The Newsletter of the Barnard-Seyfert Astronomical Society



# Catch The Waves!

by Kat Troche

#### The Electromagnetic Spectrum

If you've ever heard the term "radio waves," used a microwave or a television remote, or had an X-ray, you have experienced a broad range of the electromagnetic spectrum! But what is the electromagnetic spectrum?

According to Merriam-Webster, this spectrum is "the entire range of wavelengths or frequencies of electromagnetic radiation extending from gamma rays to the longest radio waves and including visible light." But what does that mean? Scientists think of the entire electromagnetic spectrum as many types of light, only some that we can see with our eyes. We can detect others with our bodies, like infrared light, which we feel as heat, and

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#### 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 at the Dyer Observatory 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.

# **Book Review:** The Six

# by Robin Byrne

My love of women's contributions to science, coupled with a passion for space program history immediately drew me to the book The Six: The Untold Story of America's First Women Astronauts by Loren Grush.

This book tells the story of the first women recruited by NASA for the space program. As the Space Shuttle program was ramping up, NASA needed a new batch of astronaut candidates to fly the latest spacecraft. For the first time, included in the ranks of newcomers were both women and people of color. In 1976, the call went out for applicants, publicized by a video starring Nichelle Nichols from Star Trek, highlighting the message that women and people of color were welcome. Once the application window closed in 1977, the panel in charge of recruitment had to wade through the myriad application forms to narrow the list down. Even with a much shorter list, it still took months of interviews to finally end up with a roster of 35 people who would officially become NASA Astronaut Group 8, though they gave themselves the nickname of TFNG's for Thirty-Five New Guys. Among those 35 new astronaut candidates were Anna Fisher,



Shannon Lucid, Judy Resnik, Sally Ride, Rhea Seddon, and Kathy Sullivan.

In the book, we start with what each woman was doing professionally before applying to become an astronaut, plus a little of their personal lives. We're then taken through their experiences while being interviewed, and the fateful moment when they got the news that they would be an astronaut. Once the TFNG's were introduced to the world, the media immediately focused on the women, and much of it was biased by sexist stereotypes that were still very prevalent at the time. The six women quickly developed their individual approaches for dealing with such attitudes, ranging from humor to quickly shutting it down and sticking to business.

Then it was time to get to work. The extensive training and tasks within NASA were explored for each woman, ultimately leading up to their first flights, and in some cases, subsequent flights, as well. We also learn about what was happening in their relationships and, for some of the women, growing families.

*The Six, continued* The story would not be complete without discussing the Challenger disaster that occurred on January 28, 1986, taking Judy Resnik's life, and Sally Ride's role as part of the panel that investigated the cause of the explosion. The story also takes us through Sally Ride's life after NASA, up to her death from pancreatic cancer in 2012.

As much as I pay attention to the space program, I am ashamed to admit that I had not heard of two of the original six women: Anna Fisher and Rhea Seddon. Anna Fisher had been a medical doctor prior to becoming an astronaut, and also has the distinction of being the first mother to fly in space. Rhea Seddon, from Murfreesboro, Tennessee no less, was also a medical doctor. While at NASA, she met her future husband, "Hoot" Gibson, also an astronaut. Their first child was dubbed "astrotot" as the first child born to two astronaut parents.

The Six: The Untold Story of America's First Women Astronauts by Loren Grush is an enjoyable read, with many details about each of the women that were new to me. If you like reading about the space program and women's contributions to it, you will want to read The Six, too.

#### References:

The Six: The Untold Story of America's First Women Astronauts by Loren Grush; Scribner; 2023



NASA's Curiosity Mars rover appears as a dark speck in this view captured on Feb. 28, 2025, by the High-Resolution Imaging Science Experiment (HiRISE) camera aboard NASA's Mars Reconnaissance Orbiter. At the time this image was taken, Curiosity was driving. It's likely the first time HiRISE has captured the rover while it was in motion. Trailing Curiosity are the rover's tracks, which can linger on the Martian surface for months before being erased by the wind. Image: NASA/JPL-Caltech/University of Arizona

#### Catch The Waves!, continued from Page 1

ultraviolet light, which can give us sunburns. Astronomers have created many detectors that can "see" in the full spectrum of wavelengths.

#### **Telescope Types**

While multiple types of telescopes operate across the electromagnetic spectrum, here are some of the largest, based on the wavelength they primarily work in:

#### Radio

Probably the most famous radio telescope observatory would be the Very Large Array (VLA) in Socorro County, New Mexico. This set of 25-meter radio telescopes was featured in the 1997 movie Contact. Astronomers use these telescopes to observe protoplanetary disks and black holes. Another famous set of radio telescopes would be the Atacama Large Millimeter Array (ALMA) located in the Atacama Desert in Chile. ALMA was one of eight radio observatories



NASA's Hubble Telescope captured the Pillars of Creation in 1995 and revisited them in 2014 with a sharper view. Webb's infrared image reveals more stars by penetrating dust. Hubble highlights thick dust layers, while Webb shows hydrogen atoms and emerging stars. You can find this and other parts of the Eagle Nebula in the Serpens constellation. Credit: NASA, ESA, CSA, STScI, Hubble Heritage Project (STScI, AURA)

that helped produce the first image of supermassive black holes at the center of M87 and Sagittarius A\* at the center of our galaxy. Radio telescopes have also been used to study the microwave portion of the electromagnetic spectrum.

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#### Infrared

The James Webb Space Telescope (JWST) operates in the infrared, allowing astronomers to see some of the earliest galaxies formed nearly 300 million years after the Big Bang. Infrared light allows astronomers to study galaxies and nebulae, which dense dust clouds would otherwise obscure. An excellent example is the Pillars of Creation located in the Eagle Nebula. With the side-by-side image comparison below, you can see the differences between what JWST and the Hubble Space Telescope (HST) were able to capture with their respective instruments.



The Crab Nebula, located in the Taurus constellation, is the result of a bright supernova explosion in the year 1054, 6,500 light-years from Earth. Credit: X-ray: NASA/CXC/SAO; Optical: NASA/STScI; Infrared: NASA/JPL/Caltech; Radio: NSF/NRAO/VLA; Ultraviolet: ESA/XMM-Newton

#### Visible

While it does have some near-infrared and ultraviolet capabilities, the Hubble Space Telescope (HST) has primarily operated in the visible light spectrum for the last 35 years. With over 1.6 million observations made, HST has played an integral role in how we view the universe. Review Hubble's Highlights here.

#### X-ray

Chandra X-ray Observatory was designed to detect emissions from the hottest parts of our universe, like exploding stars. X-rays help us better understand the composition of deep space objects, highlighting areas unseen by visible light and infrared telescopes. This image of the Crab Nebula combines data from five different telescopes: The VLA (radio) in red; Spitzer Space Telescope (infrared) in yellow; Hubble Space Telescope (visible) in green; XMM-Newton (ultraviolet) in blue; and Chandra X-ray Observatory (X-ray) in purple. You can view the breakdown of this multi-wavelength image here.

#### Try This At Home

Even though we can't see these other wavelengths with our eyes, learn how to create multi-wavelength images with the Cosmic Coloring Compositor activity and explore how astronomers use representational color to show light that our eyes cannot see with our Clues to the Cosmos activity.

Cover Image: This illustration shows the wavelength sensitivity of a number of current and future space- and ground-based observatories, along with their position relative to the ground and to Earth's atmosphere. The wavelength bands are arranged from shortest (gamma rays) to longest (radio waves). The vertical color bars show the relative penetration of each band of light through Earth's atmosphere. Credit: NASA, STScI

 $\square$  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.org 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!

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# Happy Birthday: Jean-baptiste Chappe d'Auteroche by Robin Byrne

This month, we celebrate the life of an astronomer who helped determine the size of the solar system. Jean-Baptiste Chappe d'Auteroche was born March 23, 1722 in Mauriac, Cantal, France. There is little known about his early life, but it is known that Chappe likely became a Jesuit priest while also pursuing astronomy as a career. He was named the assistant astronomer at the Royal Observatory, and was elected into the Royal Academy of Sciences in 1759.



One of the foremost problems of the time was the quest to determine the actual distance between the Earth and the Sun. At this time, the size of the solar system was known only in terms of relative distances compared to the Earth-Sun distance, such as the distance from the Sun to Mars is 1.5 times the distance between the Sun and Earth. But how far Earth is from the Sun was not known. The best way to determine that distance would be by observing Venus transit across the Sun from different positions on Earth. Knowing the timing of the observations, and the precise coordinates of the observation locations would allow astronomers to triangulate the distance between Earth and Venus, which would then lead to knowing the values of all the solar system distances.

Although transits of Venus across the Sun don't occur very often, Chappe happened to live in a time when two such transits would occur: one in 1761 and the other in 1769. Astronomers around the world made coordinated arrangements to observe the transits from as many locations as possible, especially from locations at latitudes far to the north and south, to provide the widest angles needed to increase the accuracy of the triangulation.

Chappe was given the assignment to travel to Tobolsk in Siberia (one of the most northern possible locations) in order to observe the June 6, 1761 transit. Chappe left Paris in November of 1760 and arrived in Tobolsk in May of 1761, which was just in time to observe a total lunar eclipse. That observation allowed him to calculate an accurate longitude for his observing site, which would be vital for the transit data to have any value.

#### Barnard-Seyfert Astronomical Society Minutes — Board of Directors April 2, 2025

The regular meeting of the Board of Directors of the Barnard-Seyfert Astronomical Society was held April 2, 2025, online, Dr. Tom Beckermann presiding. Tom Beckermann, Donna Burgess, Tony Drinkwine, Bud Hamblen, Steve Hughes, Gene Matthews, Andy Reeves and Theo Wellington logged in for the meeting.

Meetings: We are looking for presenters for April and beyond. The question of paying speakers' fees was discussed.

Membership report: Keith Rainey provided a membership count of 234.

Minutes: The minutes of the board meeting of March 5, 2025, were adopted without discussion.

Social media report: The Facebook page was liked by 2.3K and followed by 2.6K.

Star parties and outreach: Abstracts of astronomy related projects presented at the Middle Tennessee Science and Engineering Fair on March 21, 2025, were provided to the board. A public star is scheduled for April 5th at Bowie Nature Park in Fairview. The club will have a booth with solar viewing at Bells Bend Outdoor Festival on April 12.

Treasurer's report: Theo reported the bank balance to be \$9,346.06 (\$3,875.41 in the equipment fund and \$5199.33 in the general fund). The PayPal balance was \$340.66. Expenses for the month included \$17.47 for the Zoom account and \$236.38 for the new brochures and business cards, which have been received.

There being no further business, the meeting was adjourned at 8:30 p.m.

Respectfully submitted,

Bud Hamblen Secretary

Minutes from April's Regular Membership meeting on April 16 will be included in a future issue of The ECLIPSE

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





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

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For this trip, Chappe traveled in the company of an interpreter, as well as someone to maintain the working mechanisms of the clocks that were to be used for all of the measurements. Precise times were vital for accurate determinations of longitude, as well as for the timing of the transit itself.

For their stay in Tobolsk, Chappe and his team built an observatory on top of a hill outside of town. The telescope used for the observations was an incredible 19 feet long, and was unlike anything the people of the town had ever seen before. While Chappe and company were in Tobolsk, a severe flood occurred, which was blamed on this foreign man who was using bizarre equipment to bother the Sun. Chappe employed armed Cossacks for protection, and he slept in the observatory to be sure the locals didn't try to tear it down.

On June 6, the day began cloudy, but fortunately, the skies cleared just in time for Chappe to observe the entire transit. Afterwards, Chappe wrote, "I truly enjoyed the completion of my observation, and was delighted with the hopes of its being useful to posterity when I have quit this life." Chappe returned to France in August of 1762, and published his observations of the transit in 1763.

Chappe kept a detailed diary of his travels through Russia, which he published in a book titled "A Journey Into Siberia," published in 1768. This was the first book to describe life in Russia to the outside world. It was not very flattering, with less than appetizing descriptions of some of the local foods, and demeaning illustrations of the people and how they lived. A pamphlet, written as a counterargument to his book, quickly appeared, in which the author extolled how wonderful Russia was. While published anonymously, some speculated that it may have been written by Catherine the Great.

For the Venus transit of June 3 1769, Chappe was once again given an assignment to observe from an extreme latitude, but this time he was headed south to the southernmost tip of Baja California at the Mission of San José del Cabo. Chappe and his team arrived without too much difficulty, especially compared to his Russian trip, and they were able to get very good observations of the transit. However, as they were preparing for their return to France, the entire group became ill with what might have been yellow fever.

At first, Chappe was unaffected, so he tended to the sick. But, eventually, he too was stricken, and succumbed to the disease on August 1, 1769. Ultimately all but one member of the expedition team died. The lone survivor made his way back to France with Chappe's observations and personal diary. Chappe's diary of the journey was published posthumously by one of his colleagues, César Cassini de Thury, as a book titled "A Journey to California to Observe the Passage of Venus Across the Disk of the Sun."

Knowing the distance between Earth and the Sun seems so fundamental today, and is certainly a vital value to know for all space travel, whether manned or unmanned, to the other bodies in our solar system. From Pioneer and Venera missions in the early 1960's to the Europa Clipper currently en route to Jupiter, none of it would have been possible without the early observations made by astronomers like this month's honoree, Jean-Baptiste Chappe d'Auteroche.

References:

Wikipedia - Jean-Baptiste Chappe d'Auteroche https://en.wikipedia.org/wiki/Jean-Baptiste\_Chappe\_d'Auteroche

Siberia in the 1700's: What a French Astronomer Witnessed in Russian by Amos Chapple, March 24 2024, Radio Free Europe

<u>d'Auteroche Image</u>: By Yapparina (this version) - File:Jean Chappé d'Auteroche. Line engraving by J. B. Tilliard, 1 Wellcome V0001066.jpg, CC BY 4.0, https://commons.wikimedia. org/w/index.php?curid=48101362



JunoCam, the visible light imager aboard NASA's Juno, captured this view of Jupiter's northern high latitudes during the spacecraft's 69th flyby of the giant planet on Jan. 28, 2025. Jupiter's belts and zones stand out in this enhanced color rendition, along with the turbulence along their edges caused by winds going in different directions. Credit: Image data: NASA/JPL-Caltech/SwRI/MSSS Image processing: Jackie Branc (CC BY)



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.



Next BSAS meeting Wednesday, April 16, 7:00 pm

> Dyer Observatory 1000 Oman Dr. Brentwood, TN 37027