# The Bays Mountain Astronomy Club Newsletter

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# **Cosmic Reflections**

# William Troxel - BMAC Chair



reetings and hello fellow BMACers. Wow, May is here already. First, I wanted to express my feelings about getting to see each of you at the April Meeting, IN

Person. I loved seeing your faces in real life. I hope you enjoyed the in-person meeting as much I as did.

I wanted to take a few words to thank Jason and Adam for letting us see the new show. I hope you enjoyed it as well. After the show, we had a game of Constellation Shootout. Our winner and holder of bragging rights goes out to Tom Rutherford who, after 20 rounds, won with the correct ID of Ursa Minor. Congrats Tom! Remember, you can bring your binoculars inside the planetarium as they add a level of depth to the star field.



Can you see Ursa Minor (UMi) from your back yard? Image from Stellarium.

After the fun game of Constellation Shootout, we had our shown-tell, which seems to be a big hit with you. Rob was up first with his "new to him" Binocular-Telescope mounted on its own tripod. Man, those binoculars were huge! See the attached picture. Rob talked about how he acquired them. I understand why they call them Binocular-Telescopes. Thanks, Rob, for sharing them with the club members.

Next up in show-n-tell was Adam with his heated vest with its own battery pack. Now, that takes viewing to a whole new level! Future amateur astronomers are going to have it made. Gone are the days of going out dressed in three layers and still having to get back in the car or into the house to warm up. Adam talked about the working of his new toy and all the really cool features. Thanks again, Adam, for sharing with the club members.

This is a good time to remind each of you to bring your new equipment, toys and new-to-you items for show-n-tell.



Rob Armistead shows off his newto-him giant binoculars and mount. Image by William Troxel.



Adam Thanz shows off his new heated vest. Image by William Troxel.

We moved right into the business meeting part of the program. We will not be meeting in May as we will be having Astronomy Day at the Park the next day. Adam shared with the club the details and changes for this year. The celebration will be from 1p to 4p for the public and will be held at the new pavilion. I wanted to thank you for sharing your ideas for tables to set up. If you are a current club member, you are welcome to come out and help. Please note, for any of the other astronomy public programs that we may offer, you must have gone through and completed the City's volunteer program to participate and interact with the public. For Astronomy Day only, it is more of a club event and so it is open to current members to help. Those wanting to participate, please come an hour before to set up and stay an hour after to help tear down. In case you have forgotten, after we are finished we go out as a group to enjoy a meal together. Club members have been sent an e-mail with more details.

Thank you again and it was wonderful to see each of you in person. Please be safe. Until next time... CLEAR SKIES.

# **BMAC** Notes

## **Carbon Fiber Heated Clothing**



was asked to provide some information about my Show & Tell from the April meeting.

I recently found out about carbon fiber heated clothing. When you apply an electric current through this flexible material, it radiates in the far infrared, i.e. heat! You can get all kinds of garments that heat up using a USB power battery. These include vests, coats, gloves, pants, socks, scarves, hand muffs, stadium seats and more. You can also get the heating pads with the control circuit/button by themselves for your own DIY project for a fraction of the cost. Make sure that you have the right power source, though. They typically need a 5V USB source with a 2.4A rating for a total power output of up to 12 watts. The more common USB batteries handle 2.1A or less. At high, medium or low settings, my vest can run for 3.5, 5.5 or 7.5 hours respectfully from a 10,000 mAh battery. If your kit/garment has one circuit/button, then double the run time because it is at half the load. To find your own solution, look

online at a place like Amazon and search for carbon fiber heated vests (pants, gloves, etc.) and carbon fiber heating pads for the DIY kits. For the garments, make sure you can return them as they may run quite small. I also purchased extra USB power batteries for extended use. The ones I purchased are the 2-pack Miady 10,000 mAh units.

Before I sign off, you could also use the DIY kits to heat other things like an eyepiece case!

Stay warm! - Adam.



Here's the DIY kit with five pads, the control circuit/button and a 5V USB power pack. Image by Adam Thanz

## Green Bank Star Quest

The four-day event will be held June 29 to July 2, 2022 at the Green Bank Observatory in Green Bank, WV.

They plan on some speakers and very dark skies. Please note that, as of now, they are requiring all participants to be vaccinated and wear masks while indoors. Also note that it is an active radio observatory, so there are strict guidelines on use of electrical devices and there will be no cell service.

Go <u>here</u> for all the info.

# Stellar Observations

Greg Penner

## Edge-On Galaxies



ypes of celestial objects that I have always found fascinating to view visually through a telescope are galaxies that are oriented edge-on to our

perspective. Often times when observing galaxies that have more of a face-on orientation, the view can be a little underwhelming if the sky conditions aren't optimal or the aperture of your telescope isn't large. We've all occasionally experienced that feeling of "meh, just a fuzzy blob." Edge-on oriented galaxies offer a more striking perspective of the same type of object. In both cases (face-on and edge-on) you are viewing a spiral galaxy, but the edge-on view can give the impression of a dagger or needle floating in the sky, which offers a more rewarding payoff for the time spent hunting them down.



Seven Edge-on Galaxies - Stellarium image annotated by Greg Penner.

I have created a list of seven galaxies that offer an edge-on perspective and are all nicely placed for viewing in the spring sky. My plan is to make observations of these galaxies when sky conditions and New Moon allow sometime in late April or early May.

Let's have a preview of what to look for in these galaxies with our first stop in the constellation Ursa Major, where we find NGC 3079, a barred spiral galaxy about 50 million light-years away. Also known as the "Phantom Frisbee," this galaxy is a bright Seyfert galaxy with a glowing active core. An image by the Hubble Space Telescope shows pillars of gas rising above the core possibly caused by a massive burst of star formation. With a visual magnitude of +10.9, it should be visible as a narrow streak of light 8' x 1.5' in amateur telescopes.



NGC 3079 - Image by HST showing pillars of gas rising from core.

Next up is NGC 4111, located in the constellation Canes Venatici. This galaxy is quite a bit smaller, but has a fairly bright nucleus with a dark lane. HST images show dusty filaments oriented perpendicularly to the galaxy's disk, suggesting a previous collision with a smaller galaxy. Higher magnification may be needed to see details in this small galaxy.



NGC 4111 - Image by HST

Staying in Canes Venatici, we now go to NGC 4244 (aka C26), which sometimes goes by the name Silver Needle Galaxy. This galaxy is fairly bright, quite large and very elongated at 16' x 2.5' giving rise to the needle-like description. At 12-14 million light years away, NGC 4244 is part of the M94 galaxy group and is relatively close to the Local Group, which contains our own Milky Way. I expect this galaxy to make quite a striking view with its bright, narrow profile.



NGC 4244 - Image from Wikipedia

The next two galaxies are actually (apparently) very near to each other in Canes Venatici. They are so close together that they could be viewed in the same low-power eyepiece. NGC 4631 (aka C32) is also referred to as the Whale Galaxy because of its slightly distorted wedge shape. At magnitude +9.2, it is very bright and also very elongated at 14' x 2.5'. Just 3 minutes to the north is the +12.5 magnitude companion galaxy NGC 4627 that may be visible depending on aperture of telescope.



NGC 4631 - Image from Wikipedia, Credit: GALEX/en:NASA

Only ½ degree to the southwest lies our fifth edge-on galaxy, NGC 4656/57 (The Hockey Stick or Crowbar Galaxy). Earning its nickname because of a strangely warped shape at one end, astronomers believe it may have interacted with the other nearby galaxies causing a curious bend like a hockey stick. This galaxy is fairly bright at magnitude +10.5 and elongated at 13.8' x 3.3'.



NGC 4656 - Image from Wikipedia

The sixth galaxy on our list is the real showstopper. NGC 4565 (The Needle Galaxy), in the constellation Coma Berenices, is considered the finest example of an edge-on galaxy. If some of the other galaxies on this list were difficult to see, at magnitude +9.6 and a size of 16' x 2.8', this bright, large edge-on galaxy should be easily viewed even in a small telescope. Larger telescopes (6"+) should show the dark lane, but even smaller scopes will provide a pleasing view of this bright dagger of light. NGC 4565 is actually a giant spiral galaxy more luminous than the Andromeda Galaxy. This bright, narrow needle-like view provides quite an interesting contrast to Andromeda's more roundish, diffuse, glowing presence in the sky.



NGC 4565 - Image from <u>Wikipedia</u>

When you have finished gazing at the showstopper Needle Galaxy, we will finish our list by going for another challenge. NGC 4302 is another fairly small edge-on galaxy at only 6' x 1' and is magnitude +11.5, so larger aperture scopes will definitely help view this one. The core of this galaxy may be bright enough to contrast with a dark lane running the length of the galaxy. Located in Coma Berenices, it is paired with NGC 4298, which has more of an open spiral appearance.



NGC 4302 - Image from Wikipedia

Hopefully this list of frisbees, whales, needles, and hockey sticks will provide some challenges and enjoyment as you get out and enjoy the warmer spring nights!

#### **Coordinates for the Edge-on Galaxies**

Galaxy	R.A.	Dec.
NGC 3079	10h 01m 58s	+55° 40' 47"
NGC 4111	12h 07m 02s	+43° 03' 56"
NGC 4244	12h 17m 30s	+37° 48' 25"
NGC 4631	12h 42m 07s	+32° 32' 29"
NGC 4656/57	12h 43m 58s	+32° 10' 05"
NGC 4565	12h 36m 20s	+25° 59' 15"
NGC 4302	12h 21m 42s	+14° 35' 53″

# The Queen Speaks

### Robin Byrne

## Happy Birthday Williamina Fleming



his month we celebrate the life of one of the first of Pickering's Women. Williamina Fleming was born May 15, 1857 in Dundee, Scotland. She was one of nine children born to her father, Robert Stevens, a craftsman, and mother, Mary. When Williamina was 14, her father died. To help the family financially, she dropped out of school and started working as a student teacher. In 1877, at the age of 20, Williamina married James Fleming. Fleming was a widow, 16 years older than she, who worked as an accountant. A year later, in November of 1878, James and a pregnant Williamina sailed to a new life in Boston. Shortly after they settled in America,

James abandoned Williamina and their unborn child.

Pregnant and alone, Williamina eventually found work as a maid for the director of the Harvard College Observatory, Edward C. Pickering. Pickering became Williamina's hero and savior, even naming her new son Edward Charles Pickering Fleming. Pickering's wife recognized that Williamina was capable of more than housework and suggested that she could work for Pickering at the observatory. In 1879, Pickering hired Williamina to perform administrative work on a part-time basis. Two years later, she became a full-time employee, with the new duties of analyzing the spectra of stars. She was among the first of many female "computers" who would work at the observatory.

Seven years later, the defining work of the Harvard Computers began. The widow of Henry Draper, Mary Anna Draper, established a fund to support the creation of a catalog of stars classified by their spectra. This would become the Henry Draper Catalogue. Williamina was put in charge of the project. She had a reputation of being strict with the women who worked for her, but also very enthusiastic about the work they were doing.



Williamina Paton Stevens Fleming (1857-1911), circa 1890s. (Courtesy Curator of Astronomical Photographs at Harvard College Observatory.)

The first step was to establish how best to classify the stars. Nettie Farrar had begun working on it, but left shortly after she began when she married. Antonia Maury developed a very complex system that was not popular with the rest of the team. Fleming wanted something much simpler. The system she created along with Pickering, known as the Pickering-Fleming classification system, looked at the strength of the spectral lines created by hydrogen. Stars with the strongest hydrogen lines were classified as A stars, second strongest were B stars, and so on through O stars. Annie Cannon would ultimately develop the Harvard system that became the standard adopted by all astronomers to this day, where the stars are classified by their temperatures, with the categories reduced and rearranged, in order from hottest to coolest stars, to OBAFGKM.

After four years of hard work, the first Henry Draper Catalogue was published in 1890. Over 10,000 stars were classified, and the majority of those were classified by Fleming. In the process of creating the catalogue, Fleming also created an organization system for all of the photographic plates used in the process. Her system made it possible for astronomers to search through earlier plates by including information about which telescope was used and other identifiers. Because of this work, in 1898 Fleming became the first woman to be named Curator of Astronomical Photographs at Harvard.

In addition to all of her work with the photographic plates and identifying spectra, Fleming was also in charge of producing most of the research papers coming out of the observatory for the astronomers working there, with duties that included writing, proofreading, and editing the papers, data tables, and publishing the annual reports. She once said, "If one could only go on and on with original work..., life would be a most beautiful dream; but you... use most of your available time preparing the work of others for publication." However, Williamina was one of the few women who did publish some of her own work and give presentations at astronomical conferences.



"Pickering's Harem," so-called, for the group of women computers at the Harvard College Observatory, who worked for the astronomer Edward Charles Pickering. The group included Harvard computer and astronomer Henrietta Swan Leavitt (1868-1921), Annie Jump Cannon (1863-1941), Williamina Fleming (1857-1911) and Antonia Maury (1866-1952). Image circa 1890.

In the process of analyzing the photographic plates for the catalogue, Fleming made several discoveries, including identifying 59 gaseous nebulae, finding over 300 variable stars, and 10 novae. One of the best know objects that she discovered is the Horsehead Nebula, which she found on a photographic plate in 1888. However, it was over 20 years before she was given credit for the discovery. Williamina published her own catalogue of the variable stars that she had discovered. One of her last discoveries was the first identified white dwarf star, in 1910. Fleming's last publication was a catalogue of the spectra and magnitudes of thousands of stars, sorted into regions of the sky.

Despite believing that women had limitations, Williamina was a vocal crusader in favor of more women becoming astronomers. In 1893 she gave a speech at the World's Fair in Chicago, titled "A Field for Woman's Work in Astronomy," in which she wrote, "While we cannot maintain that in everything woman is man's equal, yet in many things her patience, perseverance, and method make her his superior." Williamina also was not afraid to complain about the salary discrepancy between male and female employees of the Harvard Observatory, once writing in her journal about arguing with Pickering on the subject, "I am immediately told that I receive an excellent salary as women's salaries stand....Does he ever think that I have a home to keep and a family to take care of as well as the men?...And this is considered an enlightened age!"

The work of Williamina Fleming and the other Harvard computers didn't end in the early twentieth century. In 2015, the curator of Harvard's Plate Stacks, Lindsay Smith Trull, discovered over 100 boxes filled with thousands of notebooks from the Harvard computers and astronomers. She began an effort to preserve and transcribe their work. Project PHaEDRA (Preserving Harvard's Early Data and Research in Astronomy) will allow researchers to not only access publications, but the original notes made by all of the women and men working at the observatory. So far, roughly a fourth of the over 2000 notebooks have been transcribed. Volunteers can help transcribe the notebooks through the Smithsonian Digital Volunteers Web site.

Williamina Fleming was a tireless worker, up until her hospitalization for pneumonia in 1911. She succumbed to her illness May 21 of that year. Advice Williamina once gave provides an accurate description of her own life: "Labor honestly, conscientiously, and steadfastly, and recognition and success must crown your efforts in the end." The successes and recognition of Williamina Fleming continue to this very day.

#### **References:**

Williamina Fleming - Wikipedia

Williamina Fleming Brief Life of a Spectrographic Pioneer: 1857 - 1911, Harvard Magazine, by Alan Hirshfeld

<u>Williamina Fleming Astronomer, 1857 - 1911</u>, National Library of Scotland

# The Space Place MASA Nights

# Metwork

## **David Prosper**

The Bays Mountain Astronomy Club Newsletter

# Night Lights: Aurora, Noctilucent Clouds, and the Zodiacal Light

ave you spotted any "night lights?" These phenomena brighten dark skies with celestial light ranging from mild to dazzling: the subtle light pyramid of the zodiacal light, the eerie twilight glow of noctilucent clouds, and most famous of all, the wildly unpredictable and mesmerizing aurora.

Aurora, often referred to as the northern lights (aurora borealis) or southern lights (aurora australis), can indeed be a wonderful sight, but the beautiful photos and videos shared online are often misleading. For most observers not near polar latitudes, auroral displays are relatively rare and faint, and without much structure, more gray than colorful, and show up much better in photos. However, geomagnetic storms can create auroras that dance and shift rapidly across the skies with several distinct colors and appear to observers much further away from the poles - on very rare occasions even down to the mid-latitudes of North America! Geomagnetic storms are caused when a magnetic storm on our Sun creates a massive explosion that flings a mass of particles away from its surface, known as a Coronal Mass Ejection (CME). If Earth is in the path of this CME, its particles interact with our planet's magnetic field and result in auroral displays high up in our ionosphere. As we enter our Sun's active period of its 11-year solar cycle, CMEs become more common and increase the chance for dazzling displays! If you have seen any aurora, you can report your sighting to the <u>Aurorasaurus citizen science program</u>.

#### The Shape of Aurora



A sampling of some of the various patterns created by aurora, as seen from Iceland in 2014. The top row photos were barely visible to the unaided eye and were exposed for 20-30 seconds; in contrast, the bottom row photos were exposed for just 4 seconds- and were clearly visible to the photographer, Wikimedia contributor Shnuffel2022. <u>CC BY-SA 4.0</u>

Have you ever seen wispy clouds glowing an eclectic blue after sunset, possibly towards your west or northwest? That wasn't your imagination; those luminescent clouds are noctilucent clouds (also called Polar Mesospheric Clouds (PMC)). They are thought to form when water vapor condenses around 'seeds' of dust from vaporized meteorites - along with other sources that include rocket launches and volcanic eruptions - around 50 miles high in the mesosphere. Their glow is caused by the Sun, whose light still shines at that altitude after sunset from the perspective of ground-based observers. Noctilucent clouds are increasing both in frequency and in how far south they are observed, a development that may be related to climate change. Keeping in mind that observers closer in latitude to the poles have a better chance of spotting them, your best opportunity to spot noctilucent clouds occurs from about half an hour to two hours after sunset during the summer months. NASA's AIM mission studies these clouds from its orbit high above the North Pole.

#### **Comet NEOWISE Above Noctilucent Clouds**



Comet NEOWISE flies high above a batch of noctilucent clouds in this photo from Wikimedia contributor Brwynog. <u>CC BY-SA 4.0</u>

You may have seen the zodiacal light without even realizing it; there is a reason it's nicknamed the "false dawn!" Viewers under dark skies have their best chance of spotting this pyramid of ghostly light a couple of hours after sunset around the spring equinox, or a couple of hours before dawn around the autumnal equinox. Unlike our previous two examples of night lights, observers closer to the equator are best positioned to view the zodiacal light! Long known to be composed of interplanetary dust orbiting in the plane of our Solar System reflecting sunlight, these fine particles were thought to originate from comets and asteroids. However, scientists from NASA's Juno mission recently published a fascinating study indicating a possible alternative origin: dust from Mars! Learn more about their serendipitous discovery.

#### The Zodiacal Light and The Pleiades



The zodiacal light as seen in the evening of March 1, 2021 above Skull Valley. Utah. The Pleiades star cluster (M45) is visible near the top. <u>NASA/Bill Dunford</u> Curious about the latest research into these night lights? Find news of NASA's latest discoveries <u>here</u>.

#### 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 <u>nightsky</u> to find local clubs, events, and more!

# BMAC Calendar & More

## Calendar:



#### **MAC Meetings:**

- BMAC meetings may be held in person or on Zoom depending on virus transmission rates.
- Friday, June 3, 2022 7p Via Zoom? Social time 30m before and after meeting. Topic TBA.
- Friday, August 5, 2022 7p Via Zoom? Social time 30m before and after meeting. Topic TBA.
- Friday, September 2, 2022 7p Via Zoom? Social time 30m before and after meeting. Topic TBA.
- Friday, October 7, 2022 7p Via Zoom? Social time 30m before and after meeting. Topic TBA.
- Friday, December 2, 2022 7p Via Zoom? Social time 30m before and after meeting. Topic TBA.



- Cancelled until further notice.
- Every clear Saturday & Sunday 3p-3:30p March-October On the Dam
  - View the Sun safely with a white-light & Ha view if clear.; Free.
  - You must have completed the Park Volunteer Program in order to help with the public program. If you have, and have been trained, please show up at least 30 minutes prior to the official start time.



#### tarWatch:

•Cancelled until further notice.

- October 1 & 8, 2022 7:30p
- October 15, 22, 29 & November 5, 2022 7p
- November 12, 19 & 26, 2022 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, and have been trained, please show up at least 30 minutes prior to the official start time.



• All special events are dependent on virus transmission rates.

#### • Astronomy Day - May 7, 2022 - 1p-4p

• Come help share the fun of astronomy with the public. There will be tables with different themed topics. Current BMAC members please show up at noon to help set up and stay to help break down.

#### • Annual Club Picnic - July 2022 - Day TBD - 6p?

- Site location will be sent directly to full BMAC members. BMACers and their families are welcome to enjoy an evening of astronomythemed games and activities along with a potluck dinner and observing.
- Please bring a dish to share and bring your own chair.

#### • StarFest 2022 - November 4, 5 & 6, 2022

- 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. 14, 2022 with full payment is mandatory for attendance. Sorry, no walk-ins nor "visits."
- MeadowView Marriott special hotel rate.
- <u>StarFest Link</u>

# **Regular Contributors:**



William Troxel



Greg Penner



Robin Byrne



Adam Thanz



obin 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).

reg Penner is a semi-retired architect living in the Tri-Cities area since 2018. He G has enjoyed astronomy since childhood when he received a "department store telescope" and viewed Saturn for the first time. He has been a member since 2018.



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

## **Connection:**

**B** ays Mountain Astronomy Club:

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



- Dues are highly 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. The easiest way is to pay via the CivicRec online portal. If you are a current member, please log in with your e-mail address and reset your password if you have not already done so. You can then update your membership. Here's the direct <u>link</u>. If you want to add family members, then add them via the internal link. 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.
- Stellar Observations image of Crescent Nebula by David Reagan.
  - This image was taken with a 140mm refractor in his suburban backyard using an AstroPhysics 900 mount, 8.7 hours of 5 minute Ha and OIII subexposures, combined in AstroPixelProcessor as an HOO image and processed in Lightroom and Photoshop. Image captured in 2022.
- 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.
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