

# The ECLIPSE

October  
2016

*The Newsletter of the Barnard-Seyfert Astronomical Society*

**Next Membership Meeting:**  
October 19, 2016, 7:30 pm  
Glendale United Methodist  
Church - Fellowship Hall  
900 Glendale Lane

*Topic: "Gaia: The Hubble of  
Astrometry" - Billy Teets,  
Dyer Observatory  
Details on page 9.*

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## From the President:

After a rainy summer, it's nice to have a run of clear skies! The autumn sky has so many fine deep sky objects to view when the sky clears, especially on a night with little or no moon.

It's also the season to find new board members for BSAS! There are no special talents needed, just the same interest in the night sky that brought you to the club in the first place. We do have fixed terms for most positions so that we don't have the same people in 5 or 10 years... we want a broad participation from members. We don't generally have huge momentous decisions, just the little ones that keep a group like this going. The board meets once a month on the first Wednesday night. If you'd like to serve, please let me or any board member know! It's a great way to help us grow and prosper.

Only like a short time ago we were 1000 days out... now we are now less than eleven months from the Great American Eclipse on August 21, 2017! Many of our local communities remain both unprepared and actually unaware that this event is coming! This is an unprecedented large event: no path this long has crossed such a populous continent in modern times. How many people will come? We don't really know. The Nashville Chamber will tell you that half the US population lives within a day's drive... and we'll be encouraging them to see totality! If you work for a local municipality, mention the eclipse and encourage them to read [Dr. Kate Russo's white paper](#) on how a community should prepare for an event like this. If you work for a large company, see if they would consider donating solar glasses to the local school. The best analogy I've heard is Bonnaroo, except happening everywhere along the path at once. (And for Tennessee that's huge: I-40 has 180 miles in the path, I-24 at least 70, 60 miles on I-75 and of course



## Officers

Theo Wellington  
President

[tmwellington@comcast.net](mailto:tmwellington@comcast.net)

Gary Eaton  
Vice-President

[gceaton@comcast.net](mailto:gceaton@comcast.net)

Tom Guss  
Treasurer

[t\\_guss@bellsouth.net](mailto:t_guss@bellsouth.net)

Bud Hamblen  
Secretary

[wrhamblen@comcast.net](mailto:wrhamblen@comcast.net)

(no one)  
Ex-officio

## Directors at Large

Mike Benson  
[ocentaurus@aol.com](mailto:ocentaurus@aol.com)

Spencer Buckner  
[BucknerS@apsu.edu](mailto:BucknerS@apsu.edu)

Jeffrey Horne  
[Jeffrey.Horne@gmail.com](mailto:Jeffrey.Horne@gmail.com)

Rob Mahurin  
[robert.s.mahurin@gmail.com](mailto:robert.s.mahurin@gmail.com)

Kris McCall  
[planetmccall@gmail.com](mailto:planetmccall@gmail.com)

Kathy Underwood  
[katy2222@comcast.net](mailto:katy2222@comcast.net)

Drew Gilmore  
Newsletter Editor  
[eclipse@bsasnashville.com](mailto:eclipse@bsasnashville.com)

## Observing Highlights October and November

**Globular Clusters**  
M56, M71, M55, M75,  
M15, M2, M72, M30

**Open Clusters**  
M11 (*Wild Duck*), M26,  
M73, M29, M39, M52

**Nebulae**  
M57 (Ring), NGC 6543 (*Cat's Eye*),  
NGC6826 (*Blinking*),  
M27 (*Dumbbell*),  
NGC7000 (*North America*),  
IC5146 (*Cocoon*), NGC7293 (*Helix*)

**Asterisms**  
Cr399 (*Coat Hanger*)

**Multiple Star Systems**  
Double-Double (*Epsilon Lyrae*)  
Albireo (*Beta Cygni*)  
Gamma Delphini

**Variable Stars**  
Mu Cephei (*Herschel's Garnet Star*)

## Upcoming Star Parties

Saturday 10/1	Private Star Party <a href="#">Natchez Trace Parkway mile marker 435.3</a>
Saturday 10/8 7:30 pm to 9:30 pm	Public Star Party <a href="#">Edwin Warner Park</a>
Saturday 10/29	Private Star Party <a href="#">Natchez Trace Parkway mile marker 412 (Water Valley Overlook)</a>
Friday 11/18 6:30 pm to 9:00 pm	Public Star Party <a href="#">Bowie Nature Park (Fairview)</a>



Oct 30  
Nov 29



Oct 8  
Nov 7



Oct 15  
Nov 14



Oct 22  
Nov 21

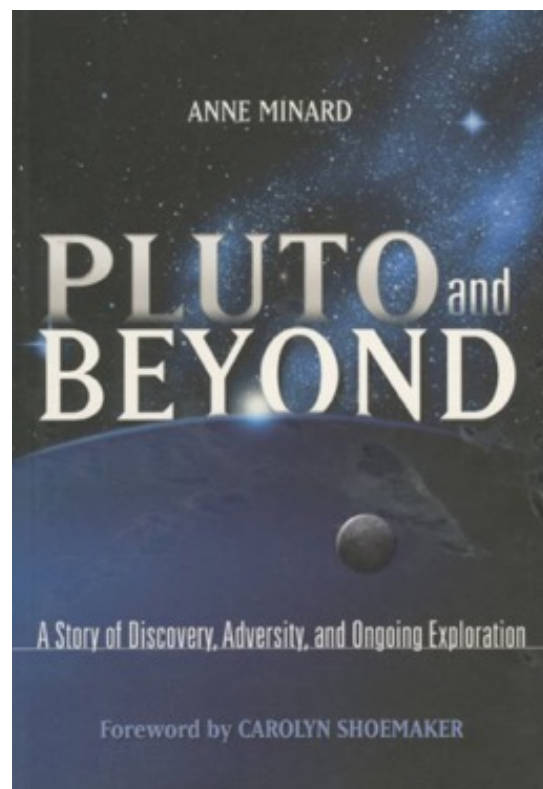
## Book Review: Pluto and Beyond reviewed by Robin Byrne

Scanning through my collection of unread books, I spotted a small book titled “Pluto and Beyond: A Story of Discovery, Adversity, and Ongoing Exploration” by Anne Minard. Based on the letter that was enclosed, it must have been sent to the Bays Mountain Astronomy Club as a preview copy, back in 2007. Apparently, it took a while for me to get to reading it.

Based on the title, I expected the book to be about the discovery of Pluto, its reclassification as a dwarf planet, and anticipation of the New Horizons Mission. I was wrong. Although these topics were covered, the theme of the book was the Lowell Observatory and all the various areas of research that have occurred there in the past, and what is happening at the present. So, strike one - misleading title.

Each chapter covers an area of research at Lowell. It begins, naturally, with Pluto, with only a small section devoted to its discovery, and a much larger section discussing the IAU’s definition of a planet vs. a dwarf planet and what that meant for Pluto. From there, we read about Vesto Slipher’s work, especially the redshifts of “spiral nebulae” and how that led to Edwin Hubble’s discovery of the velocity-distance relationship for galaxies. Other areas of research included measuring the proper motion of stars, the atmosphere composition of the gas giants, near Earth asteroids, and studying the Sun. Just about every person who worked at Lowell was mentioned, and their various areas of research. Additionally, the variety of personalities were explored. The author interviewed many of those who are still alive, and read through a myriad of journals and letters to get a sense of the people. It’s the profiles of the individuals where the author shines, exposing the wide range of personalities and some of the conflicts that arose due to clashes in style.

At the time the book was written, two major projects were in development. The first was the Navy Precision Optical Interferometer (NPOI). Now operational, the array uses up to six optical telescopes distributed in a Y-shaped pattern, with each branch of the Y allowing a separation of up to 820 feet. Now complete and in operation, the interferometer is primarily used to observe nearby stars in enough detail to resolve a disk and features, as well as provide precise measurements of their positions. There are plans to add more telescopes and increase the size of the array. The other project discussed was the construction of the Discovery Channel Telescope. When the book was written, it was not yet complete, and there were concerns about funding. In January of 2015, the telescope was declared complete. With a 4.3 meter aperture, the telescope can be used for both spectroscopy and wide field deep sky imaging. Appropriately, one area of



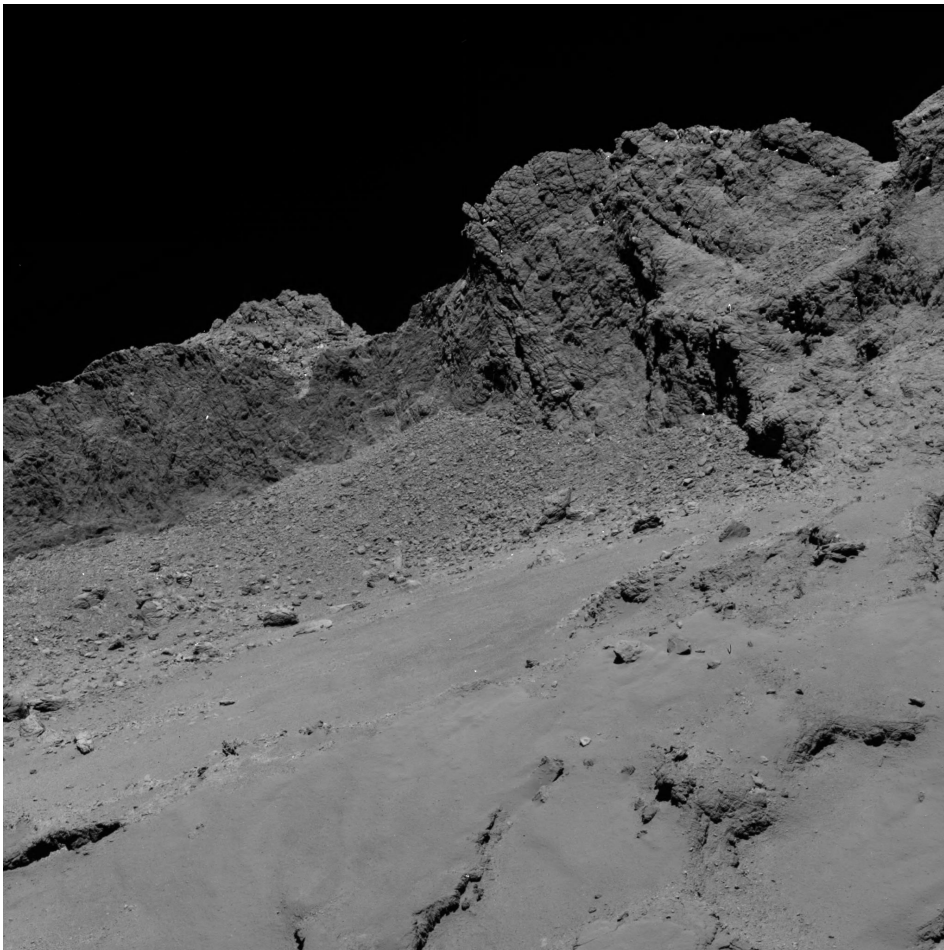
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## Pluto and Beyond, continued

research will be to study Kuiper Belt Objects, bringing Lowell Observatory full circle back to the realm of Pluto.

I already mentioned one strike against this book due to the title. The second strike is more serious. The author, Anne Minard, is a science writer and journalist, with degrees in biology. Her lack of any astronomy background is very apparent to anyone with a knowledge of the field. Almost every chapter contained at least one statement that made me shake my head, thinking, “No. That’s not quite right.” Much in the same way my students will get part of a concept right, but fill in the rest with something erroneous, Minard will start off well, but then veer into territory where she clearly doesn’t understand what she’s talking about. I found that difficult to tolerate, much less forgive.

So, I’m left with mixed emotions about “Pluto and Beyond.” The stories of the individuals and their experiences at the observatory are enjoyable and enlightening. Most of the discussion of the science is correct. But then you hit the areas that are just plain wrong, and it’s like a sudden stabbing pain in the eye. If I were grading this book the same way I grade student written reports, the wrong information would end up putting “Pluto and Beyond” in the high C/low B grade range. It’s not failing, but it could have been so much better.



A new image of comet 67P/Churyumov-Gerasimenko was taken by the European Space Agency’s (ESA) Rosetta spacecraft shortly before its controlled impact into the comet’s surface on Sept. 30, 2016. Confirmation of the end of the mission arrived at ESA’s European Space Operations Center in Darmstadt, Germany, at 4:19 a.m. PDT (7:19 a.m. EDT / 1:19 p.m. CEST) with the loss of signal upon impact.

The final descent gave Rosetta the opportunity to study the comet’s gas, dust and plasma environment very close to its surface, as well as take very high-resolution images.

The image was taken from an altitude of 167 feet (51 meters) above the comet’s surface by the spacecraft’s OSIRIS wide-angle camera on Sept. 30.

Credit: [ESA/Rosetta/MPS for OSIRIS Team MPS/UPD/LAM/IAA/SSO/INTA/UPM/DASP/IDA](#)

**Barnard-Seyfert Astronomical Society  
Minutes of a Regular Meeting of the Board of Directors  
Held On Wednesday, September 21, 2016.**

The Barnard-Seyfert Astronomical Society held its monthly membership meeting at the Glendale United Methodist Church, 900 Glendale Lane, Nashville, Tennessee, on Wednesday, September, 2016. Twenty-four members signed in. Theo Wellington called the meeting to order at 7:45pm. Theo called for a motion to approve the minutes of the August meeting as printed in the September Eclipse and the minutes were approved by unanimous voice vote. No treasurer's report was available.

Theo announced that Cheekwood will be holding a Japanese Moon Viewing Celebration on Sunday, October 16, from 4 to 9 PM. John Walker and others will participate.

Frank La Varre will be at the University of Scouting, Holy Family Catholic Church, 9100 Crockett Rd, Brentwood, Saturday, November 19.

John Walker and Chuck Schlemm will be at Montgomery State Park in November.

A public star party will be held at Cornelia Fort Airpark, Saturday, September 24, from 8 to 10 PM.

A private star party will be at Natchez Trace Mile Marker 435.3 on Saturday, October 1.

A public star party will be at Edwin Warner Park on Saturday, October 8, from 7:30 to 9:30 PM.

Dr Terry Reeves presented "What's Up," giving finding instructions and data on enjoyable objects to view in the Fall skies. Also included were travel notes on astronomy in Switzerland.

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

Respectfully submitted,

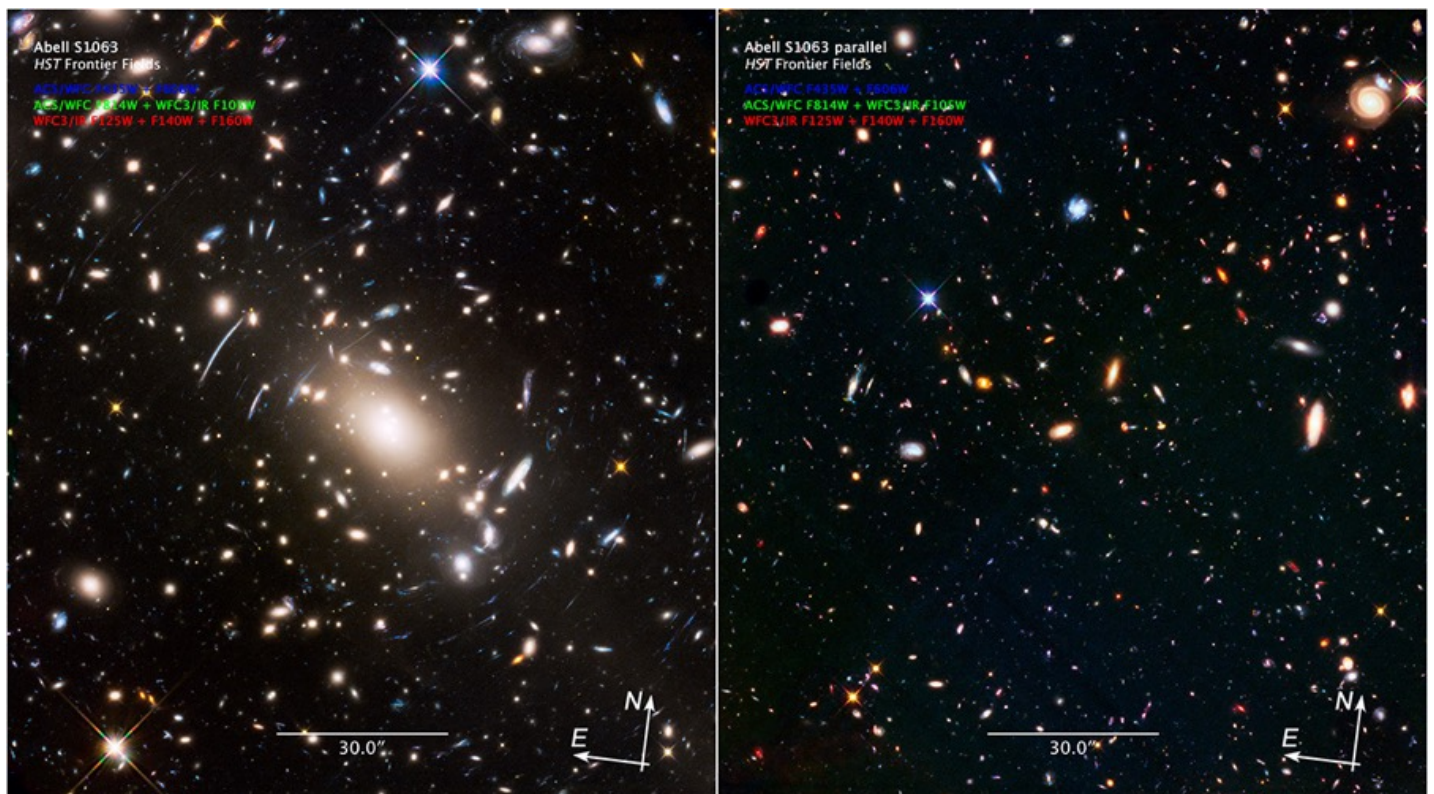
Bud Hamblen  
Secretary

**There was no BSAS Board Meeting in September 2016.**

## One Incredible Galaxy Cluster Yields Two Types of Gravitational Lenses By Ethan Siegel

There is this great idea that if you look hard enough and long enough at any region of space, your line of sight will eventually run into a luminous object: a star, a galaxy or a cluster of galaxies. In reality, the universe is finite in age, so this isn't quite the case. There are objects that emit light from the past 13.7 billion years—99 percent of the age of the universe—but none before that. Even in theory, there are no stars or galaxies to see beyond that time, as light is limited by the amount of time it has to travel. But with the advent of large, powerful space telescopes that can collect data for the equivalent of millions of seconds of observing time, in both visible light and infrared wavelengths, we can see nearly to the edge of all that's accessible to us.

The most massive compact, bound structures in the universe are galaxy clusters that are hundreds or even thousands of times the mass of the Milky Way. One of them, Abell S1063, was the target of a recent set of Hubble Space Telescope observations as part



Galaxy cluster Abell S1063 (left) as imaged with the Hubble Space Telescope as part of the Frontier Fields program. The distorted images of the background galaxies are a consequence of the warped space due to Einstein's general relativity; the parallel field (right) shows no such effects. Image credit: NASA, ESA and Jennifer Lotz (STScI)

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## Gravitational Lenses, continued

of the Frontier Fields program. While the Advanced Camera for Surveys instrument imaged the cluster, another instrument, the Wide Field Camera 3, used an optical trick to image a parallel field, offset by just a few arc minutes. Then the technique was reversed, giving us an unprecedentedly deep view of two closely aligned fields simultaneously, with wavelengths ranging from 435 to 1600 nanometers.

With a huge, towering galaxy cluster in one field and no comparably massive objects in the other, the effects of both weak and strong gravitational lensing are readily apparent. The galaxy cluster—over 100 trillion times the mass of our sun—warps the fabric of space. This causes background light to bend around it, converging on our eyes another four billion light years away. From behind the cluster, the light from distant galaxies is stretched, magnified, distorted, and bent into arcs and multiple images: a classic example of strong gravitational lensing. But in a subtler fashion, the less optimally aligned galaxies are distorted as well; they are stretched into elliptical shapes along concentric circles surrounding the cluster.

A visual inspection yields more of these tangential alignments than radial ones in the cluster field, while the parallel field exhibits no such shape distortion. This effect, known as weak gravitational lensing, is a very powerful technique for obtaining galaxy cluster masses independent of any other conditions. In this serendipitous image, both types of lensing can be discerned by the naked eye. When the James Webb Space Telescope launches in 2018, gravitational lensing may well empower us to see all the way back to the very first stars and galaxies.

If you're interested in teaching kids about how these large telescopes “see,” be sure to see our [article on this topic at the NASA Space Place](#).

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](http://spaceplace.nasa.gov) to explore space and Earth science!



## From the President, continued

I-65 from almost Brentwood to Kentucky.) [NASA finally has their official site up](#). And of course there are also other excellent resources at [eclipse2017.org](#) and [greatamericaneclipse.com](#). We'll all need solar glasses... and BSAS will have some for its members, hopefully before Christmas.

If you have spare rooms at your house, go ahead and clean them now - you will have friends and family calling to come. I carry a map of the path through Tennessee with me now to show folks I encounter where the line of totality runs. I'd encourage you to schedule your vacation now to be able to enjoy the day. Want to know how long the eclipse will be for your location? Check out [Xavier Jubier's excellent searchable map](#). Find your place under the shadow of the Moon!

Clear skies,

Theo Wellington

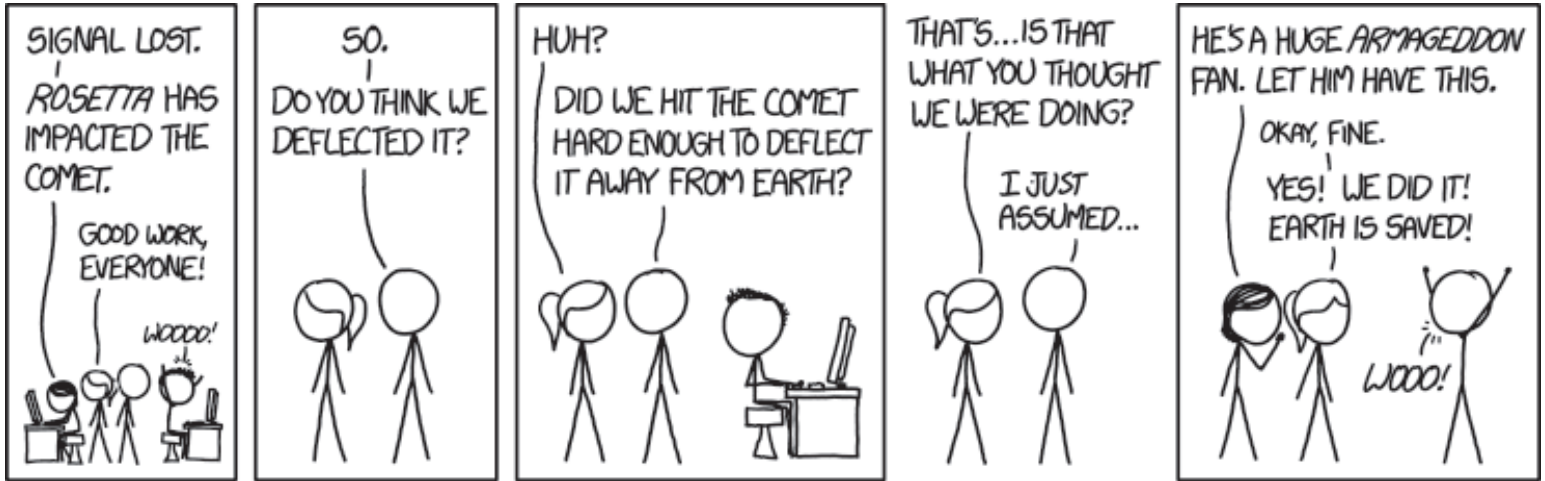


*Uranus - Keith Rainey*





xkcd



Next BSAS meeting  
 October 19, 2016, 7:30 pm  
 Glendale United Methodist Church - Fellowship Hall  
 900 Glendale Lane

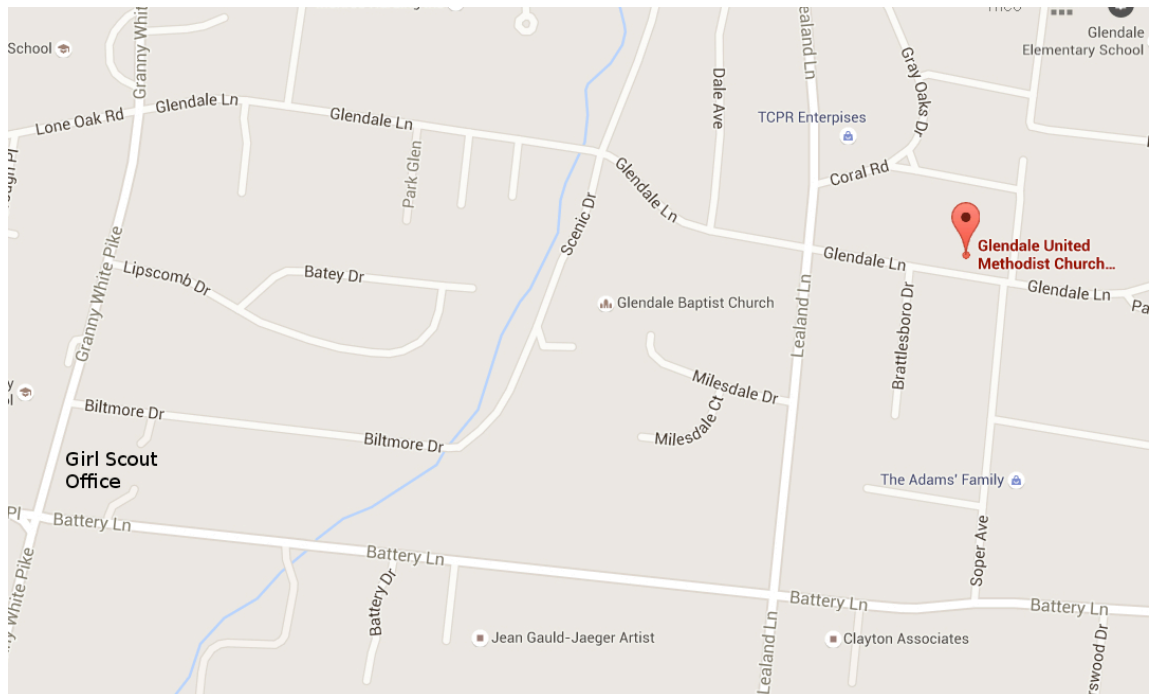
Topic: "Gaia: The Hubble of Astrometry"- Billy Teets, Dyer Observatory

The ESA's Gaia mission has been in space for nearly three years now, and the first data release has provided an impressive catalog of positions and magnitudes for both Milky Way objects and extra-galactic sources. This talk will give an overview of the Gaia mission including details of the observatory's hardware, goals of the mission, and some of the first science results.

**NOTICE:** the location for our board and member meetings has changed through December!

The Girl Scouts are renovating, so we will be at the [Glendale United Methodist Church, 900 Glendale Lane, Nashville 37204](http://www.gumc.org).

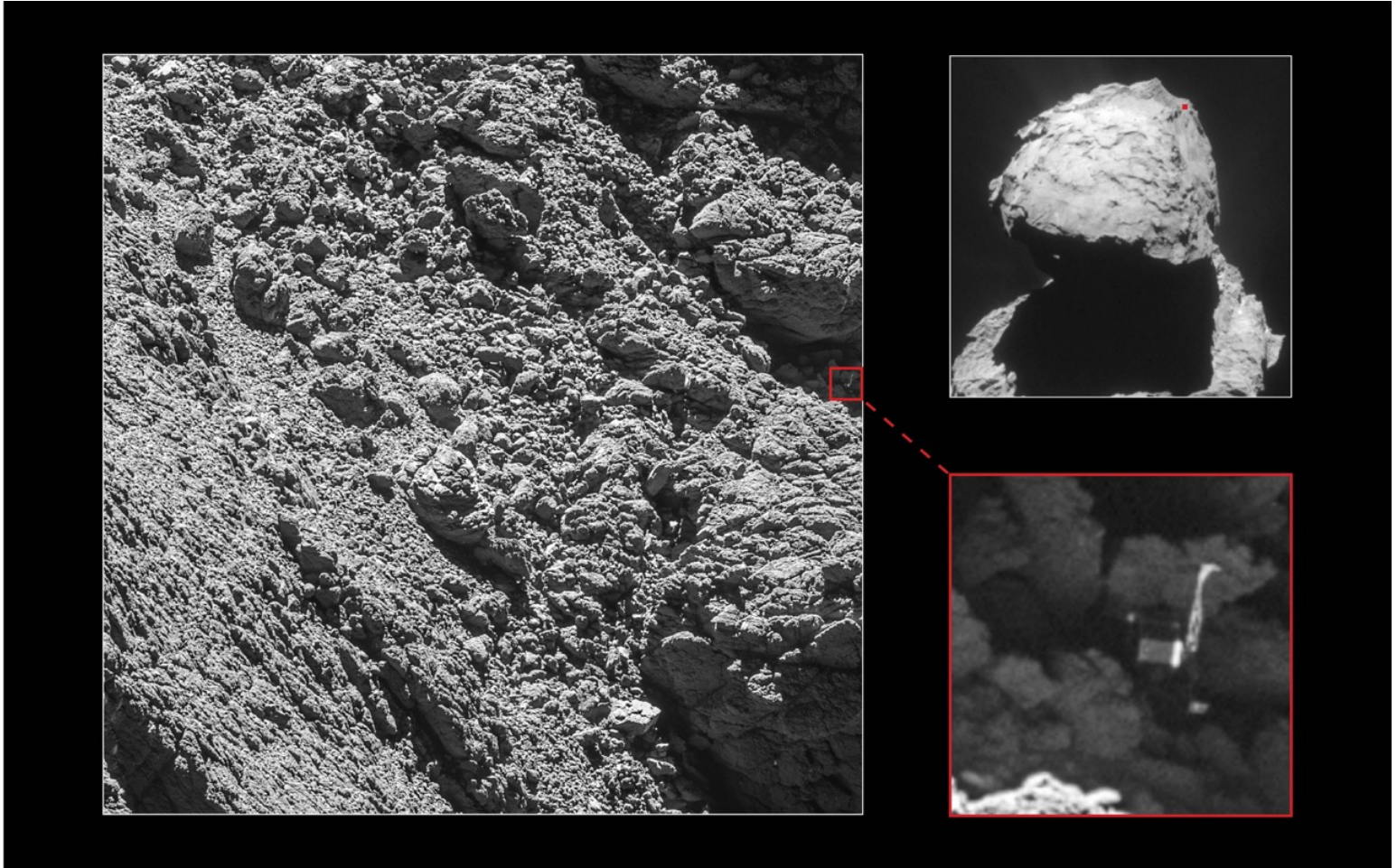
It's just around the block from the Girl Scout office.





*Lunar ISS transit - Trevor Bruns*

Send your cool astrophotos to  
[eclipse@bsasnashville.com](mailto:eclipse@bsasnashville.com)!



Less than a month before the end of the mission, Rosetta's high-resolution camera has revealed the Philae lander wedged into a dark crack on Comet 67P/Churyumov-Gerasimenko.

The images were taken on 2 September by the OSIRIS narrow-angle camera as the orbiter came within 2.7 km of the surface and clearly show the main body of the lander, along with two of its three legs.

The images also provide proof of Philae's orientation, making it clear why establishing communications was so difficult following its landing on 12 November 2014.

"With only a month left of the Rosetta mission, we are so happy to have finally imaged Philae, and to see it in such amazing detail," says Cecilia Tubiana of the OSIRIS camera team, the first person to see the images when they were downlinked from Rosetta yesterday.

"After months of work, with the focus and the evidence pointing more and more to this lander candidate, I'm very excited and thrilled that we finally have this all-important picture of Philae sitting in Abydos," says ESA's Laurence O'Rourke, who has been coordinating the search efforts over the last months at ESA, with the OSIRIS and Lander Science Operations and Navigation Center (SONC, CNES) teams.

Credit: [Main image and lander inset: ESA/Rosetta/MPS for OSIRIS Team MPS/UPD/LAM/IAA/SSO/INTA/UPM/DASP/IDA; context: ESA/Rosetta/NavCam - CC BY-SA IGO 3.0](#)



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) or call Theo Wellington at (615) 300-3044.

## 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).