

# The ECLIPSE

February  
2018

*The Newsletter of the Barnard-Seyfert Astronomical Society*

**Next Membership Meeting:**  
February 21, 2018, 7:30 pm

Cumberland Valley  
Girl Scout Council Building  
4522 Granny White Pike

Topic: Messier Marathon

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## From the President

Greetings,

Well, our plans for the January member meeting did not materialize due to the weather. The telescope workshop will be rescheduled for later this spring. For now, I thought it appropriate to update you on several issues.

First, please mark your calendar for Saturday, March 17<sup>th</sup>. BSAS member Mark Manner has graciously agreed to host a Messier Marathon at Spot Observatory. The observatory is about 50 miles west of Nashville in a very nice wooded area. Spot Observatory is pretty ideal for this event given the dark skies and facilities that Mark has available. We will start with a potluck dinner and then stay through the entire evening, or at least as long as you would like. We have sure enjoyed Mark's site and hospitality many times and it should be another great evening together.

If you are not familiar with a Messier Marathon, plan to attend our February 21<sup>st</sup> member meeting. Terry Reeves will be presenting an interesting talk on the topic. Basically, a Messier Marathon is an attempt to locate as many Messier objects as possible in a single night. I recall my first Messier Marathon several years ago was at Spot Observatory and I was positioned next to Terry and his telescope. I can attest to his expertise in finding Messier objects. I was particularly impressed with his navigation around Virgo in pursuit of all of those faint galaxies in that constellation that can look so much alike. There are several good books and numerous online resources for a Messier Marathon. We will talk about some of those resources at the February meeting. Also, we will have three loaner telescopes available at our February member meeting.

If you want some practice for the Messier Marathon, come to



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This NASA/ESA Hubble Space Telescope image shows a spiral galaxy known as NGC 7331. NGC 7331 is located about 45 million light-years away in the constellation of Pegasus (The Winged Horse). Facing us partially edge-on, the galaxy showcases its beautiful arms which swirl like a whirlpool around its bright central region. Credit: [ESA/Hubble & NASA/D. Milisavljevic \(Purdue University\)](#)

## Upcoming Star Parties

Saturday 2/17	Private Star Party Natchez Trace Parkway mile marker 412 (Water Valley Overlook)
Saturday 2/24 6:30 pm to 8:30 pm	Public Star Party Edwin Warner Park
Saturday 3/17	Private Messier Marathon Spot v hhzzvz Observatory
Saturday 3/24 8:00 pm to 10:00 pm	Public Star Party Shelby Bottoms Nature Center



Feb 15  
Mar 17



Feb 23  
Mar 24



Mar 1  
Mar 31



Feb 7  
Mar 9

## Happy Birthday Quasars by Robin Byrne

This month we celebrate the discovery of the most distant objects in the universe. Our story begins in the late 1950's when Allan Sandage and Thomas Matthews were performing surveys of the sky, searching for sources of radio radiation. Radio astronomy at this time largely involved an array of antennas that would sweep the sky as Earth rotated. When a signal was detected, its position in the sky was not very precise, so searching for where it was using optical telescopes was challenging. The first one to have an optical counterpart found was 3C 48, which looked like a faint blue star. Its spectrum was very odd-looking, and no one could identify the elements associated with the spectral lines.

Another of the radio sources, 3C 273 was going to be occulted by the Moon on five different occasions. That was the break needed to pinpoint its position in the sky. Cyril Hazard and John Bolton used the Parkes Radio Telescope to observe the occultations and were able to get a precise position. Armed with the coordinates, Caltech astronomer Maarten Schmidt used the 200-inch Hale Telescope at Mount Palomar to observe what looked like another faint star and to get its spectrum. The spectral lines again were very odd. On February 5, 1963, Maarten Schmidt realized that the spectral lines were actually those of the most common element in the universe - hydrogen. So, why did they look so unusual?

Because they were more red-shifted than anything previously observed, corresponding to moving away from Earth at a rate of 47,000 km/s, roughly 16% the speed of light. Armed with this new information, the first of these radio objects discovered, 3C 48, was found to be moving away at an even faster rate, 37% of the speed of light! According to Hubble's Law, how fast an object is moving away from us is related to its distance. Because these objects are moving faster than any other known objects, they must be farther than any known objects - billions of lightyears away. Hence these objects existed billions of years back in time. But if they are that far away, yet we can still see them optically, they must be insanely bright - brighter than hundreds of galaxies combined. Meanwhile, 3C 273 measured to be quite small - less than 1 lightyear across, compared to 100,000 lightyears across for our galaxy. How to explain that?

Meanwhile, we at least needed a name for these things. Because these objects looked like a star while giving off radio waves, they were dubbed "quasi-stellar radio sources." American astrophysicist Hong-Yee Chiu, in a 1964 article in *Physics Today* came up with the shortened name, "quasar." Because some were later found that did not give off strong radio signals, another name, "quasar-stellar object," or QSO, was adopted.

But there still remained the concern that we are looking far away at something small, but insanely bright.



Artist's rendering of the accretion disk in ULAS J1120+0641, a very distant quasar powered by a black hole with a mass two billion times that of the Sun. Credit: [ESO/M. Kornmesser](#)

## Quasars, continued

Because of this apparent contradiction, many didn't believe quasars were really that far away. Based on what was known in the 1960's, there was no known way to explain that much energy production in such a small space. So, maybe they are really something less extreme, but much closer than thought. They came up with other explanations for the extreme red-shifting, including affects due to a strong gravitational force. Over time, however, more and more evidence helped confirm that quasars are really that far away, including: eventually being able to observe that they are inside of galaxies with the same red shift and being part of galaxy clusters with the same redshift.

So, how do they produce so much energy? Starting in the 1970's and finalized in the 1980's, astronomers began modeling what happens when material falls into a black hole. As material approaches a black hole, it spirals inward toward the event horizon, the boundary of a black hole beyond which there is no escape. If a lot of material falls toward a black hole, then it develops a disk of material outside of the event horizon, called the accretion disk. Within the disk, material is moving very rapidly, generating huge amounts of friction and energy. It was found that in an accretion disk, roughly 10% of the mass is converted to energy. In comparison, typical stars convert 0.7% of their mass into energy during the nuclear fusion process. Over time, the source of material falling into the black hole will get depleted. When that happens, the insane amount of energy production comes to a stop. So quasars are actually supermassive black holes in the centers of young galaxies. That's why we only see quasars at huge distances, back when the universe was young - they now no longer have the fuel falling into the black hole that is necessary to power their huge energy output. However, we do see that most, if not all, galaxies do have a supermassive black hole in their center. That's what's left of the quasar.

The discovery of quasars was also the last nail in the coffin for the Steady State theory, which proposed that the universe has always existed, and has always looked about the same. Quasars are proof that the universe looked very different in the past, implying that the universe had a beginning as explained by the Big Bang.

Today, there are hundred of thousands of known quasars, most much farther than 3C 273. The most distant known quasar, ULAS J1120+0641 is 28.85 billion lightyears away, roughly 10x farther than 3C 273. Maarten Schmidt's discovery of quasars changed the way we think about our universe. The size of our universe became an order of magnitude larger than previously known, not to mention much, much more energetic than ever imagined. Quasar 3C 273 can be found in the constellation of Virgo. With a large enough telescope, you can actually view it optically. So, find a friend with a monster scope and check out the first known of these insanely bizarre objects from our early universe.

### References:

[Wikipedia - Quasar](#)

[Everyday Cosmology 1963 Maarten Schmidt Discovers Quasars](#)

[Today in Science: Quasar Mystery Solved by Deborah Byrd](#)

## DEEP SKY DAZE by Mike Benson

February is one of those “iffy” months; you can never predict what the weather will bring, so stay loose and be prepared for what comes. The opportunity for an evening’s observation may not present itself until late in the day. Temperatures will range from quite cool to downright frigid. At mid-evening, the winter Milky Way stretches almost N-S across the sky. Looking toward the Eastern and Western horizons, we’re peering up and down, out of the plane of the disc of our home galaxy, where few bright stars are evident.

Last month I discussed Algol and the fact that it only occurs in prime viewing time occasionally. I prevaricated! This month there are two early evenings. The first one occurs on February 1 and the center of the eclipse is around 10:30 EST. The second is on the 24th, mid-eclipse occurring around 10 PM.

The best times for deep-sky work will be between about the **6th** and the **21st**, while the moon is below the horizon for much of the night. This is a great month for open clusters. Binoculars, or telescope at low power, swept along the Milky Way, will reward the careful observer over and over again with the riches of the galactic plane.

There are at least a dozen great Messier clusters which use the galactic arm as a backdrop, this month. Some of them I discussed in last month’s column – the ones between 4 and 6 hours of right ascension. This month the emphasis will move east, between 6h and 8h RA.

There are half a dozen Messier objects – all of them galactic clusters – and a nice variety from the NGC list.

This will be a month of relatively southerly objects, beginning in Gemini at about +24. **M-35** (NGC 2168) is a particularly beautiful and distinctive open cluster. A good way to find it is to return to M-1, described last month. M-35 is a little over 2° north and about 8° east of the supernova remnant. Alternatively, it’s about 2.5° NW of  $\eta$  Geminorum. This one is the size of the full moon, so limit your power to 50 or thereabouts. There are long, curving rows of bright stars radiating out from the center, which are superimposed on a background of fainter stars. Dark lanes divide the cluster into three parts. It’s a true showpiece. Just to the SW is **NGC 2158**. This 11th magnitude cluster is small, and considerably more distant than its showy, apparent



M-35 and NGC 2158

neighbor. Now you can use some power! If you are using a scope larger than 8”, you may get some resolution if the night is clear. For most of us it will be a largely unresolved bit of nebulosity about 5’ in diameter. It is very rich, and appears, almost, to be a globular cluster.

While we’re in Gemini, move east to  $\delta$  which is about halfway between Pollux, the more southerly – and brighter – of the Twins, and  $\gamma$ , which is not too far from Betelgeuse. From  $\delta$  drop SE a bit over 2° past the wide double star, labeled 63 Geminorum, to NGC 2392. This is the planetary nebula called the “Eskimo”. It’s only about 40” in diameter and exhibits little structure in an 8” scope. Light buckets at higher power may display some of the mottling, and show the outer ring distinctly. I have seen traces of the ring under excellent seeing, through my 8” SCT.

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## DEEP SKY DAZE, continued

If you get a really clear night and have a 6" or larger instrument you might want to move north into the faint constellation Lynx, which skirts the northern boundaries of Gemini and Auriga. I am fascinated by globular clusters and this one, **NGC 2419**, while no showpiece, is worth looking up. It carries the nickname "Intergalactic Wanderer" because it is located nearly 300,000 light years away, well beyond the Large Magellanic Cloud and takes about two billion years to orbit the Milky Way. It is the most distant of the known globulars which are gravitationally bound to the Milky Way. Located about 7° north and about a degree east of Castor, the Wanderer is just east of a pair of stars, 7th and 8th magnitude. It's a small (2') fuzz ball at about 11.5 magnitude with no resolution.

Now it's time to move south of the celestial equator for the last five Messier objects. Find Sirius and look for  $\theta$  Canis Majoris, a 4th magnitude star about 5° to the NNE; then go another 4.5° NE, which should put you about a third of the way from Sirius to Procyon in Canis Minor. Any pair of binoculars should show you a small fuzz ball at that position and it might be visible to the naked eye under the very best of conditions. This is **M-50** (NGC 2323) which has a combined magnitude of 6.3. Most telescopes will show a moderately compressed open cluster with several arcs of curving stars which, many suggest, make the group look like a heart. Most of the stars are blue and white points but there is one red



M-46 and M-47

giant (M class) just south of the center of the cluster, adding a nice touch of spice to this object. There are three Herschel 400 clusters a couple of degrees to the south and a bit east, **NGC 2335**, **NGC 2343**, and – 1.5° further east – **NGC 2353**. These clusters are all in the neighborhood claimed by IC 2177, better known as the Eagle Nebula, a name which it shares with M-16. Larger instruments with nebula filters may reward the diligent, but there is not a lot of nebulosity evident in my 8".

Next, head east about 14° from Sirius and about 2° north to the northwestern reaches of Puppis, where you'll find, only a degree apart, one of the finest contrasting pairs of open clusters in the sky, **M-47** (NGC 2422) and **M-46** (NGC 2437). The former is a naked eye object at 4.4 magnitude. It's a beautiful, bright, well resolved open cluster. There is a nice yellow-white star (Struve 1121) in this group, which sets it off nicely. This cluster is rather sparse, with lots of sky between the stars. Not so with M-46, a degree to the ESE. While both are about 30' in diameter, M-46 packs four times as many stars in the same area. None appear as bright as those in M-47; this cluster is 2 or 3 times more distant and must be intrinsically much larger. Somehow, the two remind me of a silk and a wool scarf; both beautiful, but of very different textures.

Located within the confines of M-46, on its northern edge is **NGC 2438**, a planetary nebula, beautiful and very round. It is not actually a part of the cluster but is located some distance closer to us and uses the cluster as a backdrop. This object and NGC 2423, an open cluster a half degree north of M-47 are Herschel objects.

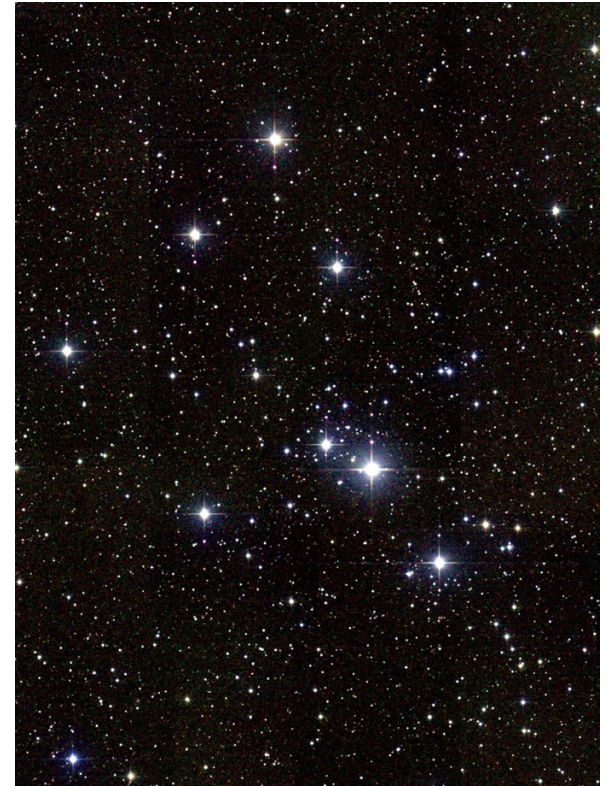
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**DEEP SKY DAZE, continued**

Next move about one field of view east of M-46 and drop due south  $9^\circ$  to **M-93** (NGC 2447). If you can find  $\xi$  Puppis (3.3 magnitude), the cluster is a bit over a degree NW of the star. This cluster is about 2/3 the size of the last two; it is moderately coarse, with a surprising variety of star colors. Some have compared the general shape of this cluster to a butterfly. For myself I saw two opposing arcs of stars which resembled the Christian sign of the fish. This cluster is in the center of the galactic arm where there are a lot of interesting objects— stars, clusters, nebulosity. Just sweep around to see what's there. Fun!

Finally, let's move to the easiest object of the evening, **M-41** (NGC 2287), a bright, beautiful object about  $4^\circ$  south of Sirius. It's an easy naked eye cluster a bit larger than the full moon, so 35-50X is plenty. There are 10 stars brighter than 8.5 magnitude and a total of over 100 which have been identified as members of the cluster. Known to Aristotle in 325 BC, M-41 may be the faintest object known in ancient times.

Have a great month. I hope everyone finds clear skies whether they stay in Tennessee or are fortunate enough to be able to head to the Keys for the Winter Star Party. Keep your head and your eyes high!



M-41

**Image Credits:**

**M-35:** Atlas Image [or Atlas Image mosaic] obtained as part of the Two Micron All Sky Survey (2MASS), a joint project of the University of Massachusetts and the Infrared Processing and Analysis Center/California Institute of Technology, funded by the National Aeronautics and Space Administration and the National Science Foundation.

**M-46 and M-47:** Boris Štromar

**M-41:** Atlas Image [or Atlas Image mosaic] obtained as part of the Two Micron All Sky Survey (2MASS), a joint project of the University of Massachusetts and the Infrared Processing and Analysis Center/California Institute of Technology, funded by the National Aeronautics and Space Administration and the National Science Foundation.

**Next BSAS meeting  
February 21, 2018, 7:30 pm**

**Cumberland Valley  
Girl Scout Council Building  
4522 Granny White Pike**

Terry Reeves: Messier Marathon  
**PLUS: A small number of new loaner scopes will be available for members at this meeting!**

**Barnard-Seyfert Astronomical Society  
Minutes of a Regular Meeting of the Board of Directors  
Held On Wednesday, January 3, 2018.**

The regular meeting of the Board of Directors of the Barnard-Seyfert Astronomical Society was held January 3, 2018, in the board room at the Girl Scouts Center, 4522 Granny White Pike, Nashville, TN 37204. Present were Mike Benson, Spencer Buckner, Gary Eaton, Drew Gilmore, Bud Hamblen, KC Katalbas, Johanna Keohane, Todd Nannie, Keith Rainey, and guest Meghan Keohane. A quorum being present, the meeting was called to order at 7:30 PM. Gary welcomed the new directors, KC Katalbas and Johanna Keohane, to the board. Gary asked for a motion to approve the minutes of the December 6, 2017, meeting. Spencer so moved, Todd seconded, and the minutes were adopted without discussion by unanimous voice vote. Keith reported that 7 persons had not paid dues in more than one year, 51 were less than one year late, and 90 persons were current. Mike said that the Astronomical League membership list is sent in quarterly, and the membership fee is sent in during June. The club has about \$6,749.18 in the checking account and \$4,155.51 in the savings account. Todd Nannie was unable to fill in for Tom Guss for the first four months of 2018 and Bud Hamblen was appointed acting treasurer for that period.

The Girl Scouts said that they would return \$25.00 to the club because of the lock-out on December 20, 2017. Gary made a motion to pay Glendale United Methodist Church \$25.00 for the use of the fellowship hall, Todd made the motion, Mike seconded, and the motion was adopted without further discussion by unanimous voice vote.

The silent auction was rescheduled for the February general meeting.

Spencer said that he would donate to the club an 8-inch goto dob for the loaner program. Todd presented some additional information on telescopes for the loaner program. After discussion, the consensus was to purchase a non-automated 8-inch dob and a push-to 8-inch dob, both with eyepieces, and a set of eyepieces for the telescope Spencer donated. Gary asked for a motion to authorize Todd to purchase the equipment. Keith so moved, Spencer seconded, and the motion carried without further discussion by unanimous voice vote.

There being no further business, Gary asked for a motion to adjourn. Spencer so moved, Todd seconded, and the meeting was adjourned at 9 PM.

Respectfully submitted,

Bud Hamblen

Secretary

**Due to icy conditions, there was no  
member meeting of BSAS in January 2018**



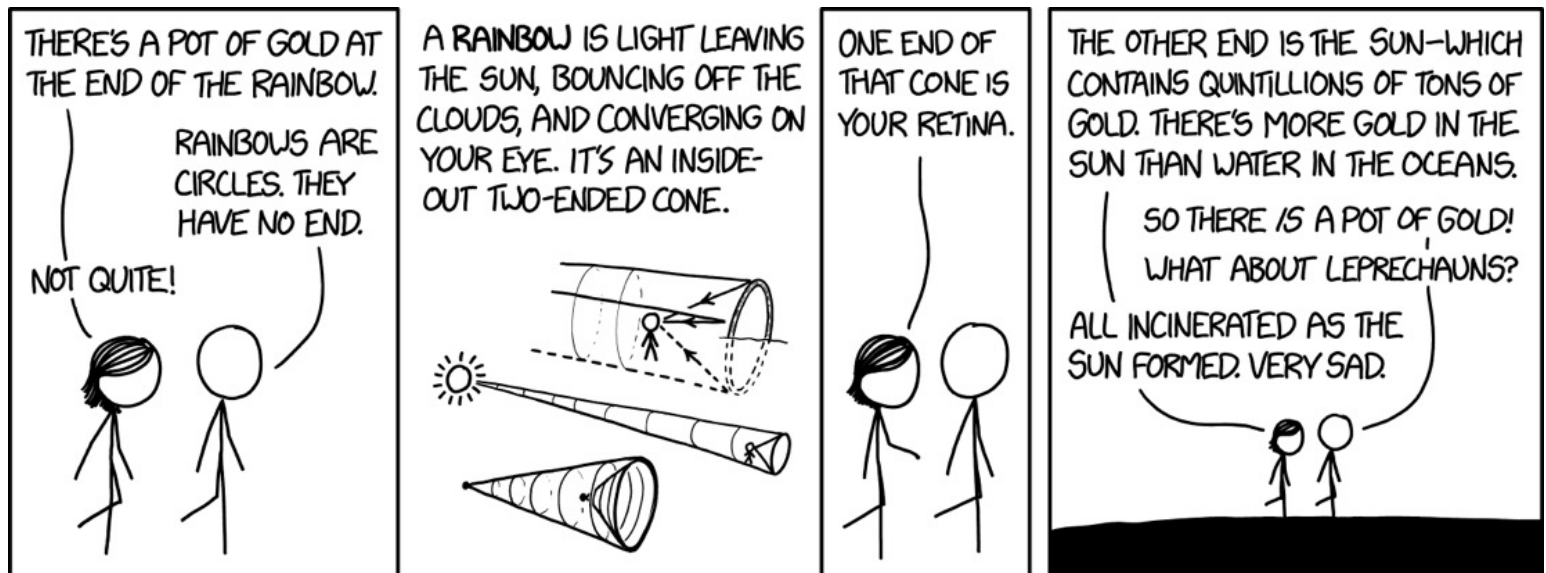
**From the President, continued**

our private star party on February 17<sup>th</sup> at mile marker 412 on the Natchez Trace Parkway (Water Valley Overlook). We will likely have several experienced members who can give you some pointers.

Finally, several of our members ordered a RASC 2018 Observer's Handbook or a Deep Space Mysteries 2018 Calendar and were not able to pick them up at the December meeting. With the January meeting being canceled, we will now have them for you at the February 21<sup>st</sup> member meeting. If you would like to pick them up sooner, I will have them available for you at the February BSAS board meeting on February 7<sup>th</sup> which starts at 7:30 PM and is also held at the Girl Scout building. Just arrive a few minutes before the meeting if you can but feel free to stay for the meeting as well.

Gary Eaton

xkcd





### **NASA Great Observatories Team-up to Identify Flickering Black Hole**

Supermassive black holes, weighing millions of times as much as our Sun, are gatherers not hunters. Embedded in the hearts of galaxies, they will lie dormant for a long time until the next meal happens to come along.

The team of astronomers using observations from the Hubble Space Telescope, the Chandra X-ray Observatory, and as well as the W.M. Keck Observatory in Mauna Kea, Hawaii, and the Apache Point Observatory (APO) near Sunspot, New Mexico, zeroed in on a flickering black hole.

A black hole in the center of galaxy SDSS J1354+1327, located about 800 million light-years away, appears to have consumed large amounts of gas while blasting off an outflow of high-energy particles. The fresh burst of fuel might have been supplied by a bypassing galaxy. The outflow eventually switched off then turned back on about 100,000 years later. This is strong evidence that accreting black holes can switch their power output off and on again over timescales that are short compared to the 13.8-billion-year age of the universe.

Credit: [NASA](#), [ESA](#), and [J. Comerford \(University of Colorado-Boulder\)](#)



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).