get good lighting for an image, or communicate with an orbiter) and building in margin makes sure that we can control exactly when everything is going to happen and also make sure the rover doesn't try to do too many things at once.

The rover is actually only awake and active for about 6 hours every day. The rest of the day is "nap" time (and yes, we actually refer to it as such!) to allow the batteries to recharge. Both Curiosity and Perseverance are powered by a device called a Radioisotope Thermoelectric Generator (RTG for short). The RTG is able to convert the heat generated from radioactive decay of plutonium into electricity. RTGs are reliable but not particularly efficient, Curiosity's only puts out a trickle charge of around 100 Watts. Put another way, the entire rover is run off the energy dissipated by a moderately bright lightbulb. The lack of a large power source is the reason for the lengthy recharge cycles.

### 4. Update on the Perseverance sample return mission

My presentation to the club was immediately after Perseverance's first attempt to collect a sample from Mars. You might recall that the attempt failed, but all the hardware seems to have functioned as expected. The sample collection drill is designed to collect a small cylinder of rock, just a couple inches long and about the width of a piece of chalk.



The drill bit itself is hollow and is what captures the cylindrical rock core. It appears that the rock targeted by Perseverance was not cohesive enough and disintegrated into grains instead of maintaining its cylindrical shape. Don't worry though. As of this writing, Perseverance has attempted two more sample collections on a stronger rock, and was successful both times! An initial assessment of the rock made by the rover indicates that

#### **Suggested further reading on Mars rover operations:**

"The Design and Engineering of Curiosity: How the Mars Rover Performs Its Job" by Emily Lakdawalla. This book is a great resource for learning more about how the rovers work. Lakdawalla includes enough technical information and details to keep the curious mind satisfied, but writes in colloquial style that will be approachable for most readers. I actually have a copy at my desk for handy reference!

*A view of the Rochette rock, the first rock that Perseverance successfully captured a sample from. Note the two drill holes in the front face of the rock.*

# Weird Ways to Observe the Moon

By David Prosper

International Observe the Moon Night is on October 16 this year– but you can observe the Moon whenever it's up, day or night! While binoculars and telescopes certainly reveal incredible details of our neighbor's surface, bringing out dark seas, bright craters, and numerous odd fissures and cracks, these tools are not the only way to observe details about our Moon.

There are more ways to observe the Moon than you might expect, just using common household materials. Put on a pair of sunglasses, especially polarized sunglasses! You may think this is a joke, but the point of polarized sunglasses is to dramatically reduce glare, and so they allow your eyes to pick out some lunar details! Surprisingly, wearing sunglasses even helps during daytime observations of the Moon.

One unlikely tool is the humble plastic bottle cap! John Goss from the Roanoke Valley Astronomical Society shared these directions on how to make your own bottle cap lunar viewer, which was also suggested to him by Fred Schaaf many years ago as a way to also view the thin crescent of Venus when close to the Sun: "The full Moon is very bright, so much that details are overwhelmed by the glare.

Here is an easy way to see more! Start by drilling a 1/16-inch (1.5 mm) diameter hole in a plastic soft drink bottle cap. Make sure it is an unobstructed, round hole. Now look through the hole at the bright Moon. The image brightness will be much dimmer than normal – over 90% dimmer – reducing or eliminating any lunar glare. The image should also be much sharper because the bottle cap blocks light from entering the outer portion of your pupil, where imperfections of the eye's curving optical path likely lie." Many report seeing a startling amount of lunar detail!

You can project the Moon! Have you heard of a "Sun Funnel"? It's a way to safely view the Sun by projecting the image from an eyepiece to fabric stretched across a funnel mounted on top. It's easy to make at home, too – directions are here: [bit.ly/sunfunnel](http://bit.ly/sunfunnel). Depending on your equipment, a Sun Funnel can view the Moon as well as the Sun– a full Moon gives off more than enough light to project from even relatively small telescopes. Large telescopes will project the full Moon and its phases, with varying levels of detail; while not as crisp as direct eyepiece viewing, it's still an impressive sight! You can also mount your smartphone or tablet to your eyepiece for a similar Moon-viewing experience, but the funnel doesn't need batteries.

Of course, you can join folks in person or online for a celebration of our Moon on October 16, with International Observe the Moon Night – find details at [moon.nasa.gov/observe](http://moon.nasa.gov/observe). NASA has big plans for a return to the Moon with the Artemis program, and you can find the latest news on their upcoming lunar explorations at [nasa.gov](http://nasa.gov).



Download [Image - NASA Moon Observing Map 2021](#)

[Print Version](#) (JPG)

[Web Version](#) (JPG)



### Sun Funnels in action!

Starting clockwise from the bottom left, a standalone Sun Funnel; attached to a small refractor to observe the transit of Mercury in 2019; attached to a large telescope in preparation for evening lunar observing; projection of the Moon onto a funnel from a medium-size scope (5 inches).

Safety tip: NEVER use a large telescope with a Sun Funnel to observe the Sun, as they are designed to project the Sun using small telescopes only.

Some eager astronomers have melted their Sun Funnels, and parts of their own telescopes, by pointing them at the Sun - large telescopes create far too much heat, sometimes within seconds!

However, large instruments are safe and ideal for projecting the much dimmer Moon. Small telescopes can't gather enough light to decently project the Moon, but larger scopes will work.

This article is distributed by the NASA Night Sky Network, a coalition of hundreds of astronomy clubs across the US dedicated to astronomy outreach. Visit [nightsky.jpl.nasa.gov](https://nightsky.jpl.nasa.gov) to find local clubs, events, stargazing info and more.





# Monthly Sky Report

## By Dave Nakamoto

Nights continue to lengthen as we head towards the Winter Solstice in December, a good thing for night observers.

As for what we can observe in the sky, the planets look like this.

**Mars** passes behind the sun during all of October and is too close to the sun to be observed. It will appear in the morning skies starting in November.

**Mercury** is the first planet to set in the evening sky. On the 1<sup>st</sup>, the sun sets at 6:37 p.m., PDT, and Mercury sets at 8:06 p.m., PDT. You may need binoculars if you're going to see it. Within a week, Mercury is too close to the sun and cannot be observed. By mid-October Mercury is in the morning sky. On October 25 Mercury will be as far west of the sun as it can get. Do not observe any planet when the sun is in the sky, for the danger to the eyes is great.

**Venus** is next to set. It is low in the southwest and about 20 degrees above the horizon. Venus is slowly approaching the earth; its size slowly increases from 19 arcseconds to 26 arcseconds, while the amount of its disk that is illuminated decreases from 62 percent to 48 percent, so this month it passes as far east of the sun during its current appearance in the evening sky.

**Saturn** is next to appear in the evening sky. It sets at 1:53 a.m., PDT, on the 1<sup>st</sup> and at 10:58 p.m., PDT, on the 31<sup>st</sup>. The planet is low in the southern sky.

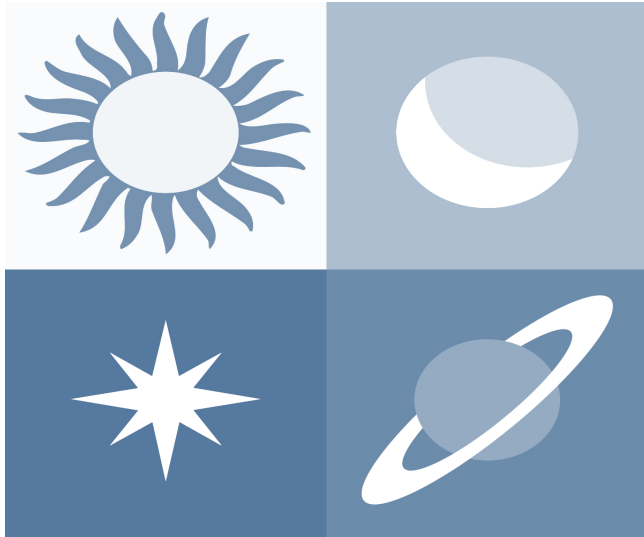
**Jupiter** is next to appear. It sets at 3:09 a.m., PDT, on the 1<sup>st</sup> and at 12:11 a.m., PDT, on the 31<sup>st</sup>. It also appears low towards the south.

For those with telescopes and star atlas apps or charts, **Uranus** is at mag +5.7 in the constellation Aries the Ram. It is available for observation almost all night long. Uranus is at Right Ascension 2h 43m 49s, Declination +15° 24' 59". The planet is only 3.7 arcseconds wide, so you'll need a telescope with a magnification of 150x to see its diminutive disk. The same applies to **Neptune**, although it's tougher to find because it is much fainter than Uranus at mag. +7.8, and much smaller with a disk only 2.4 arcseconds wide. It is in the constellation Aquarius the Water Bearer. Neptune is at Right Ascension 23h 30m 28s, Declination -4° 27' 48".

**The Moon** is new on the 6<sup>th</sup>, at first quarter on the 12<sup>th</sup>, is full on the 20<sup>th</sup>, and at last quarter on the 28<sup>th</sup>.

*David Nakamoto has been observing the heavens through various scopes since he was in the 5<sup>th</sup> grade. You can contact Dave by email at: [dinakamoto@hotmail.com](mailto:dinakamoto@hotmail.com).*





## Almanac

**October 6 - New Moon.** The Moon will be located on the same side of the Earth as the Sun and will not be visible in the night sky. This phase occurs at 11:05 UTC. This is the best time of the month to observe faint objects such as galaxies and star clusters because there is no moonlight to interfere.

**October 7 - Draconids Meteor Shower.** The Draconids is a minor meteor shower producing only about 10 meteors per hour. It is produced by dust grains left behind by comet 21P Giacobini-Zinner, which was first discovered in 1900. The Draconids is unusual in that the best viewing is in the early evening instead of early morning like most other showers. The shower runs annually from October 6-10 and peaks this year on the night of the 7th. This year, the nearly new moon will leave dark skies for what should be an excellent show. Best viewing will be in the early evening from a dark location far away from city lights. Meteors will radiate from the constellation Draco, but can appear anywhere



**October 20 - Full Moon.** The Moon will be located on the opposite side of the Earth as the Sun and its face will be fully illuminated. This phase occurs at 14:57 UTC. This full moon was known by early Native American tribes as the Hunters Moon because at this time of year the leaves are falling and the game is fat and ready to hunt. This moon has also been known as the Travel Moon and the Blood Moon.

**October 21, 22 - Orionids Meteor Shower.** The Orionids is an average shower producing up to 20 meteors per hour at its peak. It is produced by dust grains left behind by comet Halley, which has been known and observed since ancient times. The shower runs annually from October 2 to November 7. It peaks this year on the night of October 21 and the morning of October 22. The full moon will be a problem this year for the Orionids. Its glare will block out all but the brightest meteors. But if you are patient, you should still be able to catch a few good ones. Best viewing will be from a dark location after midnight. Meteors will radiate from the constellation Orion, but can appear anywhere in the sky.

**October 25 - Mercury at Greatest Western Elongation.** The planet Mercury reaches greatest western elongation of 18.4 degrees from the Sun. This is the best time to view Mercury since it will be at its highest point above the horizon in the morning sky. Look for the planet low in the eastern sky just before sunrise.

**October 29 - Venus at Greatest Eastern Elongation.** The planet Venus reaches greatest eastern elongation of 47 degrees from the Sun. This is the best time to view Venus since it will be at its highest point above the horizon in the evening sky. Look for the bright planet in the western sky after sunset.

**Nov. 4 - New Moon**

Source:

<http://www.seasky.org/astronomy/astronomy-calendar-2021.html>

# October 2021

Sun	Mon	Tue	Wed	Thu	Fri	Sat
						
3	4	5	6	7	8	9
			Board Meeting			Dark Sky Night
10	11	12	13	14	15	16
						60 Inch Night
17	18	19	20	21	22	23
	General Meeting					IOMN (Official Event)
24	25	26	27	28	29	30
31						



# Meet The New Members

## Welcome to the LAAS!



Karl Schwing and Family

Ryan Colley

Jonathan Ramos

Lloyd Edens and Family

Christine and the Marquez Family

Colin Leis

Justin Foley

Jonathan Crouch

Robert Ramirez and Family

Oscar Ibarra

Tommy Tso

Rick Garcia

Smith Dykeman

Alexander Anderson-Heflin

Tiffany Carter

Gino Hernandez

## LAAS Board Meetings

.Due to the pandemic, all Board Meetings are now held online, live on Zoom. Please check the information posted in the IO Group Forum for any current news related to these meetings. If you wish to attend a board meeting, please send a request to [secretary@laas.org](mailto:secretary@laas.org) for a link to Zoom.

## Volunteer Opportunities

Every LAAS member is a volunteer at some point. Some members volunteer to share telescopes with the public, while others tackle administrative duties, help out at our community and public events, or join a club committee. Taking photos at our events and writing articles about events for our club newsletter are great ways to volunteer and become more involved in the LAAS as a member.

HOWEVER, due to Covid-19 restrictions in our area, all outreach events have been cancelled until further notice.

Volunteers are always welcome to write articles for our monthly newsletter or share images captured of the night sky. Members are also welcome to come up with new ideas and future activities for the membership which can be shared in Board meetings. If you are artistic and enjoy creating posters or flyers, or printable astro-educational handouts for further star parties, please let us know.

## Time To Renew Your Membership?

Please remember to renew your membership once you receive notice from the Club Secretary in your email inbox.

Please send any new contact information to the club secretary at [secretary@LAAS.org](mailto:secretary@LAAS.org).





## LAAS Outreach Program

The mission of LAAS is to promote interest in and advance the knowledge of astronomy, optics, telescope making and related subjects. In furtherance of its mission, LAAS conducts public star parties and other outreach events that are intended to enhance the public's understanding of astronomy and its enjoyment and appreciation of the beauty and wonders of our universe.



We provide outreach events at local schools, Griffith Observatory, Mt. Wilson Observatory, various state and county parks, and community events.

Join our Outreach team of volunteers today.

Contact Heven Renteria, our Outreach Coordinator at [Outreach@LAAS.org](mailto:Outreach@LAAS.org)



Want to include astronomy outreach at your school's science night or open house? Follow the link below to access the request form:

[https://nightsky.jpl.nasa.gov/club-eventrequest.cfm?Club\\_ID=1344](https://nightsky.jpl.nasa.gov/club-eventrequest.cfm?Club_ID=1344)

## LAAS Club Swag

### LAAS T-SHIRTS, HOODIES, MUGS, AND MORE!

To find new merchandise from our store, please use the following link: <https://www.laas.org/store>

Please note all prices listed are subject to change and include all shipping and handling costs. All items will be shipped directly to the address you provide on your order form.



Please remember all LAAS Outreach activities are postponed due to the Covid-19 pandemic.

## Amazon Smiles

The LAAS is now listed on Amazon Smiles. When you purchase any goods on Amazon.com, Amazon will donate a small percentage of the funds they receive from you, back to the LAAS. Here's some information to help bring in funds for our club projects:

What is AmazonSmile?

AmazonSmile is a simple and automatic way for you to support your favorite charitable organization every time you shop, at no cost to you, with the added bonus that Amazon will donate a portion of the purchase price to your favorite charitable organization., such as the LAAS!

Learn more by following this link:

<http://smile.amazon.com/>



**Disclaimer:** The Los Angeles Astronomical Society, Inc. is a public charity, as defined by Internal Revenue Code Section 501(c)(3) and all contributions to the Society are deductible for Federal and State Income tax purposes. **The Society does not endorse Amazon.com or any of its business practices**, but we are registered with Amazon Smile and will accept contributions from that program. If you are an Amazon customer and would like to have part of the proceeds from your purchase returned to the Society as a contribution, please go to <https://smile.amazon.com/> when you are shopping on Amazon and select Los Angeles Astronomical Society under the caption: "Or pick your own charitable organization." A percentage of you purchases will be donated to the Society to fund its educational and outreach programs.

John O'Bryan, Jr.

Treasurer

## Astronomy Magazine Discounts

Discounts for astronomy magazines can be found on the internet. Look for the best deals possible. Send a copy of your LAAS membership card with your check or payment to receive a club member discount.

**Astronomy**  
magazine

As a member of the Night Sky Network, you may use the above link to renew your Astronomy Magazine subscription (or enter a new subscription) at the club discount rate. If this is a renewal, Astronomy Magazine will match your entered name and address and extend your subscription. For inquiries, please contact Astronomy Magazine customer service & sales at 1-800-533-6644.

[Click here to subscribe to Sky and Telescope Magazine.](#)



**Join the Astronomical Society of the Pacific** and help support the cause of advancing science literacy through engagement in astronomy. Member benefits include a **subscription to the online Mercury Magazine**, published quarterly, and **Astronomy Beat**, a monthly on-line column written by "insiders" from the worlds of astronomy research and outreach.

Subscribe or renew to the McDonald Observatory's StarDate Magazine and receive a special discount. Go to this page and press "Add to Cart" under the kind of subscription you want:

<http://stardate.org/store/subscribe>  
Then, on the Checkout form, enter "network" in the Coupon Code box.



## Club Contact Information

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communications@laas.org

## Club Contacts

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Griffith Observatory:

213-473-0800

Sky Report:

213-473-0880



Follow us on social media by clicking on one of the images below



Instagram



Find astronomy outreach activities by visiting NASA's Night Sky Network:

<https://nightsky.jpl.nasa.gov/about.cfm>

YouTube

twitter