The Bays Mountain Astronomy Club Newsletter

May 2021

Kingsport, TN

Table of Contents

Cosmic Reflections

William Troxel - BMAC Chair

Greetings and welcome to May 2021. It seems that it was just yesterday we were rushing around to get our 2020 taxes completed and filed. Time is really moving onward. For me, May signals the change to warmer nights and a few clear nights. We all know that means we get a little better chance to get out and finally enjoy our hobby. Well, at least I want to believe it could happen!

I hope everyone enjoyed the Zoom meeting last month. I know it was different, however I think you enjoyed it. It seemed that there were lots of participants for the games. I am trying a few new ideas in hopes that some of them will spark interest for you.

On a side note, I was recently interviewed for the web site "**Love the night sky**" which is an astronomy web site that comes from the UK. I enjoyed doing it and the link for you to listen should you want will be listed in the resources section when it is ready. The web site is really very nice and seems to have some good information. Check it out!

May is our club's "Students Presentation Month." Again this year, we are very honored to welcome the students of Sullivan South High School and their projects. Please see the calendar at the end of this newsletter for details.

This will be the last year for the students of South due to the upcoming closure of the school by the board of education. I hope you will sign on via the link that you will receive via email. Please make sure your correct information is sent to Adam. We are still meeting via Zoom which is only open to current BMAC members.

I wrote last month saying that I am looking at ideas for our in person meetings when we get to that place when we are able to meet in person at the park. Please share your ideas for segments, program themes, games, displays and activities with me. This is your club also and I want to make our meetings the best they can be. That goal cannot happen without your input.

Until next time, this is your chairman writing… Clear Skies!

Celestial Happenings

Jason Dorfman

With the arrival of May, spring is now in full swing. The trees and bushes have shed their April blossoms and are now becoming full and green, filling in the sparse winter landscape. The evening temperatures will continue to become warmer, making those observing sessions more bearable. As we continue to head towards summer, we'll see many of the summer constellations beginning to rise after midnight. The bright center of the Milky Way also rises a little after midnight at the start of the month bringing with it a rich field of deep-sky targets.

The length of daylight continues to increase this month as we move closer to the Summer Solstice. The Sun will rise at 6:36 a.m. on the 1st and set at 8:18 p.m. As we reach the end of May, the Sun will appear a bit earlier rising at 6:13 a.m. and sink below the horizon a bit later setting at 8:42 p.m.

Planets

As night falls, Mars no longer reigns supreme as the sole planetary target in the evening sky. As we saw at the end of April, Mercury is just emerging from the fading evening twilight and Venus will join the two after the first week of May.

Looking to the WNW 45 minutes after the Sun has gone down, Mercury sits 5° above the horizon shining at its brightest magnitude for the month at -1. With the assistance of binoculars or a telescope, the planet will appear small and gibbous at about 80% illuminated with the disk spanning 5.8". The wondrous Pleiades star cluster sits just 5° above Mercury. Over the next four days, watch as Mercury moves eastward and glides past the cluster of bright blue stars.

Catching a glimpse of this small world will become easier as Mercury climbs higher heading towards its greatest eastern elongation on the 17th. With a 22° separation from the Sun and a favorable inclination of the ecliptic, you should have no problem sighting it against the fading twilight backdrop. Turn your gaze towards the WNW 45 minutes after sundown on the 16th and look about 11° above the horizon for Mercury, now a bit fainter at magnitude +0.3. The disk spans roughly 8" on this day, but the planet now appears as a fat crescent 37% lit.

After reaching greatest elongation, Mercury will begin to move swiftly back towards the Sun. You might still be able to see it on the 28th when it sits about 5° high 45 minutes after sunset. It will be more challenging to pull it from the fading twilight, however, as its magnitude will have dropped to +2.3. If you are able to find it, you'll see it as a thin crescent spanning about 10.5".

Venus returns to our evening skies this month where it will remain until the end of the year. This sister world to ours will remain quite low to the horizon in the first week of May, but as we move into the later part of the second week, it will become more visible. On the 13th, Venus will sit about 5° high a half hour after sunset in the WNW. At magnitude -3.9, locating it against the fading glow of the twilight sky should not be too difficult. With the aid of optical equipment, the planet will appear nearly full as it is still on the far side of the Sun in its orbit. This disk of Venus spans about 10" on this day.

As the end of the month approaches, Venus is climbing higher while Mercury is beginning its dive back towards the Sun. The two will come together on the 28th for a good conjunction. Begin your observation a half hour after sundown and you'll find bright Venus about 8° high shining brilliantly at magnitude -3.85. Fainter Mercury at magnitude +2.3 is located about 25' to the left of Venus. Though Venus is much larger than Mercury, both will span about 10" on the sky. This is due to the orbital positions of each planet. Venus is still coming around from the far side of its orbit while Mercury is on the closer part of its orbit that passes between the Earth and Sun. Thus Venus will appear gibbous at 96% illuminated and Mercury will appear as a thin crescent only 12% lit.

Though Mars is still visible after sunset, the views remain a bit unimpressive as our distance from Mars continues to increase. Mars appears as a small orange orb spanning just over 4" during May. On the 1st, Mars hangs 40° high almost due west 45 minutes after sunset. It shines at magnitude +1.6 and starts the month in the lower west corner of Gemini. It will move through most of Gemini over the month, ending up next to the right shoulder of Pollux in the upper eastern part of the constellation.

Mars as it travels through the month of May in 2021. Mars starts the month in the lower right.

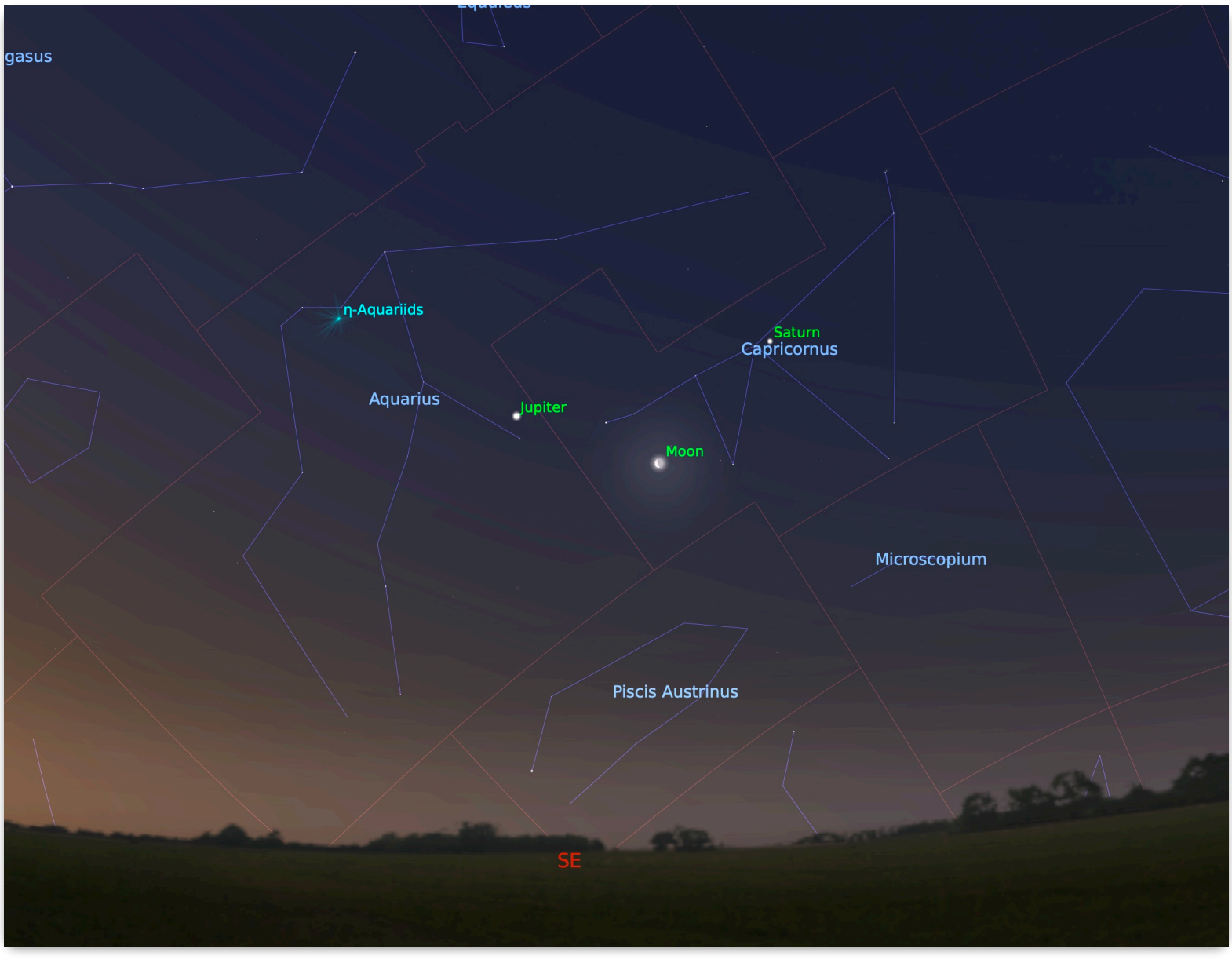
As we reach the end of the month, Mars will still be easily visible after sunset. An hour after sunset, it will be at an altitude of 23° in the West and only slightly dimmer at magnitude +1.7.

You'll have plenty of time to observe some of the non-planetary sights while you wait for the next planet to rise in the East. There are several Messier objects in the spring sky, such as M13 - a globular cluster in Hercules. Saturn rises just before 3 a.m. at the start of May followed by Jupiter about 40 minutes later. An hour before sunrise, as the first light of dawn is beginning to paint the eastern sky, the two gas giants will have risen to a more observable altitude. You'll find Saturn about 27° high in the SE with Jupiter about 15° to the lower left of Saturn sitting at an altitude of 22°.

Saturn is in the central northern part of the constellation of Capricornus, about a degree west of theta Cap. Saturn is slowing its eastern motion in the sky and in the last week of May will reach a stationary position a bit closer to theta Cap and then begin to move in retrograde. The magnitude of this beautiful ringed world will brighten slightly from +0.7 to +0.6 over the month. The disk of the planet spans about 17" with the ring plane extending to 40".

Jupiter lies in Aquarius near its lower western border with Capricornus. Over the course of the month, Jupiter's magnitude will brighten from -2.2 to -2.4 and the planet's disk will grow from 37.5" to about 41".

By month's end, Saturn and Jupiter will rise 2 hours earlier, putting them at a respectable altitude as dawn approaches for some good observing. On the 31st, an hour before sunup, the two straddle an altitude of 35° with Jupiter about 23° to the left of Saturn.



Jupiter, Saturn & the Moon on May 4, 2021.

Luna

At the start of May, we find a waning gibbous Moon rising about 1 a.m. The third quarter Moon rises with Saturn at around 2:40 a.m. on the 3rd with roughly an 8° separation between them. On the following morning, the Moon will sit a bit south of and between Jupiter and Saturn, forming an obtuse triangle.

New Moon occurs on the 11th marking the transition of the Moon from the early morning sky to the evening sky. On the 12th, a one-day old Moon will be just 1° to the left of Venus. You'll find the two 5° high a half hour after sunset. This will be a challenging observation with just a thin sliver of a crescent Moon competing with the fading twilight. On the following evening, the young crescent Moon will have moved up to 3° to the left of Mercury. Fifty minutes after sunset, the pair will be about 10° high. The two-day old Moon will still be a challenge, but, with the higher altitude, you'll have a bit more time to locate it as it begins to emerge from the dimming glow of the setting Sun.

Two days later, the growing crescent Moon will be about 2.5° west of Mars. The 1st quarter Moon occurs on the 19th and the Full Moon is on the 26th.

Good luck observing and thanks for reading!

The Queen Speaks

Robin Byrne

Happy Birthday Daniel Fahrenheit

This month we celebrate the life of a man who daily tells us, at least in the States, the temperature. Daniel Gabriel Fahrenheit was born on May 24, 1686 in, what is known today as, Gdansk, Poland, but was then Danzig in the Polish-Danish Commonwealth. His father, also named Daniel, was a successful merchant married to Concordia. They had five children, with Daniel Gabriel as the oldest, along with his one brother and three sisters.

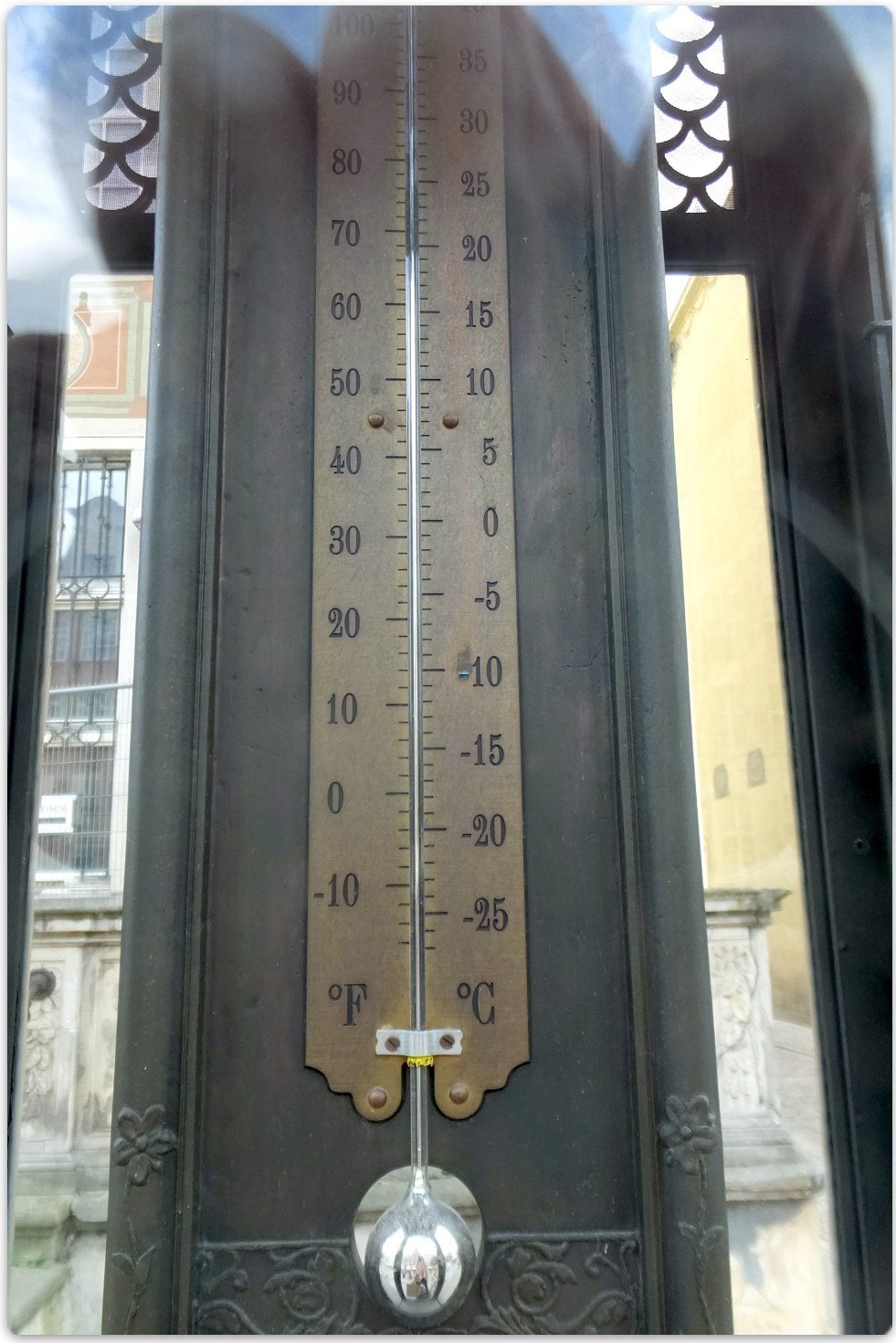
On August 14, 1701, when Daniel was 15 years old, both his parents died, possibly due to eating poisonous mushrooms. Daniel's guardian sent him to live in Amsterdam, the Netherlands to work for a shopkeeper and train to be a merchant. Fahrenheit apprenticed with the shopkeeper for four years, but discovered he was more interested in scientific instrument-making.

Fahrenheit began traveling through Europe, visiting the best known instrument makers and scientists of the time, including Roemer and Leibniz. Almost a hundred years earlier, the first thermometer had been constructed, but no standard scale had been established. In 1701, Roemer had designed a thermometer based on a scale with boiling water set at 60°, melting ice at 7.5° (intentionally set at 1/8th the temperature of boiling water), and 0° for the temperature of a water-ice-salt mixture. Fahrenheit had the opportunity to observe Roemer calibrate several of his thermometers while visiting with him. Fahrenheit described the process:

> *I found that he had stood several thermometers in water and ice, and later he dipped these in warm water, which was at blood-heat, and after he had marked these two limits on all the thermometers, half the distance between them was added below the point in the vessel with ice, and the whole distance divided into 22–1/2 parts, beginning with 0 at the bottom then 7–1/2 for the point in the vessel with ice and 22–1/2 degrees for that at blood-heat.*

In 1717, Fahrenheit returned to Amsterdam and began his career as a glass-blower and scientific instrument-maker. When Fahrenheit began making his own thermometers, a misunderstanding of Roemer's “blood-heat” led to a different scale. Fahrenheit interpreted it as meaning body temperature, whereas Roemer likely meant lukewarm water. After trying various scales, Fahrenheit settled on 96° for body temperature and 32° for an ice-water mixture. Having a difference of 64° made calibration of the scale easier, since it can be successively divided by halves down to single degrees (64 to 32 to 16 to 8 to 4 to 2 to 1).

Public monument to Fahrenheit in the streets of Gdansk, Poland. Image by Robin Byrne.

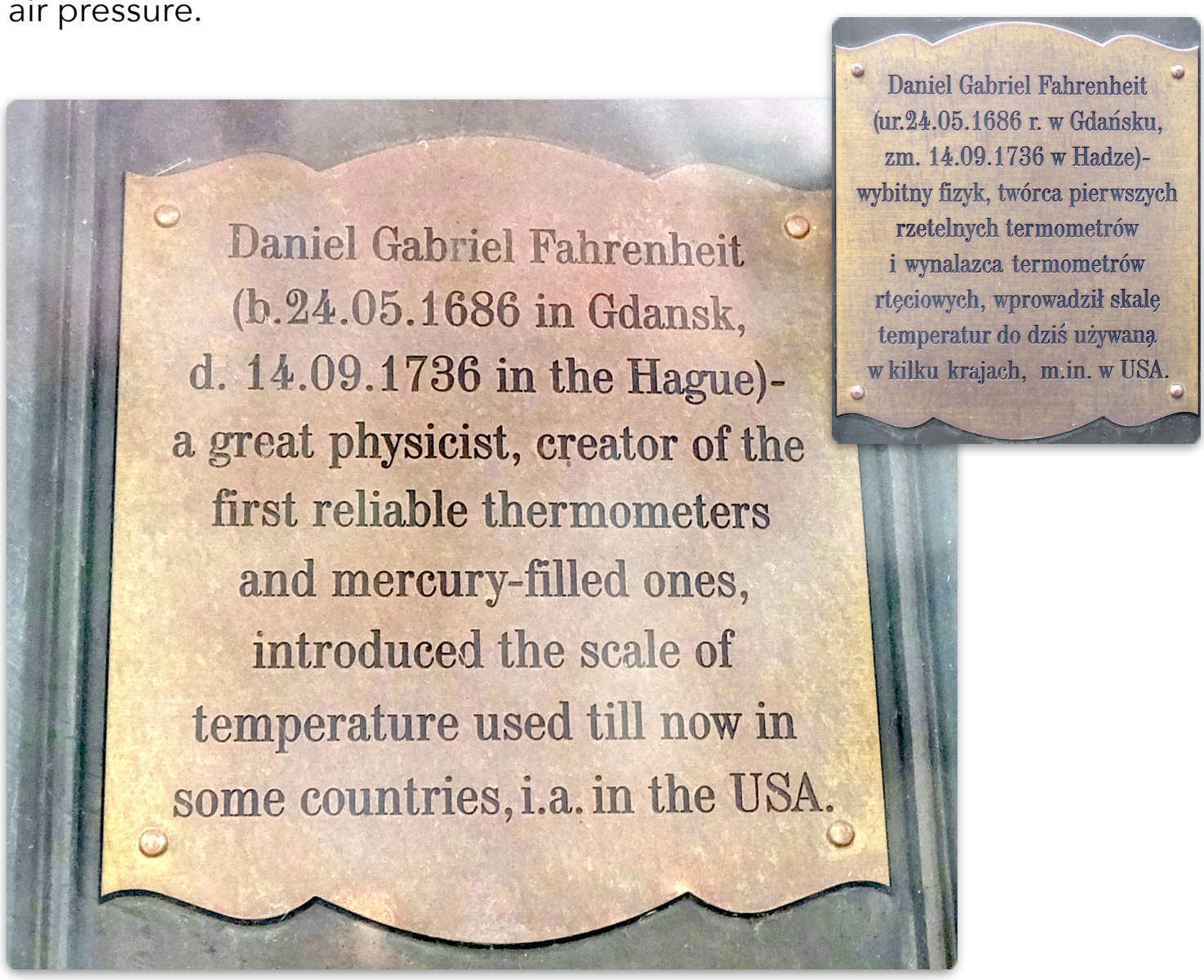


Thermometer in public monument. Image by Robin Byrne.

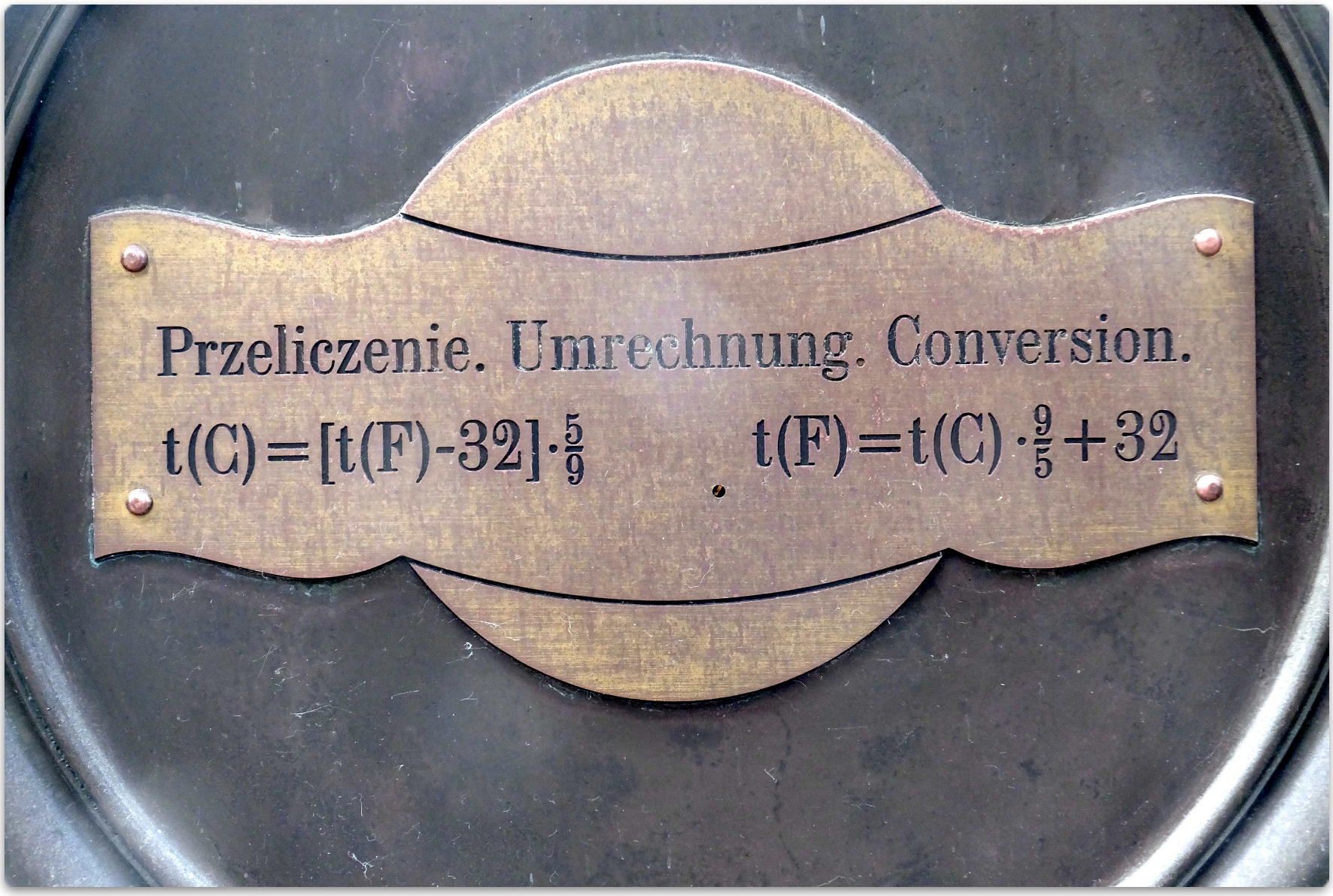
Fahrenheit's first thermometers were made with alcohol, but he later switched to using mercury. While experimenting with mercury and studying how it expands when heated, Fahrenheit discovered that the boiling point of water varies depending on the atmospheric pressure. In an article he wrote in 1724 for the Philosophical Transactions of the Royal Society, Fahrenheit stated that the boiling point of water at sea level was approximately 212°. This number was chosen because it is 180° above the water-ice freezing point, again making a convenient difference for calibrating the scale on a thermometer. However, because the boiling point of water ultimately became a more practical calibration point for constructing the thermometers, rather than body temperature, the normal temperature for a person was no longer 96°, but 98.6°.

Fahrenheit's thermometers became the first thermometers to have a standardized scale, allowing temperature measurements to have an understood physical meaning. His design included bulbs that were cylindrical, rather than spherical, and the mercury was cleaned using a method Fahrenheit developed himself. However, for 18 years, he was the only one who could make them, because he maintained that the design details were a “trade secret.”

In addition to the thermometer, Fahrenheit also designed an instrument to measure the density of a liquid, called a constant weight hydrometer. It is basically a closed tube with weights at the bottom and air at the top. It is placed in the liquid, and how far it sinks gives an indication of the liquid's density, where the lower it sinks, the lower the density. Based on his discovery that water boils at different temperatures depending on the air pressure, Fahrenheit invented a hypsometric thermometer using the temperature when water boils to estimate the air pressure.



Plaque in public monument. Image by Robin Byrne.



Conversion equation in public monument. The words on top all mean "conversion" in Polish, German and English. Image by Robin Byrne.

At the beginning of September in 1736, Fahrenheit became ill. By September 7th, he had deteriorated enough to have a will drawn up. On September 16th, 1736, at the age of 50, Daniel Fahrenheit passed away, having never married. Despite his accomplishments, he apparently died with very little money, receiving a "fourth-class funeral" for someone considered destitute. He was buried in The Hague, Netherlands.

Instrument-makers, like Fahrenheit, rarely had formal scientific training, but their trade involved many aspects of science. Fahrenheit had to be aware of many physical properties to construct his thermometers, including: the thermal expansion and contraction of various materials used in the instrument (such as glass, alcohol, and mercury), their behaviors at different atmospheric pressures, and the densities of the substances used.

Creating a device that had a standardized scale for measuring temperature allowed the scientific world to investigate thermal effects in scientific areas of study ranging from meteorology to chemistry to physics. While the United States is the only place in the world that still uses the Fahrenheit scale to measure temperature, everyone else now using Celsius, Fahrenheit's legacy is much more than just the temperature scale. His instruments helped advance the sciences into new realms. Whether you're looking at a weather forecast, checking to see if you have a fever, or popping something into the oven, the next time you see a temperature, give a nod of recognition to the man who made it all possible: Daniel Fahrenheit.

References:

Daniel Gabriel Fahrenheit - Wikipedia

Gabriel Fahrenheit Biography - Encyclopedia of World Biography

Gabriel Daniel Fahrenheit - Your Dictionary

Fahrenheit, Daniel Gabriel - encyclopedia.com

The Space Place - NASA Night Sky Network

David Prosper

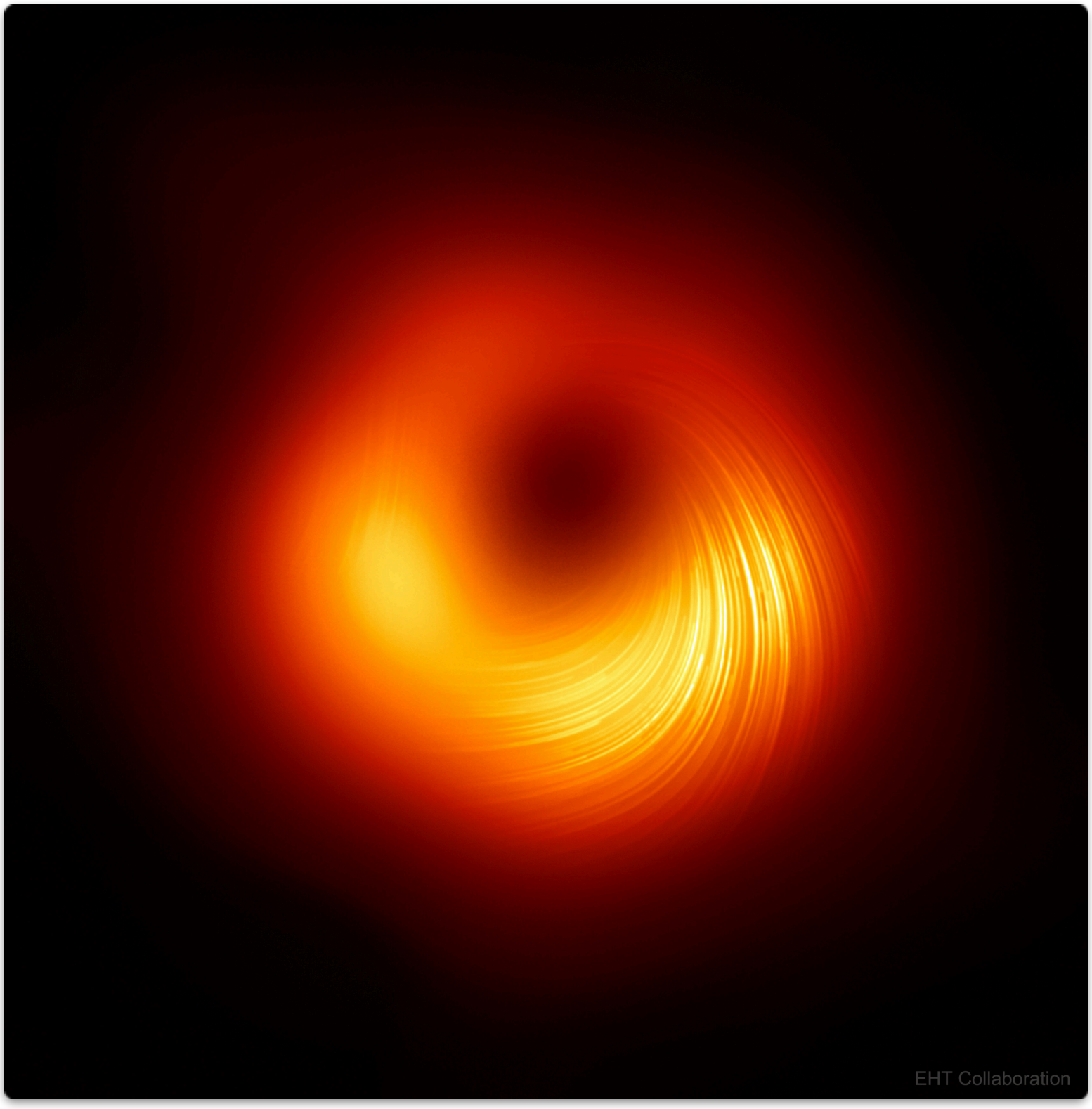
Virgo's Galactic Harvest

May is a good month for fans of galaxies, since the constellation Virgo is up after sunset and for most of the night, following Leo across the night sky. Featured in some ancient societies as a goddess of agriculture and fertility, Virgo offers a bounty of galaxies as a celestial harvest for curious stargazers and professional astronomers alike.

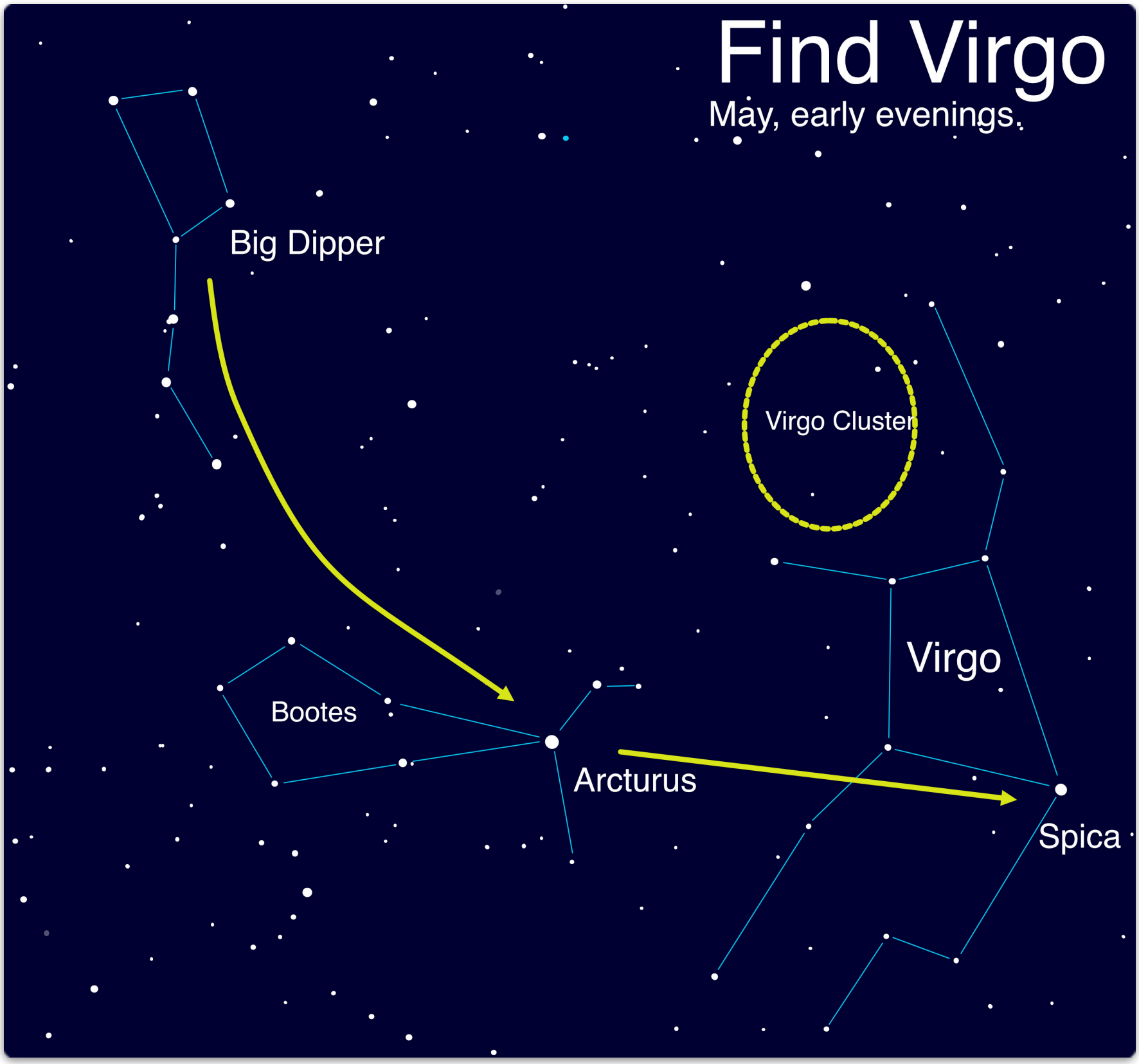
Virgo is the second-largest constellation and largest in the Zodiac. It is easily spotted once you know how to spot Spica, its brightest star. How can you find it? Look to the north and start with the Big Dipper! Follow the general curve of the Dipper's handle away from its “ladle” and towards the bright, orange-red star Arcturus, in Boötes – and from there continue straight until you meet the next bright star, Spica! This particular star-hopping trick is summed up by the famous phrase, “arc to Arcturus, and spike to Spica.”

This large constellation is home to the Virgo Cluster, a massive group of galaxies. While the individual stars in Virgo are a part of our own galaxy, known as the Milky Way, the Virgo Cluster's members exist far beyond our own galaxy's borders. Teeming with around 2,000 known members, this massive group of galaxies are all gravitationally bound to each other. They are members of the even larger Virgo Supercluster of galaxies, a sort of “super-group” made up of groups of galaxies. Our own Milky Way is a member of the “Local Group” of galaxies, which in turn is also a member of the Virgo Supercluster! In a sense, when we gaze upon the galaxies of the Virgo Cluster, we are looking at some of our most distant cosmic neighbors. At an average distance of over 65 million light years away, the light from these galaxies first started towards our planet when the dinosaurs were enjoying their last moments as Earth's dominant land animals! Dark, clear skies and a telescope with a main objective diameter of six inches or more will reveal many of the cluster's brightest and largest members, and it lends itself well to stunning astrophotos.

Virgo is naturally host to numerous studies of galaxies and cosmological research, which have revealed much about the structure of our Universe and the evolution of stars and galaxies. The “Universe of Galaxies” **activity** can help you visualize the scale of the Universe, starting with our home in the Milky Way Galaxy before heading out to the Local Group, Virgo Cluster and well beyond! You can further explore the science of galaxies across the Universe, along with the latest discoveries and mission news, at **NASA**.



*The first image of a black hole's event horizon was taken in the center of one of the most prominent galaxies in Virgo, M87! This follow up image, created by further study of the EHT data, reveals polarization in the radiation around the black hole. Mapping the polarization unveils new insights into how matter flows around and into the black hole - and even hints at how some matter escapes! Click **here** for more details. Credit: Event Horizon Telescope Collaboration*



Find Virgo by "arcing to Arcturus, then spiking on to Spica." Please note that in this illustration, the location of the Virgo Cluster is approximate - the borders are not exact.

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** to find local clubs, events, and more!

BMAC Calendar & More

Calendar:

B MAC Meetings:

- Friday, May 7, 2021 - 7p - Via Zoom - Social time 30m before and after meeting. Presentations by students from Sullivan South High School. The presenters:
  - Lily DeBraal -- Wisconsin Fast Grow plants were planted in simulated Martian soil in order to determine how difficult it would be to grow plants on Mars. The plants were grown in a variety of combinations of soils—some were grown in straight "Martian" soil, while the others were grown in a series of soils composed of "Martian" soil along with commercial potting soil mixed in various ratios.
  - Mason Cox -- The nova rate in the galaxy M31 was examined using images taken over a 10-year period. The images were taken with the 0.9-meter WIYN telescope located at Kitt Peak National Observatory and were captured through a hydrogen-alpha filter (novae show up particularly well through such a filter). The nova rate of M31 is easier to determine than the rate in our own galaxy so it acts as a good analog of the Milky Way.
  - Tom Rutherford -- The Science Research program at Sullivan South High School began in 2005. At first, it was predominantly an after-school astronomy research program, but over the past few years has expanded into other science areas and there is now an actual science research class. Almost 20 students have ended up being published as a result of the program and several have presented at the American Astronomical Society meetings each year.
- Friday, June 4, 2021 - 7p - Via Zoom - Social time 30m before and after meeting. Olivia Kuper, NASA Solar System Ambassador, Chemistry/Honors Chemistry Teacher, North Greene High School, will present "Authentic Astronomy Research Experience at McDonald Observatory." In the summer of 2019, myself and three teachers from the University of Texas EXES Teacher Astronomy Group were selected to participate in an astronomy research project with Dr. Chris Sneden, Astronomy Professor Emeritus. Dr. Sneden's primary research is spectroscopic study of old stars in the galactic halo to

determine their chemical composition. The teacher group was tasked with identifying stars that contained europium. We traveled to McDonald Observatory and collected data using the historic 2.1-meter Otto Struve Telescope with a Sandiford Echelle Spectrograph. The teachers selected targets, used the telescope and spectrograph, collected our own data, and are currently working to reduce the data. Our group presented an education poster at the American Astronomical Society Winter Meeting in January 2020 and gave a presentation at the Space Exploration Educators Conference at Johnson Space Center in February 2021. This research project is ongoing, with another observing run to McDonald Observatory once COVID-19 restrictions are lifted and continued data reduction.

unWatch:

- **Cancelled until further notice.**
- Every clear Saturday & Sunday - 3p-3:30p - March-October - On the Dam
  - View the Sun safely with a white-light & Hα view if clear.; Free.

tarWatch:

- **Cancelled until further notice.**
- October 2 & 9, 2021 - 7:30p
- October 16, 23, 30 & November 6, 2021 - 7p
- November 13, 20 & 27 - 6p
  - View the night sky with large telescopes at the observatories. If poor weather, an alternate live tour of the night sky will be held in the planetarium theater.; Free.
  - You must have completed the Park Volunteer Program in order to help with the public program. If you have, please show up at least 30 minutes prior to the official start time.

Special Events:

- **All special events are cancelled until further notice.**
- **Astronomy Day - May 15, 2021 - 1p-4p; 8:30p-9:30p**
  - Come help share the fun of astronomy with the public. There will be tables with different themed topics plus solar and night viewing.
- **Annual Club Picnic - July 2021 - Day TBD - 6p**
  - Site location will be sent directly to full BMAC members. BMACers and their families are welcome to enjoy an evening of astronomy-themed games and activities along with a potluck dinner and observing.
  - **Please bring a dish to share and bring your own chair.**
- **StarFest 2021 - October 29, 30 & 31, 2021**
  - Our 37th annual astronomy convention / star gathering for the Southeast United States. Three days of astronomy fun, 5 meals, 4 keynote speakers, unique T-shirt, and more!
  - **Pre-registration by Oct. 8, 2021 with full payment is mandatory for attendance. Sorry, no walk-ins nor "visits."**
  - MeadowView Marriott special hotel **rate**.
  - **StarFest Link**

Regular Contributors:

William Troxel

Robin Byrne

Jason Dorfman

Adam Thanz

William is the current chair of the club. He enjoys everything to do with astronomy, including sharing this exciting and interesting hobby with anyone that will listen! He has been a member since 2010.

Robin Byrne has been writing the science history column since 1992 and was chair in 1997. She is an Associate Professor of Astronomy & Physics at Northeast State Community College (NSCC).

Jason Dorfman works as a planetarium creative and technical genius at Bays Mountain Park. He has been a member since 2006.

Adam Thanz has been the BMAC Newsletter Editor for all but a number of issues since 1992. He is the Planetarium Director at Bays Mountain Park and an astronomy adjunct instructor at NSCC since 2000.

Connection:

Bays Mountain Astronomy Club:

- 853 Bays Mountain Park Road; Kingsport, TN 37650
- (423) 229-9447 - **Park Site** - **Club Site**
- Newsletter edited by **Adam Thanz**

Dues:

- Dues are supplemented by the Bays Mountain Park Association and volunteerism by the club. As such, our dues are kept at an extremely low cost.
- $16 / person / year
- $6 / each additional family member
- Note: if you are a Park Association member (which incurs a separate, additional fee), then a 50% reduction in BMAC dues are applied.
- Dues can be paid in many ways. For renewals, you will be sent an e-mail with an invoice and a direct link to pay online. You can also pay by mail, over the phone or in person at the gift shop.

Chapter Background Image Credits:

- **Cover image of Southern Milky Way by Adam Thanz.**
  - Sony A7ii with Zeiss Batis 2.8/18 lens, f/2.8, 8 sec., ISO 6,400, August 9, 2020.
- **Table of Contents image of Comet NEOWISE (C/2020 F3) by Adam Thanz**
  - Sony A7ii with Sony FE 2.8/90 Macro G OSS lens, f/2.8, 8 sec., ISO 4,000, July 15, 2020.
- **Cosmic Reflections image of the Summer Triangle area of the Milky Way by William Troxel.**
  - Image captured July 23, 2016.
- **BMAC Notes painting of the Moon with moon glow by Christa Cartwright.**
  - Painting based on a photograph of the Moon Christa captured July 2020.
- **Celestial Happenings image of sunset at the Bays Mountain Park Lake during a twilight kayak program by Jason Dorfman.**
  - Image captured October 1, 2020.
- **The Queen Speaks image of a solar halo by Robin Byrne.**
  - iPhone 7, June 8, 2020.
- **The Space Place - NASA Night Sky Network image of the Rho Ophiuchi cloud complex by Brandon Stroupe.**
  - Canon 6D with Canon 2.8/70-200mm lens, f/2.8 @200mm, 20 x 120 sec. exposures, ISO 1,000, stacked in Deepsky Stacker, processed in Adobe Photoshop CC, Skywatcher Star Adventure mount, September 19, 2015.
- **BMAC Calendar & More image of the Moon by Greg Penner.**
  - iPhone shooting through a 9mm eyepiece and 12.5" Truss Tube Dobsonian @212x.
- **All background images used with permission by their authors.**