

The ECLIPSE

January
2020

The Newsletter of the Barnard-Seyfert Astronomical Society

Next Membership Meeting:

Wednesday January 15, 7:30 pm

Cumberland Valley
Girl Scout Council Building
4522 Granny White Pike

Topic:
Telescope Workshop

From the President:

Hello everyone and Happy New Year! I hope your 2020 is full of cloudless nights and clean optics. As I reflect on 2019, I would like to extend my very heartfelt thanks to all of the members who contribute to our outreach by bringing their telescopes or their knowledge to help the public get hooked on astronomy. Our star parties would be nothing without you so “Thank You” to all of you who participated last year.

Another round of thanks goes to our board members whose term is up and will be leaving the board. Johanna Keohane and Todd Nannie have served the board wonderfully over the past couple of years and I know that everyone on the board appreciates their input and enthusiasm. Thank you, Johanna and Todd, for your help and service.

Along with the departures, January brings in another group of at-large board members and I would like to welcome them to the board. Thomas Gaudin, KC Katalbas, and Kathy Underwood will all be part of our at-large group with KC and Kathy re-joining the board after having served previously. Thank you guys for volunteering and helping BSAS.

To round off the thanks, I would like to thank all of the board members for their help and guidance in planning and executing our meetings and outreach events throughout last year. The club would be a mess if it was just up to me so please know that I recognize and appreciate all of you and your help. Gary, Tom, Theo, Bud, Andy, Chip, Drew, KC, Johanna, and Todd – Thank You!

Do you know anyone who received a telescope for Christmas and is lost in setting it up? Maybe you got a nice reflector and are wondering how to check collimation. Come and join us at the Girl Scout Office for this month’s member meeting, the telescope

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BSASNashville.com

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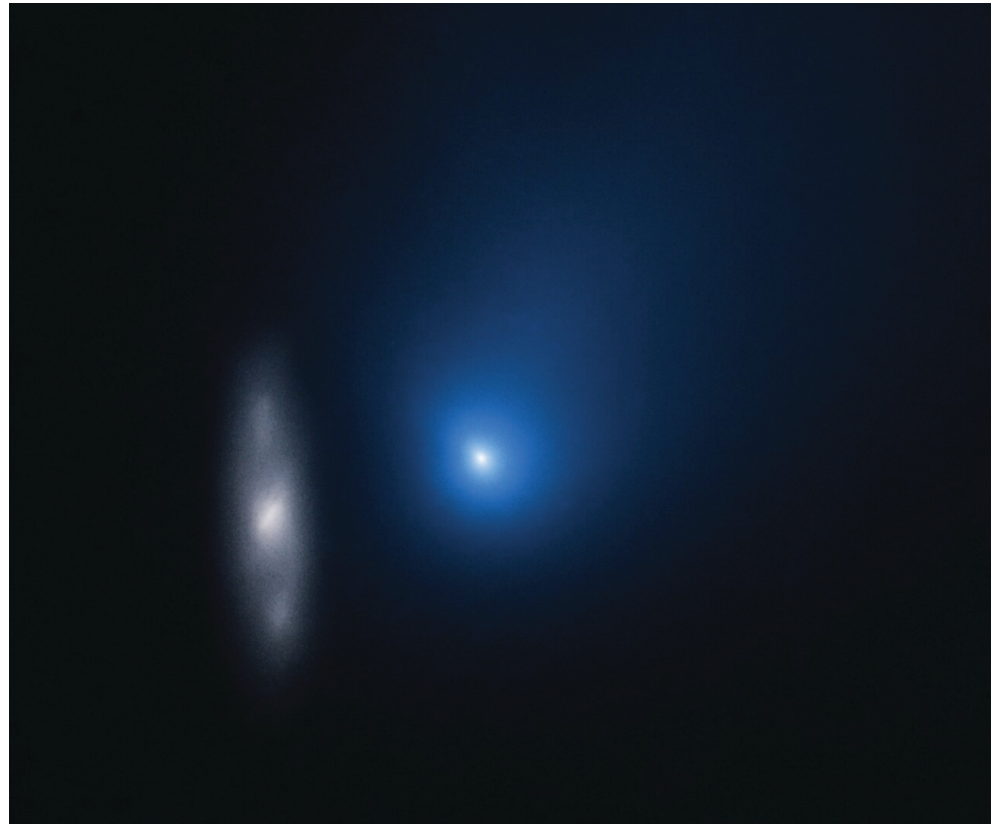
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Comet 2I/Borisov is only the second interstellar object known to have passed through our Solar System. In this image taken by the NASA/ESA Hubble Space Telescope, the comet appears in front of a distant background spiral galaxy.

The galaxy's bright central core is smeared in the image because Hubble was tracking the comet. Borisov was approximately 326 million kilometres from Earth in this exposure. Its tail of ejected dust streaks off to the upper right.

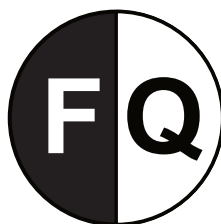
Credit: [NASA](#), [ESA](#), and [D. Jewitt \(UCLA\)](#)

Upcoming Star Parties

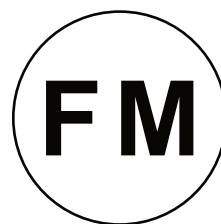
| | |
|--|--|
| Saturday January 4 6:30 to 8:30 pm | BSAS Public Star Party Bells Bend Outdoor Center |
| Saturday January 25 | BSAS Private Star Party Natchez Trace Parkway mile marker 435.3 |
| Saturday February 1 6:30 to 8:30 pm | BSAS Public Star Party Shelby Bottoms Nature Center |



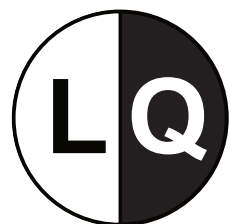
Jan 24
Feb 23



Jan 2
Feb 1



Jan 10
Feb 23

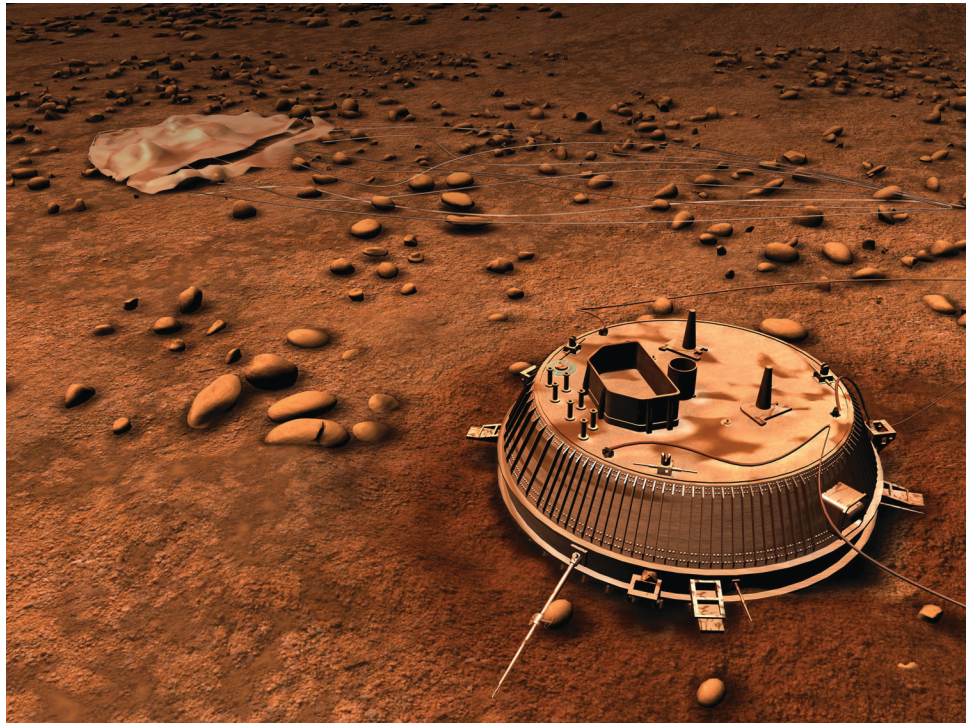


Jan 17
Feb 15

Happy Birthday Huygens Lander on Titan by Robin Byrne

This month marks the 15th anniversary of the Huygens lander setting down on the surface of Saturn's moon, Titan. The lander was named for Christiaan Huygens, who, in 1655, discovered Saturn's moon, Titan. The lander discovered so much more.

Measuring 9 feet wide, and weighing 700 pounds, the Huygens lander was designed to alight on either a solid or liquid surface, since Titan was suspected of having lakes of liquid methane on the surface. Six scientific instruments were incorporated into the lander design. The purpose of the Huygens Atmospheric Structure



Artists's impression of Huygens on Titan. Credit: [ESA](#)

Instrument (HASI) was to measure both the electrical and physical characteristics of Titan's atmosphere. The Doppler Wind Experiment (DWE) would measure wind speeds as the probe descended through the atmosphere. The Descent Imager/Spectral Radiometer (DISR) was designed to be used during the descent to study how the atmosphere affected light from the Sun, as well as imaging the landing site from above. The Gas Chromatograph Mass Spectrometer (GC/MS) would measure the composition of the atmosphere. The Aerosol Collector and Pyrolyser (ACP) analyzed aerosols in the atmosphere, in particular, looking for complex organic molecules. And the Surface Science Package (SSP) would study the physical properties of the landing site.

On October 15, 1997, the Cassini-Huygens Spacecraft began its journey to Saturn. Almost seven years later, in July, 2004, they reached Saturn. Five months after that, the Huygens lander went off on its own to complete its mission. On January 14, 2005, after parachuting for 2 hours and 27 minutes through Titan's atmosphere, Huygens became the first spacecraft to land on an object in the outer solar system and the first to land on a moon other than Earth's moon.

During the descent, Huygens was able to measure the temperature, density, and pressure of Titan's atmosphere for a large range of altitudes. These measurements allowed scientists to determine the characteristics of Titan's atmospheric layers, showing evidence of having a well-defined thermosphere, stratosphere, and troposphere, but a negligible mesosphere. The highest temperature measured was $-87\text{ }^{\circ}\text{C}$ ($-125\text{ }^{\circ}\text{F}$) at the top of the stratosphere. At the surface, the temperature was $-180\text{ }^{\circ}\text{C}$ ($-292\text{ }^{\circ}\text{F}$) with an atmospheric pressure 1.47 times

Continued on page 4

Huygens, continued

Earth's surface pressure.

Wind speeds measured during the descent confirmed that Titan has superrotating winds, which means the winds move faster in the direction the moon rotates than the ground below. The fastest speeds were measured at 120 m/s (270 mph) at an altitude of 120 km (75 miles). The speed and direction varied during the descent, buffeting the Huygens probe for much of its journey. But once on the ground, the winds had slowed to a mere 1 m/s (2.2 mph).

The atmospheric composition was confirmed to be a combination of nitrogen and methane. During the descent, the nitrogen component remained fairly constant, but the methane levels increased, implying liquid methane evaporating into the atmosphere. The evaporation may have been caused by heat from the lander. One question about the methane was related to the possibility of it being generated by life. Based on the isotopes present, it is now thought that the methane was present during the moon's formation and is stored in the moon in the form of ice. Geologic processes cycle it to the surface over time.

Huygens found that the orange, methane haze that shrouds Titan exists throughout the atmosphere, though in differing densities. The haze particles became both larger and brighter as the probe got closer to the surface. The haze coalesced into clouds of methane ice at upper altitudes, and liquid methane-nitrogen at lower altitudes. It was only near ground level that the haze cleared.

The region where Huygens landed is called the Adiri region, which appears to be a shoreline. Equipped with a battery only designed to power the spacecraft for a total of 3 hours, after landing, Huygens continued sending back data for another 72 minutes. The Cassini spacecraft monitored and imaged Huygens as it descended and after landing. Those images showed what looks like ice pebbles on an orange surface, under a haze of methane. Images of the region also show what look like channels leading into a larger body of liquid. Further analysis showed it to be a dry lakebed. However, Cassini did confirm lakes of liquid hydrocarbons in the polar regions of Titan. It is speculated that the landing region may experience periodic floods.

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Topic:
Telescope Workshop

Huygens, continued

The surface texture of the landing site was found to be a sandy consistency, but made of ice instead of rock, or similar to snow that has frozen on the top layer. The ice pebbles in the region were rounded, similar to what would happen to rocks eroded by liquids. The pebble sizes are distributed in a way implying they were transported by a river, with larger pebbles upstream, and the pebble size getting smaller the farther downstream you go.

While looking to see if Titan had lightning (it doesn't), the Huygens probe discovered another electrical phenomenon. Called Schumann resonances, these extremely low frequency signals were generated by an interaction between Saturn's magnetosphere and Titan's ionosphere. This generates a current that flows between the atmosphere and a subsurface ocean on Titan. This was the first evidence for Titan having an ocean beneath its crust.

It's always amazing how much we can learn from missions to other objects in our solar system. In just the 3 hours that the Huygens probe operated, our knowledge of Titan and its atmosphere grew exponentially. When people question spending money for the space program, results like this provide a strong argument for continuing to fund space exploration of all kinds. Thank you, Huygens!

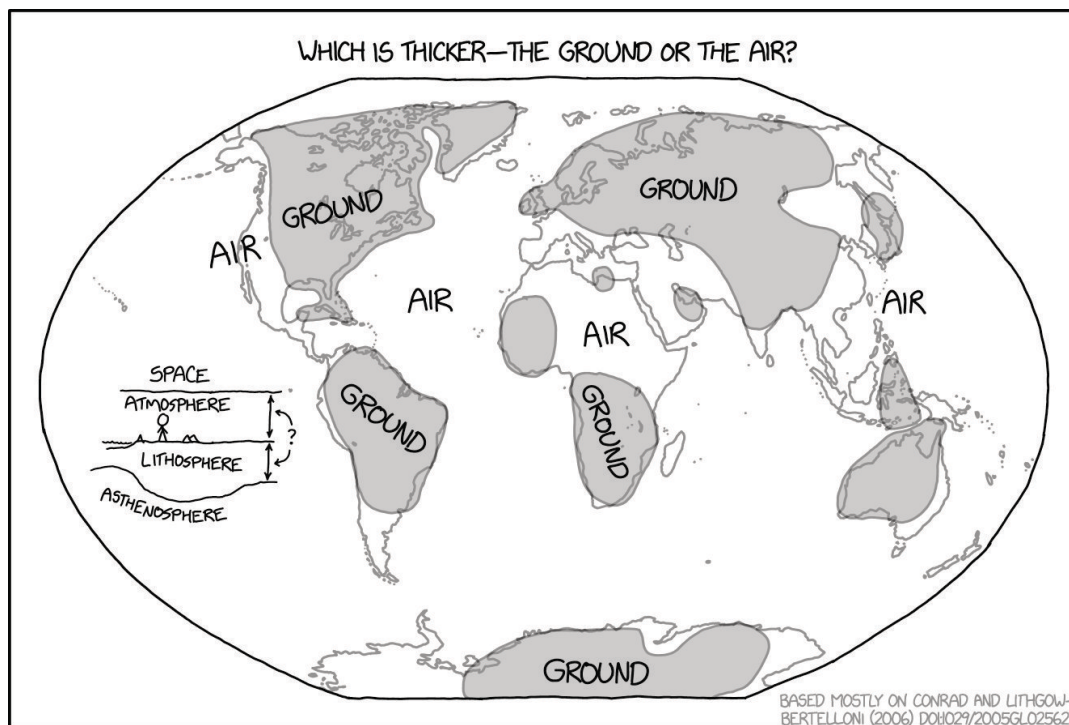
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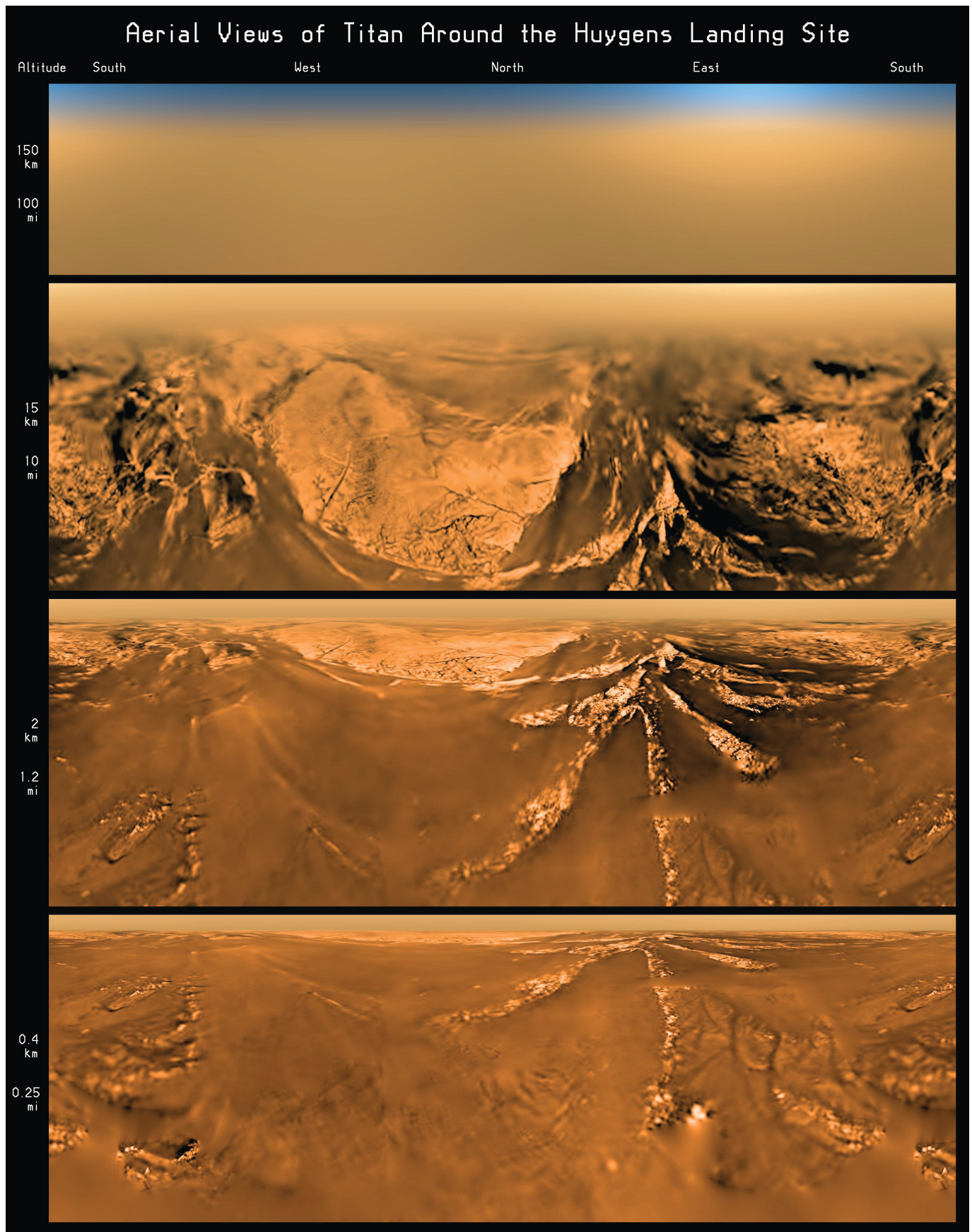
[Huygens \(Spacecraft\) - Wikipedia](#)

[Cassini Spacecraft Huygens Probe](#)

[Huygens: The Top 10 Discoveries at Titan](#)

xkcd





This poster shows a flattened (Mercator) projection of the view from the descent imager/spectral radiometer on the European Space Agency's Huygens probe at four different altitudes. The images were taken on Jan. 14, 2005. Image Credit: [ESA/NASA/JPL/University of Arizona](#)

Spot the Young Stars of the Hyades and Pleiades by David Prosper

Orion is the last of a trio of striking star patterns to rise during the late fall and early winter months, preceded by the diminutive Pleiades and larger Hyades in Taurus. All three are easily spotted rising in the east in early January evenings, and are textbook examples of stars in different stages of development.

As discussed in last month's Notes, the famous Orion Nebula (M42), found in Orion's "Sword," is a celestial nursery full of newly-born "baby stars" and still-incubating "protostars," surrounded by the gas from which they were born. Next to Orion we find the Hyades, in Taurus, with their distinctive "V" shape. The Hyades are young but mature stars, hundreds of millions of years old and widely dispersed. Imagine them as "young adult" stars venturing out from their hometown into their new galactic apartments. Bright orange Aldebaran stands out in this group, but is not actually a member; it just happens to be in between us and the Hyades. Traveling from Orion to the Hyades we then find the small, almost dipper-shaped Pleiades star cluster (M45). These are "teenage stars," younger than the Hyades, but older than the newborn stars of the Orion Nebula. These bright young stars are still relatively close together, but have dispersed their birth cocoon of stellar gas, like teenagers venturing around the neighborhood with friends and wearing their own clothes, but still remaining close to home - for now. Astronomers have studied this trio in great detail in order to learn more about stellar evolution.



Locate Orion rising in the east after sunset to find the Orion Nebula in the "Sword," below the famous "Belt" of three bright stars. Then, look above Orion to find both the Hyades and the Pleiades. Binoculars will bring out lots of extra stars and details in all three objects, but you can even spot them with your unaided eye!

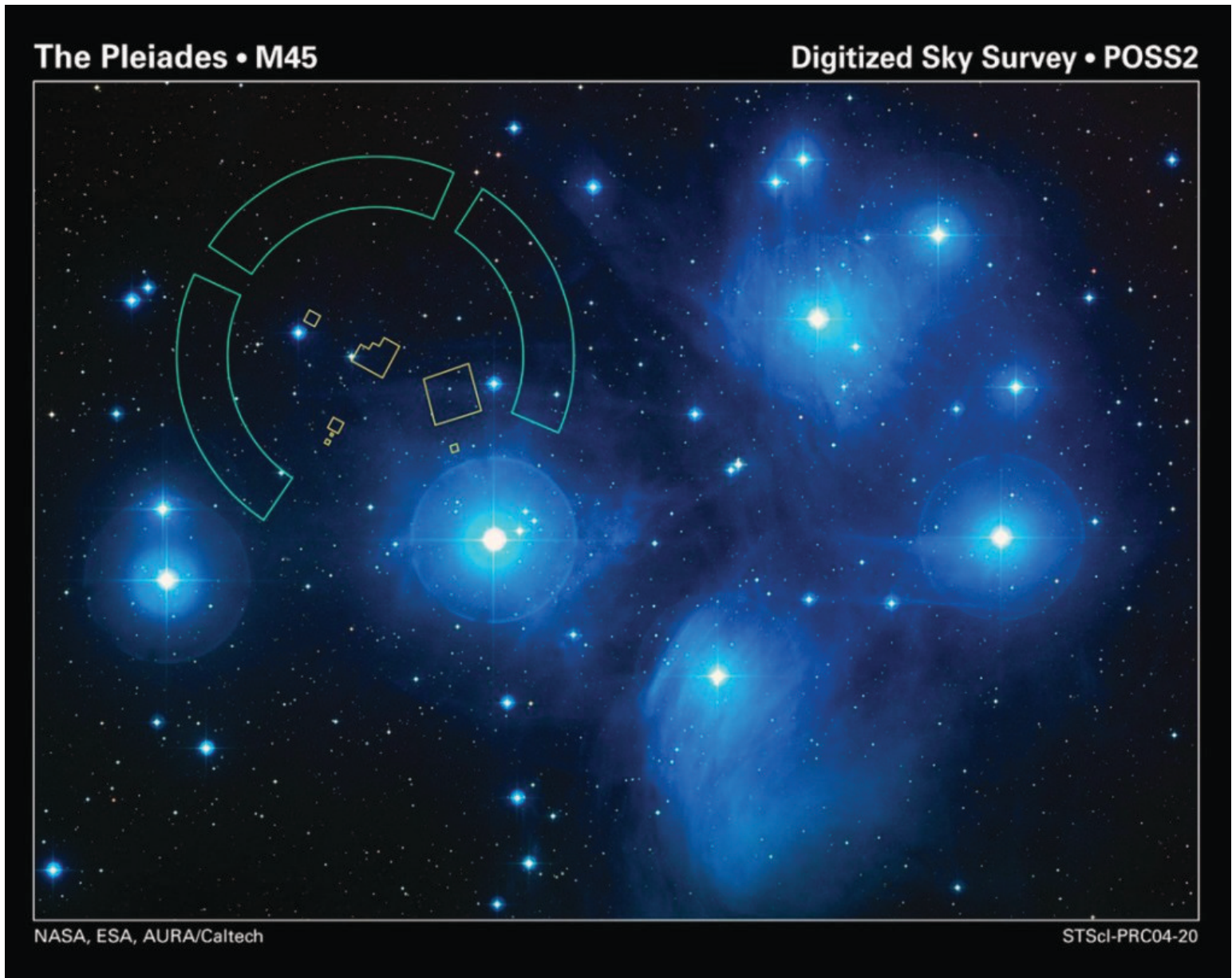
Figuring the exact distance of the Pleiades from Earth is an interesting problem in astrometry, the study of the exact positions of stars in space. Knowing their exact distance away is a necessary step in determining many other facts about the Pleiades. The European Space Agency's Hipparcos satellite determined their distance to about 392 light years away, around 43 light years closer than previous estimates. However, subsequent measurements by NASA's Hubble Space Telescope indicated a distance of 440 light years, much closer to pre-Hipparcos estimates. Then, using a powerful technique called Very Long Baseline Interferometry (VLBI), which combines the power of radio telescopes from around the world, the distance of the Pleiades was calculated to 443 light years. The ESA's Gaia satellite, a successor to Hipparcos, recently released its first two sets of data, which among other findings show the distance close to the values found by Hubble and VLBI, possibly settling

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The Orion Nebula, continued

the long-running “Pleiades Controversy” and helping firm up the foundation for follow-up studies about the nature of the stars of the Pleiades.

You can learn more about the Pleiades in the Universe Discovery Guide at bit.ly/UDGMarch, and find out about missions helping to measure our universe at nasa.gov.



Close-up of the Pleiades, with the field of view of Hubble’s Fine Guidance Sensors overlaid in the top left, which helped refine the distance to the cluster. The circumference of the field of view of these sensors is roughly the size of the full Moon. (Credit: NASA, ESA and AURA/Caltech)

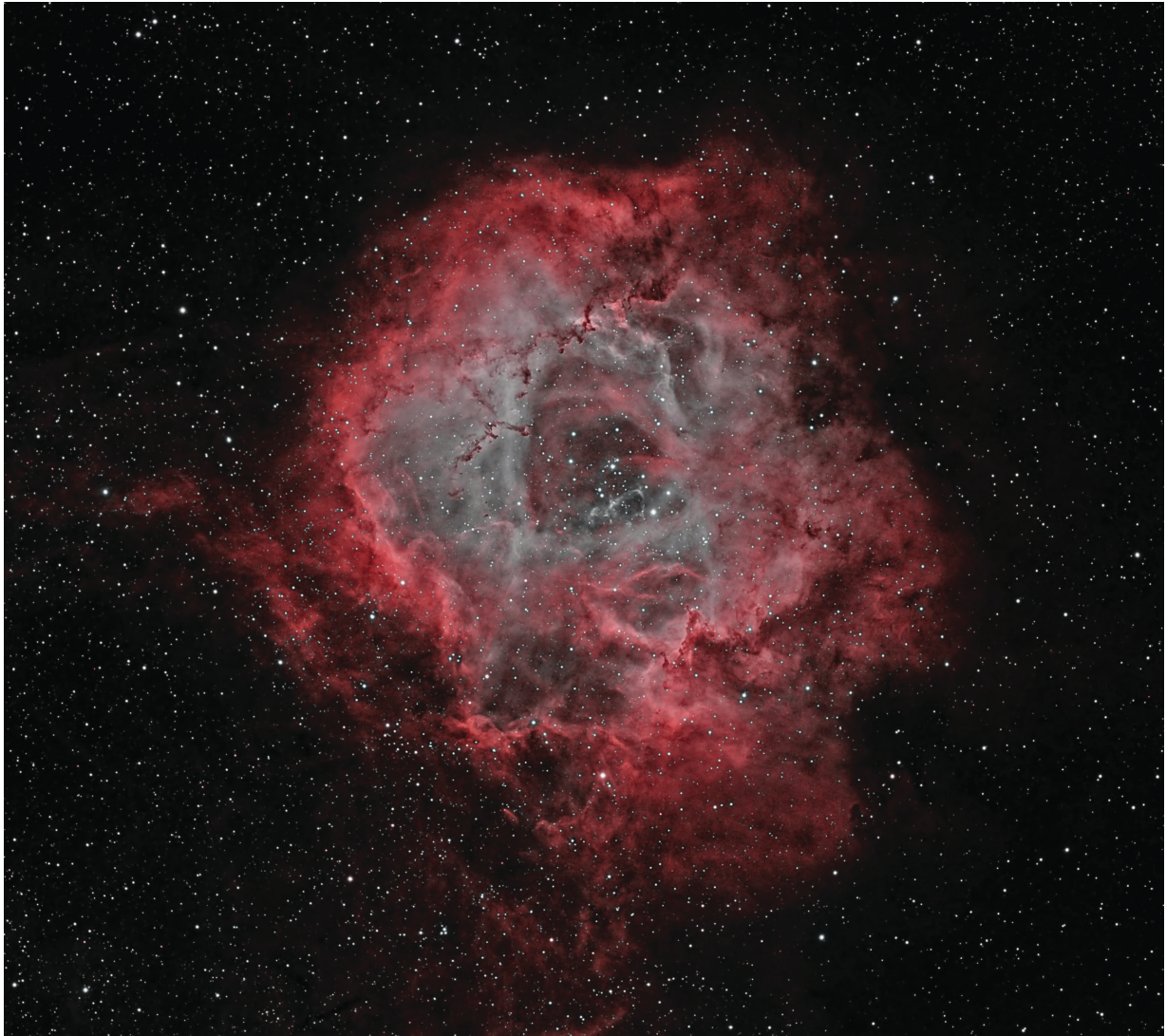
This article is distributed by NASA Night Sky Network. The Night Sky Network program supports astronomy clubs across the USA dedicated to astronomy outreach. Visit nightsky.jpl.nasa.gov to find local clubs, events, and more! You can catch up on all of NASA’s current and future missions at nasa.gov. With articles, activities and games NASA Space Place encourages everyone to get excited about science and technology. Visit spaceplace.nasa.gov to explore space and Earth science!

From the President, continued

workshop. We will have members available to help anyone that needs it. We will also have a couple of the club scopes set up if you were pondering taking one home with you.

Coming up in February, member Greg Neaveill will talk to us about telescope making and show some innovative scope designs that he created and built. In March, we will have our first "What's Up?" for the year and we will have it at the Adventure Science Center's Sudekum Planetarium. If you have a topic that you would like us to present, please let me or someone on the board know and we will try our best to get it scheduled.

Keith Rainey



Rosette Nebula

BSAS Member Hawk Wolinski

Barnard-Seyfert Astronomical Society Minutes of a Regular Meeting of the Board of Directors Held On Wednesday, December 4, 2019

The regular meeting of the Board of Directors of the Barnard-Seyfert Astronomical Society was held December 4, 2019, at the Girl Scouts Center, 4522 Granny White Pike, Nashville, TN 37204. Present were Tom Beckermann, Chip Crossman, Drew Gilmore, Bud Hamblen, KC Katalbas, Keith Rainey, and Andy Reeves. A quorum being present, Keith called the meeting to order at 7:30 PM and asked for a motion to adopt the minutes as printed in the December issue of the Eclipse. Chip so moved, Andy seconded, and the minutes were adopted by unanimous voice vote. There was \$9,679.74 in the bank account and \$727.24 in the PayPal account. A total of 28 Hatch Showprint posters have been sold. We have 13 orders for the RASC Observer's Handbook and 9 orders for the Deep Space Mysteries. Orders for the handbooks and calendars will close on December 5 to have time to get the orders by the December membership meeting. Keith reported that there were 142 members.

The program scheduled for the December membership meeting is the annual luck dinner and the 2019 solar eclipse in Chile by Theo Wellington. The telescope workshop will be in January in January, and telescope making will be presented by Greg Neaveill in February, and the Messier Marathon will be the subject of the March meeting at the Adventure Science Center.

Meeting at the Adventure Science Center was proposed:

Resolution 2019-12-04.

The March and subsequent membership meetings will be held at the Adventure Science Center,

In either the planetarium or the Jack Wood Hall at 7:30 PM on the third Wednesday of the month.

The March and subsequent board meetings will be held at the Adventure Science Center before the membership meeting on the third Wednesday of the month.

The club will pay a \$100 per meeting facility fee.

If the annual dinner is held at the Adventure Science Center, the dinner will be professionally catered.

The resolution was moved by Keith, seconded by Chip and approved by a unanimous voice vote.

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

Name tags for the membership meetings were discussed.

There being no further business, Keith moved for adjournment, KC seconded, the meeting was adjourned by voice vote of the board.

Respectfully submitted,

Bud Hamblen
Secretary

**Barnard-Seyfert Astronomical Society
Minutes of the Monthly Membership Meeting
Held on Wednesday, December 18, 2019**

The Barnard-Seyfert Astronomical Society held its annual potluck dinner and monthly meeting at the Girl Scout Center, Nashville, Tennessee, on Wednesday, December 18, 2019. Twenty-four members and guests signed in. The dinner began at 6:30 PM. Following the dinner, Keith Rainey called the monthly meeting to order at 7:30 PM. Keith asked for a motion to approve the minutes of the November 20, 2019, meeting as printed in the December issue of the Eclipse. Dr. Spencer Buckner so moved, Frank LaVarre seconded, and the minutes were approved by a unanimous voice vote. Theo Wellington reported that there was \$9,279.40 in the bank account and \$906.05 in the PayPal account. Keith reported that there were 142 members.

Keith announced a winter solstice event at the Warner Park Nature Center on December 20 from 3:30 to 6 PM, and a public star party at the Bells Bend Outdoor Center on January 4, 2020, from 6:30 to 8:30 PM.

Theo Wellington presented observations of the July 2, 2019, total solar eclipse in Chile.

RASC 2020 Observer's Handbook and Deep Space Mysteries calendars were distributed to those who had ordered copies.

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

Respectfully submitted,

Bud Hamblen

Secretary



In honor of the club's 90th anniversary we partnered with Hatch Show Print to create a unique poster that would honor the achievement of the club. For those who don't know Hatch Show has been making posters for a variety of events and concerts for 140 years. In all that time we are their first astronomy club.

On the poster at the center is the moon. This was made from a wood grained stencil that the shop has used for over 50 years. To contrast that the telescope that the people are using is a brand new stencil made for our poster. The poster has three colors. First the pale yellow color of the moon was applied. Next the small stars, circles, and figures at the bottom were colored in metallic gold. The third color is

a blue for the night sky. Where it overlaps with the metallic gold it creates a darker blue leaving the figures at the bottom looking like silhouettes. This was a one time printing so the 100 that we have are all that will be printed.

The prints are approximately 13 3/4" x 22 1/4" and are available for \$20 at our membership meetings, or \$25 with shipping by ordering through bsasnashville.com. Frame not included.



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.