

The ECLIPSE

The Newsletter of the Barnard-Seyfert Astronomical Society



February 2023



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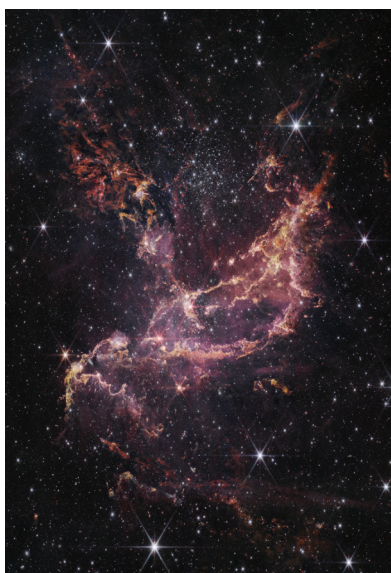
Andy Reeves

Kathy Underwood

Contact BSAS officers at
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NASA's Curiosity Mars rover captured this image of an iron-nickel meteorite nicknamed "Cacao" on Jan, 28, 2023, the 3,725th Martian day, or sol, of the mission. This meteorite, discovered in the "sulfate-bearing unit," a region on Mars' Mount Sharp, is estimated to be about 1 foot (30 centimeters) across. It's one of several meteorites Curiosity has seen while exploring Mars. **Credit:** [NASA/JPL-Caltech/MSSS](#)

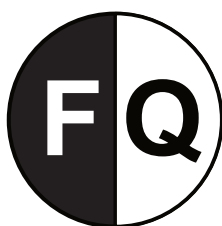


On the Cover: NGC 346, shown here in this image from NASA's James Webb Space Telescope Near-Infrared Camera (NIRCam), is a dynamic star cluster that lies within a nebula 200,000 light years away. Webb reveals the presence of many more building blocks than previously expected, not only for stars, but also planets, in the form of clouds packed with dust and hydrogen.

Credit: [NASA](#), [ESA](#), [CSA](#), [O. Jones \(UK ATC\)](#), [G. De Marchi \(ESTEC\)](#), and [M. Meixner \(USRA\)](#). Image processing: [A. Pagan \(STScI\)](#), [N. Habel \(USRA\)](#), [L. Lenkic \(USRA\)](#) and [L. Chu \(NASA/Ames\)](#)



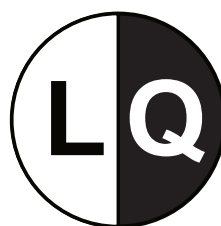
Feb 20
Mar 21



Feb 27
Mar 28



Feb 5
Mar 7



Feb 13
Mar 14

Happy Birthday Ernst Mach by Robin Byrne

This month we celebrate the life of a man whose name is associated with motion, but who studied so much more. Ernst Waldfried Josef Wenzel Mach was born February 18, 1838 in what was then part of Austria. Mach was educated at home until the age of 14, when he entered public school for three years. Mach then attended the University of Vienna, where he majored in physics. After only five years, Mach graduated in 1860 with a doctorate in physics based on his thesis about electrical discharge and induction.

After a series of positions, Mach was hired in 1864 to teach mathematics at the University of Graz, switching to physics two years later. In 1867 he was appointed as chair of experimental physics for the Charles-Ferdinand University in Prague. He would remain there for the next 28 years.

In the area of physics, Mach is best known for his work related to shock waves. With his son, Ludwig, Mach used a special photographic technique which disclosed the waves produced by an object moving through a medium. What they found was that when an object, like a bullet, travels faster than the speed of sound, it creates a shock wave of compressed air in front of it. Mach's name will live on as the term given to how fast an object is moving relative to the speed of sound.

In addition to physics, Mach also contributed to the area of philosophy. He held the belief that all of reality must be perceivable by the senses. Therefore, if something could not be directly perceived, it didn't exist. By this reasoning, Mach is quoted as having said, "I don't believe in atoms."

Another of Mach's philosophical postulates is tied to which forces need to be considered when exploring an object's motion. Isaac Newton said that the motion of an object is explained by the forces directly interacting with that object, but Mach argued that the Earth and the rest of the universe should be included. Mach was saying that you have to account for all of the universe when describing any body's inertia. Albert Einstein called this idea "Mach's Principle" and incorporated it into his Law of General Relativity.

Mach also studied human physiology. In 1873, while riding in a train around a sharp turn, Mach noticed that the trees along the track appeared to be angled instead of vertical. This



led to a study of human balance and what we use to define our perception of “vertical.” To do this, he created a chair that could be spun on multiple axes at the same time. This was the precursor to a similar device used to train astronauts. The experimental subject was placed in the center, inside a box that blocked all visual cues. When motion begins, the subjects could tell their direction of motion, but once the motion became constant, they thought they were stationary. When motion actually stopped, they thought they were now moving in reverse, with the effect lasting for several seconds. When it was repeated, but tilted at an angle, a similar effect occurred, but with an added component of shifting the perceived direction that was the true vertical. This was why the banked curve of the train affected Mach’s perception of the trees. Taking this experiment further, Mach looked to see what was happening in the human body to explain the reaction. The three semicircular canals in the inner ear, which are oriented essentially along the three directions of motion, are filled with fluid. Mach concluded that the pressure of the fluid against the canal walls is how we detect motion and define the vertical direction.

Mach’s scientific career ended in 1898 after suffering a heart attack. He retired from the university soon after, but didn’t stop working. He was appointed to the upper chamber of the Austrian Parliament. Most of his later years were spent writing various articles and books. Only one day after his 78th birthday, on February 19, 1916, Ernst Mach passed away.

While best known for his contributions to physics, Ernst Mach seemed to have been fascinated by all areas of study, especially if they began with “ph”: physics, philosophy, and physiology! Whether hearing a sonic boom, debating the nature of reality, or understanding a bout of momentary dizziness, we have much for which to thank this month’s honoree: Ernst Mach.

References:

[Ernst Mach Wikipedia](#)

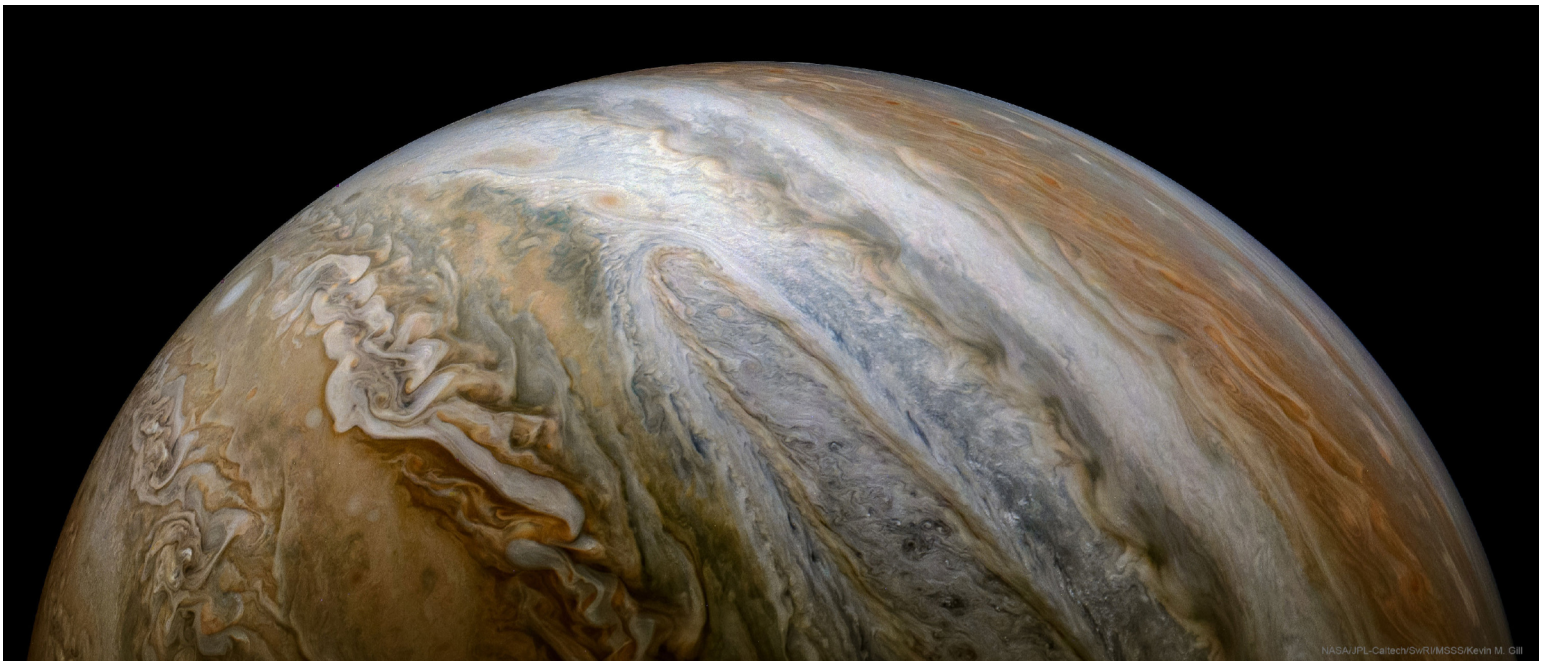
[Ernst Mach Austrian Physicist - Britannica](#)

[Ernst Mach on bodies and Buckets - Physics Today, by Richard Staley, 2013](#)

Spot the King of Planets: Observe Jupiter By David Prosper

Jupiter is our solar system's undisputed king of the planets! Jupiter is bright and easy to spot from our vantage point on Earth, helped by its massive size and banded, reflective cloud tops. Jupiter even possesses moons the size of planets: Ganymede, its largest, is bigger than the planet Mercury. What's more, you can easily observe Jupiter and its moons with a modest instrument, just like Galileo did over 400 years ago.

Jupiter's position as our solar system's largest planet is truly earned; you could fit 11 Earths along Jupiter's diameter, and in case you were looking to fill up Jupiter with some Earth-size marbles, you would need over 1300 Earths to fill it up – and that would still not be quite enough! However, despite its awesome size, Jupiter's true rule over the outer solar system comes from its enormous mass. If you took all of the planets in our solar system and put them together they would still only be half as massive as Jupiter all by itself. Jupiter's mighty mass has shaped the orbits of countless comets and asteroids. Its gravity can fling these tiny objects towards our inner solar system and also draw them into itself, as famously observed in 1994 when Comet Shoemaker-Levy 9, drawn towards Jupiter in previous orbits, smashed into the gas giant's atmosphere. Its multiple fragments slammed into Jupiter's cloud tops with such violence that the fireballs and dark impact spots were not only seen by NASA's orbiting Galileo probe,

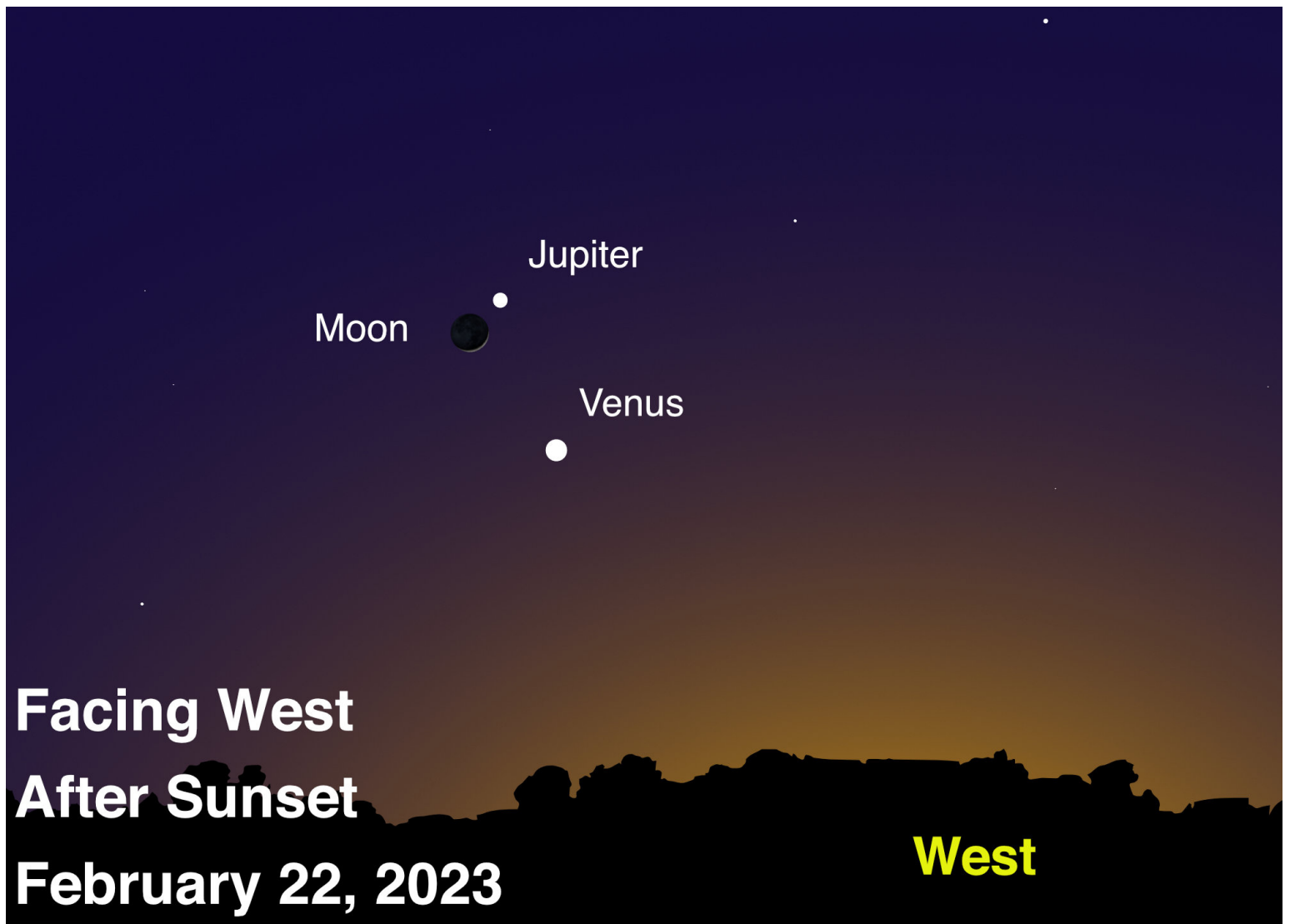


This stunning image of Jupiter's cloud tops was taken by NASA's Juno mission and processed by Kevin M. Gill. You too can create amazing images like this, all with publicly available data from Juno. Go to missionjuno.swri.edu/junocam to begin your image procession journey – and get creative!

Full Image Credit: NASA/JPL-Caltech/SwRI/MSSS; Processing: Kevin M. Gill, license: CC BY 2.0) <https://creativecommons.org/licenses/by/2.0/> Source: <https://apod.nasa.gov/apod/ap201123.html>

but also observers back on Earth!

Jupiter is easy to observe at night with our unaided eyes, as well-documented by the ancient astronomers who carefully recorded its slow movements from night to night. It can be one of the brightest objects in our nighttime skies, bested only by the Moon, Venus, and occasionally Mars, when the red planet is at opposition. That's impressive for a planet that, at its closest to Earth, is still over 365 million miles (587 million km) away. It's even more impressive that the giant world remains very bright to Earthbound observers at its furthest distance: 600 million miles (968 million km)! While the King of Planets has a coterie of around 75 known moons, only the four large moons that Galileo originally observed in 1610 – Io, Europa, Ganymede, and Callisto – can be easily



Look for Jupiter as it forms one of the points of a celestial triangle, along with Venus and a very thin crescent Moon, the evening of February 22, 2023. This trio consists of the brightest objects in the sky – until the Sun rises! Binoculars may help you spot Jupiter's moons as small bright star-like objects on either side of the planet. A small telescope will show them easily, along with Jupiter's famed cloud bands. How many can you count? Keep watching Jupiter and Venus as the two planets will continue to get closer together each night until they form a close conjunction the night of March 1. Image created with assistance from Stellarium.

observed by Earth-based observers with very modest equipment. These are called, appropriately enough, the Galilean moons. Most telescopes will show the moons as faint star-like objects neatly lined up close to bright Jupiter. Most binoculars will show at least one or two moons orbiting the planet. Small telescopes will show all four of the Galilean moons if they are all visible, but sometimes they can pass behind or in front of Jupiter, or even each other. Telescopes will also show details like Jupiter's cloud bands and, if powerful enough, large storms like its famous Great Red Spot, and the shadows of the Galilean moons passing between the Sun and Jupiter. Sketching the positions of Jupiter's moons during the course of an evening - and night to night - can be a rewarding project! You can download an activity guide from the Astronomical Society of the Pacific at bit.ly/drawjupitermoons

NASA's Juno mission currently orbits Jupiter, one of just nine spacecraft to have visited this awesome world. Juno entered Jupiter's orbit in 2016 to begin its initial mission to study this giant world's mysterious interior. The years have proven Juno's mission a success, with data from the probe revolutionizing our understanding of this gassy world's guts. Juno's mission has since been extended to include the study of its large moons, and since 2021 the plucky probe, increasingly battered by Jupiter's powerful radiation belts, has made close flybys of the icy moons Ganymede and Europa, along with volcanic Io. In 2024 NASA will launch the Europa Clipper mission to study this world and its potential to host life inside its deep subsurface oceans in much more detail. Find the latest discoveries from Juno and NASA's missions 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, February 15, 7:30 pm

Cumberland Valley
Girl Scout Council Building
4522 Granny White Pike

**Barnard-Seyfert Astronomical Society
Minutes of a Regular Meeting of the Board of Directors
Held On Wednesday, January 4, 2023**

The regular meeting of the Board of Directors of the Barnard-Seyfert Astronomical Society was held January 4, 2023, online, Dr. Tom Beckermann presiding. Logged in were Tom Beckermann, Cory Buckner, Chip Crossman, Tony Drinkwine, Bud Hamblen, Keith Rainey and Andy Reeves.

Tom asked for a review of the minutes of the board meeting on December 7, 2022, as printed in the January, 2023, edition of the Eclipse. No-one objected to the minutes.

Membership Report: Keith reported that there were 231 members.

Star Parties: The Park Service hasn't provided the Natchez Trace permit yet. Christy is our contact for the Shelby Bottoms Nature Center. Cornelia Fort Air Park is another possible location. Natchez Trace Mile Marker 435.3 is planned for a private star party (but not permit in hand yet). Edwin Warner Special Events Field is scheduled for 1/28/23.

Programs: Tony Drinkwine has a contact (Kevin Collins at George Mason) who may be able to present on observations of transiting exo-planets. A program on variable stars written by Steve Boerner is available. A "What's Up" would be timely.

Respectfully submitted,

Bud Hamblen
Secretary

**Barnard-Seyfert Astronomical Society
Minutes of the Monthly Membership Meeting
Held On Wednesday, January 18, 2023**

The Barnard-Seyfert Astronomical Society met at the Girl Scout Center and on-line via Zoom on Wednesday, January 18, 2023, Tom Beckermann presiding.

The minutes for the December 21, 2022, meeting were adopted.

Treasurer's Report: There was \$9,885 in the Truist account and \$164 in the PayPal account.

Membership Report: There were 230 members.

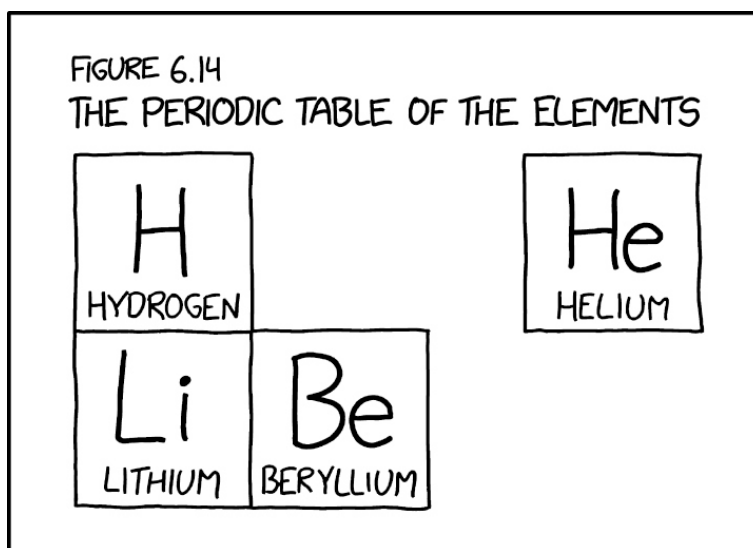
Getting solar eclipse glasses for the 10/14/23 annular solar eclipse and the 4/8/24 total solar eclipse (both partial in Nashville) was discussed. Other items up for discussion included the Hatch Show Print poster (\$20 for pickup or \$25 for shipping), RASC handbooks, new name tags (see Chip Crossman) and lanyards (see Theo Wellington). There is a call for a volunteer for the Vice President position.

The attendees broke out into groups for the telescope workshop.

Respectfully submitted,

Bud Hamblen
Secretary

xkcd



YOU CAN SPOT AN OUTDATED SCIENCE TEXTBOOK BY CHECKING THE BOTTOM OF THE PERIODIC TABLE FOR MISSING ELEMENTS. FOR EXAMPLE, MINE WAS PUBLISHED HALF AN HOUR AFTER THE BIG BANG.



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.