

# The ECLIPSE

April  
2021

*The Newsletter of the Barnard-Seyfert Astronomical Society*

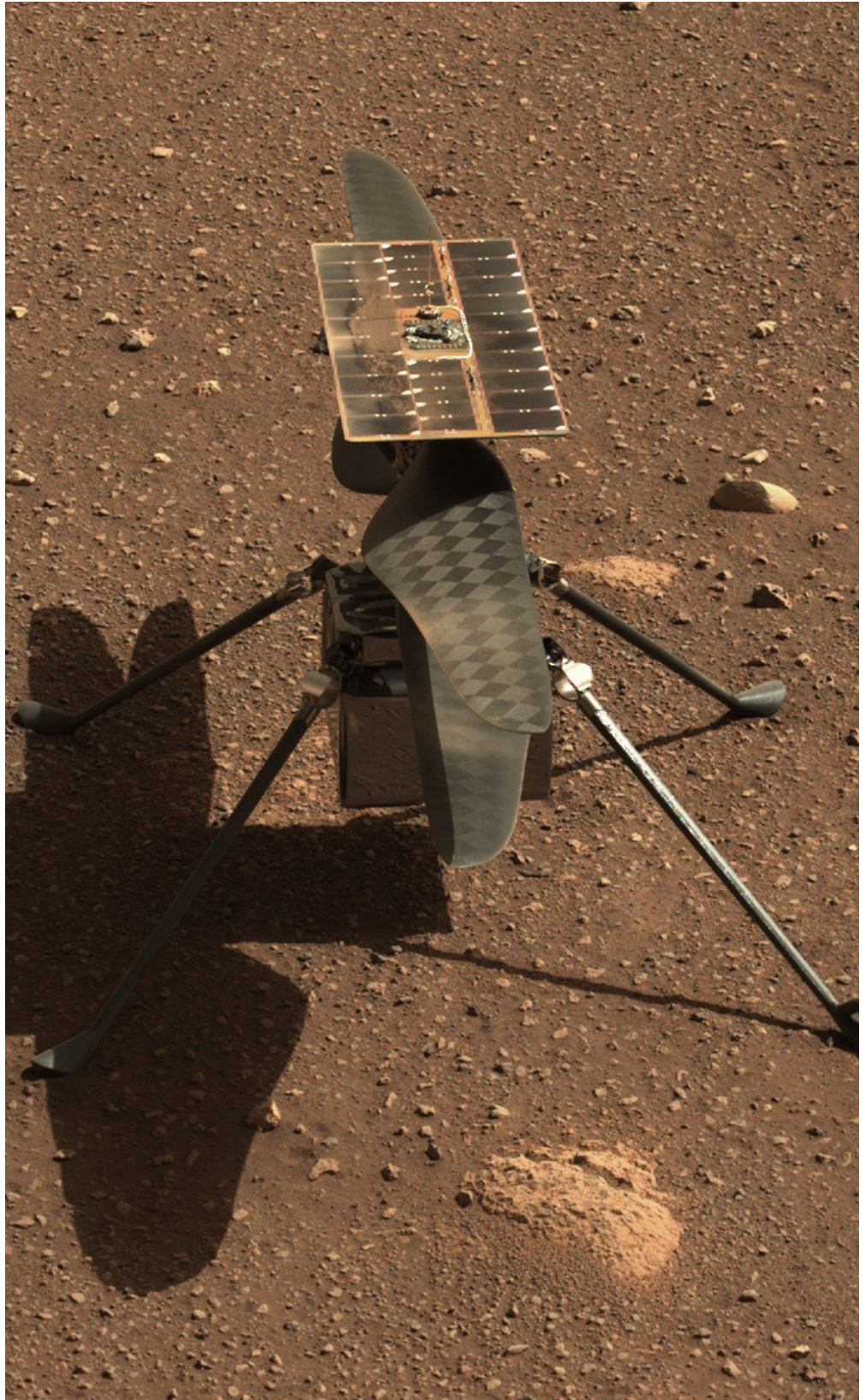
## Next Membership Meeting:

April 21, 7:30 pm  
Online meeting

Topic TBD

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## Officers

Keith Rainey  
President  
Keith.Rainey@gmail.com

Tom Beckermann  
Vice President  
tmbeckermann@gmail.com

Bud Hamblen  
Secretary  
wrhamblen@comcast.net

Theo Wellington  
Treasurer  
tmwellington@comcast.net

Gary Eaton  
Ex-officio  
gceaton@comcast.net

## Directors at Large

Chip Crossman  
chipcrossman@gmail.com

Tony Drinkwine

Andy Reeves  
reevesaf@gmail.com

Kathy Underwood  
katy2222@comcast.net



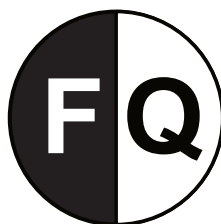
This unusual lenticular galaxy, which is between a spiral and elliptical shape, has lost almost all the gas and dust from its signature spiral arms, which used to orbit around its center. Known as NGC 1947, this galaxy was discovered almost 200 years ago by James Dunlop, a Scottish-born astronomer who later studied the sky from Australia. NGC 1947 can only be seen from the southern hemisphere, in the constellation Dorado (the Dolphinfish).

Residing around 40 million light-years away from Earth, this galaxy shows off its structure by backlighting its remaining faint gas and dust disk with millions of stars. In this picture, taken with the NASA/ESA Hubble Space Telescope, the faint remnants of the galaxy's spiral arms can still be made out in the stretched thin threads of dark gas encircling it.

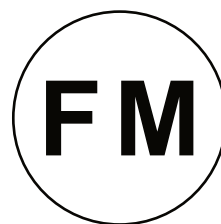
Credit: [ESA/Hubble & NASA, D. Rosario](#); Acknowledgment: [L. Shatz](#)



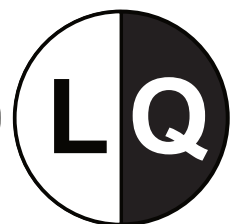
Apr 11  
May 11



Apr 20  
May 19



Apr 26  
May 26



Apr 4  
May 3

## Happy Birthday Hubble Space Telescope by Robin Byrne

This month we celebrate the life of one of the most significant pieces of equipment ever to, literally, grace the skies. The idea of an orbiting telescope is not a new one. In 1923, Herman Oberth, the German rocket engineer, proposed putting a telescope in orbit to avoid the distorting effects of Earth's atmosphere. Lyman Spitzer was also a strong proponent of a space telescope, and spent nearly 30 years trying to make it a reality. By the 1970's NASA and the European Space Agency began to seriously consider such an undertaking. Funding was established in 1977 for a 2.4 meter telescope. By 1981, the grinding of the primary mirror was complete. A launch aboard the space shuttle was scheduled for 1986, but was delayed due to the grounding of the shuttle fleet after the Challenger explosion. The Hubble Space Telescope was finally carried to orbit April 25, 1990 aboard the shuttle Discovery.



**STS061-99-009 (9 Dec 1993) --- Sunlight reflects off the Space Shuttle Endeavour's aft windows and the shiny Hubble Space Telescope (HST) prior to its post-servicing deployment near the end of the eleven-day mission. A handheld Hasselblad camera was used inside Endeavour's cabin to record the image.**

Named for Edwin Hubble, the astronomer responsible for discovering that galaxies exist beyond the Milky Way and the expansion of the universe, the Hubble Space Telescope is roughly the size of a school bus and weighs over 20,000 pounds. Orbiting at an altitude of over 300 miles, Hubble circles the Earth once every 97 minutes. Hubble is equipped with CCD detectors able to observe from the near ultraviolet part of the spectrum, through all optical wavelengths, and partly into the infrared. Using gyroscopes to point and steady the entire system, Hubble has a pointing accuracy of 7/1000th of an arcsecond.

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## **Hubble Space Telescope, continued**

The Hubble Space Telescope has a primary mirror 2.4 meters wide, and a secondary that is 12 inches wide. The grinding of the mirrors was intended to be so accurate that if the mirror were scaled up to the size of Earth, the largest bump would only be 6 inches tall. However, within 2 months of launch, it was realized that there was a flaw in the primary mirror: by less than the width of a human hair, the edges were too flat. Initial images were computer manipulated to allow astronomers to still achieve superb results. In December of 1993, during the first repair mission carried out by astronauts, corrective optics were installed to allow Hubble to perform at its maximum capabilities. With servicing missions always intended for Hubble, a total of 5 missions have been performed, allowing periodic replacements of the vital pointing gyroscopes and installation of improved detectors.

Hubble's primary mission was to carry-on in the footsteps of its namesake by measuring the age and size of our universe, observe the evolution of galaxies, and to study all objects in our solar system and beyond with an unprecedented degree of detail. Among the major achievements of Hubble are: two Hubble Deep Field images, proof that quasars are inside of galaxies, measurement of the expansion of the universe, and proof that gamma ray bursts originate in galaxies.

Another repair mission of Hubble was planned for 2006, which would have prolonged the telescope's life even farther. However, in the wake of the Columbia accident, things changed. The new safety protocols required some way of saving astronauts, should the shuttle be damaged. A mission to Hubble would be unable to reach the International Space Station (which would be able to safely return crew members to Earth with their emergency Soyuz capsule). The only other option would be to have a second shuttle prepared to launch a rescue mission, and to develop a wide new range of emergency procedures. The decision was made that this would cost too much, especially with the retirement the shuttle fleet planned to occur once the International Space Station construction was complete.

On March 7 of this year, Hubble Space Telescope was placed in "safe mode" due to a software error. Fortunately, engineers were able to fix the problem, and Hubble went back into operation on March 12.

For 31 years Hubble has provided some of the most beautiful and scientifically rich images ever seen. No one knows how much longer we will have this workhorse of the astronomical community available. Once the gyroscopes begin to fail, Hubble will be de-orbited in such a way that it will mostly burn up in our atmosphere, and whatever pieces survive reentry, will land in one of the oceans. With the launch of the James Webb Telescope planned for later this year, astronomers are fortunate to be able to

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## Hubble Space Telescope, continued

make use of both telescopes to gain a richer understanding of the universe. However long Hubble survives, it's contributions to science have more than paid for themselves, and we have been fortunate to live in the era of the Hubble Space Telescope

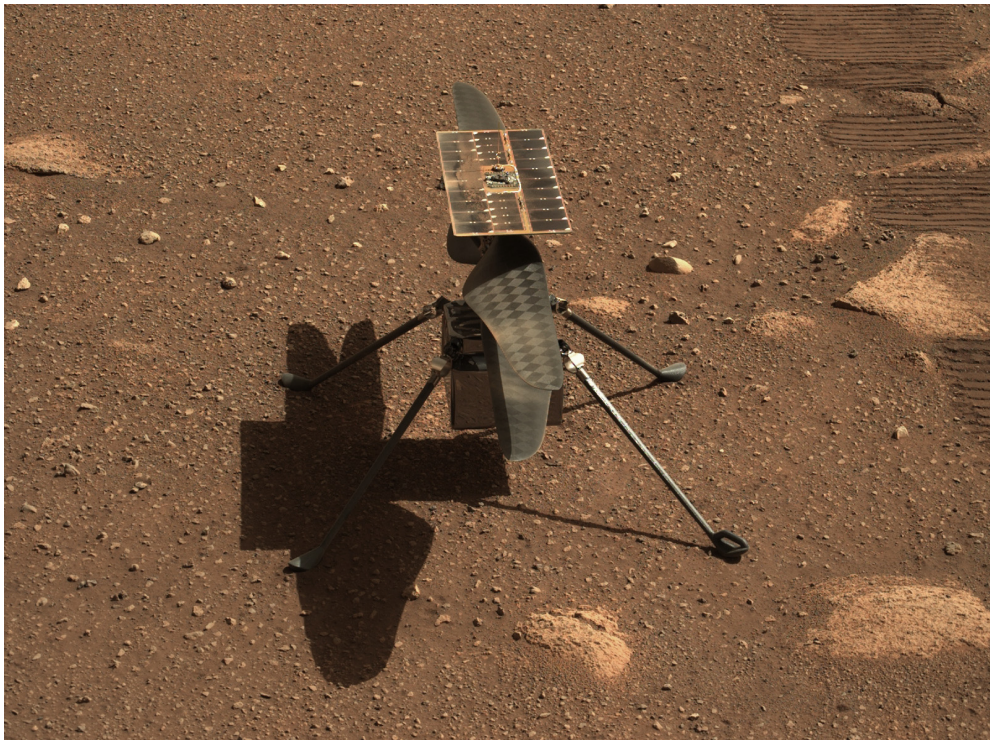
### References:

[HubbleSite](#)

[ESA Science & Technology](#)

[NASA Cancels Shuttle Mission to Service Hubble by Robert Roy Britt and Brian Berger for Space.com](#)

[Hubble Space Telescope in Safe Mode After Software Glitch by Mike Wall for Space.com](#)



**On the Cover: NASA's Ingenuity Mars helicopter is seen here in a close-up taken by Mastcam-Z, a pair of zoomable cameras aboard the Perseverance rover. This image was taken on April 5, the 45th Martian day, or sol, of the mission.**

**The mosaic is not white balanced but is instead displayed in a preliminary calibrated version of a natural color composite, approximately simulating the colors of the scene that we would see if we were there viewing it ourselves.**

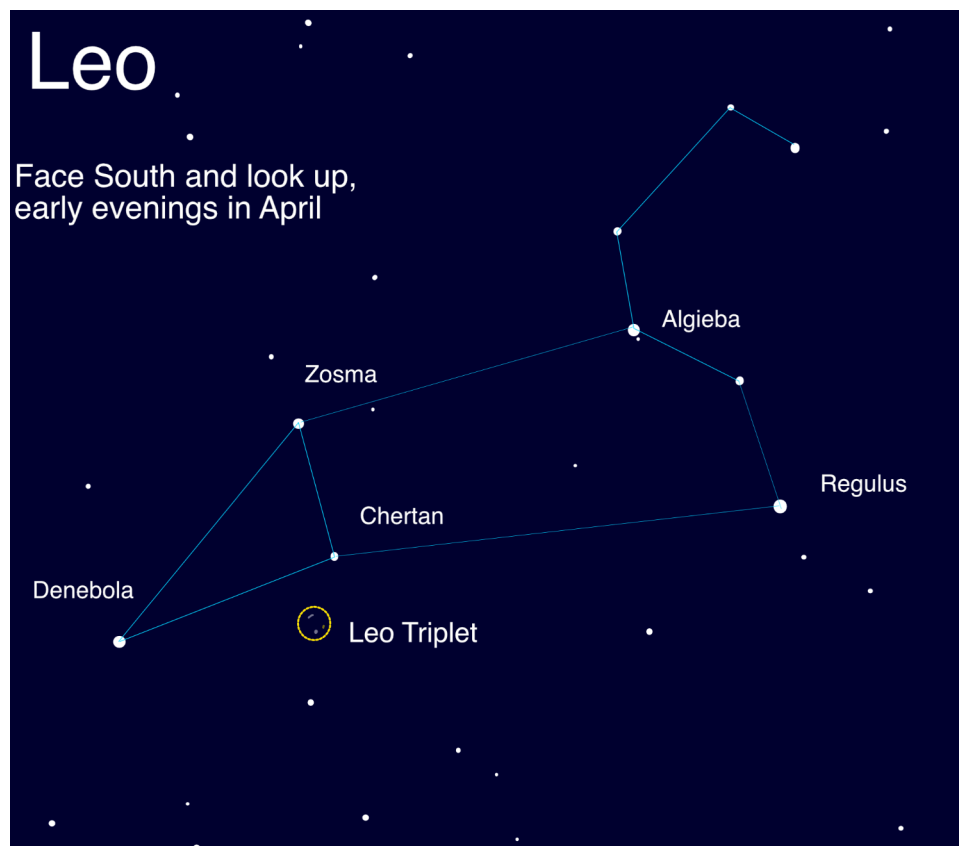
**Credit: [NASA/JPL-Caltech/ASU](#)**

## Watch the Lion: Celestial Wonders in Leo

### David Prosper

Leo is a prominent sight for stargazers in April. Its famous sickle, punctuated by the bright star Regulus, draws many a beginning stargazer's eyes, inviting deeper looks into some of Leo's celestial delights, including a great double star and a famous galactic trio.

Leo's distinctive forward sickle, or "reverse question mark," is easy to spot as it climbs the skies in the southeast after sunset. If you are having a difficult time spotting the sickle, look for bright Sirius and Procyon - featured in last month's article - and complete a triangle by drawing two lines to the east, joining at the bright star Regulus, the "period" in the reverse question mark. Trailing them is a trio of bright stars forming an isosceles triangle, the brightest star in that formation named Denebola. Connecting these two patterns together forms the constellation of Leo the Lion, with the forward-facing sickle being the lion's head and mane, and the rear triangle its hindquarters. Can you see this mighty feline? It might help to imagine Leo proudly sitting up and staring straight ahead, like a celestial Sphinx.



If you peer deeper into Leo with a small telescope or binoculars, you'll find a notable double star! Look in the sickle of Leo for its second-brightest star, Algieba - also called Gamma Leonis. This star splits into two bright yellow stars with even a small magnification - you can make this "split" with binoculars, but it's more apparent with a telescope. Compare the color and intensity of these two stars - do you notice any differences? There are other multiple star systems in Leo - spend a few minutes scanning with your instrument of choice, and see what you discover.

The stars of Leo: note that you may see more or less stars, depending on your sky quality. The brightness of the Leo Triplet has been exaggerated for the purposes of the illustration - you can't see them with your unaided eye.

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## Leo, continued

One of the most famous sights in Leo is the “Leo Triplet”: three galaxies that appear to be close together. They are indeed gravitationally bound to one another, around 30 million light years away! You’ll need a telescope to spot them, and use an eyepiece with a wide field of view to see all three galaxies at once! Look below the star Chertan to find these galaxies.

Compare and contrast the appearance of each galaxy – while they are all spiral galaxies, each one is tilted at different angles to our point of view! Do they all look like spiral galaxies to you?

April is Citizen Science Month, and there are some fun Leo-related activities you can participate in! If you enjoy comparing the Triplets, the “Galaxy Zoo” project ([galaxyzoo.org](http://galaxyzoo.org)) could use your eyes to help classify different galaxies from sky survey data! Looking at Leo itself can even help measure light pollution: the Globe at Night project ([globeatnight.org](http://globeatnight.org)) uses Leo as their target constellation for sky quality observations from the Northern Hemisphere for their April campaign, running from April 3-12. Find and participate in many more NASA community science programs at [science.nasa.gov/citizenscience](http://science.nasa.gov/citizenscience). Happy observing!

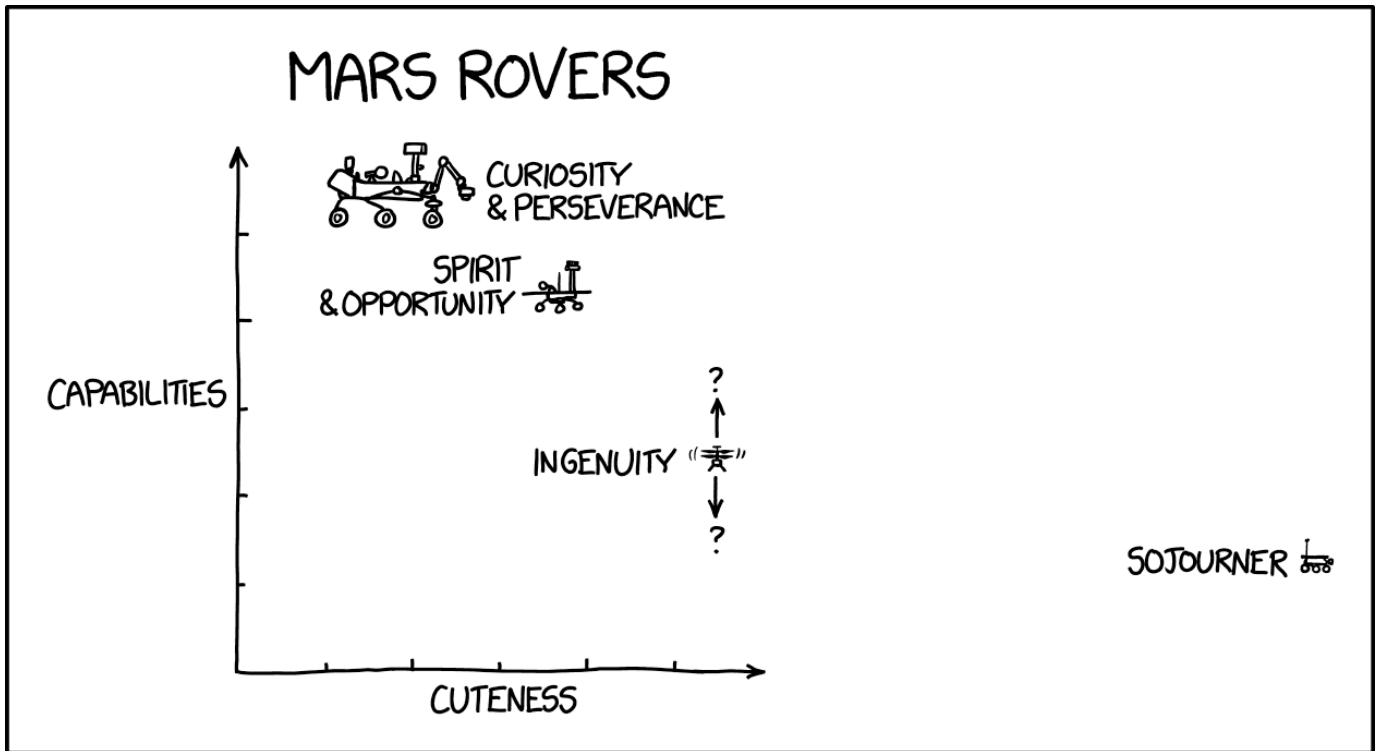


Your view of the three galaxies in the Leo Triplet won't look as amazing as this image taken by the VLT Survey Telescope, unless you have a telescope with a mirror 8 feet or more in diameter! Still, even a small telescope will help your eyes pick up these three galaxies as “faint fuzzies”: objects that seem blurry against a background of pinpoint stars. Let your eyes relax and experiment with observing these galaxies by looking slightly away from them, instead of looking directly at them; this is called averted vision, a handy technique that can help you see details in fainter, more nebulous objects.

Image Credit: ESO, INAF-VST, OmegaCAM; Acknowledgement: OmegaCen, Astro-WISE, Kapteyn I.

*This article is distributed by NASA Night Sky Network. The Night Sky Network program supports astronomy clubs across the USA dedicated to astronomy outreach. Visit [nightsky.jpl.nasa.gov](http://nightsky.jpl.nasa.gov) to find local clubs, events, and more! You can catch up on all of NASA's current and future missions at [nasa.gov](http://nasa.gov). With articles, activities and games NASA Space Place encourages everyone to get excited about science and technology. Visit [spaceplace.nasa.gov](http://spaceplace.nasa.gov) to explore space and Earth science!*

xkcd



**Next Membership Meeting:**

Wednesday, April 21, 7:30 pm Central  
online on Zoom

Topic TBD

Zoom link will be posted to [bsasnashville.com](http://bsasnashville.com)



**Barnard-Seyfert Astronomical Society  
Minutes of a Regular Meeting of the Board of Directors  
Held On Wednesday, March 3, 2021**

The regular meeting of the Board of Directors of the Barnard-Seyfert Astronomical Society was held March 3, 2021, online. Logged in were Tom Beckerman, Tony Drinkwine, Bud Hamblen, Keith Rainey and Theo Wellington. Keith called the meeting to order at 7:30 PM. Keith asked for a vote to adopt the February, 2021, minutes as printed in the March, 2021, issue of the Eclipse. Theo made the motion, Tony seconded and the minutes were adopted by voice vote. Theo reported that the Suntrust balance was \$11,591.78 and the PayPal balance was \$239.71. Poster sales stand at 34. Theo reported that there were 1,911 likes and 2,040 followers on Facebook, and 217 followers on Twitter. Keith reported there were 185 members.

Future meeting topics include a presentation by Chuck Allen and a "What's Up."

Theo mentioned that there is a new comet, C/2021A1 (Leonard) that might reach naked eye brightness toward the end of the year.

KC Katalbas and Drew Gilmore are redesigning the web site.

The light pollution ordinance has passed the second reading in the Metro Council.

Vanderbilt Dyer Observation has an on-line event scheduled for March 13. The February Virtual Star Party had a total of about 401 live views.

There being no further business, the meeting was adjourned at 8:10.

Respectfully submitted,

Bud Hamblen  
Secretary

**Barnard-Seyfert Astronomical Society  
Minutes of the Monthly Membership Meeting  
Held On Wednesday, March 17, 2021**

Because monthly in-person meetings are suspended due to the COVID-19 epidemic, the Barnard-Seyfert Astronomical Society held an on-line meeting via Zoom on Wednesday, March 17, 2021. About 20 participants zoomed in.

Keith Rainey called the meeting to order at 7:30 PM and asked for a vote to adopt the minutes for the January 20, 2021, meeting and the minutes were adopted by voice vote. Theo Wellington reported that the SunTrust balance was \$11,545.78 and that the PayPal balance was \$321.33.

Theo reported that on social media, the March 13 Virtual Star Party had 340 views so far. The club's Facebook page is liked by 1950 persons and is followed by 2044.

Keith reported 188 members.

The Middle Tennessee Engineering and Science Fair will be presented virtually on April 10, 2021.

Ron Rosano presented the latest news on commercial space flight. Ron is ticketed to fly into space with Virgin Galactic.

The being no further business, the meeting was adjourned at about 9 PM.  
Respectfully submitted,

Bud Hamblen  
Secretary





Deriving its name from its delicate, draped filamentary structures, the beautiful Veil Nebula is one of the best-known supernova remnants. It formed from the violent death of a star twenty times the mass of the Sun that exploded about 8000 years ago. Located roughly 2100 light-years from Earth in the constellation of Cygnus (The Swan), this brightly colored cloud of glowing debris spans approximately 110 light-years.

To create this colorful image, observations taken by Hubble's Wide Field Camera 3 instrument through 5 different filters were used. The new post-processing methods have further enhanced details of emissions from doubly ionized oxygen (seen here in blues), ionized hydrogen and ionized nitrogen (seen here in reds). Credit: [ESA/Hubble & NASA](#), Z. Levay





In honor of the club's 90th anniversary we partnered with Hatch Show Print to create a unique poster that would honor the achievement of the club. For those who don't know Hatch Show has been making posters for a variety of events and concerts for 140 years. In all that time we are their first astronomy club.

On the poster at the center is the moon. This was made from a wood grained stencil that the shop has used for over 50 years. To contrast that the telescope that the people are using is a brand new stencil made for our poster. The poster has three colors. First the pale yellow color of the moon was applied. Next the small stars, circles, and figures at the bottom were colored in metallic gold. The third color is

a blue for the night sky. Where it overlaps with the metallic gold it creates a darker blue leaving the figures at the bottom looking like silhouettes. This was a one time printing so the 100 that we have are all that will be printed.

The prints are approximately 13 3/4" x 22 1/4" and are available for \$20 at our membership meetings, or \$25 with shipping by ordering through [bsasnashville.com](https://bsasnashville.com). Frame not included.



Become a Member of BSAS!  
Visit [bsasnashville.com](http://bsasnashville.com) to join online.

All memberships have a vote in BSAS elections and other membership votes. Also included are subscriptions to the BSAS and Astronomical League newsletters.

Annual dues:

Regular: \$25  
Family: \$35  
Senior/Senior family: \$20  
Student\*: \$15

\* To qualify as a student, you must be enrolled full time in an accredited institution or home schooled.

## About BSAS

Organized in 1928, the Barnard-Seyfert Astronomical Society is an association of amateur and professional astronomers who have joined to share our knowledge and our love of the sky.

The BSAS meets on the third Wednesday of each month at the Cumberland Valley Girl Scout Building at the intersection of Granny White Pike and Harding Place in Nashville. Experienced members or guest speakers talk about some aspect of astronomy or observing. Subjects range from how the universe first formed to how to build your own telescope. The meetings are informal and time is allotted for fellowship. You do not have to be a member to attend the meetings.

Membership entitles you to subscriptions to *Astronomy and Sky & Telescope* at reduced rates; the club's newsletter, the *Eclipse*, is sent to members monthly. BSAS members also receive membership in the Astronomical League, receiving their quarterly newsletter, the *Reflector*, discounts on all astronomical books, and many other benefits.

In addition to the meetings, BSAS also sponsors many public events, such as star parties and Astronomy Day; we go into the schools on occasion to hold star parties for the children and their parents. Often the public star parties are centered on a special astronomical event, such as a lunar eclipse or a planetary opposition.

Most information about BSAS and our activities may be found at [bsasnashville.com](http://bsasnashville.com). If you need more information, write to us at [info@bsasnashville.com](mailto:info@bsasnashville.com).

## Free Telescope Offer

Did someone say free telescope? Yes, you did read that correctly. The BSAS Equipment & Facilities Committee has free telescopes ranging in size from 2.6" to 8" that current members can actually have to use for up to 60 days at a time. We also have some other items in the loaner program such as a photometer, H-alpha solar telescope, educational CDs, tapes, DVDs, and books. Some restrictions apply. A waiting list is applicable in some cases. The BSAS Equipment Committee will not be held responsible for lost sleep or other problems arising from use of this excellent astronomy gear. For information on what equipment is currently available, contact [info@bsasnashville.com](mailto:info@bsasnashville.com).