The ECLIPSE

The Newsletter of the Barnard-Seyfert Astronomical Society

December 2022

BSAS
Barnard-Seyfert Astronomical Society

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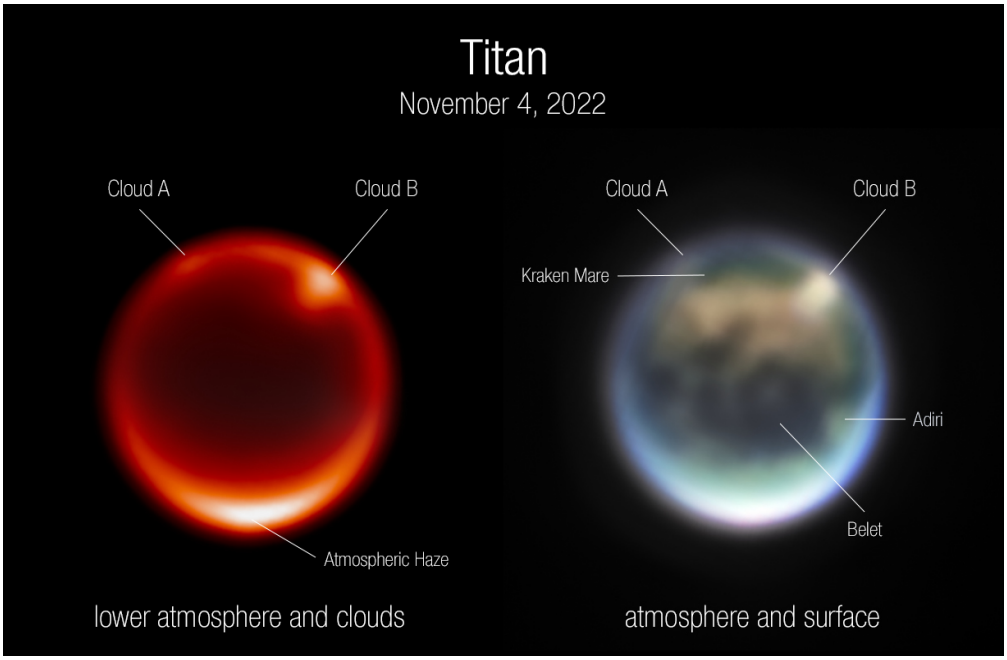

Images of Saturn's moon Titan, captured by the James Webb Space Telescope's NIRCam instrument Nov. 4, 2022. Left: Image using F212N, a 2.12-micron filter sensitive to Titan's lower atmosphere. The bright spots are prominent clouds in the northern hemisphere. Right: Color composite image using a combination of NIRCam filters: Blue=F140M (1.40 microns), Green=F150W (1.50 microns), Red=F200W (1.99 microns), Brightness=F210M (2.09 microns). Several prominent surface features are labeled: Kraken Mare is thought to be a methane sea; Belet is composed of dark-colored sand dunes; Adiri is a bright albedo feature.

SCIENCE: NASA, ESA, CSA, Webb Titan GTO Team
IMAGE PROCESSING: Alyssa Pagan (STScI)

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Dec 23 Jan 21	Dec 29 Jan 28	Dec 7 Jan 6	Dec 16 Jan 13

Happy Birthday Arthur Eddington
by Robin Byrne

This month we celebrate the life of a man who revolutionized our understanding of the stars. Arthur Stanley Eddington was born December 18, 1882 in Kendal, England. His father, Arthur Henry, was the headmaster of a Quaker school, but died of typhoid when Arthur was only 2 years old. His mother, Sarah Ann, was left to raise Arthur and his sister with limited resources.

Arthur was home-schooled for many years. When he was quite young, his interest in astronomy was first awakened by the loan of a 3 inch telescope. At the age of 11, Arthur was sent to a preparatory school. While most of the students lived at the school, Arthur was among the few "day pupils," due to the family being unable to afford to pay his boarding. It was here that his talent in mathematics was first discovered, but he quickly reached the limits of what the school could offer.

His talents were enough to earn a scholarship of 60 Pounds per year to attend Owens College in Manchester when Arthur was only 16. After a year, he decided to concentrate his studies in physics. Thanks to earning several scholarships, Arthur successfully completed his Bachelors of Science degree with First Class Honors in 1902.

After graduation, Eddington earned a scholarship to attend Trinity College, Cambridge to pursue his graduate degree. He was awarded a Masters in 1905, after which he spent a few years conducting various research projects that didn't excite him or make much progress.

In 1906, Eddington was recommended for a position at the Royal Observatory in Greenwich. He was hired to be the chief assistant to the Astronomer Royal. Eddington's first project was to analyze photographs of the asteroid 433 Eros to measure its parallax. Making use of a statistical method, Eddington's technique won him recognition that led to receiving the Smith's Prize in 1907, which resulted in a position at Trinity College. Due to two unexpected deaths, Eddington quickly found himself rising through the ranks, and he became Director of Cambridge Observatory in 1914.

Just as Eddington's career was beginning to take off, World War I began. Because of his Quaker upbringing, Eddington was a conscientious objector and did not enlist. During this time, Eddington became secretary of the Royal Astronomical Society, which put him in the position to receive letters from fellow scientists in other countries, including Germany.

Because of this, he was among the first to hear about Einstein's theory of relativity. Due to his strong math skills, Eddington could actually understand it, and his pacifistic views allowed him to view the work of a German with an open mind.

In March of 1916, England initiated conscription, requiring all eligible men to serve their country. Eddington planned to appeal on the grounds of his religious views, but the Astronomer Royal, Sir Frank Dyson, made an appeal in the name of science. Inspired by Einstein's predictions of gravitational lensing, Eddington and Dyson had made preparations to observe the total solar eclipse of 1919 to see if they could detect the apparent shift in position of stars seen near the eclipsed Sun. Science prevailed, and he was granted an exemption, provided he follow through with the eclipse expedition.

Fortuitously, the war ended prior to the eclipse, making travel that much safer. In March of 1919, Eddington traveled to the island of Principe, off the coast of Africa, to photograph the Sun and the surrounding stars during totality, which would occur on the 29th of May. The Sun was near the Hyades, providing a rich field of stars to image. After much analysis, Eddington found that the stars shifted in position an amount consistent with the predictions made by relativity.

Due to this success, Eddington became a prolific popularizer of relativity. He was known for his clear explanations of such a difficult topic. According to one anecdote, he was approached by a fellow physicist, who considered himself among the experts on relativity. This physicist said that Eddington was one of only three people who understood relativity (the speaker clearly think the three were Eddington, Einstein, and himself). Eddington, after an awkward pause replied, "I was wndering who the third might be…"

In addition to relativity, Eddington also spent the World War I years trying to understand the interiors of stars. Treating stars as a ball of gas held in a balance between gravity pulling inwards and radiation pressure pushing outwards, Eddington was able to model the temperature, density, and pressure in the interior of a star, from the center to the surface. He also argued against the conventional wisdom of the time, which held that stars generated their energy purely from the heat released due to gravitational contraction. Eddington instead proposed that stars produced energy via the fusion of hydrogen into helium. It had been shown in laboratory experiments that helium has a mass that is fractionally lower than that of the four hydrogen atoms that would be needed to fuse into a helium atom. Making use of Einstein's famous equation, $E = mc2$, Eddington proposed that the mass that is lost in the process is converted into the energy that is ultimately radiated by the star. While not initially accepted by all of the scientific community, Eddington's ideas and models were eventually vindicated when observations confirmed his predictions for the diameters of stars. Eddington's book, "The Internal Constitution of Stars," published in 1926, became so well-established that it was still a required text book in the 1980's, when I was in graduate school!

While clearly a master of understanding the structure of stars, Eddington was not always correct. Famously, he clashed with Subrahmanyan Chandrasekhar when "Chandra" was a graduate student at Cambridge. Chandrasekhar had work out mathematically that there was

a limit to the mass of a white dwarf, beyond which it would collapse to a singularity. Eddington resoundingly dismissed this idea as preposterous and impossible. Of course, in retrospect, we now know that Chandra had just predicted the existence of black holes.

In 1930, Arthur Eddington was knighted, becoming Sir Arthur Eddington, one of a myriad of honors bestowed upon him during his lifetime. At the age of 62, after a battle with cancer, Arthur Eddington died on November 22, 1944.

Gazing at the night sky, enjoying the beauty of the stars, there's an overwhelming sense of awe. I feel that the more we understand about those stars, the deeper the feeling becomes. We have Arthur Eddington to thank for helping us to appreciate those spectacular specks of light we see each clear night.

References:

Arthur Eddington - Wikipedia

Arthur Stanley Eddington - Math History

On the Cover: Nov. 28, 2022):On flight day 13, Orion reached its maximum distance from Earth during the Artemis I mission when it was 268,563 miles away from our home planet. Orion has now traveled farther than any other spacecraft built for humans. Credit; NASA JSC

Binoculars: A Great First Telescope
By David Prosper

Do you want to peer deeper into the night sky? Are you feeling the urge to buy a telescope? There are so many options for budding astronomers that choosing one can be overwhelming. A first telescope should be easy to use and provide good quality views while being affordable. As it turns out, those requirements make the first telescope of choice for many stargazers something unexpected: a good pair of binoculars!

The two most popular types of binocular designs are shown here: roof-prism binoculars (left) and porro-prism binoculars (right). Roof prisms tend to be more compact, lighter, and a bit more portable, while porro-prisms tend to be heavier but often offer wider views and greater magnification. What should you choose? Many birders and frequent fliers often choose roof-prism models for their portability. Many observers who prefer to observe fainter deep-sky objects or who use a tripod with their observing choose larger porro-prism designs. There is no right answer, so if you can, try out both designs and see which works better for you.

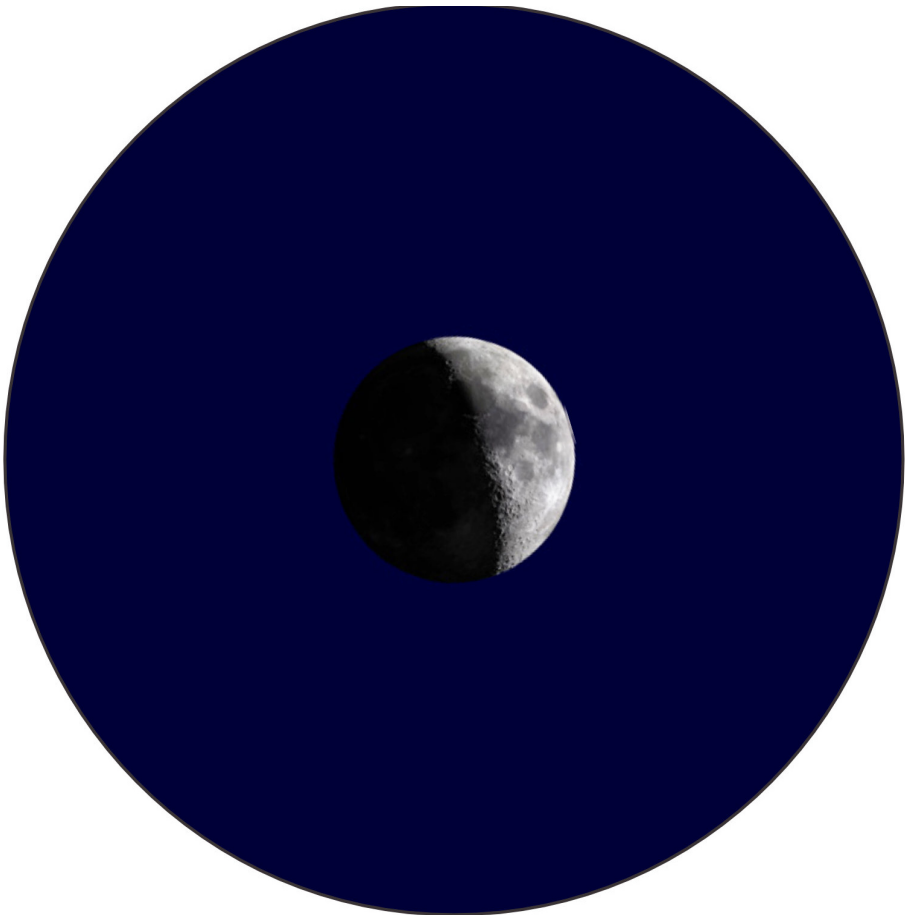
Binoculars are an excellent first instrument because they are generally easy to use and more versatile than most telescopes. Binoculars can be used for activities like stargazing and birdwatching, and work great in the field at a star party, along the hiking trail, and anywhere else where you can see the sky. Binoculars also travel well, since they easily fit into carry-on luggage – a difficult feat for most telescopes! A good pair of binoculars, ranging in specifications from 7x35 to 10x50, will give you great views of the Moon, large open star clusters like the Pleiades (M45), and, from dark skies, larger bright galaxies like the Andromeda Galaxy (M31) and large nebulae like the Orion Nebula (M42). While you likely won't be able to see Saturn's rings, as you practice your observing skills you may be able to spot Jupiter's moons, along with some globular clusters and fainter nebulae from dark sites, too.

What do the numbers on those binocular specs actually mean? The first number is the magnification, while the second number is the size in millimeters (mm) of the lenses. So, a 7x35 pair of binoculars means that they will magnify 7 times using lenses 35 mm in diameter. It can be tempting to get the biggest binoculars you can find, but try not to get anything much more powerful than a 10x50 pair at first. Larger binoculars with more power often have narrower fields of vision and are heavier; while technically more powerful, they are also more difficult to hold steadily in your hands and "jiggle" quite a

bit unless you buy much more expensive binoculars with image stabilization, or mount them to a tripod.

Would it surprise you that amazing views of some astronomical objects can be found not just from giant telescopes, but also from seemingly humble binoculars? Binoculars are able to show a much larger field of view of the sky compared to most telescopes. For example, most telescopes are unable to keep the entirety of the Pleiades or Andromeda Galaxy entirely inside the view of most eyepieces. Binoculars are also a great investment for more advanced observing, as later on they are useful for hunting down objects to then observe in more detail with a telescope.

If you are able to do so, real-world advice and experience is still the best for something you will be spending a lot of time with! Going to an in-person star party hosted by a local club is a great way to get familiar with telescopes and binoculars of all kinds – just ask permission before taking a closer look! You can find clubs and star parties near you on the Night Sky Network's Clubs & Events page at bit.ly/nsnclubsandevents, and inspire your binocular stargazing sessions with NASA's latest discoveries at nasa.gov.



A pair of good binoculars can show craters on the Moon around 6 miles (10 km) across and larger. How large is that? It would take you about two hours to hike across a similar-sized crater on Earth. The "Can You See the Flag On the Moon?" handout showcases the levels of detail that different instruments can typically observe on the Moon, available at bit.ly/flagmoon. Moon image courtesy Jay Tanner

This article is distributed by NASA's Night Sky Network (NSN). The NSN program supports astronomy clubs across the USA dedicated to astronomy outreach. Visit nightsky.jpl.nasa.gov to find local clubs, events, and more!

Barnard-Seyfert Astronomical Society
Minutes of a Regular Meeting of the Board of Directors
Held On Wednesday, November 2, 2022

The regular meeting of the Board of Directors of the Barnard-Seyfert Astronomical Society was held November 2, 2022, online, Dr. Tom Beckermann presiding. Logged in were Tom Beckermann, Chip Crossman, Bud Hamblen and Theo Wellington.

Tom asked for a review of the minutes of the board meeting on October 5, 2022, as printed in the November, 2022, edition of the Eclipse. Noone objected to the minutes.

Treasurer's Report: Theo reported $10,254.98 in the Truist account and $612.88 in the PayPal account.

Social Media: Theo reported that the Facebook page was liked by about 2,000. @BSASNashville was followed by 320 on Twitter.

The lanyards for the new BSAS nametags have been received.

The BSAS web site costs $180/year.

Bud will ask the Girl Scouts for a renewal of our contract for the meeting room. The fee is $1200 for 12 meeting dates.

There being no further business, the meeting was adjourned at 8:15.

Respectfully submitted,

Bud Hamblen
Secretary

xkcd

Barnard-Seyfert Astronomical Society
Minutes of a Regular Meeting of the Board of Directors
Held On Wednesday, November 16, 2022

The Barnard-Seyfert Astronomical Society met at the Girl Scout Center and on-line via Zoom on Wednesday, November 16, 2022, Tom Beckermann presiding. About 12 persons attended in person and via Zoom.

Treasurer's Report: The Truist bank balance was $10,254.98, and the PayPal balance was $612.88. Lanyards for BSAS name tags are in. Name tags are available. 40 RASC Handbooks are in at $26.50 a copy.

Membership report: Keith Rainey reported 226 members.

Outreach and Star Parties: A public star party is scheduled for December 3, 2022, at Shelby Bottoms Nature Center from 6:30 to 8:30 PM, weather permitting.

Gary Ottewell has resumed the Astronomical Calender. The e-book version is available for $12 from the Universal Workshop. A printed version is available for $21. Point your web browser at https://www.universalworkshop.com/astronomical-calendar-2023/ to order your copy.

Keith presented "All I want for Christmas are Astronomy Toys" via Zoom.

There being no further business, the meeting adjourned at 8:30 PM.

Respectfully submitted,

Bud Hamblen
Secretary

Next Membership Meeting:

Wednesday December 21,
potluck dinner starting at 6:30 pm

Cumberland Valley
Girl Scout Council Building
4522 Granny White Pike

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.

Barnard-Seyfert Astronomical Society

Become a Member of BSAS! Visit bsasnashville.com to join online.

All memberships have a vote in BSAS elections and other membership votes. Also included are subscriptions to the BSAS and Astronomical League newsletters.

Annual dues:

Regular: $25
Family: $35
Senior/Senior family: $20
Student*: $15

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

About BSAS

Organized in 1928, the Barnard-Seyfert Astronomical Society is an association of amateur and professional astronomers who have joined to share our knowledge and our love of the sky.

The BSAS meets on the third Wednesday of each month at the Cumberland Valley Girl Scout Building at the intersection of Granny White Pike and Harding Place in Nashville. Experienced members or guest speakers talk about some aspect of astronomy or observing. Subjects range from how the universe first formed to how to build your own telescope. The meetings are informal and time is allotted for fellowship. You do not have to be a member to attend the meetings.

Membership entitles you to subscriptions to Astronomy and Sky & Telescope at reduced rates; the club's newsletter, the *Eclipse*, is sent to members monthly. BSAS members also receive membership in the Astronomical League, receiving their quarterly newsletter, the Reflector, discounts on all astronomical books, and many other benefits.

In addition to the meetings, BSAS also sponsors many public events, such as star parties and Astronomy Day; we go into the schools on occasion to hold star parties for the children and their parents. Often the public star parties are centered on a special astronomical event, such as a lunar eclipse or a planetary opposition.

Most information about BSAS and our activities may be found at bsasnashville.com. If you need more information, write to us at info@bsasnashville.com.

Free Telescope Offer

Did someone say free telescope? Yes, you did read that correctly. The BSAS Equipment & Facilities Committee has free telescopes ranging in size from 2.6" to 8" that current members can actually have to use for up to 60 days at a time. We also have some other items in the loaner program such as a photometer, H-alpha solar telescope, educational CDs, tapes, DVDs, and books. Some restrictions apply. A waiting list is applicable in some cases. The BSAS Equipment Committee will not be held responsible for lost sleep or other problems arising from use of this excellent astronomy gear. For information on what equipment is currently available, contact info@bsasnashville.com.