The ECLIPSE

The Newsletter of the Barnard-Seyfert Astronomical Society

October 2022

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Barnard-Seyfert Astronomical Society

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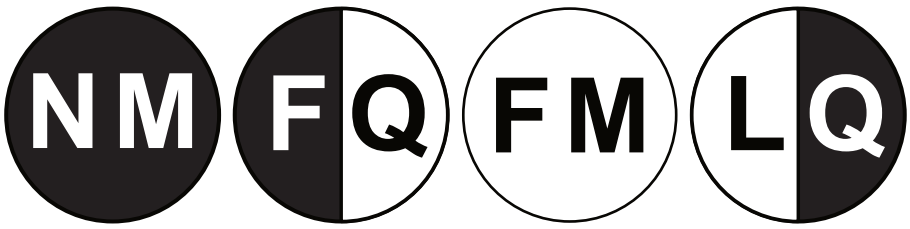
NASA's Chandra Adds X-ray Vision to Webb Images - Stephan's Quintet Composite

These new versions of Webb's first images combine its infrared data with X-rays collected by NASA's Chandra X-ray Observatory, underscoring how the power of any of these telescopes is only enhanced when joined with others.

The four galaxies within Stephan's Quintet are undergoing an intricate dance choreographed by gravity. (The fifth galaxy, on the left, is an interloping galaxy at a different distance.) The new Webb image (red, orange, yellow, green, blue) of this object features never-seen-before details of the results of these interactions, including sweeping tails of gas and bursts of star formation. The Chandra data (light blue) of this system has uncovered a shock wave that heats gas to tens of millions of degrees, as one of the galaxies passes through the others at speeds of around 2 million miles per hour. This new composite also includes infrared data from NASA's now-retired Spitzer Space Telescope (red, green, blue)

Image credits:
X-ray: NASA/CXC/SAO;
IR (Spitzer): NASA/JPL-Caltech;
IR (Webb): NASA/ESA/CSA/STScI



Oct 25 Nov 23 | Oct 2 Nov 1, 30 | Oct 9 Nov 8 | Oct 17 Nov 16

Happy Birthday Gregorian Calendar
by Robin Byrne

This month, we celebrate the anniversary of the creation of the calendar we still use today. But to understand how this calendar came to be, we must first look at what came before…

As early as 3000 BC, the Egyptians had used the annual flooding of the Nile to mark the passing of the year. On average this occurred every 365 days, leading to the Egyptians establishing a calendar based on a year of 365 days.

While this calendar mostly worked, after a while, it began to drift relative to the seasons. In 45 BC, during the reign of Julius Caesar, a modification of the calendar was developed to fix it. In this new Julian Calendar, every fourth year would have an extra day (a leap year), making a year, on average, 365.25 days in length.

The Julian calendar worked well for a while, but still wasn't perfect. Over the following years, the Catholic Church rose to power. The date for one of the most important Christian holidays, Easter, was dependent upon the calendar and the seasons being aligned. The date for Easter is set as being the first Sunday, after the first full moon, after the Spring Equinox. The Church had set March 21st as the official date for the equinox. However, due to Earth's orbital period actually being 365.242196 days in length, instead of 365.25 days, the calendar once again was shifting relative to the seasons. Now that it affected when people celebrated an important event, it became even more imperative to get a calendar that had a higher degree of accuracy.

On February 24th, 1582, Pope Gregory XIII issued a decree to develop a better calendar. Aloysius Lilius was an Italian doctor, astronomer, and philosopher. He was aware of the problems with the Julian calendar and began to work out a solution. His ideas were presented by his brother to Pope Gregory XIII, who passed it along to the calendar reform committee. The solution Lilius came up with was to reduce the number of leap years. Instead of having 100 leap years every 400 years, his version would have only 97 in the same span of time, resulting in an average year length of 365.2425 days. Ultimately, the rule became that there would be a leap year every 4 years, with the exception of most century years. For century years, to be a leap year, it must also be divisible by 400. Our most recent century year, 2000, is divisible by 400, so it was a leap year, but the years 2100, 2200, and 2300 will not be leap years. The year 2400 will be the next time a century year will also be a leap year.

By the time the new calendar had been developed and agreed upon, astronomical Spring Equinox differed from the calendar date of March 21st by several days. Lilius proposed to adjust to the new calendar gradually by not having any leap years for 40 years, at which point the calendar and equinox would align properly. An alternate suggestion, made by Christopher Clavius, was to simply eliminate 10 days from a single year. It was this second proposal that was chosen. The Gregorian calendar was first put in use the day after Thursday, October 4th 1582, on what would now be Friday, October 15th.

Because this calendar was developed by the Catholic Church, and was considered a religious calendar, only countries that were predominantly Catholic adopted it at first. Protestant

countries, such as England and its colonies, didn't think it was appropriate for their civil calendar to be dictated by the Pope, who they suspected of a plot to regain control, so they did not immediately make the switch. Gradually, though, everyone did adopt the Gregorian calendar. In the case of England and the American colonies, it was adopted in 1752, at which time 11 days had to be skipped, resulting in September 2nd 1752 being followed by September 14th. The last country to adopt the Gregorian calendar as their civil calendar was Turkey, in 1927, at which point 13 days had to be skipped.

While certainly an improvement over the Julian calendar, the Gregorian calendar is still not a perfect approximation of a true year, differing by 0.000304 days per year. Meaning that, roughly, every 3030 years, the Gregorian calendar will have drifted from the true year by 1 day. However, compared to the Julian calendar's error of 1 day for every 128 years, it is a vast improvement. John Herschel, in the 19th century, proposed a further modification, by implementing a rule where century years that are multiples of 4000 would NOT be leap years, creating a year of 365.24225 days in length. This has been supported and proposed at various times since, but has not been officially adopted.

Whether it is a paper calendar hanging on a wall, or an electronic version on your phone and computer, everyone takes the calendar for granted. Making plans for a future event, such as a doctor's appointment, a birthday, or StarFest, we jot it into our calendar and know when that event will occur. However, we rarely consider what was involved in creating the calendar we use today. So take a moment to thank Lilius and Pope Gregory XIII for the useful tool we reference almost daily.

References:

Gregorian Calendar - Wikipedia

Gregorian Calendar Reform: Why Are Some Dates Missing? by Konstantin Bikos and Aparna Kher

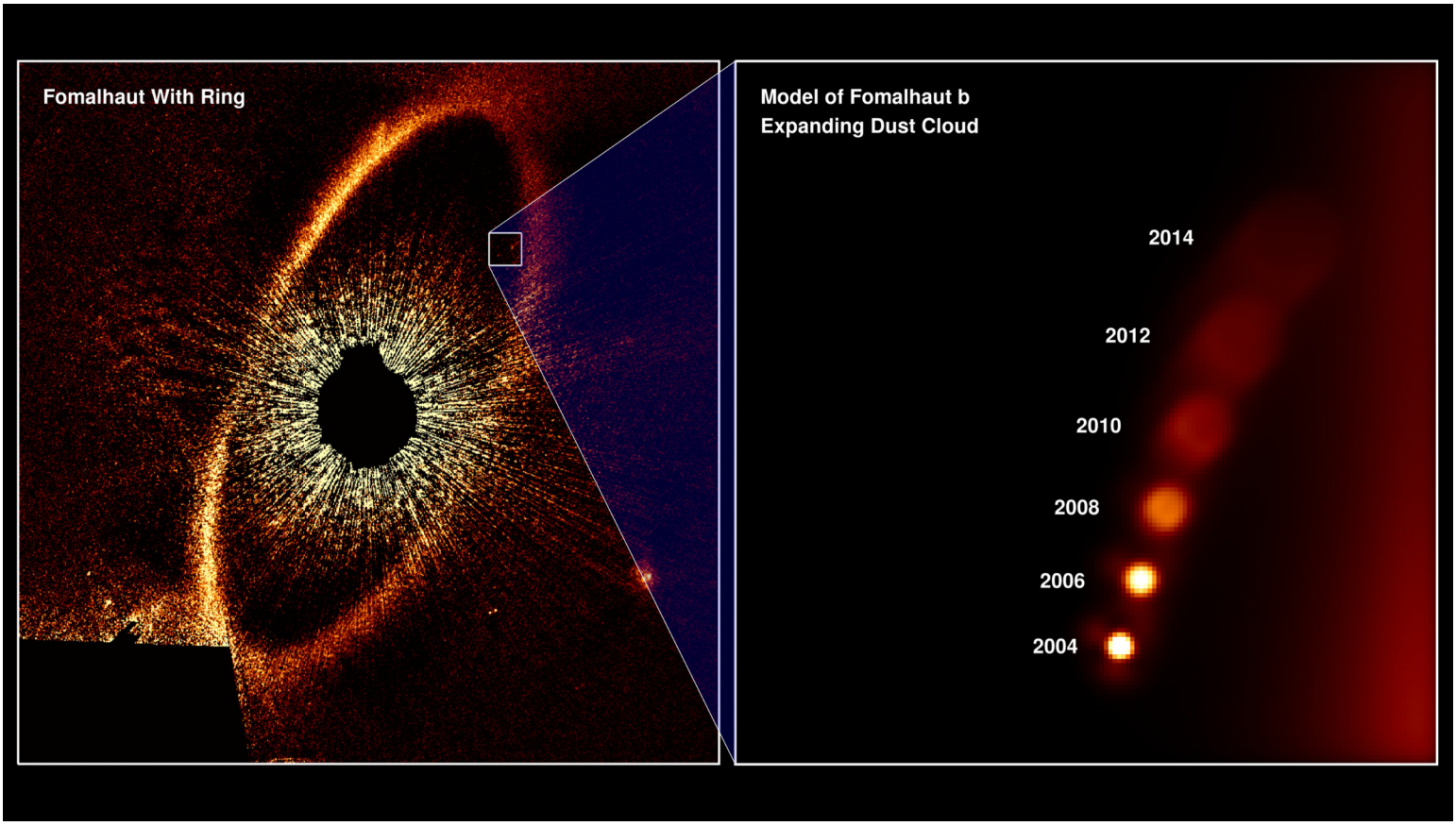
On the Cover: The last complete image of asteroid moonlet Dimorphos, taken by the DRACO imager on NASA's DART mission from ~7 miles (12 kilometers) from the asteroid and 2 seconds before impact. The image shows a patch of the asteroid that is 100 feet (31 meters) across. Dimorphos' north is toward the top of the image.

Credit: NASA/Johns Hopkins APL

Fomalhaut: Not So Lonely After All
By David Prosper

Fall evenings bring a prominent visitor to southern skies for Northern Hemisphere observers: the bright star Fomalhaut! Sometimes called “The Autumn Star,” Fomalhaut appears unusually distant from other bright stars in its section of sky, leading to its other nickname: “The Loneliest Star.” Since this star appears so low and lonely over the horizon for many observers, is so bright, and often wildly twinkles from atmospheric turbulence, Fomalhaut’s brief but bright seasonal appearance often inspires a few startled UFO reports. While technically not of this world – Fomalhaut is about 25 light years distant from our Earth – it has been extensively studied and is a fascinating, and very identified, stellar object.

Fomalhaut may appear solitary, but it does in fact have company. Fomalhaut’s entourage includes two stellar companions, both of which keep their distance but are still gravitationally bound. Fomalhaut B (aka TW Piscis Austrini, not to be confused with former planetary candidate Fomalhaut b*), is an orange dwarf star almost a light year distant from its parent star (Fomalhaut A), and Fomalhaut C (aka LP 876-10), a red dwarf star located a little over 3 light years from Fomalhaut A! Surprisingly far from its

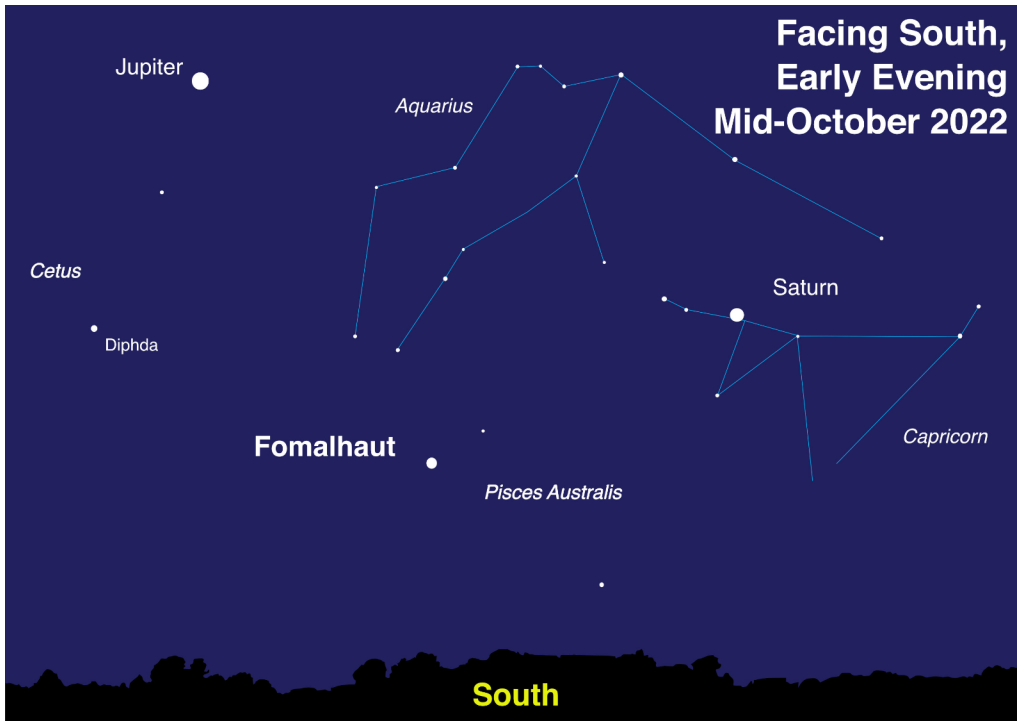


The magnificent and complex dust disc of the Fomalhaut system (left) with the path and dissolution of former planetary candidate Fomalhaut b displayed in detail (right).

Image credits: NASA, ESA, and A. Gáspár and G. Rieke (University of Arizona)

parent star – even from our view on Earth, Fomalhaut C lies in the constellation Aquarius, while Fomalhaut A and B lie in Piscis Australis, another constellation! – studies of Fomalhaut C confirm it as the third stellar member of the Fomalhaut system, its immense distance still within Fomalhaut A's gravitational influence. So, while not truly "lonely," Fomalhaut A's companions do keep their distance.

Fomalhaut's most famous feature is a massive and complex disc of debris spanning many billions of miles in diameter. This disc was first detected by NASA's IRAS space telescope in the 1980s, and first imaged in visible light by Hubble in 2004. Studies by additional advanced telescopes, based both on Earth's surface and in space, show the debris around Fomalhaut to be differentiated into several "rings" or "belts" of different sizes and types of materials. Complicating matters further, the disc is not centered on the star itself, but on a point approximately 1.4 billion miles away, or half a billion miles further from Fomalhaut than Saturn is from our own Sun! In the mid-2000s a candidate planetary body was imaged by Hubble and named Fomalhaut b. However, Fomalhaut b was observed to slowly fade over multiple years of observations, and its trajectory appeared to take it out of the system, which is curious behavior for a planet. Scientists now suspect that Hubble observed the shattered debris of a recent violent collision between two 125-mile wide bodies, their impact driving the remains of the now decidedly non-planetary Fomalhaut b out of the system! Interestingly enough, Fomalhaut A isn't the only star in its system to host a dusty disc; Fomalhaut C also hosts a disc, detected by the Herschel Space Observatory in 2013. Despite their distance, the two stars may be exchanging material between their discs - including comets! Their co-mingling may



Sky map of the southern facing sky for mid-latitude Northern Hemisphere observers. With Fomalhaut lying so low for many observers, its fellow member stars in the constellation Piscis Australis won't be easily visible for many without aid due to a combination of light pollution and atmospheric extinction (thick air dimming the light from the stars). Fomalhaut is by far the brightest star in its constellation, and is one of the brightest stars in the night sky. While the dim constellations of Aquarius and Capricorn may also not be visible to many without aid, they are outlined here. While known as the "Loneliest Star," you can see that Fomalhaut has two relatively close and bright visitors this year: Jupiter and Saturn!

Illustration created with assistance from Stellarium

help to explain the elliptical nature of both of the stars' debris discs. The odd one out, Fomalhaut B does not possess a debris disc of its own, but does host at least one suspected planet.

While Hubble imaged the infamous "imposter planet" of Fomalhaut b, very few planets have been directly imaged by powerful telescopes, but NASA's James Webb Space Telescope will soon change that. In fact, Webb will be imaging Fomalhaut and its famous disc in the near future, and its tremendous power is sure to tease out more amazing discoveries from its dusty grains. You can learn about the latest discoveries from Webb and NASA's other amazing missions at nasa.gov.

*Astronomers use capital letters to label companion stars, while lowercase letters are used to label planets.

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!

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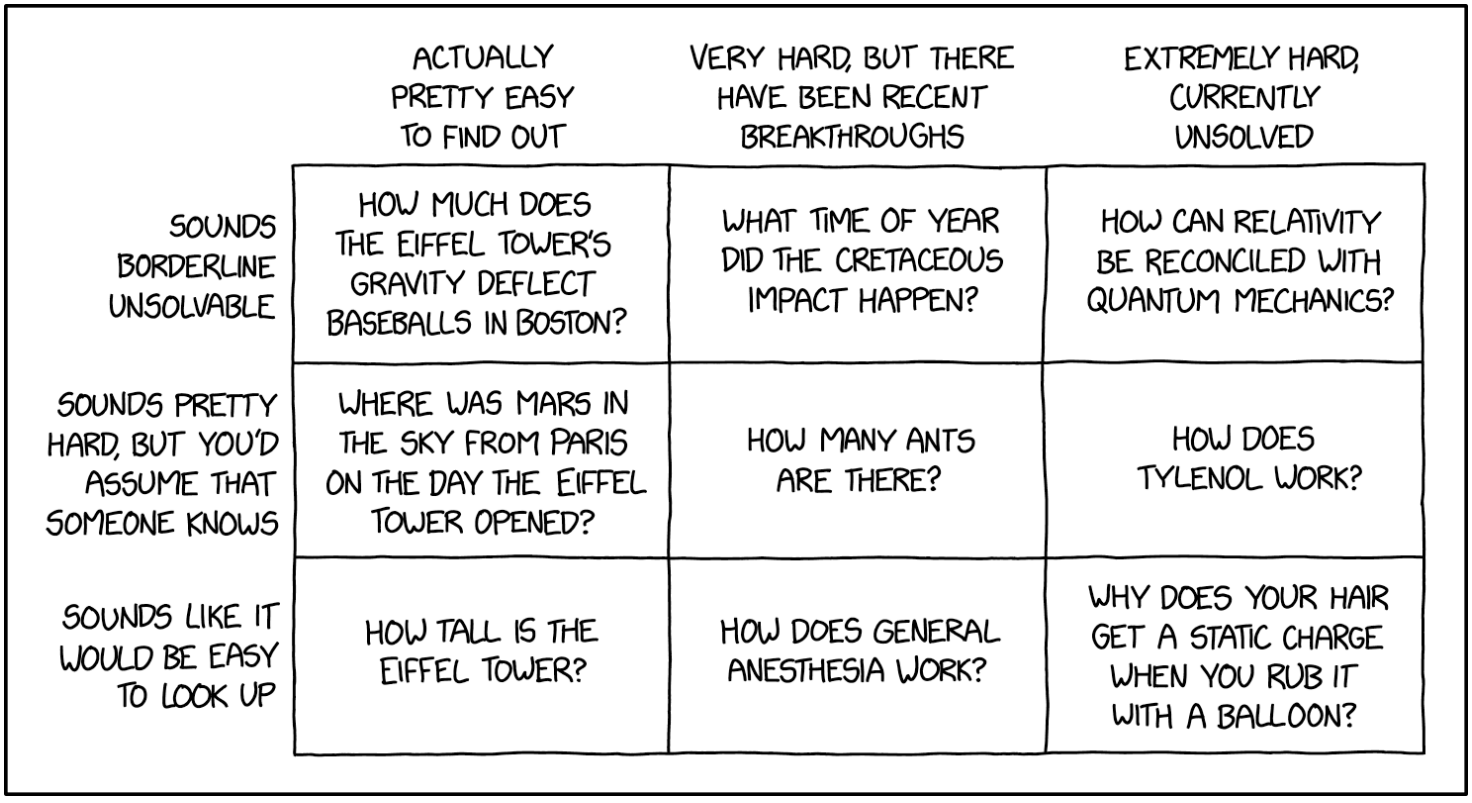

Barnard-Seyfert Astronomical Society
Minutes of a Regular Meeting of the Board of Directors
Held On Wednesday, September 7, 2022

The regular meeting of the Board of Directors of the Barnard-Seyfert Astronomical Society was held September 7, 2022, online, Dr. Tom Beckermann presiding. Logged in were Tom Beckermann, Chip Crossman, Tony Drinkwine, Bud Hamblen and Osvaldo Gonzolez.

Tom asked for a review of the minutes of the board meeting on August 3, 2022, as printed in the September, 2022, edition of the Eclipse. Noone objected to the minutes.

Membership: Tom said there were 219 members listed on Night Sky Network.

Equipment: Chuck Schlemm now has the new solar filter for outreach activity.

Name tags: Chip has the new design for name tags.

Upcoming star parties: Public star parties are planned for Bells Bend on 9/10 (weather looks poor for this one), 9/24 at Pickett State Park (Picket Astronomy Night), 10/1 at Warner Park (observe the moon). Private star parties are planned for Natchez Trace mile marker 435.3 on 9/24 abd 10/22 at the Water Valley Overlook.

Meetings: Steve Boerner is scheduled for a presentation on variable stars at the September meeting. Dr Shane Larson is scheduled for a presentation on dark matter at the October meeting.

The board members discussed putting the membership meetings on the Night Sky Network calendar as club events.

Respectfully submitted,

Bud Hamblen
Secretary

Next Membership Meeting:

Wednesday October 19, 7:30 pm

Cumberland Valley
Girl Scout Council Building
4522 Granny White Pike

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.

Barnard-Seyfert Astronomical Society

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.