



**MARCH 2020**

**Volume XX Number 3**

***OBSERVE - LEARN - SHARE***

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Upcoming Events	
March 21 (Cancelled)	NHAC Star Party (weather backup March 28) O'Brien Dark Site
March 25 (Cancelled)	Trails as Parks Stargazing (Outreach Event) Pundt Park
March 27 (Cancelled)	Novice and General Meeting Lone Star College – Kingwood
March 28 (Cancelled)	NHAC Star Party (backup Messier Marathon) O'Brien Dark Site
April 3 (Cancelled)	Public Night Insperty Observatory
April 18	NHAC Star Party O'Brien Dark Site
April 22	Kickerillo–Mischer Preserve Star Party (Outreach Event)
April 24	Novice and General Meeting Lone Star College – Kingwood
April 29	Trails as Parks Stargazing (Outreach Event) Pundt Park

# CORONA VIRUS IMPACT ON NHAC

**NHAC members,**

**This is a difficult time we live in, as the COVID-19 pandemic has totally upended our personal lives. The North Houston Astronomy Club activities have been affected as well.**

**You will note that all Club events through April 3 have been cancelled. Cancellations may also extend through April and into May. Stay tuned.**

**Although the official Club events are on hiatus, it is still possible to be involved in astronomy. The dark site is accessible, provided you obtain permission from the O'Brien's according to our usual practices.**

**We will continue to publish the North Star newsletter, our website is up and running and the Club emails and Facebook page are all good ways to communicate among ourselves and share information, images and astronomy news.**

**As you go about your daily routines, please follow all the current medical advice for good health: hand washing, social distancing, covering mouth and nose if you need to sneeze or cough, self-isolation as needed, etc.**

**If there are any changes to our events schedule, including cancellations, we will advise you via Club emails, and website and Facebook postings. Please watch for updates.**

**We wish you clear skies and good health. We will get through this.**

**NHAC Board**

# CLUB NEWS

## NHAC Commemorative T Shirt

**LAST CALL!!!** Deadline for ordering the NHAC 20th Anniversary commemorative T shirts is March 31. Provide your size and quantity to Joanna Tan ([treasurer@astronomyclub.org](mailto:treasurer@astronomyclub.org)). Prices are \$15.00 for regular sizes (S, M, L, XL) and \$16.00 for larger sizes (XXL and up).



## NHAC Outreach

See the calendar at the [NHAC Website](#) for dates and more information about outreach events. These are outdoor events and are weather dependent. Due to the corona virus situation, they also may be subject to cancellation.

Cliff Herseim and Aaron Clevenson will provide NHAC coordination and will advise of any changes or cancellations via Club email. Any cancellations will also be posted on the NHAC website event calendar.

We welcome news, photos, comments and contributions for North Star, the NHAC newsletter. Please send them to [newsletter@astronomyclub.org](mailto:newsletter@astronomyclub.org) by the 10th of each month.

## Astronomical League

The North Houston Astronomy Club has been a member of the Astronomical League since the Club's inception in 1999. Club members have been active participants in the League's observing programs since the start:

- The Astronomical League currently lists 66 observing programs.
- Sixty NHAC members have earned over 260 certificates and awards.
- NHAC members have earned 71 Outreach Awards.

Learn about the League's programs at the [Astronomical League Website](#). The NHAC Coordinator is Aaron Clevenson, at [aaron@clevenson.org](mailto:aaron@clevenson.org).

One of the newer Astronomical League programs is the Spectroscopy Observing Program. Dr. Bruce Pollard, PhD, NHAC, is our expert in spectroscopy and is a very effective teacher. He will be happy to help you get started on the program. For more information, see [Spectroscopy Observing Program](#).



The latest issue of "What's Up, Doc" by Dr. Aaron Clevenson is at [What's Up, Doc?](#)

# GALLERY

Image by Chris Morisette, NHAC

Taken March 5, 2020, in Kingwood, Tx.

Video taken with a Nikon DSLR (D5100) attached to a 6" Meade Dobsonian telescope with a 2x Barlow. PIPP and Autostakkert software used to process the video and create the photo. Final touch-up done in Adobe Lightroom.

In the movie "2001: A Space Odyssey" Clavius is where the Moon Base was located. Tycho is where the Monolith was discovered.

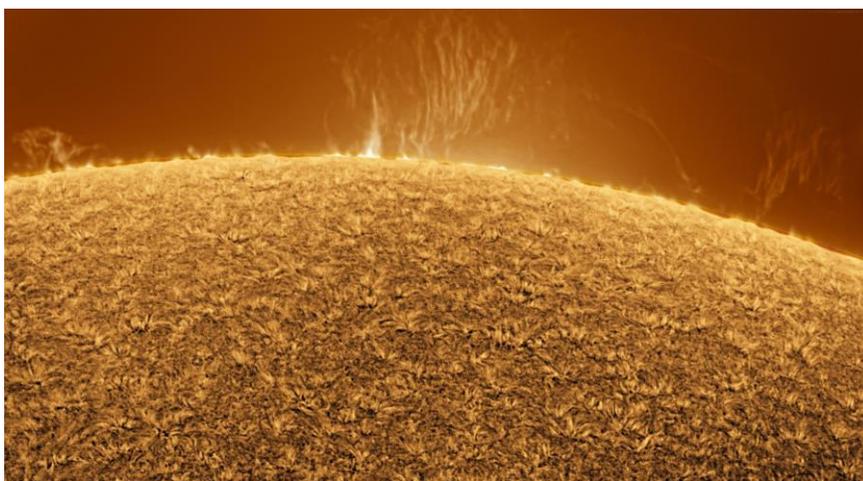
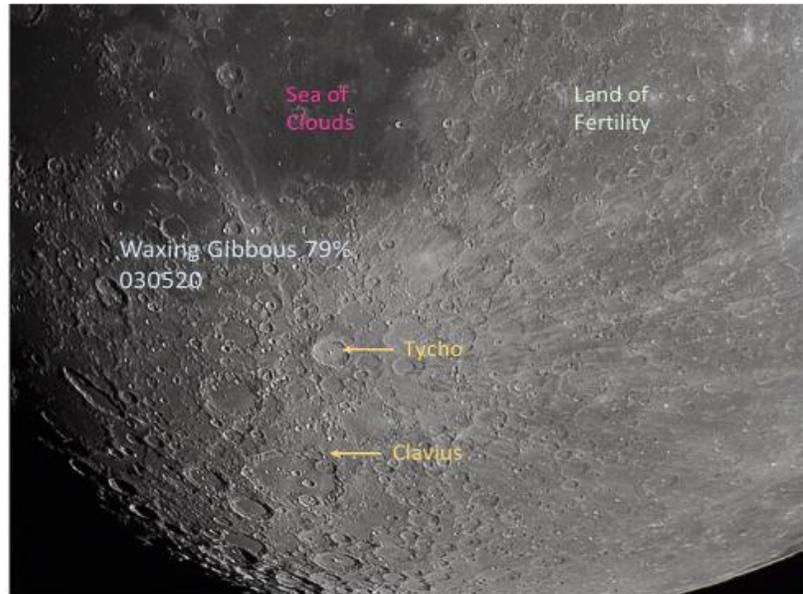


Image by Loyd Overcash, NHAC

The Sun changes daily in HA. This image was taken on March 5, 2020 with a 5" Takahashi scope and the Daystar Quark HA solar filter with the ZWO 174mm camera. I used the best 10% of 2000 frames taken.

SOLARACTIVITY Picture of the Day for March 9th, 2020.

(<https://www.facebook.com/groups/solaractivity/>)

# THE ARMILLARY SPHERE (PART 2)

By James Barbasso, NHAC

This is the second part of a two - part series on the armillary sphere (Fig 1). Last month I gave some history of the armillary sphere and its primary purpose. This month I will discuss how to build an armillary sphere. The armillary sphere I built consisted of 7 rings. Mine can be moved manually to depict the position of the sun, earth and moon with the earth as the center. As an option, the design can be such that the entire model can be moved with a hand crank connected to a gear box at the base of the armillary sphere. The discussion here will just cover the manual armillary sphere model.

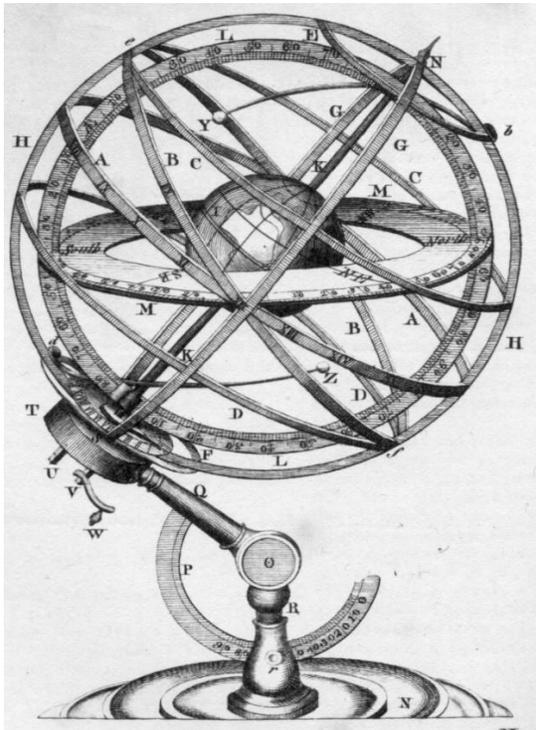


Fig 1 The Armillary Sphere

- A. Equator
- B. Ecliptic
- C. Tropic of Cancer
- D. Tropic of Capricorn
- E. Arctic Circle
- F. Antarctic Circle
- G. Equinoctial Colure
- H. Solstitial Colure
- I. Terrestrial Globe
- J. N/A
- K. Axis
- L. Celestial Meridian
- M. Horizon
- N. North Celestial Pole
- O. Joint
- P. Arc
- Q. Support
- R. Upright Piece
- S. South Celestial Pole
- T. Gear Box
- U. Pinion
- V. Pinion
- W. Winch
- X. N/A
- Y. Sun
- Z. Moon

The outer frame will be constructed first and the various components added working from the inside out. Start out with planning the size of the armillary sphere. Draw up a simple plan and make a list of the materials you will need. Once you have the materials, it is time to get started.

Mine (at right) was designed at 5" in diameter. First the two 5" brass rings are formed from 1/8" diameter brass rods. Each ring is cut in half to produce 4 semi-circles. Each of the semi-circles are soldered to a brass washer, 90° apart from each other. Avoid getting any excess solder inside the center of the washers. The rings will pass through the north and south "poles" of the earth. These two circles are the solstitial colure, H and equinoctial colure, G; both in Fig 2. Colure means meridian in astronomy.

The equinoctial colure passes through the two celestial poles and the two equinoxes (spring and fall.) The solstitial colure passes through the two celestial poles and the two solstices (summer and winter.) So, we have two great circles attached. Set that aside. Now, we need to build the inside components - the earth (1 1/2" diameter.) For the axis of the earth, cut the 1/8" brass rod about 8" in length. These can be trimmed later.

Drill a hole through the earth exactly centered, such that the brass rod will fit easily through. Then grind a groove around the equator of the earth about 1/16" in depth. Set the earth aside and the axis. Take a length of brass rod and form a ring that will fit snugly inside the groove you just made on the earth. Do not push the ring inside the earth yet. Take two lengths of brass rod and cut them 1 1/2" each. Solder these 90° apart onto the brass ring.

Set that piece aside. This piece will support the horizon. Take a 1/8" thick brass plate and trace out two circles. One is 3 3/4" O.D. X 2" I.D. (horizon) and the other 3 1/2" I.D. X 4 1/8" O.D. (meridian). Brass plate is not cheap nor too easy to find, but work with what you can buy or are willing to spend.



Jim's armillary sphere

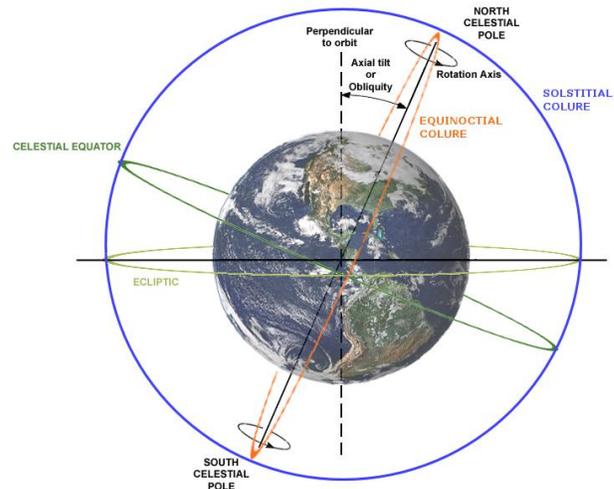


Fig 2 The colures or principal meridians of the celestial sphere

I made my meridian differently, but you can discuss that with me. It is quite tedious to do. Cutting the shapes out of brass plate is much easier. I used 1/8" metal split rings as clamps to assemble all the parts that go on the earth's axis. If you find brass colored ones, use those. Put the split rings on the side. At this point, you should have the earth, 8" axis, the horizon support, horizon, earth's meridian, and the split rings.

A scribed pattern is made on the horizon piece denoting the cardinal directions on one side of the piece. Make a notch at N and S, such that the meridian can slide through both. On the horizon's bottom, solder two metal bearing surfaces, one under the E side and one under the W side. Solder one bearing first and then slide one end of the horizon support through the bearing. Then secure the horizon support by soldering the other bearing over the remaining horizon support end. The horizon should move freely around the horizon support. Try to balance the horizon on the support, as best as you can. Snap the earth onto the horizon support and check that the horizon is still moving freely and balanced. Place this assembly to the side.

Scribe 0° to 90° onto the earth's meridian every 5°. Use whatever scale you wish. To prepare the meridian to scribe, divide the meridian into four quadrants. Then, mark 0° on the E-W ends and 90° on the N-S ends. Set down the scribe marks on the meridian and scribe. Set the meridian aside. The meridian will measure the declination of the armillary sphere, so accuracy is important.

Take the basic frame you made with the two great circles and insert the earth's axis through both sides. Check that the axis slides up and down easily and can spin freely. We do not want any binding or misalignments. Once the axis is fitted, pull the axis up and insert the assembly containing the earth and horizon. Don't forget to secure the axis with the little split rings you have set aside and secure the top and bottom of the earth, as well. The earth needs to be centered on its axis. At this point, the earth and its axis and horizon should be secured inside the armillary sphere. The earth should move freely and the horizon securely moving with the earth. Try to align the earth's equator with the horizon plane.

Solder the meridian such that 0° aligns with the earth's equator to the axis top and bottom. Ensure the horizon can rotate freely up and down the meridian without binding. Remember, the grooves made on the horizon need to pass over the meridian. Adjust as needed and be patient. This step is very important because you will measure the declination of the armillary sphere aligning the horizon with the meridian degree marks.

The other five great circles can now be made. These circles fit outside of the frame. Make the Tropic of Cancer, Tropic of Capricorn, Arctic and Antarctic circles. You will need to figure the diameters of these according to your own framework. The Tropic of Capricorn and Cancer will rest at 23.5° above and below the equator. The Arctic and Antarctic circle will rest 23.5° above the north or south poles. The equator has a diameter equal to the center of the armillary sphere, in line with the equator of the earth, hopefully. You want the equator to be accurately placed because you will measure the "hour angle" from this circle. Solder all the circles in place except the equator. Check that the meridian inside the armillary sphere rotates around the armillary sphere without binding. Set the equator aside.

There are two things we need to do. First, the equator needs to be scribed with the Roman Numerals, I to XXIV equally around the circumference (Fig 3). These will serve as hour angles. On my armillary sphere, I placed the equator inside, so I could attach the base to the outside of the sphere.

The other item is to make the ecliptic band (Fig 3). A brass band is cut from brass sheet, such that the band can pass through the Tropic of Capricorn (winter solstice) and the Tropic of Cancer (summer solstice) from the inside of the armillary sphere. This band is scribed with the twelve Zodiac signs, degrees 0° to 360°, and the dates each sign begins and ends. My band is ½" thick and I divided the band into 12 rectangular spaces all equal size; placed the dates on top 1/3 of the rectangle, the zodiac sign is centered inside the rectangular space, bottom 1/3, degrees of azimuth. Take your time and sketch the ecliptic on paper first to show how you plan to scribe everything. When the pattern is to your satisfaction, then scribe the marks according to your sketch.

Once the ecliptic band is complete, attach the band inside the armillary sphere. Be certain the band passes over the solstice points and equatorial points exactly.

The band should be inclined 23.5° from the equator, if all is correct. Make certain the meridian does not hit the ecliptic band as it rotates. Of course, the ecliptic band may be attached outside the sphere. The equator should be installed prior to the ecliptic band. Check that the meridian can rotate freely without bumping into other structures and check the horizon to make certain that it can move up and down.

The last two items to add are the sun and the moon. The sun is secured inside the armillary sphere with a piece of brass wire near the north pole, so the sun can move around the ecliptic band. The moon is secured the same fashion as the sun, but near the south pole. The moon should rotate such that it crosses the ecliptic at 5° ascending and descending to denote the nodes of the lunar orbit.



Fig 3 The ecliptic band-date (top red oval), degrees (bottom circle) zodiac (right circle). Also, vertical divisions for each "month". Note the meridian (blue arrow) with its scribed marks.



Fig 4 Axis with snap ring (red) and brass square (blue) as guides

Do not concern yourself, if this does work out too well; as long as the two bodies are in the armillary sphere you doing o.k. You can play around with the design to make the sun and moon work properly as a future endeavor.

If you choose to tackle this project my only advice is to take time and learn as you go along. There is no one way to make these and you can get creative to make your own one-of-a-kind armillary sphere. It is an instrument and as such, some degree of care needs to be followed for the armillary sphere to work as it was designed. I made mine by hand, since I do not have a machine shop. Also, the markings are scribed by hand; I do not have a scribing machine. However, I have a Dremel tool. It took me 2 or 3 months to make mine and am always finding ways to make it work better. Don't forget to draw plans ahead of making the individual pieces.

Good luck.

# MARCH STAR PARTY CANCELLED

By Rusty Hill, NHAC

Cancelled! Also, the make-up Messier Marathon on March 28, 2020.

With the combination of the Coronavirus threat and the overall lousy weather, it looks as though March might not even be happening this year. But it is, just not how we want it.

If, a big “if”, you have a clear sky to go to, you can still work on the Messier Challenge, our local in-house NHAC Messier event.

M74 is one of the hardest to see Messier objects in the Marathon/Challenge, and is often the first on the list to look for. Currently, the Pisces Constellation, home of M74, is nicely up in the west. When it is dark about an hour after sunset M74 is still high enough to see if you have a dark sky. But as we move on towards the month of April, it will be getting lower and lower in the West as the sun sets. If you have an opportunity, the earlier in March you look for it, the better are your chances. If you do bag M74, then your chances of observing all the Messiers is still alive. Look next for M77, in Cetus. For the Challenge, all the Messier objects can be observed over several nights.

I personally am hoping we will get a break in the weather, maybe up near Waco. I would like to see how many I can find with my 8” Dobsonian Mount telescope. Starting with M74, I have observed M77, 31, 32, 33, 110, 53, 103, 76, 42, 43, and 45 with the 8”, but well before the Challenge started. I am still hoping. For the Challenge, I will need to start over again if I find clear skies.

Finding them, of course, is the big challenge. That is why I enjoy using the Dobsonian Mount!

For those trying to catch some comets, and that does include me, Drako has provided some good information on C2019 Y4, Atlas. His information is available on the NHAC Google groups email list. As Ken points out, while Y4 Atlas is currently a night-time comet, by mid-May it will become a sunset object. It will likely be hard to see. So now is the time to observe it, if you can.

Everybody: Limit your personal exposure to others who may be Coronavirus carriers, wash often, keep your immune system strong through plenty of rest, exercise, and proper nutrition including lots of antioxidants.

Stay positive! This, too, shall pass.

Clear skies.

Rusty

# DARK SITE INFORMATION

If you are new to the club, Star Parties are especially for you. We, the members, are the reason we have observing Star Parties, and they are great occasions to get familiar with observing. We have 10" Dobsonian telescopes available at the Dark Site for your use. There will also be several other scopes available for all to try. And do bring a Binocular-- you can do lots of successful observing with nothing more.

NHAC Club Policy is that the focus of the Star Parties will be to give as much assistance as possible to new observers. For those who may not have been to the O'Brien Dark Site, it is just north of Dobbin, which is on Highway 105 west of Montgomery. It has reasonably dark skies and a great low horizon in all directions. The Owners, Tim and Wanda O'Brien, are very generous hosts, and they do turn off any outside lights which might bother us, if we remember to ask.

**The specific Dark Site location is password protected. Any club officer can give you the password, but it is NOT FOR THE GENERAL PUBLIC!**

Access to the Dark Site must be requested from the O'Brien's in advance via the NHAC email. It is only necessary for any 1 member to request access... Access approved for any of us is access approved for all of us.

On our NHAC web site, click on "Observing" then select "O'Brien Dark Site". Scroll down to the O'Brien Dark Site information and look for the "detailed directions" link. You will need to enter the password. There are maps as well as directions. It is well worth the drive, which is about 6- or 7-minutes driving time north of Dobbin off of State Highway 105 west of Montgomery.

Star Parties are routinely scheduled for the Saturday on, just before, or just after the New Moon throughout the year. This is to provide the best opportunity for dark skies.

# INSPERITY OBSERVATORY



***Due to the COVID-19 pandemic, the April 3 Public Night has been cancelled. Hopefully we will be able to resume the monthly Public Nights later this spring...***

These Public Nights are a great opportunity for us to be a part of Astronomy Outreach, and also to observe with scopes we might never get to use, otherwise. The Observatory has a 6" Takahashi refractor, a 16" Meade Schmidt-Cassegrain, and a 20" Plane Wave telescope. Each is computer controlled, and provides an awesome view of the sky. There are usually about 75 to 100 guests, sometimes more, on Public Night, with many repeating. Our guests are very appreciative of the opportunity to enjoy the sky and also expose their kids to Astronomy. Then after all our guests have departed, several of us usually stay for a while and enjoy the views and each other's company. This can be an opportunity to see a new or favorite object in a large telescope.

The Observatory is about 3/4 of a mile south of Will Clayton Parkway on S. Houston Ave, just north of Rankin Road in Humble, in the back part of the Jack Fields Elementary School on the East side of S. Houston Ave. The address is:

Jack Fields Elementary School  
2505 S. Houston Ave.  
Humble, TX 77396

For more information, the Observatory phone number is 281-641-STAR and the web site is <https://www.humbleisd.net/observatory>.

Dates and times are subject to change.

# ABOUT NHAC

The North Houston Astronomy Club (NHAC) is a not-for-profit organization established in 1999 for educational and scientific purposes, for people of all races, creeds, ethnic backgrounds and sex. Our primary purpose is to develop and implement programs to increase the awareness and knowledge of astronomy, especially for those living near the north side of Houston, Texas.

NHAC is dedicated to providing an opportunity for people to pursue the science of astronomy, to observe in a dark-sky site, to learn the latest technology, and to share their knowledge and experience, thus our “Observe-Learn-Share” motto.

Public meetings are normally held each month on the fourth Friday. In the months of October, November and December they are usually rescheduled for the third Friday of each month, so as to not conflict with the Annual All Clubs meeting, Thanksgiving, or Christmas.

The benefits for membership include:

- Loaner telescopes after being a member for 6 months.
- Opportunity to observe from dark sky observing sites.
- Learn from experienced observers.
- Astronomy Magazine subscriptions at a discount.
- Astronomical League membership, with its many observing programs.
- Subscription to the Astronomical League magazine "Reflector".
- Access to the NHAC library
- Discounts on purchases at Land, Sea and Sky. Be sure to identify yourself as an NHAC member.

More information at the [NHAC Website](#)

Check out our [Facebook page](#).

Our mailing address is:

North Houston Astronomy Club  
Post Office Box 5043  
Kingwood, TX 77335-5043

NHAC is sponsored by:



# CALENDAR. MEMBERSHIP. OFFICERS

NHAC General Calendar			
	Executive Board Meeting	Star Party	General Meeting
March 2020	Mar 9	Mar 21 (weather backup Mar 28)	Mar 27
April 2020		Apr 18	Apr 24
May 2020	May 11	May 16 (and BBQ)	May 22
June 2020		Jun 20	Jun 26
July 2020	Jul 13	Jul 18	Jul 24
August 2020		Aug 15	Aug 28
September 2020	Sep 14	Sep 12 (and BBQ)	Sep 25
October 2020		Oct 17	Oct 23
November 2020	Nov 9	Nov 14 (and BBQ)	Nov 20
December 2020		Dec 12	Dec 18

Dates and times are subject to change. Star parties are weather permitting.

## Membership

Memberships run from January 1 through December 31.

Full year dues are:  
 Students \$10  
 Individuals \$30  
 Family Groups \$40

Membership applications and dues payments can be made at the NHAC website at:

[NHAC Website](#)

## 2020 NHAC Executive Board

President	Carlos Gramajo - <a href="#">email</a>
Vice-President	Bruce Pollard - <a href="#">email</a>
Secretary	Rusty Hill - <a href="#">email</a>
Treasurer	Joana Tan - <a href="#">email</a>
Newsletter Editor	Jesse Roberts - <a href="#">email</a>
Astronomical League Coordinator	Aaron Clevenson - <a href="#">email</a>
Webmaster	Bruce Pollard (interim) - <a href="#">email</a>
Observation Chair	James Billings - <a href="#">email</a>
Membership Chair	Hagen Miller - <a href="#">email</a>
Program Chair	Trevor Arnold - <a href="#">email</a>

# AFFILIATIONS

NHAC is a member of:



The Astronomical League

<https://www.astroleague.org/>



Night Sky Network

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



INTERNATIONAL DARK-SKY ASSOCIATION

International Dark Sky Association

<https://www.darksky.org/>