

# CONSTELLATION

the official publication of Bucks-Mont Astronomical Association, Inc

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Scott Petersen, editor

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## Those Ancient Astronomers Were Amazing

- by Gary Sprague

I enjoy reading history and especially about some of the historical astronomers. They were truly amazing. I feel incompetent when I consider the tools they had at their disposal, sometimes none, and often only their reason and their logic. The Greeks were especially notable in their logic, even though their measurements were sometimes lacking and imprecise. Aristarchus of Samos was a Greek astronomer whose work inspired Copernicus over 1000 years later. Aristarchus proposed that the Earth rotates on its axis and revolves around the Sun. Only references to his work survived but he was thoroughly denounced by other Greek philosophers of his time “for putting into motion the hearth of the universe.”

Aristarchus used his logic and observations of lunar and solar eclipses to estimate the relative sizes of Sun, Earth and the Moon. Using the same observations, he underestimated the relative distances of the Sun and Moon from the Earth, by about 20 times, but his logic was sound. His measurements were lacking, possibly because of the crudeness of his geometric tools, but I doubt I would be able to match his logic! Many have said the Greeks were the greatest “thinkers” in the history of mankind and I’m inclined to agree with them.

Even after astronomical telescopes were developed, have you considered doing your observations with some of the early ones? Before multiple lens were developed, the only way to reduce effects of chromatic aberration of early refractors was to increase the focal length. Can you imagine trying to observe Venus with a telescope having a 2 inch objective and focal length of 20 feet? Some of these telescopes with larger aperture lens had focal lengths approaching 100 feet? Sir Isaac Newton helped the telescope situation with the advent of his reflector but many of these scopes were also huge and unwieldy. They required multiple people to operate them for a routine observing session.

We take our modern telescopes and cameras out at night and enjoy the sights we see and the photographs we take. Next time, appreciate how far we have come, and consider what Galileo could have done with your telescope!

- Gary Sprague is BMAA co-president [-ed]

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### 2017 BMAA officers

[info@bma2.org](mailto:info@bma2.org)

**Gary Sprague**, co-president

**Dwight Dulsky**, co-president

**Lee Zagar**, vice-president

**Robert Mittel-Carey**, secretary

**Ed Radomski**, treasurer

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**Bucks-Mont Astronomical Association, Inc**  
**General Meeting Minutes**  
**March 1, 2017**

Location: Upper Dublin Lutheran Church, 411 Susquehanna Road, Ambler PA 19002  
Officers present: Gary Sprague (co-president), Lee Zager (vice-president)  
and Robert Mittel-Carey (secretary)

**Meeting called to order by Gary Sprague at 7:30p. In attendance: 16 members and guests**

- Gary presented several photos for the January 2017 meeting
- Reviewed calendar for March – April and 2017 Star watch calendar
- Briefly discussed Feb daylight observing focused around Mars, Venus, and Uranus
- Robert Oughton is clearing out a large lot of astronomy related gear such as books, ATM stuff, scopes; Gary likely to bring these to the April meeting.
- Share and Tell: Gary showed off his new battery box housed in a plastic file tote; Igor's take on the newest version of Stellarium and a astrophotography calendar he put together.
- Solar observing safety disclaimer
- August 21<sup>st</sup> 2017 solar eclipse: around 3:00pm for the metro philly and surrounding areas.
- Where will club members be?
- Main topic: **Ophthalmology: Impact of Visual Observing**  
Lee Zager presented a detailed and educational review with very helpful graphics and metrics.

Respectfully submitted,  
Robert Mittel-Carey, BMAA secretary

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The CONSTELLATION is the official publication of the Bucks-Mont Astronomical Association, Inc, a 501(c)(3) non-profit organization incorporated in the Commonwealth of Pennsylvania and exists for the exchange of ideas, news, information and publicity among the BMAA membership, as well as the amateur astronomy community at large. The views expressed are not necessarily those of BMAA, but of the contributors and are edited to fit within the format and confines of the publication. Unsolicited articles relevant to astronomy are welcomed and may be submitted to the Editor. Reprints of articles, or complete issues of the CONSTELLATION, may be available by contacting the Editor at the address listed below, and portions may be reproduced with permission, providing proper acknowledgment is made and a copy of that publication is sent to the Editor. Contents of this publication, and format (hard copy or electronic) are copyright ©2017 BMAA, Inc. Submission deadline for articles is the 15th of the month prior to quarterly publication.

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**Bucks-Mont Astronomical Association, Inc**  
**General Meeting Minutes**  
**April 5, 2017**

Location: Upper Dublin Lutheran Church, 411 Susquehanna Road, Ambler PA 19002  
Officers present: Gary Sprague and Dwight Dulsky (co-presidents), Lee Zager (vice-president)  
and Robert Mittel-Carey (secretary)

**Meeting called to order by Gary Sprague at 7:30p. In attendance: 23 members and guests**

- Gary reviewed the Bowman's Hill starwarch
  - Calendar recap for April – May
  - Club has received several requests for solar eclipse presentations
  - Sun spots have been very minimal lately
  - Robert Oughton, one of BMAA founders, has donated several telescopes and other pieces of equipment to the club. Nicer items will be auctioned off for club funds
  - Reviewed the number of people within the US that live within 100, 200, 300 miles of the zone of totality for the upcoming eclipse.
  - The next eclipse visible in the US after the August one is April 24<sup>th</sup> 2024 which will pass NE-SW over central PA.
  - Show and Tell: Brad had several samples of streaming live aurora videos.
- **Main topic: Urban Visual Observing**  
Bernie Kosher gave a very detailed and informative presentation of making the best of visual observing from urban environments.

Respectfully submitted,  
Robert Mittel-Carey, BMAA secretary

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***Editor's Note***

The *CONSTELLATION* is your BMAA club newsletter and its success depends solely on your input. Please submit articles to me at: [constellation@bma2.org](mailto:constellation@bma2.org). I am trying to maintain a quarterly publication cycle, on or about the Solstices and Equinoxes with supplements as required. Thanks.

- Scott Petersen, *CONSTELLATION* editor

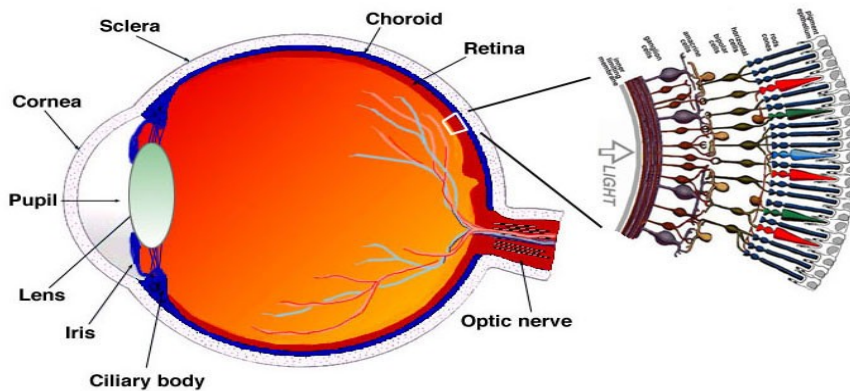
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# EYE ANATOMY AND VISUAL OBSERVING

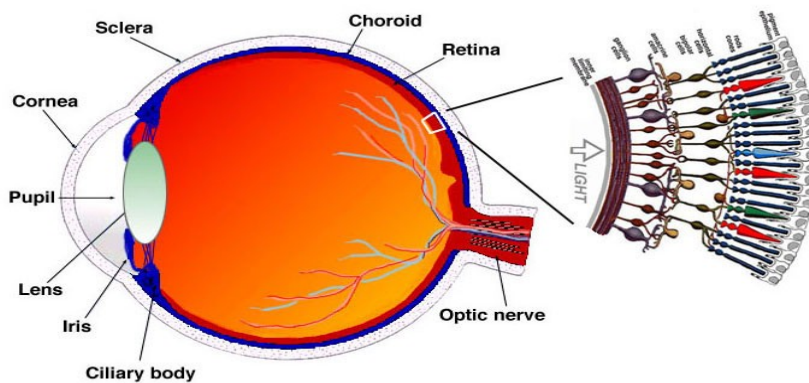
- by Lee Zagar

At the March General Meeting, BMAA vice-president Lee Zagar made an interesting presentation on ophthalmology as it relates to visual observing:

- Why do we not see color when our eyes are dark adapted?
- If you wear glasses, do you need to wear them when observing?
- How and why do we dark adapt our eyes?
- How do you determine an eyepiece exit pupil diameter and why is it important?
- How and why does averted vision help in seeing faint objects?

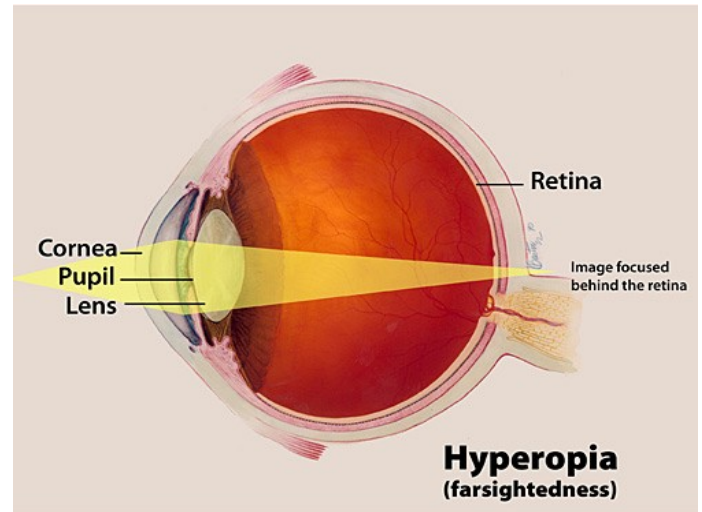
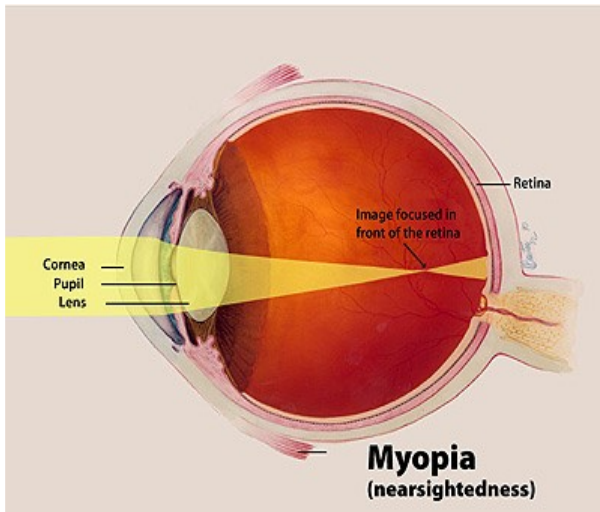


Your retina has two types of cells, rods and cones. In light-adapted mode, the cones detect bright light and colors. In dark-adapted mode, only the rods detect faint light, but it takes a long time to dark-adapt, about 20-60 minutes; however, going from dark-adapted to light-adapted mode only takes a few seconds. That is why we don't use a bright white light flashlight while observing.



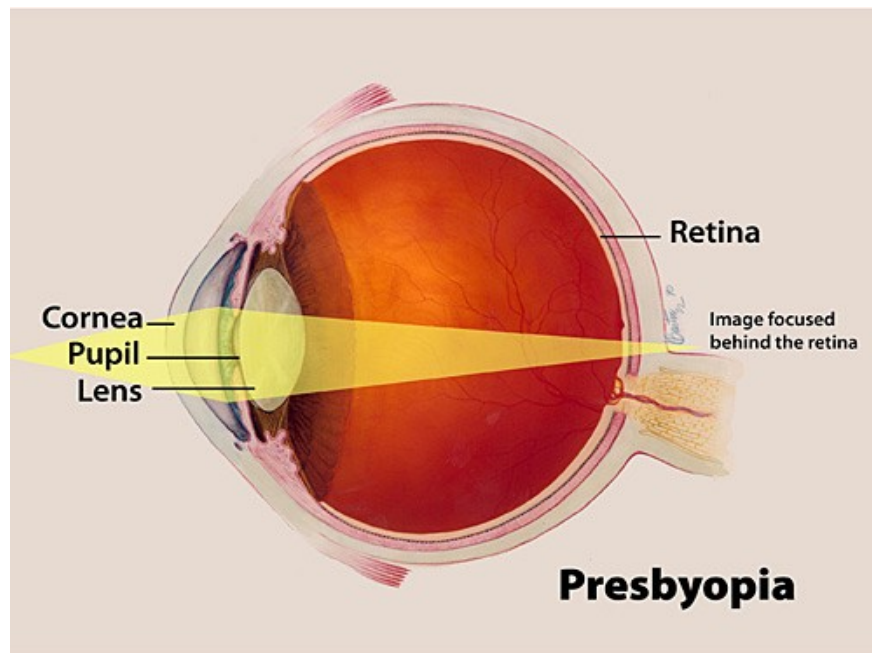
Both rods and cones contain dyes that undergo a chemical change called “bleaching” when hit by light. In light-adapted mode, the dyes in your rods are fully bleached, so they can't detect faint light, but the cones can detect color. In dark-adapted mode, the rods detect faint light, but the cones, which can only detect bright light, cannot detect color.

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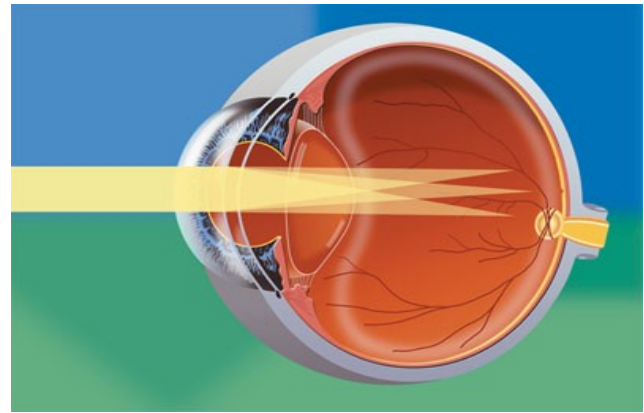
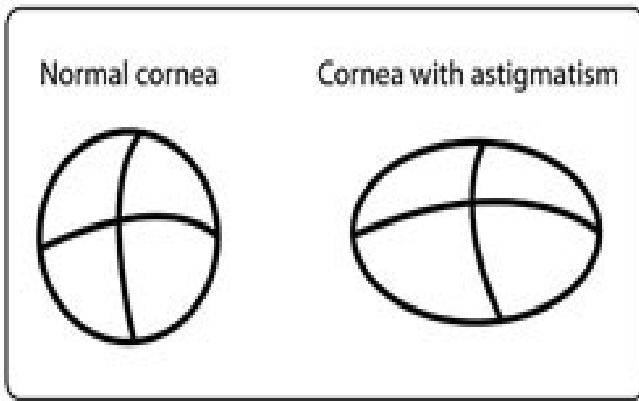
There are several reasons why you might need to wear glasses. The most common are myopia (near sighted), hyperopia (far sighted), and astigmatism (which may be combined with myopia or hyperopia). Based on the reason why you need to wear glasses, the answer could be yes or no.

If you have myopia or hyperopia and no, or very little, astigmatism you do not need to wear glasses when observing. Adjusting the focuser will apply the necessary correction.

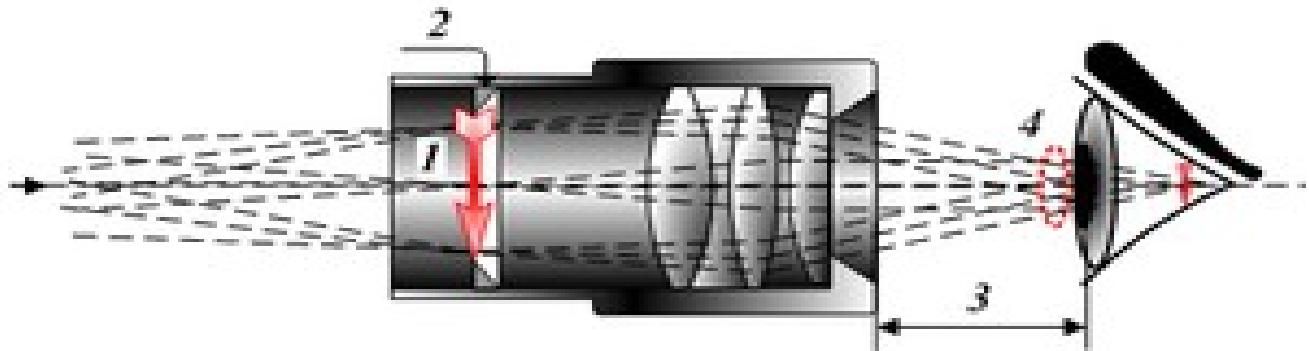


Presbyopia, which results in the inability to focus up close, is a common type of vision disorder that occurs as you age. The correction for presbyopia is the use of bifocal glasses or “readers”, that are simply magnifying lenses.

If you have presbyopia and have no, or very little, astigmatism, you do not need to wear your glasses while observing.



Astigmatism is a defect in the eye caused by a deviation from spherical curvature (similar to the shape of an egg or a football instead of a soccer ball), which results in distorted images, as light rays are prevented from meeting at a common focus. If you have astigmatism, with either myopia or hyperopia, wearing glasses is advised.



1 - Real Image 2 - Field Diaphragm  
3 - Eye Relief 4- Exit Pupil

Wearing glasses while you are using an eyepiece with a short eye relief, may make it difficult to get your eye close enough to the eyepiece. If you wear bifocals, especially those with progressive lenses, it may be difficult to keep an object in focus. Therefore, not wearing glasses would be an advantage.

**How do you determine eyepiece exit pupil diameter and why is it important?**

Eyepiece exit pupil diameter = Aperture/Magnification or Eyepiece FL/F-ratio

Example: 250mm f/4.5 Telescope and 25mm Eyepiece

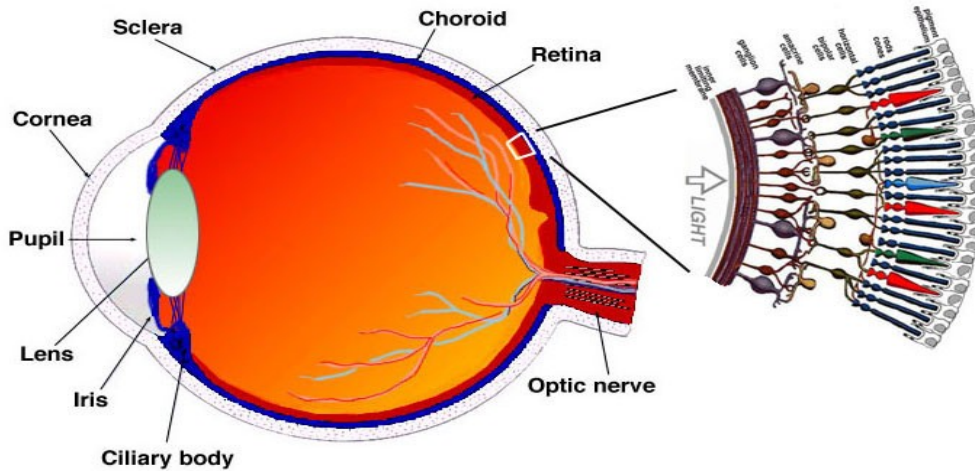
$$1125/25 = 45 \text{ Power} \quad 250/45 = 5.6\text{mm} \text{ or } 25/4.5 = 5.6\text{mm}$$





Age	Day Pupil	Night Pupil
20	4.7mm	8mm
30	4.3mm	7mm
40	3.9mm	6mm
50	3.5mm	5mm
60	3.1mm	4.1mm
70	2.7mm	3.2mm
80	2.3mm	2.5mm

If a 60 year old person with with an eye pupil diameter of about 4mm used the eyepiece in the example above, their eye pupil would not open wide enough to see all of the light from the 5.6mm exit pupil of the 25mm eyepiece.



Averted vision involves not looking directly at the object, but looking a little off to the side. Cones are densely packed near the center of your retina. Rods are mostly away from the center of your retina. You see less detail and no color with the rods, but they are much more sensitive to light; therefore, averted vision exposes the most sensitive part of your eye and lets you see much fainter objects.

- BMAA vice-president Lee Zagar provided this article and graphics [-ed]

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## Space Place



April 2017

## **NOAA's Joint Polar Satellite System to monitor Earth as never before**

*- by Ethan Siegel*

Later this year, an ambitious new Earth-monitoring satellite will launch into a polar orbit around our planet. The new satellite, called JPSS-1, is a collaboration between NASA and NOAA. It is part of a mission called the Joint Polar Satellite System, or JPSS.

At a destination altitude of only 824 km, it will complete an orbit around Earth in just 101 minutes, collecting extraordinarily high-resolution imagery of our surface, oceans and atmosphere. It will obtain full-planet coverage every 12 hours using five separate, independent instruments. This approach enables near-continuous monitoring of a huge variety of weather and climate phenomena.

JPSS-1 will improve the prediction of severe weather events and will help advance early warning systems. It will also be indispensable for long-term climate monitoring, as it will track global rainfall, drought conditions and ocean properties.

The five independent instruments on board are the main assets of this mission:

- The Cross-track Infrared Sounder (CrIS) will detail the atmosphere's 3D structure, measuring water vapor and temperature in over 1,000 infrared spectral channels. It will enable accurate weather forecasting up to seven days in advance of any major weather events.
- The Advanced Technology Microwave Sounder (ATMS) adds 22 microwave channels to CrIS's measurements, improving temperature and moisture readings.
- Taking visible and infrared images of Earth's surface at 750 meter resolution, the Visible Infrared Imaging Radiometer Suite (VIIRS) instrument will enable monitoring of weather patterns, fires, sea temperatures, light pollution, and ocean color observations at unprecedented resolutions.
- The Ozone Mapping and Profiler Suite (OMPS) will measure how ozone concentration varies with altitude and in time over every location on Earth's surface. This can help us understand how UV light penetrates the various layers of Earth's atmosphere.
- The Clouds and the Earth's Radiant System (CERES) instrument will quantify the effect of clouds on Earth's energy balance, measuring solar reflectance and Earth's radiance. It will greatly reduce one of the largest sources of uncertainty in climate modeling.

The information from this satellite will be important for emergency responders, airline pilots, cargo ships, farmers and coastal residents, and many others. Long and short term weather monitoring will be greatly enhanced by JPSS-1 and the rest of the upcoming satellites in the JPSS system.

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Want to teach kids about polar and geostationary orbits? Go to the NASA Space Place:  
<https://spaceplace.nasa.gov/geo-orbits/>



*Caption: Ball and Raytheon technicians integrate the VIIRS Optical and Electrical Modules onto the JPSS-1 spacecraft in 2015. The spacecraft will be ready for launch later this year. Image Credit: Ball Aerospace & Technologies Corp.*

With articles, activities, crafts, games, and lesson plans, NASA Space Place encourages everyone to get excited about science and technology.

Visit [spaceplace.nasa.gov](https://spaceplace.nasa.gov) to explore space and Earth science!

- Space Place is provided by NASA to amateur astronomy clubs [-ed]

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# BMAA Registration Form

Renewal

New Member

Name \_\_\_\_\_

\_\_\_\_\_

Address \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Telephone

Home \_\_\_\_\_

Cell \_\_\_\_\_

E-Mail \_\_\_\_\_

Dues are **\$30.00** for an individual or **\$40.00** for a family membership (more than one person at same address).

Make check payable to **BMAA and send to:**

BMAA  
c/o Ed Radomski  
36 Far View Rd.  
Chalfont, PA 18914

If you would prefer to register and pay using **PayPal** do not use this form. On the [PayPal](https://www.paypal.com) website send your payment to [treas@bma2.org](mailto:treas@bma2.org) . Send it as a "purchase of goods" so that I receive your address. In the Email section make the subject "Dues" include your telephone # and your preferred Email address in the message area.