

The ECLIPSE

September
2020

The Newsletter of the Barnard-Seyfert Astronomical Society

Next Membership Meeting:

September 16, 7:30 pm
Online meeting:
"Cosmic Horizons"

Details on page 9

In this Issue:

From the President	2
Happy Birthday Maria Mitchell by Robin Byrne	3
Summer Triangle Corner: Deneb by David Prosper	5
Board Meeting Minutes August 5, 2020	8
Membership Meeting Minutes August 19, 2020	9
Membership Information	11





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Letter from the President

I am sitting here on Labor Day Weekend with writer's block. I don't know what to write about. Do I write about meeting topics and ideas that people have for meetings? With the Zoom meetings, almost anyone and any topic is available. We have had people ask about astrophotography before and it is a topic that we are considering for a future program. However, we do need more ideas so any idea you have is welcome! Do I write about our equipment program and how we have a bunch of telescopes to loan out to any member that wants to "try before you buy?" Just email equipment@bsasnashville.com if you are interested.

Do I write about COVID and how our meetings will be over Zoom for the foreseeable future? We have had pretty good response to our Zoom meetings and I look forward to seeing you on the next one. This month's topic will be covered by Chuck Allen, who is vice-president of the Astronomical League. We had made plans for him to be in-person earlier this year, but, well you know.

Maybe I should talk about the upcoming conjunction of Jupiter and Saturn at the end of the year. I am very excited about this conjunction and I hope to get some good pictures out of it. Right now, you can find Jupiter and Saturn and watch them get closer and closer as the weeks go by.

Maybe I can talk a little about all of those things. That might work.

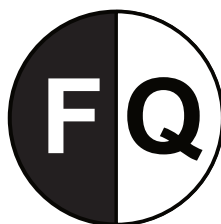
I hope we get some less cloudy nights so everyone can go out and enjoy the wonders of the night sky!

Clear skies and have a great month!

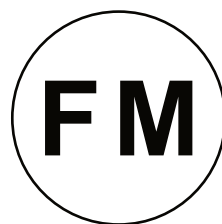
Keith Rainey



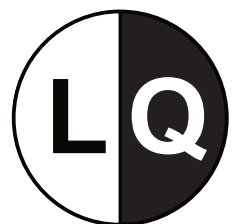
Sept 17
Oct 16



Sept 23
Oct 23



Sept 2
Oct 1, 31



Sept 10
Oct 9

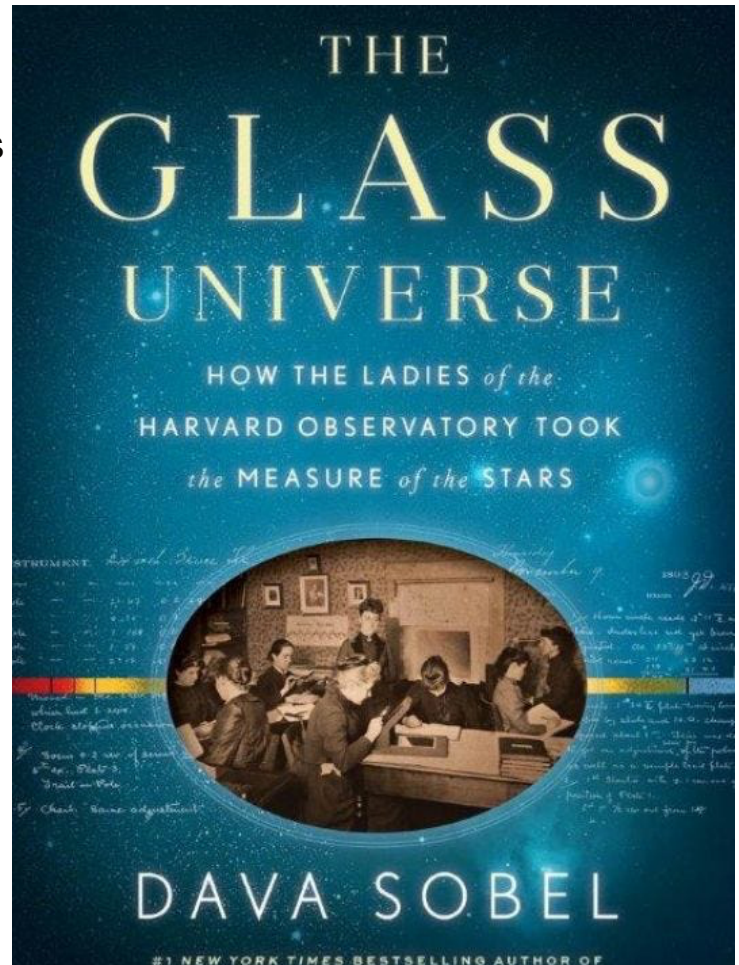
Book Review: The Glass Universe by Dava Sobel
Reviewed by Robin Byrne

Sometimes I'm slow to getting around to reading a book, so it's no surprise that four years after it came out, I finally read Dava Sobel's "The Glass Universe: How the Ladies of the Harvard Observatory Took the Measure of the Stars." Regardless of the delay, reading this book was a pure joy.

I've been a fan of Dava Sobel since "Longitude," so I wasn't surprised by how much I enjoyed the book. What did surprise me were the number of stories and accomplishments of women coming out of the Harvard Observatory. The story begins in the 1880's when Anna Draper began looking for a way to memorialize her late husband, Henry, while also continuing the work he had begun in studying the spectra of the stars. Corresponding with her friend, Edward Pickering, who was the director of Harvard Observatory, ultimately led to Mrs. Draper establishing a fund to produce a catalog of the spectra and characteristics of stars. This immense project would lead to Pickering hiring more women to work as "computers" to analyze the spectra, and, ultimately, the publication of the Henry Draper Catalog of Stars. If you've ever seen a star referenced by its HD number, that is the number it was assigned in this catalog.

Before the funding from Anna Draper, Pickering had already been using women at the observatory to do computational work, but with this influx of money, he could expand the number of projects being conducted by the observatory, and even build new observatories at Harvard and abroad.

Among the notable women discussed in the book, easily the most famous was Annie Jump Cannon. The way we classify stars can be traced back to her system of classification. But in the book, we learn about Annie Cannon as a person, and her lifetime of contributions. Henrietta Leavitt is also highlighted, with her discovery of the Period-Luminosity Relationship for Cepheid variable stars. We then see how that relationship gets used by Harlow Shapley, who will be Pickering's successor as Director of the observatory, to measure the size of the Milky Way, and by Edwin Hubble to prove that there are galaxies beyond the Milky Way.



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The Glass Universe, continued

In addition to the above two women, who are deservedly considered to be astronomy superstars, we meet many other women who also merit recognition, but have been in the shadows for too long. One of the very first women to work as a computer for Pickering was Williamina Fleming, who began as Pickering's housekeeper, but proved to have exceptional astronomical ability. It was her classification system of stars that Annie Cannon modified to create the system still used today. Additionally, Fleming was very good at discovering spectroscopic binaries - binary star systems too close together to see two separate stars, but whose spectra indicated that there were multiple stars contributing to one spectrum.

"The Glass Universe" spans the era of the women computers from the 1880's to the 1950's, and shares the stories of almost twenty different women who worked at the Harvard Observatory over the years. Some had no formal training in astronomy, but others held some of the first advanced degrees in astronomy awarded to women. One of the last women spotlighted in the book was Cecilia Payne, who came to the observatory after being the first to earn her doctorate in astronomy at Harvard. Through the study of the spectra of stars, she determined the relative abundances of different elements in the stars. Her finding, that stars are composed of primarily hydrogen and helium, was dismissed by the astronomical establishment, who "knew" that the stars are composed of the same materials as Earth. It wasn't until many years later that her critics relented and accepted her findings. Payne became a professor of astronomy at Harvard, and was later appointed chair of the Astronomy Department.

With the development of mechanical computers, the era of women working as computers at the observatory ended. But it was the vision of two of the male observatory directors, Edward Pickering and Harlow Shapley, that allowed so many women to not only work at the observatory, but to be valued as contributors to the science. Both men created a supportive environment that encouraged the women to pursue degrees in astronomy and to be active members of the professional astronomical community. If the observatory had been run by men with a very different attitude toward the women working there, we would likely not know about any of these women, and the advances made in astronomy and astrophysics during this era would have suffered as a result.

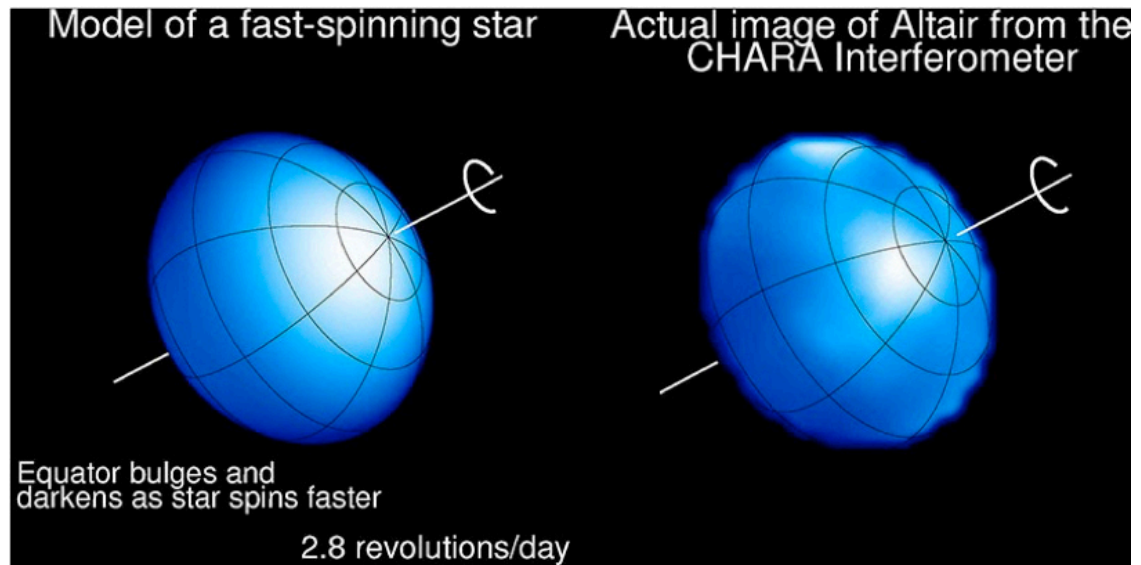
"The Glass Universe" by Dava Sobel celebrates the contributions of the women, and men, working at the Harvard Observatory, and is both entertaining and inspiring to read.

References:

The Glass Universe: How the Ladies of the Harvard Observatory Took the Measure of the Stars" by Dava Sobel, Penguin Books, 2016

Summer Triangle Corner: Altair by David Prosper

Altair is the final stop on our trip around the Summer Triangle! The last star in the asterism to rise for Northern Hemisphere observers before summer begins, brilliant Altair is high overhead at sunset at the end of the season in September. Altair might be the most unusual of the three stars of the Triangle, due to its great speed: this star spins so rapidly that it appears “squished.”



The image on the right was created using optical interferometry: the light from four telescopes was combined to produce this image of Altair's surface. Image credit: Ming Zhao. More info: <https://bit.ly/altairvsmode>

A very bright star, Altair has its own notable place in the mythologies of cultures around the world. As discussed in our previous edition, Altair represents the cowherd Niulang in the ancient Chinese tale of the “Cowherd and the Weaver Girl.” Altair is the brightest star in the constellation of Aquila the Eagle; while described as part of an eagle by ancient peoples around the Mediterranean, it was also seen as part of an eagle by the Koori people in Australia! They saw the star itself as representing a wedge-tailed eagle, and two nearby stars as his wives, a pair of black swans. More recently one of the first home computers was named after the star: the Altair 8800.

Altair's rapid spinning was first detected in the 1960s. The close observations that followed tested the limits of technology available to astronomers, eventually resulting in direct images of the star's shape and surface by using a technique called interferometry, which combines the light from two or more instruments to produce a single image. Predictions about how the surface of a rapidly spinning massive star would appear held true to the observations; models predicted a squashed, almost “pumpkin-like” shape instead of a round sphere, along with a dimming effect along the widened equator, and the observations confirmed this! This equatorial dimming is due to a phenomenon called gravity darkening. Altair is wider at the equator than it is at the poles due to centrifugal force, resulting in the star's mass bulging outwards at the equator. This results in the denser poles of the star being hotter and brighter, and the less dense equator being cooler and therefore dimmer. This doesn't mean that the

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Altair, continued

equator of Altair or other rapidly spinning stars are actually dark, but rather that the equator is dark in comparison to the poles; this is similar in a sense to sunspots. If you were to observe a sunspot on its own, it would appear blindingly bright, but it is cooler than the surrounding plasma in the Sun and so appears dark in contrast.

As summer winds down, you can still take a Trip Around the Summer Triangle with this activity from the Night Sky Network. Mark some of the sights in and around the Summer Triangle at bit.ly/TriangleTrip. You can discover more about NASA's observations of Altair and other fast and furious stars at nasa.gov.



Altair is up high in the early evening in September. Note Altair's two bright "companions" on either side of the star. Can you imagine them as a formation of an eagle and two swans, like the Koori?

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!

xkcd

AFTER A STAR BEGINS FUSING HYDROGEN, IT MAY REACH A STABLE EQUILIBRIUM IN WHICH IT SEPARATES FROM MASSACHUSETTS AND DEVELOPS A THRIVING LOBSTER INDUSTRY. THIS IS KNOWN AS THE MAINE SEQUENCE.



Board Meeting, continued

There being no further business, Keith asked for a motion to adjourn. Kat so moved and Andy seconded. The meeting was adjourned at 8:15.

Respectfully submitted,

Bud Hamblen
Secretary



On the Cover: “Jupiter Abyss” – NASA's Juno spacecraft captured this view of an area within a Jovian jet stream showing a vortex that has an intensely dark center. Nearby, other features display bright, high altitude clouds that have puffed up into the sunlight.

The color-enhanced image was taken at 12:55 a.m. PDT (3:55 a.m. EDT) on May 29, 2019, as the spacecraft performed its 20th science flyby of Jupiter. At the time, Juno was about 9,200 miles (14,800 kilometers) from the planet's cloud tops, above approximately 52 degrees north latitude.

Citizen scientists Gerald Eichstädt and Seán Doran created and named this image using data from the spacecraft's JunoCam imager. JunoCam's raw images are available for the public to peruse and process into image products at missionjuno.swri.edu/junocam/processing.

More information about Juno is at www.nasa.gov/juno and missionjuno.swri.edu.

NASA's Jet Propulsion Laboratory manages the Juno mission for the principal investigator, Scott Bolton, of Southwest Research Institute in San Antonio. Juno is part of NASA's New Frontiers Program, which is managed at NASA's Marshall Space Flight Center in Huntsville, Alabama, for NASA's Science Mission Directorate. Lockheed Martin Space Systems, Denver, built the spacecraft. Caltech in Pasadena, California, manages JPL for NASA.

Barnard-Seyfert Astronomical Society Minutes of a Regular Meeting of the Board of Directors Held On Wednesday, August 5, 2020

The regular meeting of the Board of Directors of the Barnard-Seyfert Astronomical Society was held August 5, 2020, online. Logged in were Tom Beckermann, Gary Eaton, Drew Gilmore, Bud Hamblen, Keith Rainey, Andy Reeves, Kathy Underwood and Theo Wellington. A quorum being present, Keith called the meeting to order at 7:30 PM. Keith asked for a vote to adopt the June 18, 2020, minutes as printed in the July issue of the Eclipse. Kathy so moved, Theo seconded and the minutes were adopted by voice vote. Theo reported that the total bank balance was \$11,314.44 (\$4,578.07 savings, \$6,735.37 in checking) and that the

Paypal balance was \$187.21. Expenditures included \$777.00 for the club's Astronomical League dues and \$50.00 for Warner Parks to boost our virtual star party. Keith reported that there were 162 members.

Programs for upcoming meetings were discussed.

August – Comets! (Zoom)

September – Cosmic Horizons by Chuck Allen. (Zoom)

October – What's Up (Zoom)

November – All I Want for Christmas (Zoom)

December – Annual Dinner (if possible)

January – Telescope Workshop (if possible)

Zoom costs about \$15/month for essentially unlimited meeting time/participates and there is no annual contract. If we don't need it in the future we won't have to pay for it.

Recent star parties and outreach were discussed.

Theo reported that the virtual Tennessee star party had 1,500 participants initially and that the number increased by several hundred over the course of the event. An edited version with better sound will be put on line.

Up-coming star parties and outreach were discussed. The Friends of Mill Ridge Park, located Old Hickory Blvd near I-24, had asked for a public star party for August 22, but the Metro Parks Department has not yet opened parks for large groups. The first star party at this new park is hoped-for in the future. Dr Billy Teets, Dyer Observation, will host another virtual star party August 25, which will be bigger and better than ever (weather permitting).

Tom had no equipment news.

We had contact with a couple operating a cabin rental near Altamont, TN. Sunrise Mountain Cabin is on AirBnB.

The next board meeting is planned to be on line the first Wednesday in September.

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Barnard-Seyfert Astronomical Society Minutes of the Monthly Membership Meeting Held On Wednesday, August 19, 2020

Because monthly in-person meetings are suspended due to the COVID-19 epidemic, the Barnard-Seyfert Astronomical Society held an on-line meeting via Zoom on Wednesday, August 19, 2020.

Keith Rainey called the meeting to order at 7:30 PM and announced the on-line star party Tuesday, August 25, 2020, starring the “Lunar X” formation as presented by Dr Billy Teets, Vanderbilt University’s Dyer Observatory, and other solar system and deep sky objects as presented by amateur astronomers across Tennessee. There also will be international participation from McGill University, Montreal, Quebec, Canada.

Keith reported that there are 166 club members.

Keith showed an image of M-27 made by Lonnie Puterbaugh and an image of the Crescent Nebula made by Josh Van.

Theo Wellington presented “The Great Comet of ...” about recent great and not-so-great comets.

The being no further business, the meeting was adjourned at 8:40 PM

Respectfully submitted,

Bud Hamblen

Secretary

Next Membership Meeting:

Wednesday September 16, 7:30 pm Central
online on Zoom

Chuck Allen: “Cosmic Horizons”

Cosmic Horizons explores the limits of human visibility imposed by planetary curvature, photon sensitivity of the human eye, and the speed of light in an expanding universe. We briefly explore the definition of planetary horizons and the role of planetary size in defining them. Next, we examine the faintest astronomical objects we can see with and without optical aid, and the smallest number of photons theoretically detectable by humans. Finally, we discuss the four horizons imposed by time and the speed of light (the Hubble distance, cosmic particle horizon, cosmic event horizon, and future visibility horizon) and consider how these horizons change in an accelerating universe and what effect they have on what we can, or ever will, see.

Zoom link will be posted to bsasnashville.com



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.