# The ECLIPSE

April 2017

*The Newsletter of the Barnard-Seyfert Astronomical Society*

**Next Membership Meeting:**
April 19, 2017, 7:30 pm
Cumberland Valley
Girl Scout Council Building
4522 Granny White Pike

*Topic: The Tennessee and Alabama Meteorite Impact Sites*
*Details on page 9.*

## In this Issue:



Barnard-Seyfert Astronomical Society
bsasnashville.com

**From the President**

Greetings,

BSAS was represented last weekend at Pickett State Park's Dark Sky Celebration. The clouds were also represented as well, unfortunately. That seems to be the norm these days. But, two day-time presentations were given by BSAS members. Theo Wellington gave an informative talk on this summer's total solar eclipse. Keith Rainey and I spoke on mobile astronomy apps. While preparing, I was struck by the incredible amount of information one can access though a smart phone. Here are three of my favorite astronomy apps:

**Exoplanet** – this app provides background information about the hunt for exoplanets and very detailed information on each exoplanet. The app shows their location on an interactive map with amazing graphics. I'm very intrigued by the TRAPPIST-1 ultracool dwarf star with seven earth-sized planets, just 40 light years away. According to the app's link to an article in Nature, evidence suggest all seven of these planets could support liquid water and three of these planets are within the habitable zone. Check out the other 3,461 exoplanets in your spare time.

**Moon Globe** – If you're like me, there is something very special about showing someone the moon in a telescope. The event is almost always accompanied by some sound of excitement or amazement. With the Moon Globe, you can add to the experience by using the app's telescope mode and easily identify the features you are viewing. To do that, just rotate the image left-right or north-south to match your telescope view. Then tap the name to learn more. Being able to quickly reference the size of a crater

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Barnard-Seyfert Astronomical Society

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## Observing Highlights April and May

**Open Clusters**
M36, M37, M38, M35, *NGC2264 (Christmas Tree)*, M41, M50, M47, M46, M93, M48, M44 *(Beehive)*, M67, Mel111 *(Coma Star Cluster)*, NGC4755 *(Jewel Box Cluster)*

**Nebulae**
NGC1499 *(California)*, M1, M42 *(Orion)*, M43, M78, NGC2392 *(Eskimo)*, NGC3242 *(Ghost of Jupiter)*, M97 *(Owl)*

**Multiple Star Systems**
Beta Orionis *(Rigel)*, Alpha Geminorum *(Castor)*, Gamma Leonis *(Algieba)*, M40, Gamma Virginis *(Porrima)*, Alpha Canum Venaticorum *(CorCaroli)*, Zeta Ursae Majoris *(Mizar)*

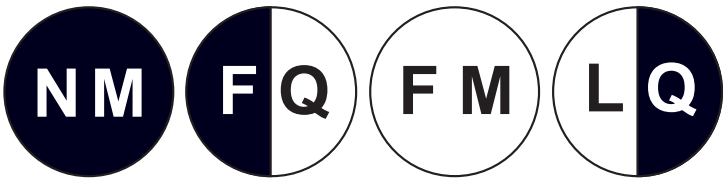
**Variable Stars**
R Leporis *(Hind's Crimson Star)*, U Orionis, L Puppis, R Leonis

**Globular Clusters**
M79, M53, M3

**Galaxies**
M81, M82, NGC3115 *(Spindle Galaxy)*, M95, M96, M105, M108, M65/M66/NGC3628 *(Leo Triplet)*, M109, M98, M99, M106, M61, M100, M84, M85, M86, M49, M87, M88, M91, M89, M90, M58, M68, M104 *(Sombrero Galaxy)*, M59, M60, M94, M64 *(Black-Eye Galaxy)*, M63 *(Sunflower Galaxy)*, M51 *(Whirlpool Galaxy)*, M83

## Upcoming Star Parties

| | |
|---|---|
| Saturday 4/8<br>9:00 am to 3:30 pm | Public Solar Observing Star Party<br>Bells Bend Outdoor Center |
| Saturday 4/22 | Private Star Party<br>Natchez Trace Parkway mile marker 412 (Water Valley Overlook) |
| Friday 4/28<br>8:30 pm to 10:30 pm | Public Star Party<br>Bells Bend Outdoor Center |
| Saturday 5/13<br>8:30 pm to 10:30 pm | Public Star Party<br>Long Hunter State Park |
| Saturday 5/27 | Private Star Party<br>Natchez Trace Parkway mile marker 435.3 |




Apr 26 May 25 | Apr 3 May 2 | Apr 11 May 10 | Apr 19 May 18

**Happy Birthday Bart Bok**
**by Robin Byrne**

This month we celebrate the life of a man who helped us to better understand our galaxy and the formation of stars, and who enjoyed sharing his discoveries with all the people. Bartholomeus Jan Bok was born April 28, 1906 in Hoorn, Holland. His interest in astronomy began at an early age, and by the time he was 13, he knew he would be an astronomer. While in high school, Bart was active in an astronomy club and wrote an astronomy article for The Hague's newspaper.

In 1924, Bart Bok entered the Sterrewacht in Leiden to study astronomy. Among his teachers were Ejnar Hertzsprung and Jan Oort. In 1927, he began his graduate work in Groningen. The following year, Bok attended the Third General Assembly of the International Astronomical Union, where he met two people who would change his life. First, he met Harlow Shapley, whom Bok had admired since childhood. Shapley invited Bok to come to Harvard to continue his graduate work, which he did the next year. Second, Bart met Priscilla Fairfield, an American astronomer. After much persuasion on Bok's part, they married on September 9, 1929, only two days after Bok arrived in the United States. Bok completed his PhD in July of 1932.

Bart Bok stayed on at Harvard for the next 25 years. While there, his research concentrated on the structure of the Milky Way. He and Priscilla worked together as a team on such areas as the structure and evolution of star clusters and mapping the spiral arms of the Milky Way. His study of interstellar gas and dust led to studying star formation. In particular, Bok was interested in small dark nebulae where star formation occurs. These dark regions are now known as Bok globules. While at Harvard, Bok initiated a program in radio astronomy, which he also promoted elsewhere. Bok helped to establish the National Radio Astronomy Observatory program.

Bok enjoyed teaching both undergraduate and graduate courses. He especially enjoyed the introductory level courses, where his enthusiastic teaching style grabbed the attention of several students who went on to major in astronomy. Bok felt it was

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**Bart Bok, continued**

important to popularize astronomy and make it accessible to everyone. In 1941, Bart and Priscilla published their book, "The Milky Way."

In 1955, Bart and Priscilla moved to Australia, where Bok was given the position of director of the Mount Stromlo Observatory. Here, he encouraged work in both the radio and optical wavelengths and oversaw the establishment of the Anglo-Australian Observatory at Siding Springs. Bok also established the Graduate School of Astronomy at the university. Bok's presence attracted a number of American scientists to do their research in Australia, including Walter Baade, Harlow Shapley, Paul Hodge, and a former professor of mine and Adam's, Frank Bradshaw Wood, who was known to start a story with the immortal line, "I remember back in Australia..."

In 1966, Bart and Priscilla returned to the United States, where Bok took the position of director of the Steward Observatory at the University of Arizona. Here he continued working on regions of star formation. After Priscilla's death in 1975, Bok cut back on many of his activities. He was finally brought back into action as he became involved with the development of what was then called the NASA Large Space Telescope, but which we now know as the Hubble Space Telescope. This was Bok's last big project. Bart Bok died August 5, 1983 at the age of 77, although he was very active and continued to be involved with research up to the very end.

When I was in graduate school, "Bok and Bok" was synonymous with all there was to know about galaxies, and their writings were considered required reading for any respectable galaxy course. Although Bart and Priscilla brought so much new knowledge about our Milky Way to the scientific community, like so many successful scientists, Bok felt that an equally important part of his career involved bringing astronomy to all the people, not just the academics. In many ways his last project, the Hubble Space Telescope, embodies Bok's philosophy and life. HST has brought about a tremendous amount of scientific understanding about our own galaxy, as well as others. But the images from Hubble have also made astronomy accessible to the general public by sharing the beauty of our universe and the mysteries that make astronomy so enjoyable. I think Bart Bok would be very pleased.

**References:**

Bright Sparcs-The 1997 Australian Science Festival Important Scientists Web Page

Nat'l Academy Press, Biographical memoirs (1994), pages 72-94, in chapter Bart J. Bok

**From the President, continued**

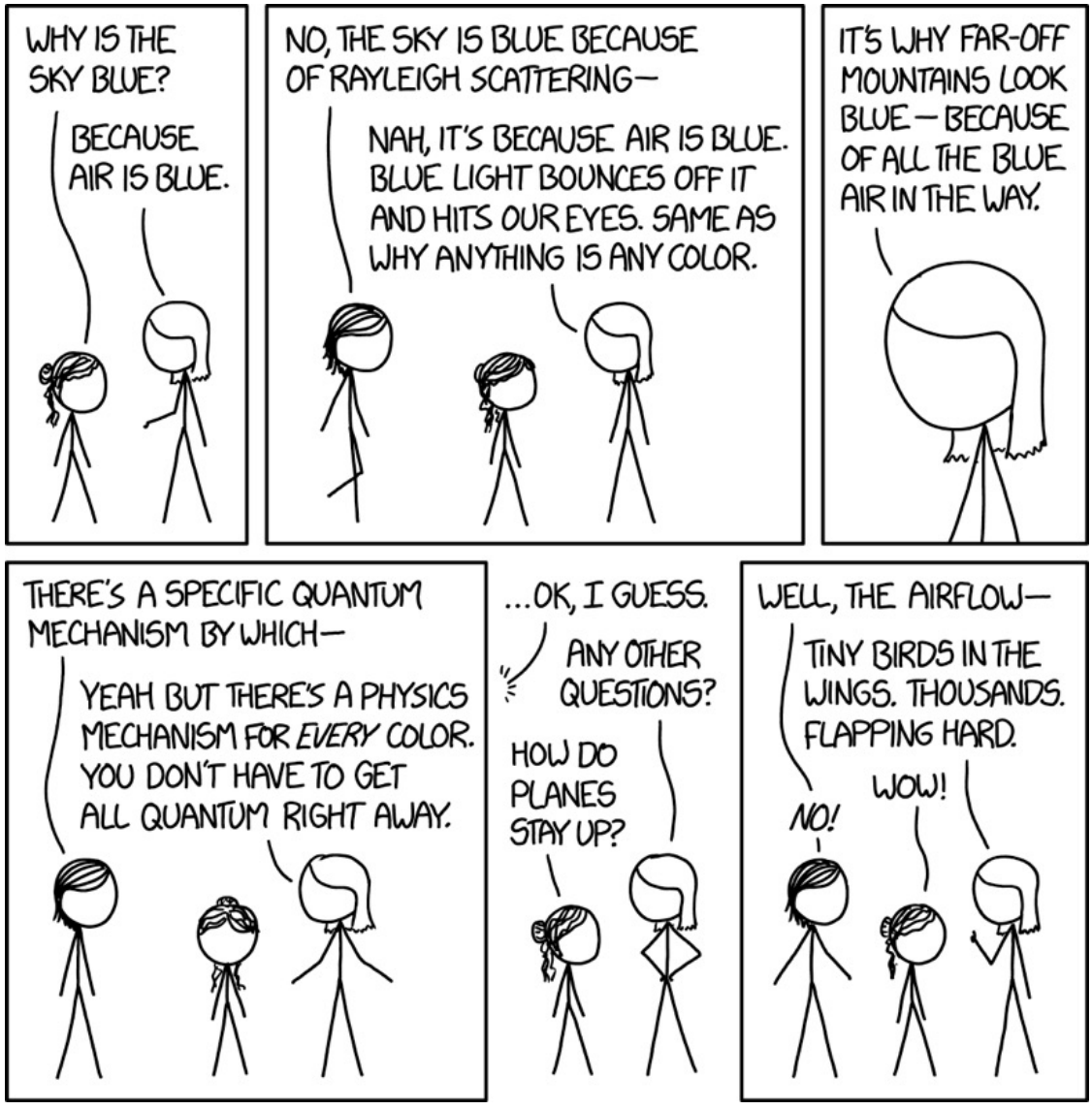
helps a viewer grasp what they are seeing. A link on Mare Imbrium tells about the March 17, 2013 explosion that occurred when a small bolder hit that area.

**Solar Walk 2** – Touring the planets on a smart phone using this app is very cool. The graphics are stunning. It allows you to zoom in and out to get a perspective on any object from anywhere in the solar system. The 3D mode provides a representation of the inside of each of the planets. You can hook up Solar Walk to your TV and enjoy it on a larger screen as well.

But you know, regardless of how good these apps are now or ever become, there is nothing that will ever compare to viewing the universe with your own eyes through an eyepiece.

Gary Eaton

xkcd



**What It's Like on a TRAPPIST-1 Planet**
**By Marcus Woo**

With seven Earth-sized planets that could harbor liquid water on their rocky, solid surfaces, the TRAPPIST-1 planetary system might feel familiar. Yet the system, recently studied by NASA's Spitzer Space Telescope, is unmistakably alien: compact enough to fit inside Mercury's orbit, and surrounds an ultra-cool dwarf star—not much bigger than Jupiter and much cooler than the sun.

If you stood on one of these worlds, the sky overhead would look quite different from our own. Depending on which planet you're on, the star would appear several times bigger than the sun. You would feel its warmth, but because it shines stronger in the infrared, it would appear disproportionately dim.

This artist's concept allows us to imagine what it would be like to stand on the surface of the exoplanet TRAPPIST-1f, located in the TRAPPIST-1 system in the constellation Aquarius.
Credit: NASA/JPL-Caltech/T. Pyle (IPAC)

"It would be a sort of an orangish-salmon color—basically close to the color of a low-wattage light bulb," says Robert Hurt, a visualization scientist for Caltech/IPAC, a NASA partner. Due to the lack of blue light from the star, the sky would be bathed in a pastel, orange hue.

But that's only if you're on the light side of the planet. Because the worlds are so close to their star, they're tidally locked so that the same side faces the star at all times, like how the Man on the Moon always watches Earth. If you're on the planet's dark side, you'd be enveloped in perpetual darkness—maybe a good thing if you're an avid stargazer.

If you're on some of the farther planets, though, the dark side might be too cold to survive. But on some of the inner planets, the dark side may be the only comfortable place, as the light side might be inhospitably hot.
On any of the middle planets, the light side would offer a dramatic view of the inner planets as crescents, appearing even bigger than the moon on closest approach.

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**TRAPPIST-1, continued**

The planets only take a few days to orbit TRAPPIST-1, so from most planets, you can enjoy eclipses multiple times a week (they'd be more like transits, though, since they wouldn't cover the whole star).

Looking away from the star on the dark side, you would see the outer-most planets in their full illuminated glory. They would be so close—only a few times the Earth-moon distance—that you could see continents, clouds, and other surface features.

The constellations in the background would appear as if someone had bumped into them, jostling the stars—a perspective skewed by the 40-light-years between TRAPPIST-1 and Earth. Orion's belt is no longer aligned. One of his shoulders is lowered.

And, with the help of binoculars, you might even spot the sun as an inconspicuous yellow star: far, faint, but familiar.

Want to teach kids about exoplanets? Go to the NASA Space Place and see our video called, "Searching for other planets like ours".

This article is provided by NASA Space Place.
With articles, activities, crafts, games, and lesson plans, NASA Space Place encourages everyone to get excited about science and technology.
Visit spaceplace.nasa.gov to explore space and Earth science!

Contribute to *The Eclipse*!
eclipse@bsasnashville.com!

## Barnard-Seyfert Astronomical Society
## Minutes of a Regular Meeting of the Board of Directors
## Held On Wednesday, March 1, 2017.

The regular meeting of the Board of Directors of the Barnard-Seyfert Astronomical Society was held March 1, 2017, at Glendale United Methodist Church, 900 Glendale Lane, Nashville, TN 37204. Present were Spencer Buckner, Gary Eaton, Drew Gilmore, Tom Guss, Bud Hamblen, Todd Nannie, Keith Rainey and Theo Wellington. Gary called the meeting to order at about 7:30 PM. Gary then asked for a motion to approve the minutes for the February 1, 2017, board meeting as printed in the March, 2017, issue of the Eclipse. Spencer so moved, Keith seconded, and the minutes were approved by voice vote. Tom reported that there was $2,849.44 in the checking account and $1,870.15 in the savings account.

The club has approximately 105 members.

About 20 attended the private star party at the Water Valley Overlook.

Upcoming star parties were discussed: March 4 public star party at Shelby Bottoms Nature Center; March 24-26 dark sky celebration weekend held by the state park service at Pickett State Park; March 25 private star party at Natchez Trace mile marker 435.3; March 31 public star party at Bowie Nature Park; April 1 star party request from Brentwood Baptist Church and a later star party request from First Baptist Church in downtown Nashville.

Awarding a prize at the upcoming Middle Tennessee Science and Engineering Fair was discussed. The club will award prizes for the best astronomy related entries and invite the winners to present at a membership meeting of the club.

Resolution 2017-03-01-1

It is resolved to award prizes sponsored by the Barnard Seyfert Astronomical Society to astronomy related entries at the Middle Tennessee Science and Engineering Fair being held at Belmont University on March 17, 2017. First prize is $100 plus 1 year family membership in the BSAS. Second prize is $50 plus 1 year family membership. Third prize is $25 plus 1 year family membership. If there are no qualifying entries no prize will be awarded.

Motion was made by Theo, seconded by Spencer, and approved by voice vote.

Meeting programs were discussed. The schedule looks as follows: Derrick Rohl to present in March, the OPT and SBIG representatives in April, the MSFT award recipient and/or Paul Lewis in May, Jana Ruth Ford on the Night Sky Network in June, a “What’s Up?” in July, the solar eclipse in August, observations made by members of last month’s solar eclipse in September, telescope maintenance in October, astronomy toy wish list in November, the pot luck dinner in December with program still to be determined.

A club-sponsored event for the solar eclipse was discussed and the board decided not to attempt to hold an event. Drew is putting links to eclipse related web sites and requests for

## Minutes of a Regular Meeting of the Board of Directors, continued

participation on the club's web site. Members will be encouraged to help at non-club events as they desire.

Solar eclipse glasses are being distributed to club members by Theo.

Todd is collecting a database of the club-owned equipment to give the loaner program a boost.

Miss K. C. Katalbas has volunteered to help with social media.

Repairs to one of the club's dobsonian telescopes was discussed.

Resolution 2017-03-01-2

Resolved to authorize the necessary and proper expenses for Keith to repair the telescope.

Motion was made by Spencer, seconded by Todd and adopted by voice vote.

There being no further business, the meeting was adjourned about 9:00 PM.

Respectfully submitted,

Bud Hamblen
Secretary

**Next BSAS meeting**
**April 19, 2016, 7:30 pm**

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

*Topic: The Tennessee and Alabama Meteorite Impact Sites*
*JanaRuth Ford, Assistant Professor at MTSU, Physics and Astronomy Department*

*Terrestrial impact structures offer astronomers and geologists opportunities to study the impact cratering process. Tennessee has four structures of interest. Information gained over the last century and a half concerning these four sites and one in Alabama has changed perspectives on impact cratering and may lead to a better understanding of other terrestrial surfaces in our Solar System or even extrasolar planets in the future.*

This image, taken by the JunoCam imager on NASA's Juno spacecraft, highlights a swirling storm just south of one of the white oval storms on Jupiter. The image was taken on March 27, 2017, at 2:12 a.m. PDT (5:12 a.m. EDT), as the Juno spacecraft performed a close flyby of Jupiter. At the time the image was taken, the spacecraft was about 12,400 miles (20,000 kilometers) from the planet.

Citizen scientist Jason Major enhanced the color and contrast in this image, turning the picture into a Jovian work of art. He then cropped it to focus our attention on this beautiful example of Jupiter's spinning storms.

JunoCam's raw images are available for the public to peruse and process into image products at: missionjuno.swri.edu/junocam. More information about Juno is at www.nasa.gov/juno and missionjuno.swri.edu

Credits: NASA/JPL-Caltech/SwRI/MSSS/Jason Major

**Barnard-Seyfert Astronomical Society**
**Minutes of the Monthly Membership Meeting**
**Held On Wednesday, March 15, 2017.**

The Barnard-Seyfert Astronomical Society held its monthly meeting at the Glendale United Methodist Church, 900 Glendale Lane, Nashville, Tennessee, on Wednesday, March 15, 2017. About 30 members were present.

Gary Eaton called the meeting to order at 7:30pm. The minutes of the February 15 meeting as printed in the March issue of the Eclipse were adopted by voice vote. The club now has 103 members. Gary introduced a guest, Mr. Frank Eaton. John Walker said that a friend has a 60mm Coronado hydrogen alpha telescope on offer for about $1,000. The location of the Coronado is Hopkinsville, Ky. About 20 persons attended the private star party at the Water Valley Overlook on February 25.

Gary announced upcoming star parties and outreach opportunities: Pickett State Park April 24-26 – astronomy weekend. Bells Bend Outdoor Center March 24 from 7:30 to 9:00 PM – Sierra Club After School Outing. About 20-30 attendees are expected and telescopes and help are requested. Natchez Trace mile marker 435.3 March 25 – private star party. Bowie Nature Park March 31 from 7:30 to 10:00 PM – public star party. Brentwood Baptist Church rear parking lot April 1 from 7:30 to 9:00 PM. About 300-400 students are expected and telescopes and help are requested. Boxwell Boy Scout Reservation April 8. Telescopes and help requested. Centennial Park April 22 from 11:00 AM to 6:00 PM – solar observing at Nashville's Earth Day Festival. Water Valley Overlook April 22 – private star party. Pickett State Park April 22 – International Dark-Sky Association Celebration. Bells Bend Outdoor Center April 28 from 8:30 to 10:30 PM – public star party. Fall Creek Falls State Park May 26-28 – Tennessee Spring Star Party. August 21 – total solar eclipse.

Derrick Rohl made a presentation describing research on rotational properties of jovian trojan asteroids.

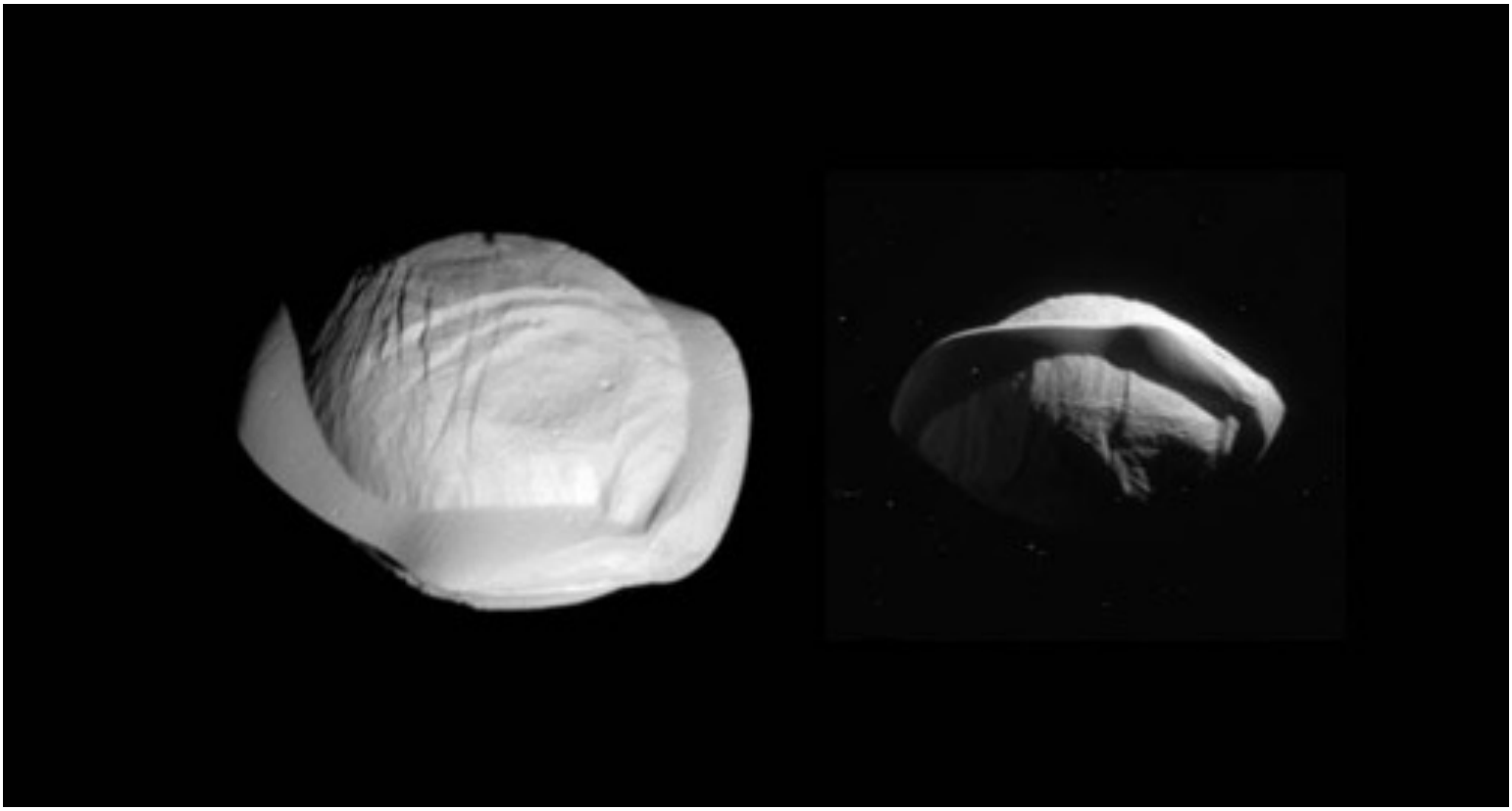
Lonnie Puterbaugh said that there was an outreach opportunity on the evening of April 8 at the Parnell site at Boxwell. Solar telescopes would be needed on May 20.

There being no further business the meeting was adjourned at 9:00pm.

Respectfully submitted,

Bud Hamblen

Secretary



These two images from NASA's Cassini spacecraft show how the spacecraft's perspective changed as it passed within 15,300 miles (24,600 kilometers) of Saturn's moon Pan on March 7, 2017. This was Cassini's closest-ever encounter with Pan, improving the level of detail seen on the little moon by a factor of eight over previous observations.

The views show the northern and southern hemispheres of Pan, at left and right, respectively. Both views look toward Pan's trailing side, which is the side opposite the moon's direction of motion as it orbits Saturn.

Cassini imaging scientists think that Pan formed within Saturn's rings, with ring material accreting onto it and forming the rounded shape of its central mass, when the outer part of the ring system was quite young and the ring system was vertically thicker. Thus, Pan probably has a core of icy material that is denser than the softer mantle around it.

The distinctive, thin ridge around Pan’s equator is thought to have come after the moon formed and had cleared the gap in the rings in which it resides today. At that point the ring was as thin as it is today, yet there was still ring material accreting onto Pan. However, at the tail end of the process, that material was raining down on the moon solely in (or close to) its equatorial region. Thus, the infalling material formed a tall, narrow ridge of material. On a larger, more massive body, this ridge would not be so tall (relative to the body) because gravity would cause it to flatten out. But Pan’s gravity is so feeble that the ring material simply settles onto Pan and builds up. Other dynamical forces keep the ridge from growing indefinitely.

Image Credit: NASA/JPL/Space Science Institute

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.

Monday, March 27, 2017

## Star-gazing

**John Walker led a night of star-gazing for members of Boy Scout Troop 772 at the Water Valley Overlook on Natchez Trace Parkway on March 18. Walker, a Bon Aqua resident who is a member of the Barnard-Seyfert Astronomical Society in Nashville, focused his computerized scope at Venus, Jupiter, the red giant Betelgeuse ("Beetlejuice"), Rigel and a few binary stars and galaxies on a clear evening. With correct programming, the computerized instrument can find 40,000 celestial bodies on command, and is able to magnify the stars by a factor of 13.**

## Centerville Police report

The Centerville Police Department reported the following matters in recent driving while his license was revoked and resisting arrest. According to Sgt. James offenses during a traffic stop for a broken taillight. According to Officer Patrick

## Special crop grants availab

The Tennessee ment of Agricult cepting applicatio USDA Special Block Grant Prog Asst. Commis Harlan said the and information r apply are ava www.tn.gov/agri ic/ag-businesses crop.

Proposals are April 21 and sho mitted by tn.scbg@tn.gov.

"Funds from crop block gran the opportunity research, expan provide educatio mote the specia dustry," Harlan

Proposals are and ranked ac criteria provid website. Applic notified by June the agency inte ent their proje USDA. First-t ents have a func $25,000.

Universities, cooperatives, and industry nity-based or may submit a p funding. The pr to support proj rectly affect m nessee produce a positive, long pact on Tenne ture.

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*Hickman County Times*