

The ECLIPSE

July
2017

The Newsletter of the Barnard-Seyfert Astronomical Society

Next Membership Meeting:

July 19, 2017, 7:30 pm
Cumberland Valley
Girl Scout Council Building
4522 Granny White Pike

Topic TBA

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From the President

Greetings,

So, the total eclipse of 2017 is just a few weeks away. By now most of us have probably heard a presentation or two about it and read numerous articles in astronomy magazines or on-line. It's time to finalize viewing plans. I'm a list guy, so here's my top 10 list of eclipse reminders:

- Whatever you do, don't settle for viewing just a partial eclipse. Make the effort to view totality and the closer you are to the center line, the better. Seconds matter. You can add 44 seconds of totality by driving less than 25 miles north of Nashville.
- Arrive early to your ideal viewing spot. Traffic will likely be terrible, so be there well before first contact to relax and enjoy the anticipatory moments leading up to the event. Have a Plan B in case cloudy skies are predicted where you originally planned to be. Go to eclipsophile.com for help.
- You may not agree, but I say, unless you are very well prepared, leave photography to the pros. Taking quality photos of an eclipse is challenging and can keep you from enjoying the moment. There will be plenty of photos taken.
- Be very attentive. Look west for the approaching umbral shadow on the ground and east when it retreats. Just before totality, look for Bailey's Beads and then the Diamond Ring caused by the moon's valleys.
- Don't forget to take off your eclipse viewing glasses or whatever solar filter you plan to use during totality. You will want to experience the natural darkness.



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Observing Highlights July and August

Nebulae

NGC3242 (*Ghost of Jupiter*),
M97 (*Owl*), NGC6302 (*Bug*),
NGC6309 (*Box*),
NGC6543 (*Cat's Eye*),
M20 (*Trifid*), M8 (*Lagoon*),
M16 (*Eagle*), M17 (*Swan*),
M57 (*Ring*),
NGC6818 (*Little Gem*),
NGC6826 (*Blinking Planetary*),
M27 (*Dumbbell*)

Multiple Star Systems

Gamma Leonis (*Algieba*),
M40, Gamma Virginis
Alpha Canum Venaticorum
Zeta Ursae Majoris (*Mizar*),
Epsilon Bootis (*Izar or Pulcherrima*)
Mu Bootis (*Alkalurops*),
Beta Scorpii (*Acrab*),
Alpha Herculis (*Rasalgethi*),
Epsilon Lyrae (*Double Double*),
Beta Cygni (*Albireo*)

Galaxies

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,
M104 (*Sombrero Galaxy*),
M59, M60, M94,
M64 (*Black-Eye Galaxy*),
M63 (*Sunflower Galaxy*),
M51 (*Whirlpool Galaxy*),
M83, M101/M102,
NGC 6822 (*Barnard's*)

Open Clusters

Mel111 (*Coma Star Cluster*),
M6 (*Butterfly*), M7, M23,
M21, M18, M25, M26,
M11 (*Wild Duck*)

Globular Clusters

M68, M53, M3, M5, M80, M4,
M107, M13, M12, M10, M62, M19,
M92, M9, M14, M28, M69, M22,
M70, M54, M56, M55, M71

Upcoming Star Parties

Saturday 7/1 9:00 pm to 11:00 pm	Public Star Party Edwin Warner Park
Saturday 7/22	Private Star Party Natchez Trace Parkway mile marker 435.3
Friday 8/11 8:30 pm to 10:30 pm	Public Star Party Bowie Nature Park (Fairview)
Saturday 8/19	Private Star Party Natchez Trace Parkway mile marker 412 (Water Valley Overlook)
Friday 8/25 8:30 pm to 10:30 pm	Public Star Party Bells Bend Outdoor Center



July 23
Aug 21



July 30
Aug 29



July 8
Aug 7



July 16
Aug 14

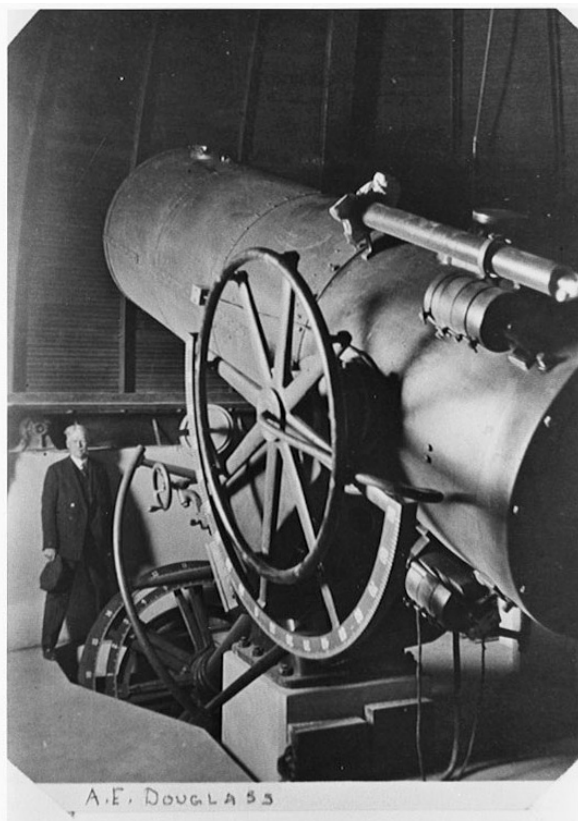
Happy Birthday Andrew Ellicott Douglass by Robin Byrne

This month, we celebrate the life of a man who started in astronomy, but eventually found himself to be an expert on tree rings, instead. Andrew Ellicott Douglass was born in Windsor, Vermont on July 5, 1867. At the age of 18, he began attending Trinity College in Hartford, Connecticut, where he majored in astronomy, math and physics.

After graduating in 1889, Douglass was part of an expedition by the Harvard College Observatory to Arequipa, Peru. They helped establish the site for a new observatory that would be used for southern hemisphere photographic surveys. It became known as Boyden Station. The data taken of stars was analyzed primarily by Pickering's Women back at Harvard. So the work of Henrietta Leavitt on Cepheid variable stars, and Annie Cannon's development of the spectral classification system can be linked to this observatory.

In 1894, Douglass moved to Flagstaff, Arizona to work at the Lowell Observatory. Douglass was essentially considered second in command, filling the role of acting director whenever Percival Lowell was out of town. However, Douglass and Lowell had a falling out when Douglass expressed his doubts about features Lowell claimed were canals on Mars. In 1901, Douglass was fired.

For a few years, Douglass worked as a probate judge before being hired by the University of Arizona in 1909. He was made an Assistant Professor of Physics and Geography. During this time, he spent eight years unsuccessfully trying to raise funds for a large telescope in Tucson. Meanwhile, Douglass was the Head of the Physics and Astronomy Department, served as the university's interim president during the 1910-1911 academic year, and was finally made Dean of the College of Letters, Arts, & Sciences.



Prof. A. E. Douglass and the original Steward Observatory 36-inch Telescope (moved to Kitt Peak in 1963)

Andrew Ellicott Douglass, continued

In 1916, Douglass' dream of a large telescope in Tucson started to come true. An anonymous loan gave the university \$60,000 to build such a telescope. Eventually, the donor was identified as Lavinia Steward, who had an interest in astronomy and wanted to commemorate her late husband, Henry. World War I interfered with its construction, since the best manufacturers of large mirrors were in Europe, so an American company had to be found. Ultimately, the Spenser Lens Co. in Buffalo, New York was given the contract for the 36 inch Newtonian telescope. Six years after the project began, the Steward Observatory was officially dedicated and ready for business.

It was during this time that Douglass continued his study of tree rings that had begun at Lowell Observatory. One of the first patterns he established is that tree rings correlate with rainfall. Not too surprising, years with more rain were indicated by more growth. Douglass even taught a class on dendrochronology - the use of tree rings to determine the date of an event. His expertise on tree rings brought Douglass to the attention of the American Museum of Natural History. Douglass was contacted to help determine the sequence of events associated with prehistoric ruins in the American Southwest. After three years of study, Douglass was able to establish that samples from an Aztec Ruin in New Mexico all came from the same two-year period, while samples from another site were 25 years older, which, after more study, was later modified to 40-45 years older.

Unfortunately, the museum cut off funding for further research of this subject in 1920, but Douglass was able to get backing through the National Geographic Society in 1922. The resulting project became known as the Beam Expeditions. From 1923 to 1929, Douglass studied samples throughout the Southwest, ultimately establishing a timeline correlating to tree rings dating all the way back to the year 700 CE. This relationship allowed for accurate dating of archeological ruins throughout the region.

Douglass connected his interest in tree rings with his career in astronomy by studying the link between tree rings and the sunspot cycle. Using a precursor to Fast Fourier Transfer Series, which pull out repeating patterns, Douglass analyzed tree rings for repeating patterns and cycles. He did the same analysis to sunspot frequency. Douglass studied over 52,000 rings on 305 trees from the region between the Rocky Mountains and the coast. Relating the patterns to specific years, Douglass found that the tree ring data showed no cycle between the years of 1650 and 1725. That was of great concern. However, three years later, Maunder published his description of the almost complete lack of sunspots from 1645 to 1715, which is now known as the Maunder Minimum. That correlation added a tremendous boost to Douglass' work. Overall, Douglass found that

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Andrew Ellicott Douglass, continued

trees in Europe experienced more growth during sunspot maximum, but also a lesser boost of growth at minimum. Meanwhile, the sequoias in the western United States had a stronger growth correlation with the Sun's 22-year sunspot cycle. Ultimately, all of this pointed to a connection between tree growth, climate, and the sunspot cycle that is still not fully understood.

In 1937, Douglass established the Laboratory of Tree-Ring Research at the University of Arizona. He served as its director until his retirement in 1958.

A. E. Douglass died March 20, 1962 in Tucson, Arizona. His legacy lives on in the use of tree rings to study the history of: forest fires, volcanic activity, hurricane activity, the movement of glaciers, rainfall, geologic events, and floods. There are even craters on both the Moon and Mars named after him. While you peer at the Sun during our current solar minimum, bemoaning the lack of sunspots, think about their connection to climate and tree growth, and the man who figured it all out - A. E. Douglass.

References

[Chrono-Biographical Sketches Douglass, Andrew Ellicott](#) (United States 1867 - 1962)
by Charles H. Smith 2005

[The Douglas Archives: A collection of historical and genealogical records A.E. Douglass](#)

Next BSAS meeting
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Cumberland Valley
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4522 Granny White Pike

Topic: TBA

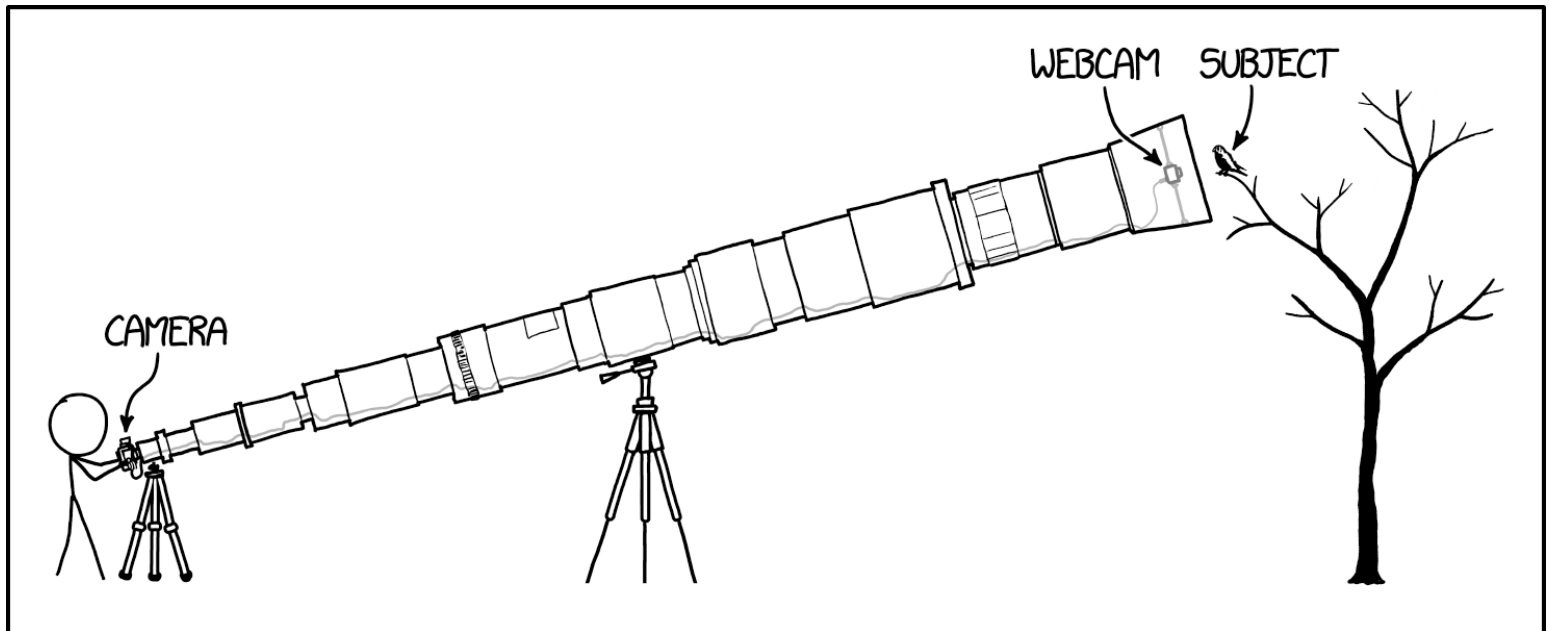
Be sure to RSVP for a special BSAS meeting August 16, 2017, to be held at the Sudekum Planetarium at Adventure Science Center. Details [here!](#)

From the President, continued

- With the corona visible during totality, be prepared to identify prominences, polar plumes, helmet streamers and coronal loops. Cool stuff but you need to know what to look for.
- Briefly look around during totality. You should be able to see bright stars and planets. If you are in an open area, you should see a 360 degree sunrise/sunset glow.
- Use other senses besides your sight. If you are viewing the eclipse from a natural area, listen for changes in animal sounds and feel the drop in temperature.
- Be safe. Inspect your eye protection before the eclipse, protect your eyes during the entire partial phase and don't look directly at the sun through a camera, telescope or binoculars while using your solar glasses. More safety tips can be found at eclipse2017.nasa.gov/safety
- An audio recording might be fun. Capture your descriptions of what you are seeing or thinking or what the people around you say. Yes, it's okay to express yourself during an eclipse, most people do.

Gary Eaton

xkcd



TELEPHOTO TIP: IF YOU ADD ENOUGH CONVERTERS AND EXTENDERS, YOU DON'T ACTUALLY NEED A FANCY LENS.

The Shape of the Solar System

By Marcus Woo

When Stamatios (Tom) Krimigis was selected for the Voyager mission in 1971, he became the team's youngest principal investigator of an instrument, responsible for the Low Energy Charged Particles (LECP) instrument. It would measure the ions coursing around and between the planets, as well as those beyond. Little did he know, though, that more than 40 years later, both Voyager 1 and 2 still would be speeding through space, continuing to literally reshape our view of the solar system.

The solar system is enclosed in a vast bubble, carved out by the solar wind blowing against the gas of the interstellar medium. For more than half a century, scientists thought that as the sun moved through the galaxy, the interstellar medium would push back on the heliosphere, elongating the bubble and giving it a pointy, comet-like tail similar to the magnetospheres—bubbles formed by magnetic fields—surrounding Earth and most of the other planets

“We in the heliophysics community have lived with this picture for 55 years,” said Krimigis, of The Johns Hopkins University Applied Physics Laboratory in Laurel, Maryland. “And we did that because we didn’t have any data. It was all theory.”

But now, he and his colleagues have the data. New measurements from Voyager and the Cassini spacecraft suggest that the bubble isn’t pointy after all. It’s spherical.

Their analysis relies on measuring high-speed particles from the heliosphere boundary. There, the heated ions from the solar wind can strike neutral atoms coming from the interstellar medium and snatch away an electron. Those ions become neutral atoms, and ricochet back toward the sun and the planets, uninhibited by the interplanetary magnetic field.

Voyager is now at the edge of the heliosphere, where its LECP instrument can detect those solar-wind ions. The researchers found that the number of measured ions rise and fall with increased and decreased solar activity, matching the 11-year solar cycle, showing that the particles are indeed originating from the sun.

Meanwhile, Cassini, which launched 20 years after Voyager in 1997, has been measuring those neutral atoms bouncing back, using another instrument led by Krimigis, the Magnetosphere Imaging Instrument (MIMI). Between 2003 and 2014, the number of measured atoms soared and dropped in the same way as the ions, revealing that the latter begat the former. The neutral atoms must therefore come from the edge of the heliosphere.

If the heliosphere were comet-shaped, atoms from the tail would take longer to arrive at MIMI than those from the head. But the measurements from MIMI, which can detect incoming atoms

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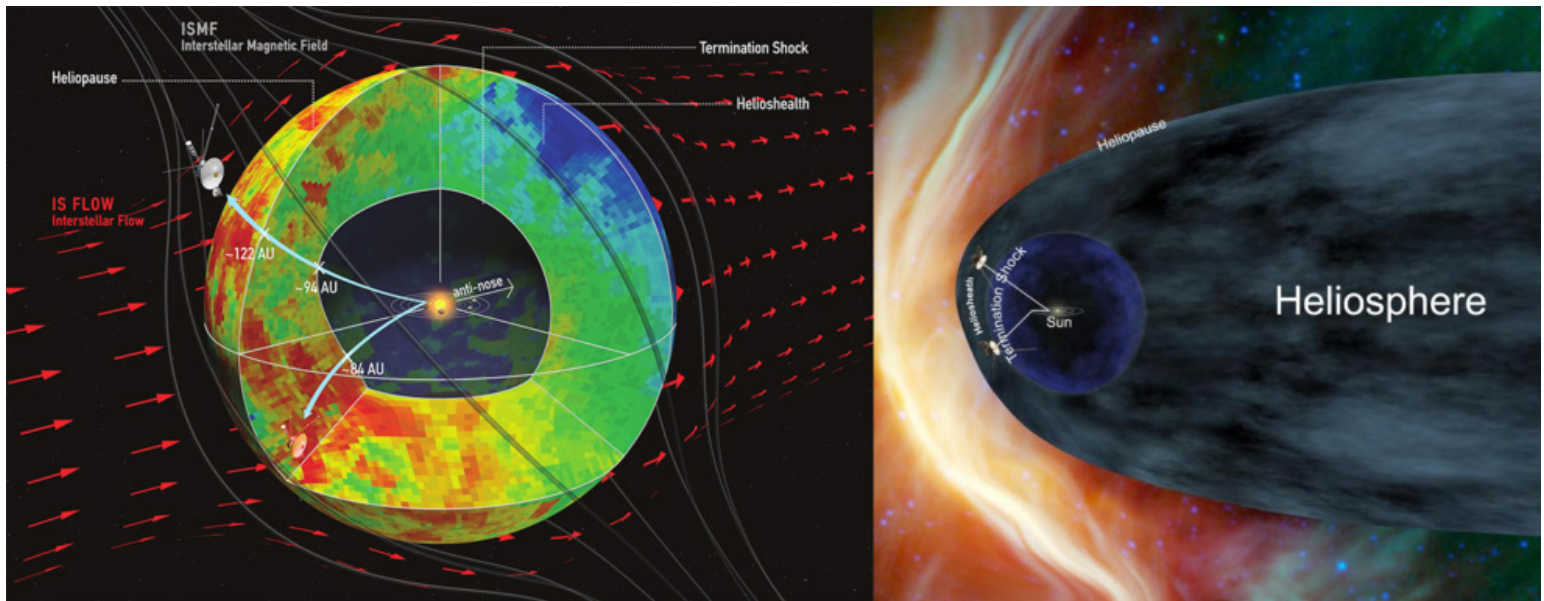
The Shape of the Solar System, continued

from all directions, were the same everywhere. This suggests the distance to the heliosphere is the same every which way. The heliosphere, then, must be round, upending most scientists' prior assumptions.

It's a discovery more than four decades in the making. As Cassini ends its mission this year, the Voyager spacecraft will continue blazing through interstellar space, their remarkable longevity having been essential for revealing the heliosphere's shape.

"Without them," Krimigis says, "we wouldn't be able to do any of this."

To teach kids about the Voyager mission, visit the [NASA Space Place](https://www.nasa.gov/spaceplace)!



New data from NASA's Cassini and Voyager show that the heliosphere – the bubble of the sun's magnetic influence that surrounds the solar system – may be much more compact and rounded than previously thought. The image on the left shows a compact model of the heliosphere, supported by this latest data, while the image on the right shows an alternate model with an extended tail. The main difference is the new model's lack of a trailing, comet-like tail on one side of the heliosphere. This tail is shown in the old model in light blue.

Image credits: Dialynas, et al. (left); NASA (right)

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!



**Barnard-Seyfert Astronomical Society
Minutes of a Regular Meeting of the Board of Directors
Held On Wednesday, June 7, 2017.**

The regular meeting of the Board of Directors of the Barnard-Seyfert Astronomical Society was held June 7, 2017, in the board room at the Girl Scouts office, Nashville, TN 37204. Present were Mike Benson, Gary Eaton (by telephone), Drew Gilmore, Tom Guss, Bud Hamblen, Rob Mahurin and Keith Rainey (presiding). Keith asked for a motion to approve the minutes of the May 3, 2017, meeting of the board. Mike moved to adopt the minutes as printed the minutes as published in the June, 2017, edition of the Eclipse. Tom seconded the motion and the minutes were approved by voice vote. Tom reported that the club had \$1,870.26 in the savings account and \$2,799.24 in the checking account.

Upcoming star parties were discussed. A make-up date in October at Cornelia Fort Airpark was not determined.

Upcoming member meetings were discussed. The June program will be a "What's Up" presented by Theo Wellington Terry Reeves. The August program will be at Adventure Science Center. An on-line reservation system may be available to assure availability of seats for members.

The possibility of a star party with Nissan North America was discussed. The date would be August 20.

The membership roster is to be supplied to Mike Benson for the Astronomical League.

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

Respectfully submitted,

Bud Hamblen
Secretary

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

**Barnard-Seyfert Astronomical Society
Minutes of the Monthly Membership Meeting
Held On Wednesday, June 21, 2017.**

The Barnard-Seyfert Astronomical Society held its monthly meeting in the City Room at the Girls Scout office, 4522 Granny White Pike, Nashville, Tennessee, on Wednesday, June 21, 2017. About 22 members signed in.

Gary Eaton called the meeting to order at 7:30pm. Spencer Buckner moved to approve the minutes of the May 17 meeting as printed in the June issue of the Eclipse, Joe Boyd seconded, and the minutes were approved by unanimous voice vote.

Keith Rainey reported that there were 112 members. Bud Hamblen noted that as of June 7 the savings account had \$1,870.26 and the checking account had \$2,799.24.

Club members had five telescopes and 45-50 guests at Bowie Nature Park on June 16, and John Walker and Chuck Schlemm had two telescopes and about 150 guests at Montgomery Bell State Park on the 17th. Upcoming star parties will be on June 23 at Bells Bend Outdoor Center, June 24 (private) at the Water Valley Overlook, and on July 1 at Warner Park Special Events Field.

The August 16 meeting will be at the Adventure Science Center. Persons planning to attend will be asked to make reservations using a web site that will be given on notices distributed by means of the Night Sky Network. The plan is to have an optional showing at 6 PM of the ASC's program about the eclipse before the meeting for which the ASC will require an admission fee, and the meeting at 7 PM in the planetarium with overflow seating in the meeting room across the lobby. Part of the reason for reservations is to see whether the overflow seating will be required. The meeting will include a panel discussion about the eclipse.

Nissan North America has asked for assistance in holding a star party at Owls Hill Nature Sanctuary, Brentwood, on Sunday, August 20, and is offering the club a \$2,500 donation. This event is in connection with Nissan's roll out of 2018 car models.

The Boy Scouts are putting on astronomy programs August 19-20 and have asked for assistance. The Girl Scouts also have asked for assistance that weekend. Requests for assistance are on the club web site.

Solar viewing glasses are still available.

Spencer Buckner commented on his recent observing run at Kitt Peak, performing photometry on star cluster candidates, and getting some pretty pictures in addition. One of his students was gathering data on star forming regions of galaxies. Data were also collected on white dwarf stars.

Theo Wellington presented "What's Up" this summer with material provided by Terry Reeves,

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Membership Meeting, continued

Steve Wheeler, Gary Eaton and others. Objects of interest included the Moon and the Sun. Finder charts presented included binocular objects (M6, M7, M8, M11, the Coat Hanger Cluster (Brocchi's Cluster) and M13. Telescopic object included M57, M27, M71, M4, M80, M17, M16, NGC6818, NGC6822, Alberio, Izar and Pulcherrima, Alkalurops, Zeta Corona Borealis, and double stars in Capricornus.

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

Respectfully submitted,

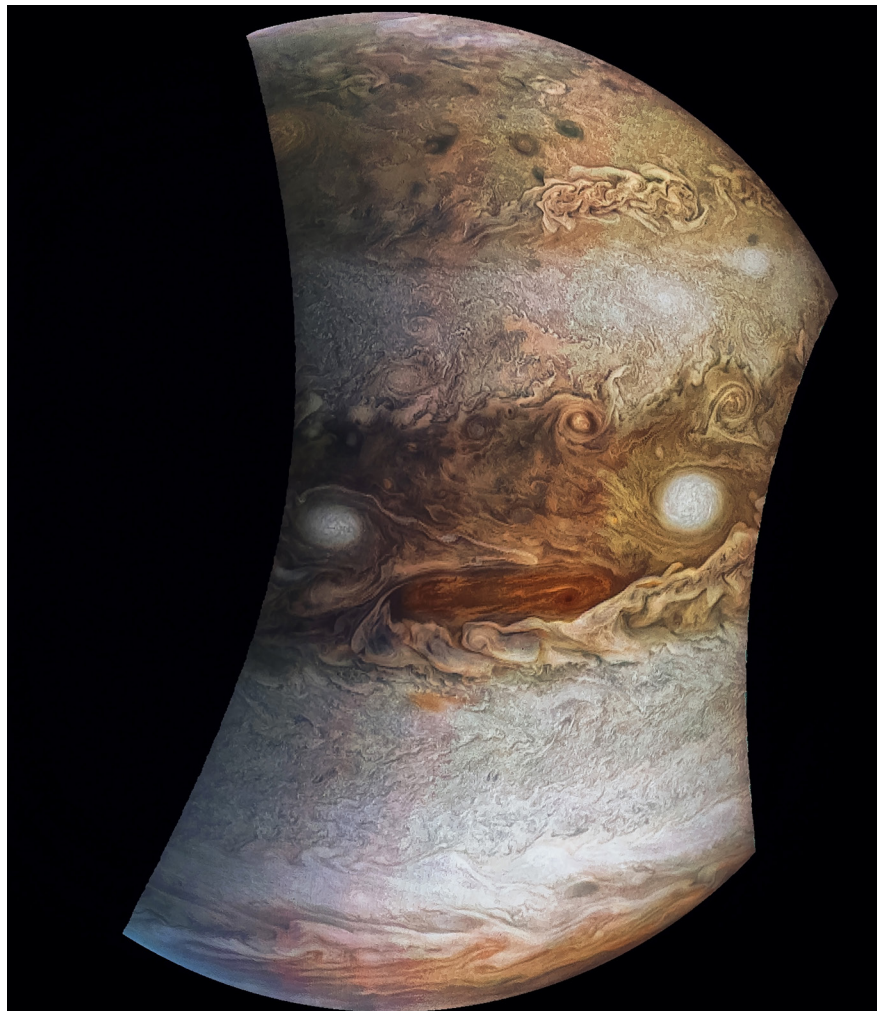
Bud Hamblen

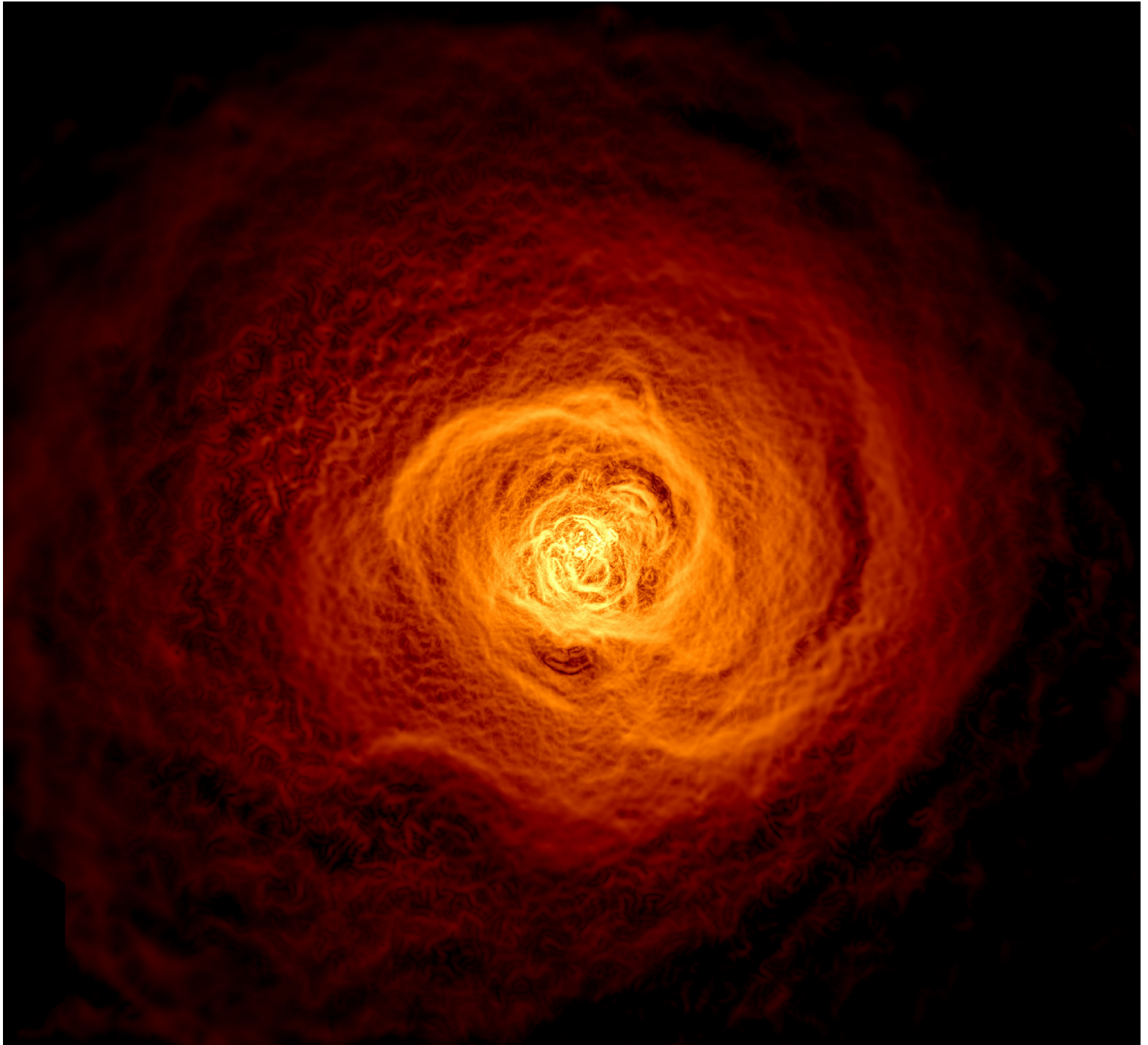
Secretary

JunoCam images aren't just for art and science - sometimes they are processed to bring a chuckle. This image, processed by citizen scientist Jason Major, is titled "Jovey McJupiterface." By rotating the image 180 degrees and orienting it from south up, two white oval storms turn into eyeballs, and the "face" of Jupiter is revealed.

The original image was acquired by JunoCam on NASA's Juno spacecraft on May 19, 2017 at 11:20 a.m. PT (2:20 p.m. ET) from an altitude of 12,075 miles (19,433 kilometers).

Credits: [NASA/JPL-Caltech/SwRI/MSSS/](#)
[Jason Major](#)





Combining data from NASA's Chandra X-ray Observatory with radio observations and computer simulations, scientists have found a vast wave of hot gas in the Perseus galaxy cluster. Spanning some 200,000 light years, the wave is about twice the size of the Milky Way galaxy.

Researchers think the wave formed billions of years ago after a small galaxy cluster grazed Perseus and caused its vast supply of gas to slosh around in an enormous volume of space.

Credit: [NASA/CXC/GSFC/S.A.Walker, et al.](#)



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.