

The ECLIPSE

November
2017

The Newsletter of the Barnard-Seyfert Astronomical Society

Next Membership Meeting:
November 15, 2017, 7:30 pm

Cumberland Valley
Girl Scout Council Building
4522 Granny White Pike

Topic:
*Astronomy Toys For
Night and Day*

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From the President

Greetings,

I hope you are enjoying the cooler weather and clear skies, which have been a bit scarce. If you are like me, when clouds get in the way of viewing, maintaining equipment or looking for new equipment is always a good option. Equipment is also one of the focuses of BSAS these days. With growth in our membership, revenue from the NISSAN star party and the sale of solar glasses, we have about \$7,000 in our bank account, which is much more than usual. If you were at our October meeting you heard me ask for ideas on how we might want to use a portion of those funds. Members made several suggestions including new equipment to loan, new sound equipment, new displays and more. If you have additional thoughts, feel free to let us know.

You should have received a notice from Theo Wellington with information about equipment from the estate of our former member, Bob Rice who passed away. We thought our members might find some of that equipment of interest. BSAS may very well acquire some as well.

The Royal Astronomical Society of Canada is that countries leading astronomy organization. The RASC has been publishing the annual Observer's Handbook for over 100 years and it's a great guide for amateurs. About half of the resource covers astronomical events for the upcoming year and the other half has more general information that is updated with each publication. BSAS can offer the handbook to our members at a substantial discount. A single copy has a regular price of \$39.95 but with our quantity discount, we can order them for \$26.95 (including shipping). The



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The galaxy NGC 4993 is located about 130 million light-years from Earth. On August 17, 2017, the Laser Interferometer Gravitational-Wave Observatory detected gravitational waves from a neutron star collision within this galaxy. The event also resulted in a flare of light called a kilonova, which is visible to the upper left of the galactic center in this Hubble Space Telescope image. [Link](#)

Upcoming Star Parties

| | |
|------------------------------------|---|
| Friday 11/10 6:30 pm to 8:30 pm | Public Star Party Shelby Bottoms Nature Center |
| Saturday 11/18 | Private Star Party Natchez Trace Parkway mile marker 435.3 |
| Friday 12/8 6:30 pm to 8:30 pm | Public Star Party Bells Bend Outdoor Center |
| Saturday 12/16 | Private Star Party Natchez Trace Parkway mile marker 412 (Water Valley Overlook) |



Nov 18
Dec 18



Nov 26
Dec 26



Nov 3
Dec 3



Nov 10
Dec 10

Happy Birthday Pulsars by Robin Byrne

This month we commemorate the discovery of an astronomical object that was hypothesized to exist before ever being observed. In 1934, Walter Baade and Fritz Zwicky had worked on modeling what would be left of a star after a supernova explosion. They proposed that the remaining core would collapse down so much that electrons and protons would combine, leaving nothing but a ball of neutrons, hence... a neutron star. In 1967, Franco Pacini suggested that if a neutron star had a magnetic field and was rotating, it would emit energy along the magnetic poles, sweeping radiation through space with each rotation.

In 1965, Jocelyn Bell was a graduate student in Astronomy at Cambridge University. Her thesis advisor was Anthony Hewish. From 1965 to 1967, Bell and other graduate students built a 4.5 acre radio telescope array comprised of over 2000 dipole antennas held up by over 1000 posts they drove into the ground with mallets. More than 120 miles of wire and cable connected it all together. Operating at 81.5 MHz, the telescope began observations in July of 1967. Their primary goal was to observe quasars by looking for interplanetary scintillation (“twinkling”), which affects quasars more than other objects. Bell was in charge of operating the telescope and analyzing the data. Radio telescopes at that time produced data in the form of one long strip chart, with bumps and wiggles indicating when a source is detected. As Earth rotates, sources move in and out of view of the telescope. Electronically, you can adjust how far north or south the telescope is observing, based on how the data is combined. Every day, Bell would have to plow through roughly 100 feet of strip charts, becoming an expert at picking out scintillating quasars.



Jocelyn Bell (Burnell), 1967

On November 28, 1967, Bell noticed a strange-looking “bit of scruff” in the data. Out of the 100 feet, a section that was only 7 mm in length, appeared to be something different emitting at a wavelength of 3.7 meters. There were distinct pulses every 1.33 seconds. Not only that, but on subsequent nights, it was there again, but returning 4 minutes earlier than the night before - proof that it was an astronomical source, rather than terrestrial. Another telescope confirmed the observation, so they knew it wasn't

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Pulsars, continued

an instrumentation effect. Because of the regularity of the signal, Bell and Hewish first thought that it might be a signal from an extraterrestrial intelligence, so they dubbed it a LGM-1 (standing for Little Green Men). Bell said, “we did not really believe that we had picked up signals from another civilization, but obviously the idea had crossed our minds and we had no proof that it was an entirely natural radio emission. It is an interesting problem—if one thinks one may have detected life elsewhere in the universe, how does one announce the results responsibly?”

Not long after the first observation, another bit of “scruff” showed up, coming from a different part of the sky and with a slightly faster pulse rate. That greatly reduced the likelihood of aliens, since what are the odds of getting the same kind of signal from completely different places? Bell said, “I found a second pulsar, killing the L(ittle)G(ree)M(en) hypothesis and indicating a new kind of astronomical source.” By Christmas of 1967, a total of four similar sources had been confirmed. Bell and Hewish submitted a paper to *Nature* about the discovery, and Hewish made a formal announcement of the discovery at a seminar in Cambridge in February 1968. The combination of the remote possibility of discovering alien life with an astronomer who was (gasp) a woman was too good for the press to pass up. Bell described what she had to endure: “I had my photograph taken standing on a bank, sitting on a bank, standing on a bank examining bogus records, sitting on a bank examining bogus records. Meanwhile the journalists were asking relevant questions like was I taller than or not quite as tall as Princess Margaret, and how many boyfriends did I have at a time?”

Because of the regular “pulsing” of the star, these pulsating stars were quickly dubbed “pulsars.” The original LGM-1 was renamed CP 1919 (standing for Cambridge Pulsar, followed by its right ascension). After the announcement by Hewish, other astronomers began searching the skies, finding dozens of pulsars by the end of the year. While many hypotheses were put forth to explain what these objects were, Thomas Gold was the first to propose that pulsars were neutron stars. As the remaining core of a massive star collapses down, the magnetic field becomes extremely strong. Along the poles of the magnetic field, energy is emitted in a beam. If the magnetic field is angled relative to the axis of rotation, then every time the star rotates, the beam of radiation sweeps past. A popular analogy is that it is like the beacon from a lighthouse. As the light source rotates, a ship at sea will only see a flash of light every time the light beam is pointed in its direction. Similarly, every time the beam of radiation from a pulsar points to Earth, radio telescopes record a brief blip. In the case of CP 1919, the star rotates

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Pulsars, continued

once every 1.33 seconds, so we see a blip once every 1.33 seconds. Later in 1968, the pulsar in the Crab Nebula was found. Being in the nebula helped to link pulsars with supernovas (the Crab Nebula is known to be a supernova remnant), but what sealed the deal was observing that the beam from the pulsar interacts with the nebula itself. This eliminated any doubt that the pulsar was merely in a chance alignment with the nebula, rather than being actually inside of it.

In 1968, Bell finished her thesis about quasars and received her PhD. Pulsars were only briefly mentioned in the appendix of her dissertation. In 1974, Anthony Hewish and Martin Ryle became the first astronomers to receive a Nobel Prize in Physics. Ryle was honored for his development of radio telescope technology, while Hewish was awarded for the discovery of pulsars. Despite the fact that Bell's name was the second listed on the first publication announcing the discovery of pulsars, and despite the fact that she was the one who spotted the "scruff" and did most of the work, she was overlooked for the Nobel Prize. Although Bell has been philosophical about it, many feel that the lack of recognition for her work is an outrage. It's fitting justice, though, that most people who know about pulsars, know who Jocelyn Bell is, but fewer people have heard of Anthony Hewish.

Although pulsars are largely in the realm of non-visual astronomy, as you're out observing the night sky this time of year, you can observe some objects in their vicinity. The first pulsar, CP 1919 can be found within the Summer Triangle, in Vulpecula not far from M27, the Dumbbell Nebula, while Taurus brings the Crab Nebula and its own famous pulsar. While you enjoy the view of these beautiful nebulae, take a moment to think about some of the other unseen astronomical objects out there, including the over 1000 known pulsars that have been discovered in the past 50 years.

References:

[Wikipedia: Pulsar](#)

[This Month in Physics: February 1968: The Discovery of Pulsars](#)
[APS News Ernie Tretkoff](#)

[PBS: People and Discoveries Bell and Hewish discover pulsars 1967](#)

[University of Glasgow: World Changing Achievement Discovery of Pulsars](#)

DEEP SKY DAZE

by Mike Benson

Over two decades ago I prepared a series of articles which described star walks, which, if followed, would lead to the completion of the Astronomical League's list of Messier objects, along with a good start toward the Herschel list as well. I have been asked to update and repeat these articles for the *ECLIPSE*. This is the first of a monthly series that will continue for the next year or so. If you have questions or comments, please feel free to contact me at ocentaurus@aol.com.

* * *

Fall is my favorite time of year. To me it signifies new beginnings, perhaps as a result of our educational system which traditionally began after the harvest, when children were no longer needed in the fields. Even in my late seventies, I still miss the joy of a new school year, the walk to school, kicking my way through crisp, colorful leaves fallen from maples and oaks, birches and poplars and aspens, collecting my new books with their crisp pages; meeting old friends and new teachers. The smell of wood smoke and burning leaves and the transitional weather that brings dry, high pressure systems, cooler temperatures, and clear, steady air out of the north, all invigorated me then, much as they do today.

In the sky, the appearance of the Pleiades and the Hyades, Cassiopeia riding high to the North, the hazy patch of M-31 (the Andromeda Galaxy), first glimpses of the Orion Nebula, and the beautiful triple star system of Omicron² Eridani all bring a sense of expectancy when I step outside in the evening. Yes, I love Autumn.

* * *

Let's start with seven objects scattered in Capricornus, Aquarius, Pegasus, Perseus, and Cassiopeia, The first two are low in the west as the sky darkens in November, so it would be best to go for the three globular clusters and the asterism located in them first. There will be time for Pegasus and the Vain Queen later in the evening, where we'll find another globular cluster and two galactic clusters.

Capricornus, the Sea Goat is located in a rather dark part of the sky just southeast of Aquila and is the most westerly of the "water constellations". It contains no star brighter than 3rd magnitude. Shaped rather like a triangle with the apex pointed toward the horizon, it may take you a few minutes to trace its shape. Once you have the outline you'll note Alpha and Beta marking the westerly point, Omega to the south, the tip on which the triangle balances, and Delta at the eastern point. A bit over a third of the distance between Delta and Omega is

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DEEP SKY DAZE, continued

3.7 magnitude ζ Capricorni with 4.5 magnitude, 36 Capricorni about a degree to the NE. Our first Messier object of the evening, M-30 (NGC 7099), is located about 3.5° ESE of Zeta. This 8th magnitude globular cluster is only about 6' in diameter with soft edges, a much brighter interior, and a stellar core of about 12 Mag which will require a mid sized instrument to detect.

Let's move on to Aquarius, which will prove a bit more productive. Swing your scope about 10 degrees NW to a position about midway between θ Capricorni and ϵ Aquarii. There you will find two of the more nondescript Messier objects. M-72 (NGC 6981) is an 8.5 magnitude globular cluster only about 3' in diameter. Definitely not an earth shaker!

About 1.5° ESE is M-73 (NGC 6994). Watch out! It'll probably bite you before you recognize it. I wonder how Messier found any nebulosity here to confuse it with a comet. Most telescopes will show you a small asterism containing, perhaps, four stars. Yawwwwwn!

Much more impressive is NGC 7009 located about 2° NE of M-73. Also known as the "Saturn Nebula", this planetary nebula is oblong – about 30" by 15" – and appears to have two *ansae* – ears – much like Galileo pictured the planet, several centuries ago. It's very bright (8th magnitude) and blue-green in color. A nebula or SkyGlow filter will help, if you have one available.

Our final object in Aquarius is 6.0 magnitude, M-2 (NGC 7089), a fine globular cluster. Under similar conditions of transparency, I achieved partial resolution of stars at the edges of the cluster, but found a dense, solid core with no resolution at about 170X in my 8" SCT, while Clint Bach, a friend with a 12.5" Newtonian at 85X found the core to be partially resolved in East Tennessee.

Now find the Great Square of Pegasus; then ϵ Pegasi ("Enif"), the nose of the flying horse. (Remember, Pegasus is flying west, upside down unless you are lying on your back with your feet to the south. θ Pegasi marks the approximate position of Pegasus' ears and our next Messier object, M-15 (NGC 7078), lies on a line extended from θ through ϵ , about half again the distance between those two stars. At 6.5 magnitude, spread over about 10' of arc, it is not as dense as M-2. Most scopes will show some resolution of the core at powers over 100X. Bright, easy, and very pretty!

Our next two Messier objects are in Cassiopeia, and here you have to be very careful of directions. At this season of the year, the vain mother of Andromeda is actually higher in the

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DEEP SKY DAZE, continued

sky than Polaris, so North is actually down and to the left as you look at the constellation, a squashed "W" with the base of the figure toward the east. Start with α (the base of the least flattened part of the "W"), extend a line through β (the most westerly of the stars that make up the "W") a bit further than the distance between the two stars. You are now at M-52 (NGC 7654) a 7.0 magnitude, open cluster about 12' in diameter, with over a hundred members, none above 9th magnitude. Believe it or not, you are looking out along the plane of the disk of the Milky Way at this point, away from the center of our galaxy. Finally, swing to δ Cassiopeiae, the base of the squashed part of the "W". Another open cluster, M-103 (NGC 581) lies a degree NW. Clint, using his 12.5" and I in a 17.5", both had difficulty separating the cluster from the background, which is very rich, running right along the galaxy's disk.

Nearby, are three of my favorite telescopic objects. All are in Perseus. M-76 (NGC 650-1) is a bright planetary nebula located just NNE of ϕ Persei in the western extension of Perseus, right on the Andromeda border. Also known as the "Little Dumbbell," both lobes are clearly visible in my 8" SCT on a good night. A smaller instrument will show a bright, irregularly shaped blob, and averted vision will usually permit the two lobes to be separated. A larger light bucket reveals considerable internal detail with dark lanes and variable brightness in the central bar, along with wispy nebulosity east and west of the bar. Use as much power as your scope permits. I tend to prefer about 150X in my 8".

Next, move to β Persei, better known as Algol (While you're in the area, check to see if the "Demon Star" is in eclipse). Hop to 16 Persei about 4.50 SW of Algol. From there look for NGC 1023 just less than a degree N and two degrees W. This is a lens shaped, elliptical galaxy with a much brighter center and an odd, bright tuft at its western edge. The tuft was clearly visible in my 8" even through a faint haze layer. Various sources list this galaxy from 11th magnitude to a bright 9.3. I tend to agree with the brighter figure. It's a really pretty object, and worth a sketch, I think.

Now head a degree NNE to 12 Persei and from there, due north 2.50 to M-34 (NGC 1039). This is a big, bright, loose galactic cluster with about 80 stars ranging in brightness from 8.5 magnitude on down. It's the size of the full moon and is best viewed at lower powers, although there are a couple of nice double stars that can be split under high magnification. There are several arcs of stars radiating out from the center of the cluster. Take your time and see how deep you can go. There will be stars all the way down to the limit of your telescope.

Happy Turkey Day, and cloudless skies!

**Barnard-Seyfert Astronomical Society
Minutes of a Regular Meeting of the Board of Directors
Held On Wednesday, October 4, 2017.**

The regular meeting of the Board of Directors of the Barnard-Seyfert Astronomical Society was held October 4, 2017, in the board room of the Girl Scout office. Present were Mike Benson, Spencer Buckner, Gary Eaton, Drew Gilmore, Bud Hamblen, Keith Rainey and Theo Wellington. A quorum being present, the meeting was called to order at 7:30 PM. Gary asked for a motion to adopt the minutes of the August meeting. Keith so moved and Spencer seconded. The minutes were adopted without discussion by unanimous voice vote. The club has \$4,890.26 in the checking account and \$4,206.38 in the savings account. There are 126 members.

Possible uses for the money in the club treasury were discussed. Options included a portable sound system, new loaner telescopes and additional materials for outreach. It was noted that a portable planetarium would cost about \$40,000. Gary soad he would solicit suggestions from the floor at the next regular meeting. The club Google group also could be used to collect suggestions.

Owing to the success of the August meeting at Adventure Science Center, the ASC said they would be interested in hosting the BSAS in future.

Mike Benson will submit the updated member list to the Astronomical League (BSAS members are also members of the AL).

There being no further business, Gary asked for a motion to adjourn. Spencer so moved, Theo seconded, and the meeting was adjourned at 8:45 PM.

Respectfully submitted,

Bud Hamblen
Secretary

xkcd



**Barnard-Seyfert Astronomical Society
Minutes of the Monthly Membership Meeting
Held On Wednesday, October 18, 2017.**

The Barnard-Seyfert Astronomical Society held its monthly meeting in the City Room at the Girl Scouts office, 4522 Granny White Pike, Nashville, Tennessee, on Wednesday, October 18, 2017. 26 members and guests signed in.

Gary Eaton called the meeting to order at 7:30pm. Gary asked for a motion to approve the minutes of the September 20, 2017, meeting as printed in the October, 2017, issue of the Eclipse and the minutes were adopted without discussion by a unanimous voice vote. Tom Guss reported that there was \$4,890.26 in the regular account and \$4,356.51 in the equipment account.

Gary received suggestions from the floor on how to use the money now in the treasury:

Additional loaner telescopes

A computerized go-to telescope

Portable public address system

Table top display panel

Subscription to remote telescope

BSAS logo tee shirts or hoodies

Use funds to promote BSAS at local educational institutions

Theo Wellington announced that longtime member Bob Rice's widow Jean is selling his collection of astronomy gear. There is a long list of stuff from telescopes to eyepieces and filters, so we've listed it in a Google sheet. Feel free to ask questions, the initial asking price is 75% of retail when we could find a current price (some is just not made anymore). Most is in excellent condition. Giving club members first crack before Theo lists it on Astromart / Cloudy Nights. Gear is stored at Theo's house if you would like to look in person. The URL is: <http://tinyurl.com/yc7jpsrh>

Gary announced upcoming star parties: public event on October 20 from 7 to 9 pm at Bowie Nature Park, private event on October 21 at Water Valley Overlook, public event on October 27 from 7:30 to 10 pm at Montgomery Bell State Park, public event on October 28 from 7 to 9 pm at Long Hunter State Park, and a public event on November 10 from 6:30 to 8:30 pm at the Shelby Bottoms Nature Center.

Monthly Membership Meeting, continued

Pat Alan (contact through the club) has asked for help using the Deep Sky Stacker software.

Dr JanaRuth Ford made an informative presentation on proven and probable meteorite impact craters located in Tennessee.

There being no further business the meeting was adjourned at 9:45 PM.

Respectfully submitted,

Bud Hamblen

Secretary

Next BSAS meeting
November 15 2017, 7:30 pm

Cumberland Valley
Girl Scout Council Building
4522 Granny White Pike

*Topic: "Astronomy Toys For Night and Day" Spencer Buckner and Theo Wellington
With the upcoming eclipse, this year's pre-Thanksgiving meeting will cover astronomy toys for both
daytime solar and eclipse observing as well as nighttime stargazing.*

Contribute to *The Eclipse!*
[eclipse@bsasnashville.com!](mailto:eclipse@bsasnashville.com)

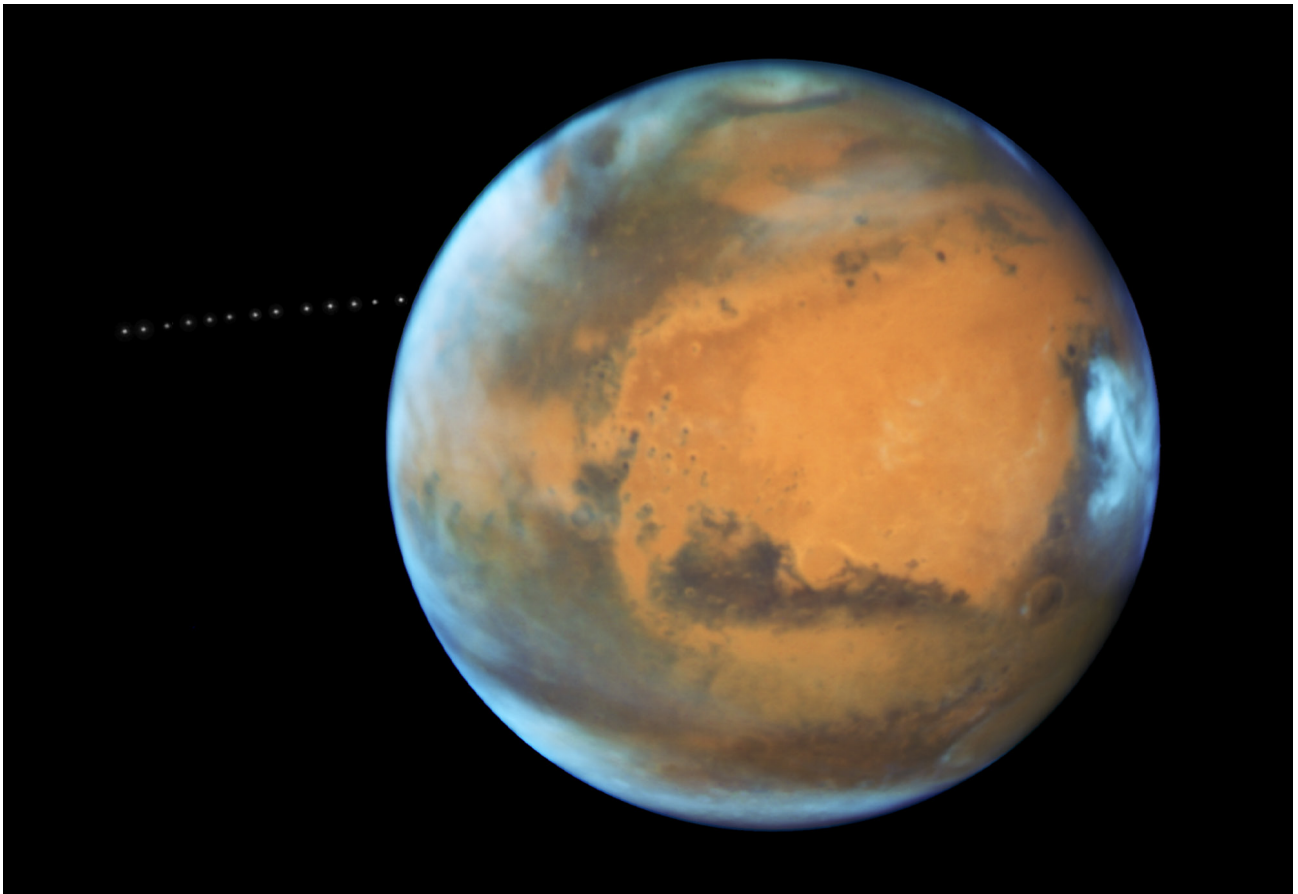
From the President, continued

2018 edition is particularly interesting since the RASC is now publishing a U.S edition.

Another great resource is Astronomy Magazine's 2018 Deep Space Mysteries calendar. My guess is more than a handful of our members have that calendar hanging on the wall of their home or office. Aside from awesome images each month, it also has dates marked for key astronomical events and historical facts. A single copy has a retail price of \$12.99 and ordering thru BSAS will save on postage.

If you would like either of these resources, please be prepared to pay a deposit at our November 15th meeting. We will then place our group's orders and have them available at our December meeting.

Gary Eaton



The sharp eye of NASA's Hubble Space Telescope has captured the tiny moon Phobos during its orbital trek around Mars. Because the moon is so small, it appears star-like in the Hubble pictures. Over the course of 22 minutes, Hubble took 13 separate exposures, allowing astronomers to create a time-lapse video showing the diminutive moon's orbital path. The Hubble observations were intended to photograph Mars, and the moon's cameo appearance was a bonus. Image Credit: [NASA](#), [ESA](#), and [Z. Levay \(STScI\)](#)



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.