

The Mason-Dixon Astronomer



April Meeting:

- Wed., April 9th – 7:30 pm
Bear Branch Nature Center
- **Dr. Marc Swisdak**
“The Voyager Mission and the Edge of the Solar System”

Dinner With Our Speaker!

- Wed., April 9th – 6pm.
- Harry's Main Street Grill
65 W Main Street
Westminster, MD 21157

INSIDE THIS ISSUE:

Meeting Info.	2
Coming Events	2
Messier Marathon - Take Two!!	5
Astronomy Day	6
S.P. Build Your Own Satellite	6
Space Place For April	7

St*r Points

April's Total Eclipse of the Moon

April 2014 – Curt Roelle

The big news this month is the upcoming total lunar eclipse early on April 14-15 in the late hours past midnight. In other words the eclipse takes place very early Tuesday morning as the moon glides through the earth's shadow which is being projected into space by the sun.

The only instrument needed to observe any lunar eclipse is the unaided eye. Of course optical boosts given by binoculars or a small telescope will enhance the experience all the more.

A precise geometrical alignment is in effect as the moon passes through the earth's shadow and a total lunar eclipse takes place. The moon, earth and sun need to be perfectly aligned, with the sun and moon in opposite directions from the earth. Thus, from earth, a lunar eclipse may only be viewed at night when the moon is up and the sun is down. Because of this geometry, the moon phase is always full at the time of a lunar eclipse. To witness a lunar eclipse, an observer must be located on the night side of the earth from which the moon is visible at the time.

The upcoming eclipse occurs in stages between 12:52 a.m. and 06:39 a.m. EDT on Tuesday the 15th, with the most dramatic stages occurring between 01:58 and 05:33 a.m. The details for each stage are outlined below.

The “penumbral” eclipse stage begins at 12:52 a.m. EDT as the moon

Continued on Page 3...

President's Message

April 2014 – Tony Falletta

Greetings Fellow Astronomers!

Well, here we are in the spring month of April. Winter is now behind us. Wait! Why is it still cold? Why is snow still being discussed on the local weather forecasts as a possible type of precipitation? I could have sworn the Vernal Equinox was on March 20th and with that would be the ushering in of warmer springtime temps. This cold weather has certainly been an exercise in patience for me. I love the clear skies that typically come with winter but these colder than normal temperatures have kept me and my scopes in the house longer than I planned. Hopefully April will renew my stargazing spirits!



Credit: Fred Espenak/NASA's Goddard Space Flight Center

April Meeting – Guest Speaker (Rescheduled from February)

Dr. Marc Swisdak (University of Maryland)

“The Voyager Mission and the Edge of the Solar System”

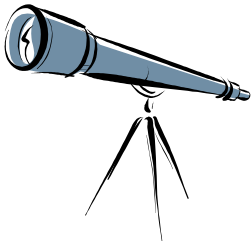
During the summer of 2012 the Voyager 1 spacecraft passed the heliopause, the boundary separating our solar system from interstellar space, and marked yet another in a long line of firsts for the Voyager program since the launches of the twin spacecraft in 1977. Along with their famous planetary discoveries, the Voyagers have upended our understanding of the outer solar system. I'll describe what was thought before the missions, how data from the spacecraft tested those theories, what we now believe to be the case, and what the future holds for the farthest man-made object from Earth.

Bio:

Dr. Marc Swisdak received his Ph.D. in astrophysics from the University of Colorado at Boulder. After post-doctoral positions at the University of Maryland and the Naval Research Laboratory he became a research scientist at the University of Maryland. His research interests include the outer heliosphere, solar flares, and the Earth's magnetosphere.

Upcoming Events From Our Calendars

- ❖ **Monthly Meeting** April 9th, 7:30 p.m., at Bear Branch Nature Center (BBNC)
- ❖ **Planetarium Show** April 12th, 7:30 p.m., at Bear Branch Nature Center (BBNC)
- ❖ **Soldiers Delight Public Stargazing** April 12th, 8 p.m., at Soldiers Delight Natural Environment Area in Owings Mills
- ❖ **Messier Marathon** April 26th, Sunset, Marstown Observatory – New Windsor –
More details on page 5



Join The Westminster Astronomical Society...

Joining WASI gives you a great opportunity to meet fellow astronomers and provides group memberships to the [Astronomical League](#) and the [International Dark-Sky Association](#). Additionally, benefits include access to our [Library](#) (over 500 astronomy-related books), the ability to borrow [club scopes](#), a subscription to the Astronomical League's *Reflector*, access to members-only observing sessions and sites, and club discounts on astronomical magazine subscriptions.

Adult Membership is still only \$25 per year.



NEW THIS YEAR – JUNIOR MEMBERSHIP

Yearly Membership For Anyone Under 18 Is Now Just \$5!
(YES...JUST FIVE DOLLARS!)

<http://www.westminsterastro.org>



St*r Points for March...

Continued from Page 1

first touches the earth's penumbral shadow. Earth has two distinct conical shadows shaped like very long dunce caps with the cap wearer's head representing the earth. These shadows are concentric, with one inside of the other. The longer outer shadow is the penumbra and the shorter inner shadow is known as the umbra. Just picture a person wearing two very long dunce caps, a shorter one inside a longer one.

An astronaut anywhere inside this outer penumbral shadow looking back toward the earth would see it blocking only part of the sun. The farther into the shadow they ingress the less they can see of the sun as the shadow is darker the deeper inside.

A person on the earth viewing the moon during the penumbral eclipse stage might notice nothing at first. But after a while they may perceive the brilliant full moon as being somewhat dimmed. I found this effect striking at last May's penumbral lunar eclipse. The unfiltered full moon was almost painfully bright when viewed in binoculars. But minutes later during the penumbral eclipse not only could the moon be observed without discomfort, but in greater detail as well due to its reduced glare.

The next stage is the "partial eclipse" beginning at 01:58 a.m. EDT. At that time the moon begins slowly sliding into the earth's umbral shadow. The moon will appear to have a deep darkening along its leading edge. The umbral shadow is the darker inner dunce cap in our hypothetical model.

As the partial stage progresses the large dark circular umbral shadow seems to slowly devour the moon. Actually, what is happening is the moon that is moving as it plunges headlong into the shadow all on its own in the normal course of its orbit around the earth.

If we were astronauts standing on the moon's surface within the earth's umbral shadow we would see a magnificent sight. The sun is completely invisible because it is totally blocked by the earth. The surface of the earth is dark because we are looking at its night side. As Sky & Telescope magazine's Alan McRobert describes it in his online blog, "you'd see Earth ringed with a thin, brilliant band of sunset- and sunrise-colored light."

This exact scene was predicted and produced using special effects in the 1929 classic German science fiction silent film "Frau im Mond," or "Woman in the Moon" (available on Netflix™). German visionary and rocket scientist Hermann Oberth served as technical advisor for the film. Oberth's work as well as the movie were inspirations for the young Wernher von Braun. In later life Von Braun would lead a German rocket team in developing the deadly Aggregat-4 rocket (a.k.a. Vengeance Weapon 2, or V-2) during World War II. Von Braun's career would eventually culminate with the building of America's Apollo Saturn V rocket which carried the first humans to land on the moon in 1969, some 40 years after the movie's release. For better or worse, events like these are a testament to the film's long term historical impact through the tumultuous events during the decades of the 20th century.

As the film's cast stands gaping at the view through the window on their way to the moon, they are transfixed at the beautiful sight of the earth brightly ringed by light from the eclipsed sun. The young Gustav, a lad who had stowed away aboard the rocket, solemnly remarks, "On our earth the sun is just rising."

Gustav was partly correct. For that reddish ring is not only the light from every point on earth where dawn's morning twilight is occurring, but also includes the light from everywhere that dusk's evening twilight is happening as well at that instant in time. Some of this light is scattered moonward during the eclipse resulting in the moon taking on colors ranging from copper red to dark dusky brown.

Notice how, as the moon darkens, stars that were not visible earlier due to the light of the full moon seem to be coming out even though it is already night. This effect is sometimes described as a "night within a night."

Finally, at 03:06 a.m. EDT the "totality" stage begins. The moon is now completely inside the cone of the umbral shadow. It will remain totally engulfed by the umbra for some 79 minutes. The moon passes just south of the shadow's central axis. Therefore, the moon's southern edge could remain lighter than the northern.

Once totality ends at 04:25 a.m. the stages occur in reverse beginning with the partial eclipse. The shadow slowly recedes and the stars begin to fade again as the moon brightens. The partial eclipse ends at 05:33 a.m. as the moon exits the umbra. The penumbral eclipse then ends at 06:39 a.m. However, in the minutes leading up to the ultimate end of the eclipse, the sun rises and the moon sets.

You don't need to go anywhere special to view the eclipse. Just step out of your house and look up. If you want to view through a telescope, the Westminster Astronomical Society is planning to set up a telescope or two at the main Westminster branch of the Carroll County Library, weather permitting of course.

President's Message

Continued from Page 1

As I continue to wait for these elusive warmer temperatures, I am planning on having my telescopes start earning their keep a little better. Once the weather finally breaks, in addition to our Outreach events and our club Observing Events, I plan on setting up one of my telescopes here in Mount Airy where I live. I don't mean just in my backyard but someplace where there is a lot of foot traffic. I see a need to show and share our passion of astronomy to whoever is even mildly curious. I come across many people in my town that when I get on the subject of astronomy and stargazing, it is usually followed by something like, "Gee I would like to see that." or "Tell me when you will have your scope out because that sounds pretty interesting." Every month, with something up there different to see, I plan to point my scope at whatever is overhead, be it the Moon, a planet, a star cluster, or colorful double star. I'm sure I'll get smiles from curious people passing by to take a peek through the eyepiece. With longer days of summer approaching, I will even set up for solar viewing. Many people have never actually seen the Sun directly through a telescope and are always awed by the view. I encourage you all to try something similar where you live. You too might be pleasantly surprised.

I hope you had a chance to try the Messier Marathon. As I write this, the event has not yet occurred. I hope the weather was cooperative and fun was had by all. I could not be there due to my job. As an airline pilot, when I go to work, I am out of town the entire time. March 29th had me flying around deep in the heart of Texas. If the weather did not cooperate, the backup date is April 26th. Hopefully that day will have clear skies.

March didn't see much change on the observatory front for the club. We are still working out the agreement with the County for the observatory here at BBNC. Once the final issues are hammered out, we can begin the task of the installation of a beautiful dome courtesy of the Roelke Family. We also await to hear from Taneytown Officials for a meeting date to discuss the construction of a roll-off roof observatory there.

For our April Meeting, our featured speaker will be Dr. Marc Swisdak of the University of Maryland. Dr. Swisdak's presentation is titled, "The Voyager Mission and the Edge of the Solar System".

You will recall that Dr. Swisdak was scheduled to be our speaker in February but the winter storms and the subsequent power outages and loss of heating at Bear Branch Nature Center forced us to cancel the meeting. I am thankful that Dr. Swisdak is able to reschedule to talk with us for our April meeting. I look forward to this presentation. Launched in 1977, Voyager is the farthest man-made object from Earth.....wow, very cool!

As a reminder, please join us before the meeting at Harry's Main Street Grill in Westminster for dinner with Dr. Swisdak. If you haven't been there before, our pre-meeting dinners are just a nice way of thanking our speakers by treating them to dinner and provides a very informal and casual venue for you to meet and get to know a little bit about our featured speaker.

A Total Lunar Eclipse will be the highlight of April. The last time we had a total lunar eclipse was back in 2011. This one will occur on April 15th when the full Moon will pass through the Umbra of the Earth's shadow. The Penumbra should be first visible around 1:20am with the total eclipse beginning at 3:07am and ending at 4:25am. Whether you can pull an all-nighter or can set an alarm clock for a little before 3am, you should really plan to see this if you are able. If you haven't seen one before or don't remember what you saw, expect the Moon to take on an orange-red tint. It's an awesome sight to behold.

Finally, as promised in the last edition of the MDA, this month's "Tony's Astronomy Target" is Hydra, The Water Snake which is on Meridian on April 20th. Hydra is a very large constellation winding through about a quarter of the sky. Hydra's head is a small circling of stars just south of Cancer. Its body winds past Leo the Lion and its tail ends near Libra the Scales. In Hydra, look for M48. At magnitude 5.5, this large open cluster near Hydra's head is a great binocular target. After seeing M48, move along Hydra's body and stop at NGC 3242, known as The Ghost of Jupiter. This planetary nebula is at magnitude 8.5 and has a pale bluish green color to it. While you're at NGC 3242, try to spot V Hya. It is a very red carbon star that varies in magnitude from 6.6 to 8.5. As it varies in magnitude, it also varies in its color, going from a deep red at 6.6 to deep orange at 8.5. Finally, work your way down towards Hydra's tail and spot M83. Known also as the Southern Pinwheel, M83 is a face-on spiral galaxy at magnitude 7.6. It is one of the brightest galaxies in Hydra.

That's all for now. I hope to see you all at our next meeting to talk about Voyager and hopefully get in a little stargazing too!

Clear Skies,

Tony Falletta

Messier Marathon 2014

Rained Out - March 29th

New date: April 26th

Location: Marstown Observatory - New Windsor, MD

Site is located off Marston Road (Md. 407) in New Windsor. Directions and other information will be posted at Marstown.org (<http://www.marstown.org>) prior to the event.

Setup begins at 7:30 p.m. Sunset at 7:57 p.m.

For those not familiar with the marathon...here is a good explanation from Wikipedia:

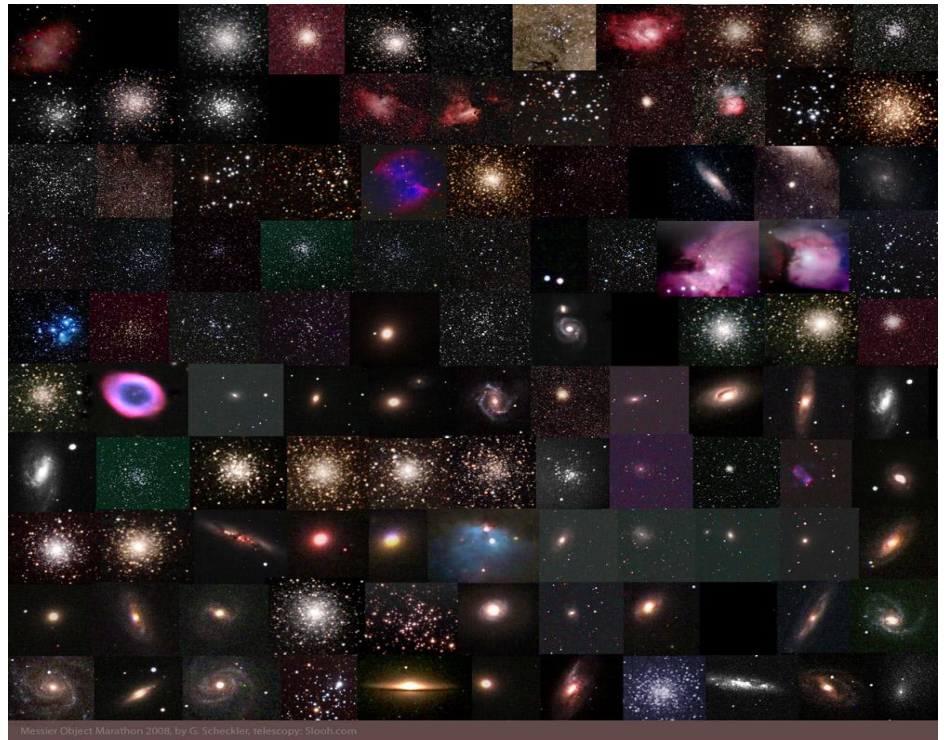
“A **Messier marathon** is an attempt, usually organized by [amateur astronomers](#), to find as many [Messier objects](#) as possible during one night. The Messier catalogue was compiled by French astronomer [Charles Messier](#) during the late 18th century and consists of 110 relatively bright [deep sky objects](#) ([galaxies](#), [nebulae](#), and [star clusters](#)).”

The full article can be found at the following location:

http://en.wikipedia.org/wiki/Messier_marathon



Charles Messier



Messier Object Marathon 2008, by G. Scheckler, telescope, 300cm

Astronomy Day is Coming – May 10th



Facts

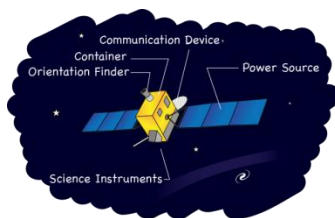
Astronomy Day is a grass roots movement designed to share the joy of astronomy with the general population - "Bringing Astronomy to the People." On Astronomy Day, thousands of people who have never looked through a telescope will have an opportunity to see firsthand what has so many amateur and professional astronomers all excited. Astronomy clubs, science museums, observatories, universities, planetariums, laboratories, libraries, and nature centers host special events and activities to acquaint their population with local astronomical resources and facilities. Many of these events are located at non-astronomical sites; shopping malls, parks, urban centers—truly Bringing Astronomy to the People. It is an astronomical PR event that helps highlight ways the general public can get involved with astronomy - or at least get some of their questions about astronomy answered. Astronomy Week encompasses Astronomy Day starting on the previous Monday and ending on the following Sunday.

History

Astronomy Day was born in California in 1973. Doug Berger, then president of the Astronomical Association of Northern California, decided that rather than try to entice people to travel long distances to visit observatory open houses, they would set up telescopes closer to where the people were - busy locations - urban locations like street corners, shopping malls, parks, etc. His strategy paid off. Not only did Astronomy Day go over with a bang, not only did the public find out about the astronomy club, they found out about future observatory open houses. Since the public got a chance to look through a portable telescope, they were hooked. They wanted to see what went on at the bigger telescopes, so they turned out in droves at the next observatory open house.

Where

Astronomy Day events take place at hundreds of sites across the United States. Internationally England, Canada, New Zealand, Finland, Sweden, the Philippines, Argentina, Malaysia, Iran, Ireland, New Guinea plus many other countries have hosted Astronomy Day activities. Each location plans and executes events that work best for their local area. To locate the nearest event or to list your events see: <http://www.astroleague.org/al/astroday/astroday.html>



Be sure to check out the latest activity on [NASA's Space Place](#) - build your own satellite!

Ready, set, build!

In this activity we teach the main components of a satellite while putting them in charge of the design process, encouraging them to think creatively and outside the box. We provide suggestions for materials (both edible and non-edible!), a basic framework, and some examples for inspiration. The rest is up to you! Check it out at <http://spaceplace.nasa.gov/build-a-spacecraft>.



Old Tool, New Use: GPS and the Terrestrial Reference Frame

By Alex H. Kasprak

Flying over 1300 kilometers above Earth, the Jason 2 satellite knows its distance from the ocean down to a matter of centimeters, allowing for the creation of detailed maps of the ocean's surface. This information is invaluable to oceanographers and climate scientists. By understanding the ocean's complex topography—its barely perceptible hills and troughs—these scientists can monitor the pace of sea level rise, unravel the intricacies of ocean currents, and project the effects of future climate change.

But these measurements would be useless if there were not some frame of reference to put them in context. A terrestrial reference frame, ratified by an international group of scientists, serves that purpose. "It's a lot like air," says JPL scientist Jan Weiss. "It's all around us and is vitally important, but people don't really think about it." Creating such a frame of reference is more of a challenge than you might think, though. No point on the surface of Earth is truly fixed.

To create a terrestrial reference frame, you need to know the distance between as many points as possible. Two methods help achieve that goal. Very-long baseline interferometry uses multiple radio antennas to monitor the signal from something very far away in space, like a quasar. The distance between the antennas can be calculated based on tiny changes in the time it takes the signal to reach them. Satellite laser ranging, the second method, bounces lasers off of satellites and measures the two-way travel time to calculate distance between ground stations.

Weiss and his colleagues would like to add a third method into the mix—GPS. At the moment, GPS measurements are used only to tie together the points created by very long baseline interferometry and satellite laser ranging together, not to directly calculate a terrestrial reference frame.

"There hasn't been a whole lot of serious effort to include GPS directly," says Weiss. His goal is to show that GPS can be used to create a terrestrial reference frame on its own. "The thing about GPS that's different from very-long baseline interferometry and satellite laser ranging is that you don't need complex and expensive infrastructure and can deploy many stations all around the world."

Feeding GPS data directly into the calculation of a terrestrial reference frame could lead to an even more accurate and cost effective way to reference points geospatially. This could be good news for missions like Jason 2. Slight errors in the terrestrial reference frame can create significant errors where precise measurements are required. GPS stations could prove to be a vital and untapped resource in the quest to create the most accurate terrestrial reference frame possible. "The thing about GPS," says Weiss, "is that you are just so data rich when compared to these other techniques."

Continued from Page 7...

You can learn more about NASA's efforts to create an accurate terrestrial reference frame here: <http://space-geodesy.nasa.gov/>.

Kids can learn all about GPS by visiting <http://spaceplace.nasa.gov/gps> and watching a fun animation about finding pizza here: <http://spaceplace.nasa.gov/gps-pizza>.



Artist's interpretation of the Jason 2 satellite. To do its job properly, satellites like Jason 2 require as accurate a terrestrial reference frame as possible. Image courtesy: NASA/JPL-Caltech.

Editors: download photo at

<http://www.jpl.nasa.gov/missions/web/ostm.jpg>