

The ECLIPSE

The Newsletter of the Barnard-Seyfert Astronomical Society



March 2023



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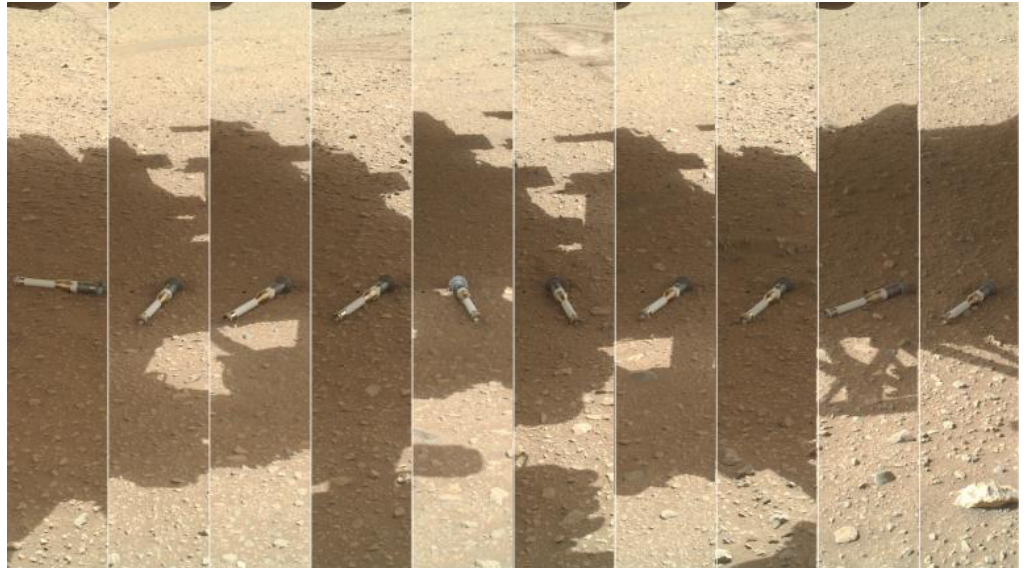
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Oswaldo Gonzalez

Andy Reeves

Kathy Underwood

Contact BSAS officers at
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This photomontage shows each of the sample tubes shortly after they were deposited onto the surface by NASA's Perseverance Mars rover, as viewed by the WATSON (Wide Angle Topographic Sensor for Operations and eNginEering) camera on the end of the rover's 7-foot-long (2-meter-long) robotic arm.

Shown, from left, are "Malay," "Mageik," "Crosswind Lake," "Roubion," "Coulettes," "Montdenier," "Bearwallow," "Skyland," "Atsah," and "Amalik." Deposited from Dec. 21, 2022, to Jan. 28, 2023, these samples make up the sample depot Perseverance built at "Three Forks," a location within Mars' Jezero Crater.

Credit: NASA/JPL-Caltech/MSSS

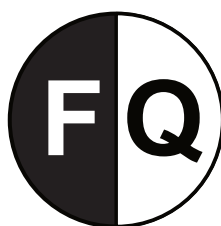


On the Cover: Chandra X-ray Observatory teamed up with the Webb telescope to create a new stunning composite image of the Tarantula Nebula. Chandra's X-rays (shown in royal blue and purple) identify extremely hot gas and supernova explosion remnants, while Webb reveals forming baby stars.

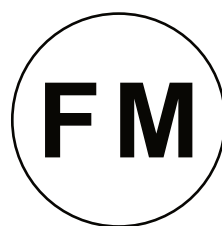
Credit: X-ray: NASA/CXC/Penn State Univ./L. Townsley et al.; IR: NASA/ESA/CSA/STScI/JWST ERO Production Team



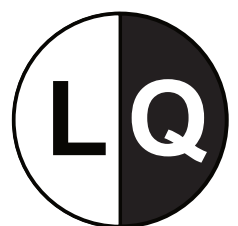
Mar 21
Apr 19



Mar 28
Apr 27



Mar 7
Apr 5



Mar 14
Apr 13

Happy Birthday Christopher Clavius by Robin Byrne

This month we recognize the contributions from a man whose name is not as well known as his work. Christopher Clavius was born in Bamberg, Germany on March 25 in either 1537 or 1538. The name Clavius (Latin for “key”) is one he took later in life, but there’s no record of his original last name. Scholars have suggested Clavius could have been a Latinized version of Clau, Klay, or possibly Schlüssel (German for “key”). At the time of his birth, the Protestant Reformation was taking place in Germany, however the region where Clavius lived was still devoted to Catholicism. When Clavius was three years old, the Jesuit Order was established, which would be an integral part of the remainder of his life.

At the age of 17, Clavius joined the Jesuit Order. As part of his studies, he attended the University of Coimbra in Portugal, followed by studying in Rome at the Jesuit Collegio Romano. During his time in school, the one subject that really took a hold of Clavius was mathematics. His interest in astronomy began shortly later, with a solar eclipse he observed on August 21, 1560 while in Coimbra.



In 1564, Clavius was ordained and he began his lifelong position as Professor of Mathematics at the Collegio Romano. As was typical for the Jesuits, Clavius continued his religious studies for many years after being ordained, not becoming a full member of the Jesuit Order until 1575. Clavius developed the math curriculum for the college, adding courses in optics, statics, astronomy, and acoustics. He made many contributions to the mathematics field, including being one of the first in the West to use a decimal point.

Clavius had the opportunity to observe a second solar eclipse, this time in Rome on April 9, 1567. In his description of the event, Clavius wrote, “...although the Moon was placed between my sight and the Sun it did not obscure the whole Sun as previously but... a certain narrow circle was left on the Sun, surrounding the whole of the Moon on all sides.” This sounds like an annular eclipse, but calculations show that it was just barely a total eclipse, with only 14 seconds of totality. What Clavius observed could have been a form of Bailey’s Beads all around the Moon’s limb, or it could have been light from the Chromosphere.

In 1570, Clavius continued his astronomical work by writing a commentary on “De Sphaera,” which was considered the most important astronomy book of the era. This commentary became one of the standard astronomy text books, with 15 revisions being published over the next 48 years. In one of the revisions, Clavius wrote about observing a nova in 1572 in the constellation of Cassiopeia. This was the same nova observed by Tycho Brahe. Clavius

compared his observation with those of other astronomers across Europe. He concluded that everyone recorded the nova in exactly the same location relative to the stars, leading to the conclusion that the nova had to be farther away from Earth than the Moon. This was one of the first proofs that the Aristotelian claim of unchanging heavens was false.

In addition to writing several other mathematical text books (the reason he's known as "the Euclid of the sixteenth century"), Clavius also designed various instruments. One device was used to measure fractions of angles. This was based on a technique he described concerning a method for dividing a measuring scale into smaller increments. Other instruments designed by Clavius included a sundial and a surveyor's quadrant.

What is easily his most important contribution to society began in 1579, when Clavius was given the assignment to reform the existing Julian calendar. Because the Julian calendar included a leap year every 4 years (making the average length of the year slightly too long), the date of Easter had shifted relative to the seasons. Clavius proposed a modification in which leap years occur every 4 years in years divisible by 4, with the exception of century years, when a leap year only occurs if the century year is divisible by 400. In 1582, by order of Pope Gregory XIII, this calendar was adopted in all Catholic nations, and is now known as the Gregorian Calendar, which we still use today. When the calendar was adopted, Clavius proposed that October 4, 1582 be followed by October 15, 1582, in order to realign the date of March 21 with the actual occurrence of the Spring Equinox. While not exact, this calendar will take 3500 years before having an error of one day.

In his astronomical books, Clavius clearly favors the Geocentric model of the heavens, and he argued against the Heliocentric Model of Copernicus, using evidence from both scripture and physical arguments. In 1587, Galileo Galilei made a point of meeting the famous mathematician while visiting Rome. The two men exchanged correspondence from this point on, arguing their ideas and comparing mathematical proofs. Both men would send copies of their latest books to the other for constructive feedback. Clavius may have been instrumental in helping Galileo to clarify his arguments (something with which Galileo is reputed to have had difficulty), since Galileo was first trying to convince Clavius.

In 1611, Galileo visited Clavius again, this time armed with his recent discoveries made using a telescope and his recently published "Siderius Nuncius." Clavius, as the senior scientist at the Collegio, was responsible for passing judgement on Galileo's new book. At first, he didn't have access to a quality telescope, making it difficult to confirm Galileo's observations. Once he had used a sufficiently well-made telescope, Clavius agreed that he could see more stars through the telescope than with the naked eye, craters on the Moon were visible, Jupiter's moons were observed to orbit around the planet, and, most importantly, Venus exhibits phases like the moon. This last observation could only be explained by Venus orbiting the Sun, not Earth. He concluded by saying, "Since things are thus, astronomers ought to consider how the celestial orbs may be arranged in order to save these phenomena." In other words, the Geocentric Model cannot account for these observations. However, Clavius never accepted the Heliocentric Model, instead, the Jesuits embraced Tycho Brahe's compromise system of all planets orbiting the Sun while the Sun orbits Earth.

Christopher Clavius died the following year on February 6, 1612. The one place where Clavius' name lives on is on the Moon - Crater Clavius. This is ironic, since he originally had

serious doubts about Galileo's claim that the Moon was covered in rugged features. Despite his resistance to the Heliocentric Model of the Solar System, the rest of Clavius' career has aged well. While the Gregorian Calendar is by far his most lasting contribution, his writings in both mathematics and astronomy influenced the scientific world for years to come. The next time the skies cooperate, and the Moon is between 1st and 3rd Quarter, pull out a pair of binoculars or a telescope, and enjoy the crater that was named after this month's honoree: Christopher Clavius.

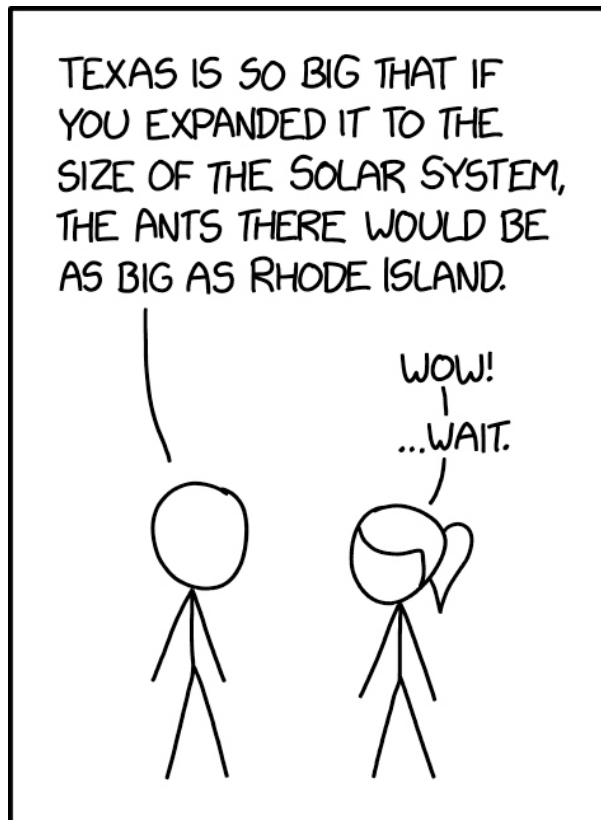
References:

[Christopher Clavius - Wikipedia](#)

[Christopher Clavius by J J O'Connor and E F Robertson, School of Mathematics and Statistics University of St Andrews, Scotland](#)

[Christopher Clavius \(1537-1612\) - The Galileo Project](#)

xkcd



MY HOBBY: UNHELPFUL
SIZE COMPARISONS

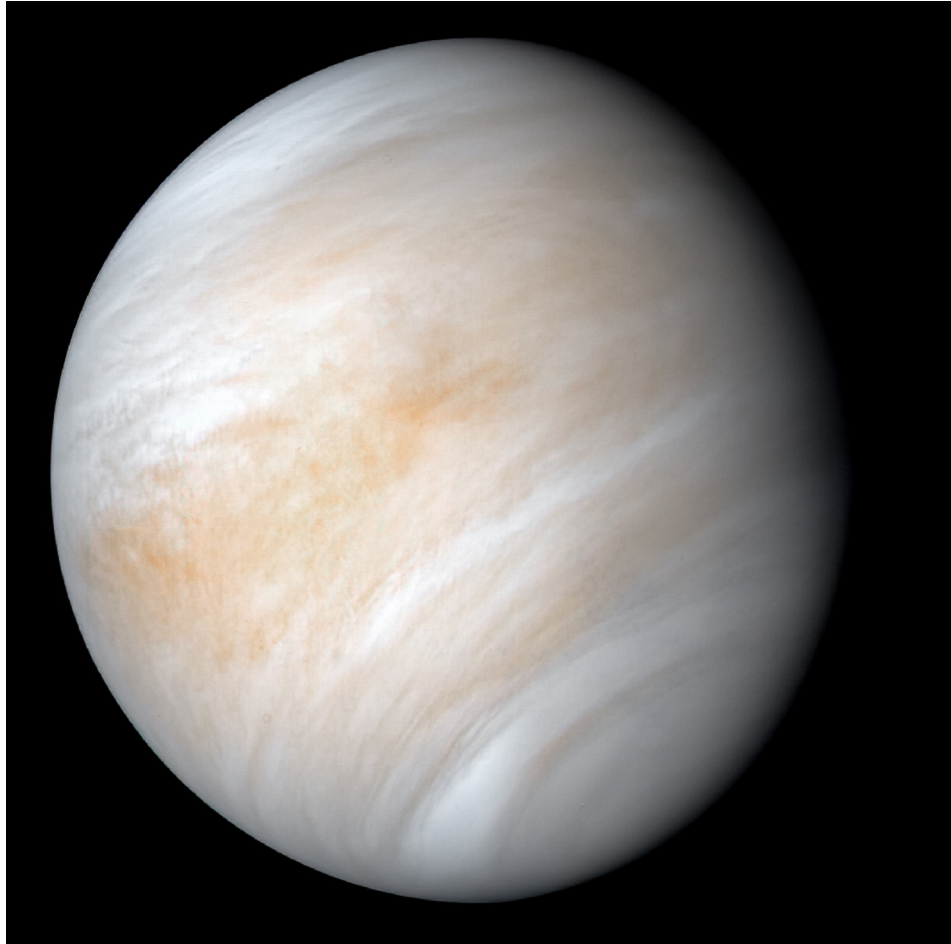
Spot the Morning and Evening Star: Observe Venus By David Prosper

Venus is usually the brightest planet in our skies, and is called “Earth's Twin” due to its similar size to Earth and its rocky composition. However, Venus is a nightmare version of our planet, featuring a thick, crushing atmosphere of acidic clouds, greenhouse gasses, howling winds, and intense heat at its surface.

This rocky inner world's orbit brings it closer to Earth than any of the other planets, and is the second closest to the Sun after Mercury. Like Mercury, Venus orbits between our planet and the Sun, so Earth-based observers can observe Venus in the morning before sunrise, or in the evening after sunset – but never high in the sky in the middle of the evening, unlike the outer planets. Since Venus is so striking in its twilight appearances, the planet features heavily in sky mythologies worldwide. Venus's bright morning and evening appearances are the origin for its dual nicknames: the Morning Star, and the Evening Star. Some ancient astronomers never made the connection, and assumed the Evening Star and Morning Star were two unrelated objects! Observers can even spot Venus during the daytime, if the sky is very clear and the planet is bright enough. Venus also has

phases, similar to the Moon and Mercury. Galileo's observations of Venus's phases helped turn the astronomy world upside down in the early 1600s, and you can see them yourself using a telescope or even a surprisingly low-power pair of binoculars. Warning: Please be very careful when observing Venus with a telescope in the early morning or daytime. Never allow the Sun to enter your instrument's field of view, as you could be permanently blinded.

Venus's other moniker of “Earth's Twin” is a bit misleading. In terms of their surface temperatures and atmospheres, Venus and Earth are extremely different! The surface



The top layers of Venus's cloud pop in this contrast-enhanced image, reprocessed with modern techniques from Mariner 10 data.
Credit: [NASA/JPL-Caltech](#)

of Venus is warmer than that of Mercury, despite Mercury being many millions of miles closer to the Sun. While Mercury is still a scorching 800 degrees Fahrenheit (427 degrees Celsius), Venus is even hotter: 900 degrees Fahrenheit (482 degrees Celsius). The vast amount of carbon dioxide in the thick Venusian atmosphere acts as an insulating blanket that retains much of the Sun's heat, creating the runaway greenhouse effect that dominates its present-day climate. The Venusian surface is a crushing 90 Earth atmospheres on top of its absurd temperatures. These extreme conditions mean that the mission life of any past Venusian robotic landers were measured in hours at best – and usually minutes! However, conditions in Venus's upper atmosphere may be much more hospitable, with temperatures and pressures at 30 miles (50 km) above the surface that are much more Earth-like in temperature and pressure. Studies of the Venusian atmosphere, including seasonal appearances of dark streaks and faint signals of suggestive chemistry, intrigue researchers with the possibility that some sort of life may persist in its clouds. But far more evidence is needed to confirm such a claim, since non-biological factors like volcanism and other processes could also be the source for these signals.

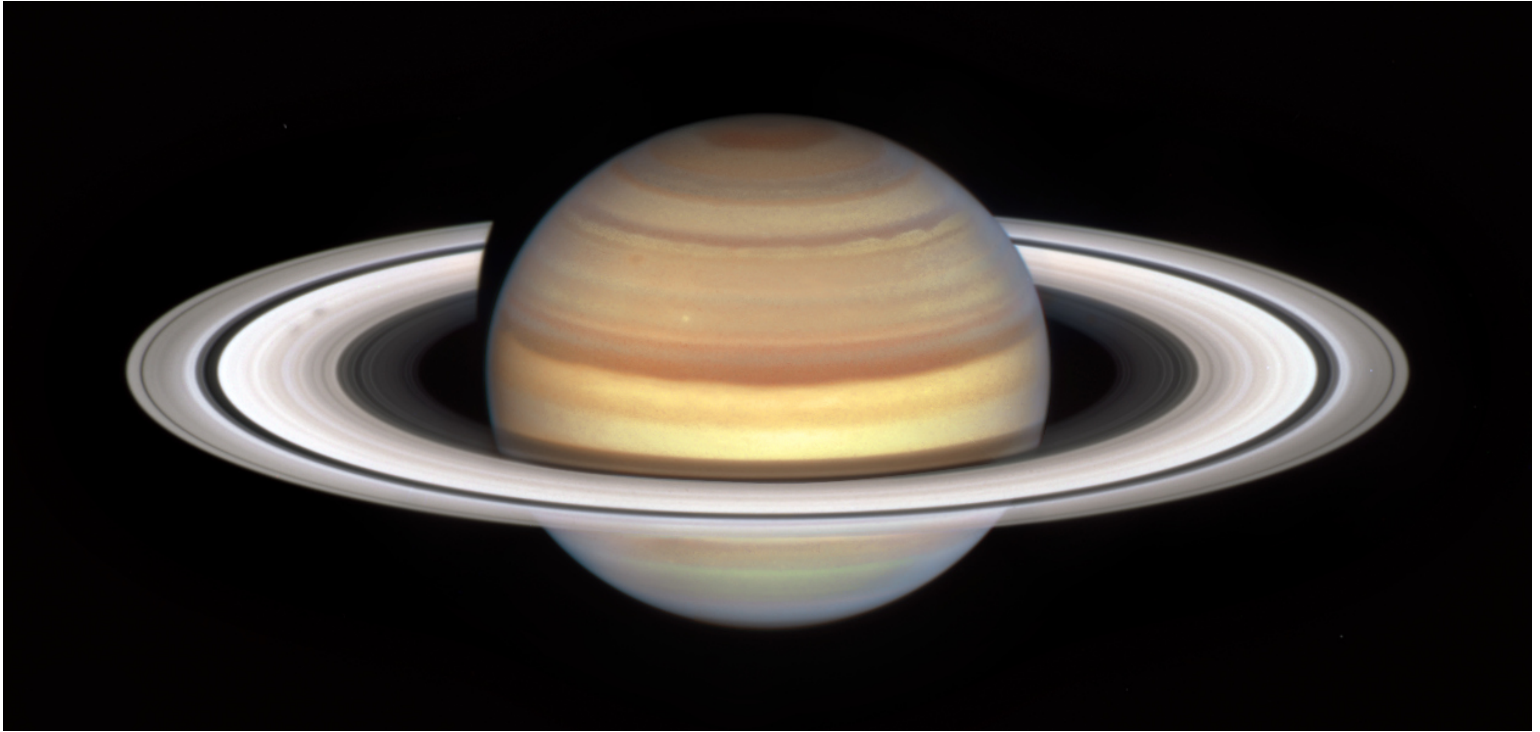
Venus's thick sulfuric acid clouds block direct visual observations of its surface from optical telescopes on Earth. Multiwavelength observations from space probes show evidence of active volcanoes and possibly some sort of plate tectonics, but followup missions will be needed to confirm the presence of active volcanism, plate tectonics, and any possible signs of life. In order to do so, NASA is sending two new missions to Venus by the end of this decade: the orbiter VERITAS, which will map the surface in high detail and study the chemistry of its rocks and volcanoes, and DAVINCI+, which will study its atmosphere and possible tectonic surface features via a "descent sphere" that will plunge into Venus's clouds. Follow their development and discover more about Venus at solarsystem.nasa.gov/venus, and of course, continue your exploration of the universe at nasa.gov.

This article is distributed by NASA's Night Sky Network (NSN). The NSN program supports astronomy clubs across the USA dedicated to astronomy outreach. Visit nightsky.jpl.nasa.gov to find local clubs, events, and more!

Next Membership Meeting:

Wednesday, March 15, 7:30 pm

Cumberland Valley
Girl Scout Council Building
4522 Granny White Pike



The NASA/ESA Hubble Space Telescope has observation time devoted to Saturn each year, thanks to the Outer Planet Atmospheres Legacy (OPAL) program, and the dynamic gas giant planet always shows us something new. This latest image heralds the start of Saturn's "spoke season" with the appearance of two smudgy spokes in the B ring, on the left in the image.

The spokes are enigmatic features which appear across Saturn's rings. Their presence and appearance varies with the seasons — like Earth, Saturn is tilted on its axis and therefore has four seasons. With Saturn's much larger orbit, each season lasts approximately seven Earth years. Equinox occurs when the rings are tilted edge-on to the Sun and marks the height of spokes' visibility, while during a solstice when the Sun is at its highest or lowest latitude, the spokes disappear.

The shape and shading of spokes varies — they can appear light or dark, depending on the viewing angle, and sometimes appear more like blobs than classic radial spoke shapes, as seen here. The ephemeral features don't last long, but as the planet's autumnal equinox approaches on 6 May 2025, more will appear.

Scientists will be looking for clues to explain the cause and nature of the spokes. It's suspected they are caused by interaction between Saturn's magnetic field and the solar wind, which also causes aurorae to appear on the planet. The hypothesis is that spokes are the smallest, dust-sized, icy ring particles being temporarily electrically charged and levitated, but this has not been confirmed.

Saturn's last equinox occurred in 2009, while the NASA/ESA/ASI Cassini spacecraft was orbiting the gas giant planet for close-up reconnaissance. With Cassini's mission completed in 2017, Hubble is continuing the work of long-term monitoring of changes on Saturn and the other outer planets.

Credit: [ESA/Hubble](#), [NASA](#) & [A. Simon](#), [A. Pagan \(STScI\)](#)

**Barnard-Seyfert Astronomical Society
Minutes of a Regular Meeting of the Board of Directors
Held On Wednesday, February 1, 2023**

The regular meeting of the Board of Directors of the Barnard-Seyfert Astronomical Society was held February 1, 2023, online, Dr. Tom Beckermann presiding. Logged in were Tom Beckermann, Chip Crossman, Tony Drinkwine, Bud Hamblen, Keith Rainey, Andy Reeves and Theo Wellington.

Tom asked for a review of the minutes of the board meeting on January 4, 2022, as printed in the February, 2023, edition of the *Eclipse*. No-one objected to the minutes.

Treasurer's report: Theo reported \$9,603.56 in the Truist account and \$567.33 in the PayPal account. The Zoom fee has been paid, and the IRS e-postcard from 990 filed.

Membership report: Keith reported that there were 230 members.

Star Parties: Water Valley Overlook is scheduled for February 18. Shelby Bottoms Nature Center is scheduled for February 25. The Bells Bend Outdoor Festival is going to be held April 15. Earth Day is going to be held April 23 at Centennial Park. BSAS has had booths at these events. Ron Ladd is ready to host the Messier Marathon at his property near Natchez Trace Parkway.

The meeting was adjourned at 8 PM.

Respectfully submitted,

Bud Hamblen
Secretary

Barnard-Seyfert Astronomical Society Minutes of the Monthly Membership Meeting Held On Wednesday, February 15, 2023

The Barnard-Seyfert Astronomical Society met at the Girl Scout Center and on-line via Zoom on Wednesday, February 15, 2023, Tom Beckermann presiding.

The minutes for the January 18, 2023, meeting were adopted.

Treasurer's report: Theo Wellington reported there was \$9,600.56 in the Truist account and \$661 in the PayPal account.

Membership report: There were 232 members.

Social media report: There were 2000 likes on Facebook and 21-22 followers on Twitter.

Star parties: Gary Eaton and Chuck Schlemm had a good event at Timberland Park on January 27. Timberland Park is a relatively dark sky site. Water Valley Overlook is scheduled for February 18. Shelby Bottoms is scheduled for February 25. The Messier Marathon is scheduled for March 24 or 25, weather permitting, on Ron Ladd's property. Ron Ladd's property is about 2 minutes from Water Valley Overlook. The Green Bank, West Virginia, star party is scheduled for June 21 to 24. Attendance fee is \$90 for 4 days. Bunk house accommodations are available for \$60.

Outreach: The Middle Tennessee Science and Engineering Fair is scheduled for March 31. Awards presentation is scheduled for April 13. Frank LaVarre noted that John Trotwood Moore Middle School is asking for assistance for astronomy classes February 24 or March 4. Adventure Science Center will have an Astronomy Day event April 29.

Theo presented "What's Up" in the Spring sky.

The meeting adjourned at 9 PM.

Respectfully submitted,

Bud Hamblen
Secretary



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. Frame not included.



Become a Member of BSAS!
Visit 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. If you need more information, write to us at 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.