The ECLIPSE

The Newsletter of the Barnard-Seyfert Astronomical Society

Organized in 1928

September 2013

The Membership meeting will be held on September 18, 2013 at the Cumberland Valley Girl Scout Council Building located at the intersection of Harding Place and Granny White Pike at 7:30 pm.

Dr. John Wallin, MTSU, will speak on "**The Zooniverse: Making Meaningful Contributions to Astronomy as a Citizen Scientist.**"

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Upcoming Events

Board of Directors Meeting, September 4 at the Cumberland Valley Girl Scout Building – 7:30 pm

In this issue

From the President

Perhaps the weather has finally changed out of perpetually rainy mode, and we can enjoy the night skies of fall occasionally. Just in time to begin observations of Comet C/2012 S1, better known as Comet ISON. The jury is still way out on whether this will actually be a very bright comet, and starting in the pre-dawn sky is not a good way to build a fan club. Hopefully the Sun will knock some dirt off in the next month or so

I'd like to welcome the several new members that have joined this summer….I hope to see you at the star parties, both private and public. You don't have to bring a telescope! Just come on out and enjoy the sky. Bring a chair, binoculars…and your interest in the sky. Not all observing is at night…there's that pesky bright star in the daytime, and we hope for a sunny day to show that off at the Dragonboat festival on September 7th. Stop by the BSAS table along First Avenue and say hello, or stay a while and help out!

New members are also welcome to give suggestions, ideas, and to volunteer! You don't have to be a BSAS officer to have great ideas. And, as this is fall and time to look for new members for the Board….say, have I got a deal for you! We need to fill some positions, so if you would like to help steer BSAS for the next year, please volunteer. It's an excuse to spend one more evening talking about astronomy, so good fun. There are always more requests from groups for someone to bring a telescope out than we can do, so the more we can do to grow the BSAS the more great astronomy outreach we can do here in the Nashville area.

If you have never had the opportunity to participate in a public star party, it is a very rewarding couple of hours when the weather is good. Astronomy is such an accessible science, the sky is there for everyone, and people are so happy to have someone show them the Moon, planets, and other bright objects. There's no better way to make youngsters think science is cool! "Awesome!" is one of the most uttered phrases just looking at the Moon. So don't worry if you don't have the biggest telescope on the field (I don't). If you do bring a telescope, bring

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Observing Highlights for September & October

Moon phases

September 2013
09/05 NEW Moon
09/12 FIRST Quarter
09/19 FULL Moon
09/26 Last Quarter

October 2013
08/04 NEW Moon
08/11 FIRST Quarter
08/18 FULL Moon
08/26 LAST Quarter

Objects:

Globular Clusters
M5, M80, M4, M107, M13, M12, M10,
M62, M19, M92, M9, M14,
M28, M69, M22, M70, M54,
M56, M55, M71,
M75, M72, M15, M2, M30

Open Clusters
M6 (Butterfly), M7, M23,
M21, M18, M25, M26, M11 (Wild Duck),
M29, M73, M39,
M52

Nebula
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),
NGC6888 (Crescent),
NGC6905 (Blue Flash),
NGC6960/6974/6979/6992/6995 (Veil),
NGC7000 (North America),
NGC7009 (Saturn),
IC 5146 (Cocoon),
NGC7293 (Helix), NGC7635 (Bubble), NGC7662 (Blue Snowball)

Galaxies
M101/M102,
NGC 6822 (Barnard's)

Other
Bardnard's Star (star with fastest proper motion)
M24 (Small Sagittarius Star Cloud)
Cr 399 (Coat Hanger)

Multiple Star Systems
Epsilon Bootis (Izar or Pulcherrima)
Mu Bootis (Alkalurops),
Beta Scorpii (Acrab),
Alpha Herculis (Rasalgethi),
Epsilon Lyrae (Double Double),
Beta Cygni (Albireo)

Variable Stars
Mu Cephei (Herschel's Garnet Star)

Planets
Mercury
Venus
Saturn
Neptune

Happy Birthday Galileo-Jupiter Impact

by Robin Byrne

This month we honor the end of a highly successful mission. I was tempted to replace "Birthday" with "Deathday" in the article title, but that seemed too morbid. Construction of the Galileo spacecraft began in 1977. It was launched from the Space Shuttle Atlantis on October 18, 1989, arrived at Jupiter December 7, 1995, and ended its mission in spectacular style ten years ago on September 21, 2003.

Due to delays in the scheduled launch for a variety of reasons, including the hiatus in shuttle missions after the Challenger disaster, plus a change in policy concerning the type of boosters allowed on the shuttle, the planned route to Jupiter for this spacecraft had to be dramatically altered. Instead of a fairly direct path using a more powerful booster, a highly ingenious circuitous path was taken, using gravity assists from Venus, and twice from Earth. This resulted in two passes into the Asteroid Belt, with Galileo chalking up important firsts each time. The initial trip into the Asteroid Belt provided the opportunity for the first fly-by of an asteroid - Gaspra. The second trip, which was passing through the belt toward Jupiter, allowed Galileo to fly near the asteroid Ida. This led to the discovery of the first known moon orbiting an asteroid - Ida's moon, Dactyl.

En route to Jupiter, Galileo was positioned for another important observation: it was the only object in our solar system in the right place to directly observe Comet Shoemaker-Levy 9 impact Jupiter in 1994. From Earth, all of the impacts would occur on the side facing away from us, and then the impact sites would rotate into view a few hours later. Galileo was aligned with the impact sites directly and sent back stunning images of the collision.

Five months prior to Galileo arriving at Jupiter, it released a small probe to enter Jupiter's atmosphere and send back data. Without any braking, the 750 pound device plunged into the cloud tops at a speed of almost 30 miles per second. Slowing to subsonic speeds in less than 2 minutes, the spacecraft experienced an acceleration of 230 g's. For 58 minutes, it traversed 98 miles of Jupiter's upper atmosphere, sending back data until pressures 23 times that of Earth and temperatures over 300 ˚F began to destroy the probe. It discovered that we don't understand Jupiter's atmosphere as well as we thought. Conditions were hotter then expected, and much more turbulent than anticipated. There wasn't as much helium, water, or lightning as thought, and the winds were much faster, sustaining 330 mph during the entire time it sent back data.

Originally scheduled to spend 2 years orbiting the Jupiter system, the Galileo probe was granted three extensions to its mission. The orbit around Jupiter was highly elongated to provide several opportunities to fly near some of the moons and to measure Jupiter's magnetosphere from a variety of positions. Each orbit took about two months. The four largest moons were prime targets, though close encounters with Io were saved for the extended missions due to the unknown results of flying through the intense radiation found in its vicinity. Toward the end of the mission, in 2002, the radiation finally took its toll when the cameras became too damaged to use, but other instruments continued to operate to the end, despite being exposed to four times the radiation the spacecraft was designed to withstand. During the eight years and 35 orbits of Jupiter, it made several important discoveries: Jupiter's clouds are composed of ammonia ice crystals; Io's volcanic activity is 100 times greater than Earth's; Io's volcanoes create an electrical current that connects to Jupiter's atmosphere; Europa, Ganymede and Callisto have evidence for liquid saltwater under their surfaces; Ganymede is the first moon found to have a magnetic field; and Jupiter's rings are the result of material knocked off of four of its closest moons.

As radiation damage started to pile up, and the power supply began to dwindle, the decision was

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made to end the Galileo mission. With the confirmation of a large salty ocean under the crust of Europa, the possibility of life existing there became more likely. Because the spacecraft had not been sterilized prior to launch, it was feared that it could contaminate Europa if it impacted there. So, the decision was made to send the spacecraft on a crash course with Jupiter. The final descent began about 600,000 miles from Jupiter, its farthest distance since arrival. Eight hours later, it crossed the orbit of Io at 262,000 miles - only the third time it had traveled this close to Jupiter. As the radiation levels increased, it could no longer reliably use its star scanner to navigate. At a distance of 89,000 miles, the last magnetic field measurement was made. Beyond this point, the field was so strong the instrument to measure it was saturated. The last scientific experiment occurred as it passed Amalthea. On its previous encounter with the small moon, it detected light that could have been from debris surrounding the moon, so it was scanned again to see if the same signals were detected. This debris may be associated with one of Jupiter's rings. With seven minutes left, the spacecraft passed into the night side of Jupiter. One minute later, it was behind the limb as seen from Earth, and no more signals were received. Traveling at a speed over 30 miles per second, it plunged into the clouds and disintegrated.

During its 14 year lifetime, Galileo traveled more than 2.8 billion miles, gathered 30 gigabytes of data, and took 14,000 pictures. Not bad at all. With Jupiter in our morning sky, take time to gaze at it, whether with your naked eye, binoculars or telescope. While you enjoy its beauty, pause to thank the Galileo spacecraft for all we have learned from its incredible journey.

References:

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NASA - Surprising Jupiter; Busy Galileo spacecraft showed jovian system full of surprises
http://www.nasa.gov/vision/universe/solarsystem/galileo_end.html

End of Mission Sequence of Events - Galileo End of Mission Press Kit
http://www.jpl.nasa.gov/news/press_kits/galileo-end.pdf

NASA - Galileo End of Mission Status
http://www.nasa.gov/vision/universe/solarsystem/galileo_final.html

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Dr. John Wallin, MTSU

Amateur astronomers have made meaningful contributions to astronomy research for decades. With over a dozen active projects ranging from classifying galaxies and finding extrasolar plants to transcribing ancient Greek documents, the Zooniverse project has allowed volunteers to make important contributions to science. In this talk, I will describe the Zooniverse project. In particular, I will talk about how we used Citizen Scientists to find the best models for systems of colliding galaxies. I will also discuss how computer vision and computational intelligence can be blended with Citizen Science to transform the endless flood of data into meaningful knowledge.

Size Does Matter, But So Does Dark Energy

By Dr. Ethan Siegel

Here in our own galactic backyard, the Milky Way contains some 200-400 billion stars, and that's not even the biggest galaxy in our own local group. Andromeda (M31) is even bigger and more massive than we are, made up of around a *trillion* stars! When you throw in the Triangulum Galaxy (M33), the Large and Small Magellanic Clouds, and the dozens of dwarf galaxies and hundreds of globular clusters gravitationally bound to us and our nearest neighbors, our local group sure does seem impressive.

Yet that's just chicken feed compared to the largest structures in the universe. Giant clusters and superclusters of galaxies, containing thousands of times the mass of our entire local group, can be found omnidirectionally with telescope surveys. Perhaps the two most famous examples are the nearby Virgo Cluster and the somewhat more distant Coma Supercluster, the latter containing more than 3,000 galaxies. There are millions of giant clusters like this in our observable universe, and the gravitational forces at play are absolutely tremendous: there are literally *quadrillions* of times the mass of our Sun in these systems.

The largest superclusters line up along filaments, forming a great cosmic web of structure with huge intergalactic voids in between the galaxy-rich regions. These galaxy filaments span anywhere from hundreds of millions of light-years all the way up to more than a *billion* light years in length. The CfA2 Great Wall, the Sloan Great Wall, and most recently, the Huge-LQG (Large Quasar Group) are the largest known ones, with the Huge-LQG -- a group of at least 73 quasars – apparently stretching nearly 4 billion light years in its longest direction: more than 5% of the observable universe! With more mass than a million Milky Way galaxies in there, this structure is a puzzle for cosmology.

You see, with the normal matter, dark matter, and dark energy in our universe, there's an upper limit to the size of gravitationally bound filaments that should form. The Huge-LQG, if real, is more than *double* the size of that largest predicted structure, and this could cast doubts on the core principle of cosmology: that on the largest scales, the universe is roughly uniform everywhere. But this might not pose a problem at all, thanks to an unlikely culprit: **dark energy**. Just as the local group is part of the Virgo Supercluster but recedes from it, and the Leo Cluster -- a large member of the Coma Supercluster -- is accelerating away from Coma, it's conceivable that the Huge-LQG isn't a single, bound structure at all, but will eventually be driven apart by dark energy. Either way, we're just a tiny drop in the vast cosmic ocean, on the outskirts of its rich, yet barely fathomable depths.

Learn about the many ways in which NASA strives to uncover the mysteries of the universe: http://science.nasa.gov/astrophysics/. Kids can make their own clusters of galaxies by checking out The Space Place's fun galactic mobile activity: http://spaceplace.nasa.gov/galactic-mobile/

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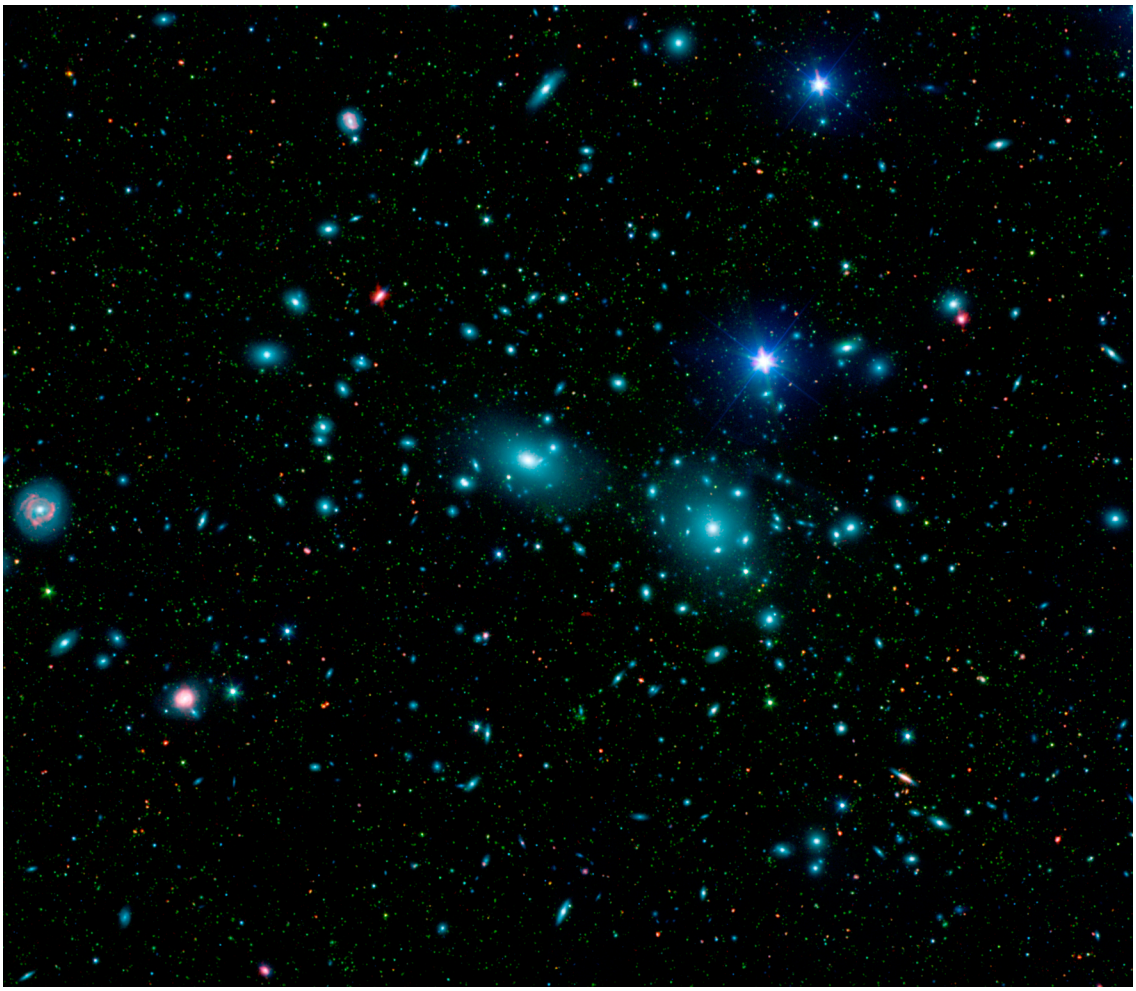

Digital mosaic of infrared light (courtesy of Spitzer) and visible light (SDSS) of the Coma Cluster, the largest member of the Coma Supercluster. Image credit: NASA / JPL-Caltech / Goddard Space Flight Center / Sloan Digital Sky Survey.

Star Parties for months of September and October

Sat	9/7	BSAS trace	NM is 9/5	mile marker 435.5	
Sat	9/14	Long Hunter	800 to 1000	FQ is 9/12	Saturn & Venus early, Moon, Andromeda Galaxy, etc
Sat	10/5	BSAS trace	NM is 10/5	mile marker 412 water valley overlook	
Sat	10/12	ASC	730 to 1030	FQ is 10/11	2nd Saturday & Int'l Observe the Moon Night
Fri	10/25	Bells Bend	800 to 1000	LQ is 10/30	Andromeda Galaxy, Pleiades, double stars, clusters, etc

Barnard-Seyfert Astronomical Society
Minutes of the Regular Meeting of the Board of Directors
Held on Wednesday, August 7, 2013

The board of directors of the Barnard-Seyfert Astronomical Society (BSAS) met in regular session at the Cumberland Valley Girl Scout Council Building in Nashville, Tennessee on Wednesday, August 7, 2013. A sign-in sheet was passed around in lieu of a roll call. Board members Joe Boyd, Dr. Spencer Buckner, Steve Cobb, Bill Griswold, Melissa Lanz, Kris McCall, Bob Norling, Poppy Simmons, and Theo Wellington were present. A quorum being present, President Theo Wellington called the meeting to order at 7:37 P.M.

Theo Wellington asked for corrections to the minutes of the previous board meeting held on July 10, 2013 and, there being none, asked for a motion declaring them to be approved as published in the August 2013 edition of the Society's *Eclipse* newsletter. Spencer Buckner so moved and Steve Cobb seconded his motion, which was subsequently passed by a unanimous voice vote.

Treasurer Bob Norling reported that the BSAS had $1,889.81 in its regular checking account and $1,251.28 in its equipment account.

Bob Norling announced that he will be taking orders for Deep Space Mysteries Calendars. They will be sold for $10 each. Bob has a brochure with pictures. Bob will also check the web-site for the price of the Observers' Handbooks.

Theo Wellington announced these upcoming star parties:

- Aug 09 – Public star party @ Bells Bend Park from 8:30 P.M. to 10:30 P.M.
- September 07 – Private star party @ Natchez Trace Parkway mm 435.5
- September 07 – Solar observing at Dragon boat Festival – Poppy and Theo are planning to be there.
- September 14 – Public star party @ Long Hunter State Park from 8:30 P.M. to 10:30 P.M.

The board then discussed upcoming meetings. Jana Ruth has lined up a speaker for September. Theo will send the topic to Bill Griswold for the newsletter. Theo noted that we need to invite Brad Hill again for a talk, and has sent him a message about October.

The program committee needs to meet for the coming year. Joe Boyd, Spencer Buckner, and Poppy Simmons have volunteered to serve. Theo is willing to host the meeting.

The BSAS, having regretfully accepted the resignation of Bob Rice, needs a new secretary. Melissa Lanz suggested that we ask Bud Hamblen to serve as interim secretary. Spencer Buckner is heading up the Nominating Committee, and we will vote on officers at the December meeting.

The board then discussed new member recognition. Bill Griswold sends them a welcoming email. Steve Cobb suggested he copy our President, Theo Wellington, who can then recognize and introduce our new members.

The board next discussed star parties for 2014. Kris McCall usually recommends star party dates based on new moons and holidays. Theo reported that Jessica House, ranger at Nathan Bedford Forrest State Park, will respond with the best dates for Nathan Bedford Forrest star parties.

Theo also reported that Jessica House has talked with her supervisor, who will meet with the Director of Interpretation for State Parks, about the 2017 solar eclipse. Eight Tennessee state parks will see a total eclipse of the sun in 2017. A fair percentage of the sun will be covered for more state parks. This is free publicity for us.

The board then discussed the possibility of having the dates for private star parties span three consecutive nights, and choosing the best date based on the weather. State Park permits are renewed at the beginning of year. Bill Griswold sends the application in mid-November. Theo Wellington offered to contact the District Ranger to ask for flexibility in scheduling the private star parties. It was noted that Public star parties cannot have tentative dates, due to publicity and park rangers' schedules.

Theo Wellington brought a draft of an updated BSAS brochure. Steve Cobb moved, and Spencer Buckner seconded, that we approve the printing of 100 copies.

Joe Boyd reported that Megan Barry, Council person at large, has scheduled an appointment for Joe Boyd and Bill Griswold to meet with her on Thursday, September 5th, to discuss the contacts with NES and Public Works, and get her views on how to proceed. NES and Public Works each says the other is responsible for choosing public lighting. Theo stated that the IDA (International Dark-Sky Association) needs to talk to the Complete Street people, whose blog claims they have designed streetscapes for 500 cities.

Since there was no further business to discuss, Joe Boyd moved that the meeting be adjourned. Bill Griswold seconded his motion that passed by a unanimous voice vote of the board at 8:43 P.M. without additional discussion.

Respectfully submitted,
Melissa Lanz, substituting for Bob Rice, Secretary

Barnard-Seyfert Astronomical Society
Minutes of the Monthly Membership Meeting
Held On Wednesday, August 21, 2013

The Barnard-Seyfert Astronomical Society held its monthly membership meeting for August at the Girl Scouts of Middle Tennessee, 4522 Granny White Pike, Nashville, Tennessee, on August 21, 2013. President Theo Wellington called the meeting to order at 7:30 pm. Twenty-two members and 5 guests were present. Curt Porter noted that the minutes of the August 7, 2013, board meeting should be amended to replace all instances of "Nathan Bedford State Park" with "Nathan Bedford Forrest State Park". Theo Wellington asked for a motion to approve the minutes of the July 17, 2013, membership meeting as published in the August 2013 issue of the Eclipse. Joe Boyd so moved, Spencer Buckner seconded the motion, and the minutes were adopted by a unanimous voice vote. Treasurer Bob Norling reported that there was $1,974.81 in the regular account and $1,251.28 in the equipment account. Bud Hamblen has volunteered to perform the duties of secretary for the unexpired term of Bob Rice.

Theo distributed "Official NASA Lithographs" to the new members and guests.

Theo noted these upcoming events and star parties:

Saturday, September 7, 2013 - Solar Observing at the Cumberland River Dragon Boat Festival, Riverfront Park, Nashville. Theo Wellington, Poppy Simmons and Bud Hamblen operated solar telescopes at this venue in 2012.

Saturday, September 7, 2013 - BSAS Private Star Party at Natchez Trace Parkway mile marker 435.5.

Saturday, September 14, 2013, 8:00 - 10:00 pm - BSAS Public Star Party at Long Hunter State Park.

Saturday, October 5, 2013 - BSAS Private Star Party at Natchez Trace Parkway mile marker 412 (Water Valley Overlook).

Theo provided an update on Comet ISON. The comet will be near the Beehive Cluster in the pre-dawn sky on September 1, 2013. The observed light curve of the comet has been slightly lower than the predicted light curve.

Bob Norling is accepting orders for the Deep Space Mysteries Calendar. See Bob Norling if you would like to order a copy of the calendar. The prices of the 2014 RASC Observer's Handbook and the 2014 Guy Ottewell Astronomical Calender have not yet been determined. These are available through the BSAS with a volume discount if we have enough orders.

New BSAS Brochures have been shipped. Copies have been promised to Chuck Schlemm to distribute at the upcoming Star Trek Convention, September 7 and 8, at the Opryland Hotel. Chuck and Lonnie Puterbaugh will present exhibits on spaceflight and astronomy, respectively, at the Star Trek Convention.

Theo mentioned the equipment loaner program. The BSAS has telescopes to lend to members. For free!

Joe Boyd solicited support for the efforts of the International Dark-Sky Association to encourage public lighting that is better for astronomy, and for a Middle Tennessee chapter of the IDA.

Russ Ward remarked that an upcoming course in astrophysics may be audited at Tennessee State University. Senior citizens, persons aged 60 or older, may audit courses at Tennessee public universities without charge. Contact the university for additional information.

Theo solicited ideas for programs for upcoming membership meetings.

Theo introduced a presentation of the PBS Nova video production, "Secrets of the Sun". The Sun is headed for a "wimpy" solar maximum. New tools, including the Solar Dynamics Observatory, let scientists better grasp our star's potentially destructive solar storms. The video showed information on the structure of the Sun, its magnetic fields and associated sunspots, solar flares and coronal mass ejections. The video had coverage of the 1851 Carrington event, which produced strong auroras and damaged telegraph circuits. A similar event today could severely damage electrical power grids, telecommunications and aviation assets. There was a brief discussion following the one hour video. The web site of the Solar Dynamics Observatory is <http://sdo.gsfc.nasa.gov/>. Comet ISON will pass within one solar diameter of the center of the Sun.

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

Respectfully submitted,
Bud Hamblen, Interim Secretary

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along a 2 or 3 step sturdy stepladder so that the youngest observers can get to your eyepiece. No telescope? Bring binoculars! Point out the visible constellations. Look up times for transits of bright satellites and point them out. Much of the public isn't aware that you can see satellites, and again, the reaction is "cool!" Don't worry about whether or not you can answer questions….I love it when I get asked something I don't know, because then I will look up the answer (or find someone on the field who knows) and learn something new myself.

I hope to see more of you this fall both inside at meetings…and outside, under the night sky!

Clear, dark skies,
Theo Wellington, President

Become a Member of the BSAS!

Download and print the Application for membership from www.bsasnashville.com (Adobe® Acrobat Reader® required).

Then fill it out and bring it to the next monthly meeting or mail it along with your first year's membership dues to:

BSAS
P.O. Box 150713
Nashville, TN 37215-0713

Annual dues, which include membership in the BSAS and Astronomical League, and subscriptions to their newsletters, are:

$20 Individual
$30 Family
$15 Senior (+65)
$25 Senior Family (+65)
$12 Student*

* To qualify, you must be enrolled full time in an accredited institution or home schooled.

All memberships have a vote in BSAS elections and other membership votes.

Also included are subscriptions to the BSAS and Astronomical League newsletters.

IMPORTANT DUES INFORMATION

To find the expiration date for your current membership, visit our web site at http://www.bsasnashville.com and click the Renewals link.

There will be a two month grace period before any member's name is removed from the current distribution list.

About Our Organization

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 www.bsasnashville.com. If you need more information, write to us at info@bsasnashville.com or call John Harrington at (615) 739-4500.

BSAS on Facebook

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 Lonnie Puterbaugh at 615-661-9540.