New Jersey ASTRONOMICAL Association

The Journal

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Contributors Needed

The NJAA Journal is soliciting contributions for future issues. Click here if you would like to submit an article to The Journal. Any submission is welcome and will be reviewed for publication. This is a great opportunity for younger members to see their work published in a periodical.

We Value Your Feedback

We hope you're enjoying The Journal, but tell us what you think. Suggestions are welcomed at this email address: Membership@njaa.org.

The Cocoon Galaxy (NGC 4490 & 4485/Arp 269)

By Michael Sweetman

March through May is often referred to as “galaxy season” among amateur astronomers. During this period, the night sky is oriented away from the Milky Way’s central plane, improving visual access to extragalactic space. This galaxy season, I decided to focus on photographing interacting galaxy groups. For this submission, I chose: NGC 4490 and NGC 4485 (catalogued together in the Atlas of Peculiar Galaxies as Arp 269; shown in Figure 1).

Figure 1. Arp 269: NGC 4490 (on the left) interacting with NGC 4485 (on the right).

Acquisition

I photographed this on the night of 3-4 May 2026. The conditions were less than ideal, as the moon was 93% illuminated and it rose at 23:22. As a result of the bright moon, I was not able to resolve stars suitable for my preferred guiding integration period of 0.5 seconds; I had to increase to 2 seconds, which did cause some additional spread of the stars beyond the

atmospheric dispersion limit. Additionally, there were some occasional light clouds which caused several periods of complete guidance failure. Despite all that, better than 80% of my frames overall were of acceptable quality, and I was able to create a clean image.

This image was captured with an 8” Celestron SCT on the AVX mount, with a .63x reducer. The camera was a ZWO ASI 2600mc pro, with a ZWO ASI 220 guide camera on an off-axis guider.

Processing Summary

I gathered 130 images at 180 seconds each, and these were stacked in PixInsight along with 25 flat images, 20 dark frames, and 100 bias frames. I used GraXpert to extract the gradient, performed a SpectroPhotometric Color Calibration, deconvolution with Blur-Xterminator and noise removal with Noise-Xterminator. I then removed the stars with Star-Xterminator, and stretched the image with the MultiScale Adaptive Stretch tool. I performed some sharpening with MultiScale Median Tranformation, some minor adjustments with the Curves tool, and then I stretched and added back the stars to complete the image.

Scientific Context & Recent Findings

NGC 4490 is a barred spiral galaxy in the constellation Canes Venatici. As with many other galaxies, it was discovered by William Herschel in 1788. NGC 4490 and NGC 4485 form an interacting pair of dwarf Galaxies approximately 25 million light-years from earth. This is one of the closest pairs of interacting dwarf galaxies, which provides a unique opportunity for study of an interacting dwarf pair. Dwarf galaxies are of particular interest because it is believed that these galaxies are most similar to the galaxies of the early universe, and are the subject of several recent studies.

In a 2020 paper, based on data from the Spitzer Space Telescope, it was revealed that NGC 4490 has two cores, one in the visible wavelengths and another visible only in radio wavelengths. These two cores are similar to other dual-core interacting galaxies, making it likely that NGC 4490 is itself the product of a merger of two smaller galaxies.

In 2025, a study was published based on data from the James Webb Space Telescope. It had long been known that the two galaxies were connected by a stream of cold neutral hydrogen (H I) gas, but this had not been effectively studied yet. The JWST collected data in the Near IR and Mid IR, which was combined with a visible light image from Hubble to create a stunningly detailed image of the connecting region, shown in Figure 2.

What these data were able to establish is that there were two recent periods of intense star formation, approximately 200 million and 30 million years ago. The earlier period likely is the product of the cores passing by each other, dragging a trail of gas between them. This trail of gas then mixed and caused the second, more recent period of star formation.

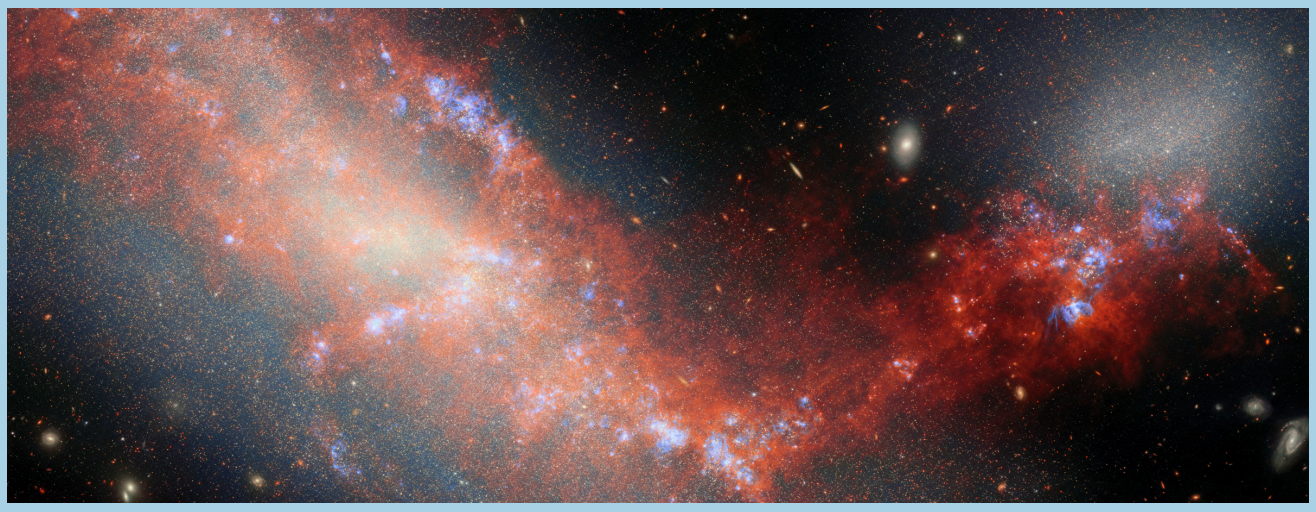


Figure 2: Image of NGC 4485 and (most of) NGC 4490, showing the H I gas stream connecting them. Photo Credit: ESA/Webb, NASA & CSA, A. Adamo (Stockholm University), G. Bortolini, and the FEAST JWST team.

References

FEAST: JWST/NIRCam View of the Resolved Stellar Populations of the Interacting Dwarf Galaxies NGC4485 and NGC4490

https://iopscience.iop.org/article/10.3847/1538-4357/adfccc/pdf

Revealing the Double Nucleus of NGC 4490

https://iopscience.iop.org/article/10.3847/1538-4357/ab6c6a/pdf

Capturing a 0.62-Second Solar Transit: The International Space Station in H-alpha

By Isbel Gonzalez

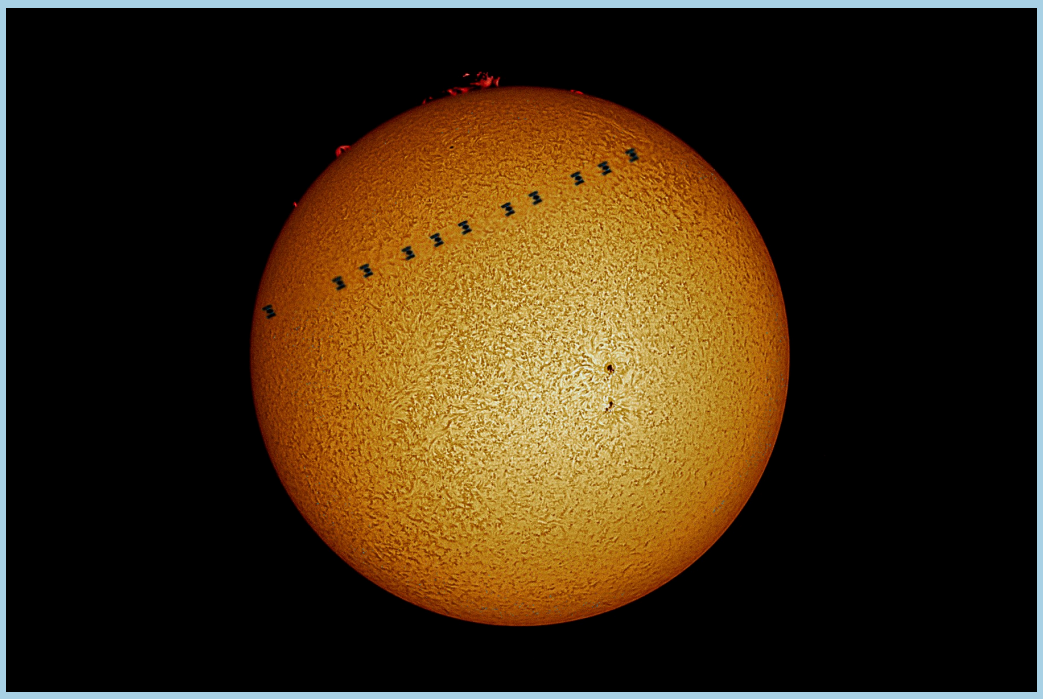
On **April 18, 2026**, around local noon, I had the opportunity to capture one of the most challenging and rewarding events in solar imaging: a transit of the **International Space Station (ISS)** across the face of the Sun. The event was observed from the grounds of the **New Jersey Astronomical Association (NJAA)** using a **Coronado SolarMax II H-alpha solar telescope** and a **ZWO ASI174MM** camera.

The transit itself lasted only **0.62 seconds**, requiring precise planning, accurate positioning, and high-speed video acquisition to successfully record the event.

Planning the Observation

Unlike solar eclipses or planetary transits that can be observed across large geographic regions, ISS solar transits are highly localized events. The path from which the transit is visible is typically only a few kilometers wide, making accurate location selection critical.

Predictions indicated that the NJAA observing site would provide an excellent advantage for the transit. Arriving well before the event allowed sufficient time to set up the telescope, verify focus, and optimize camera settings for high-speed recording.



Equipment

The observation was conducted with the following equipment:

- **Telescope:** Coronado SolarMax II H-alpha Solar Telescope
- **Camera:** ZWO ASI174MM Monochrome CMOS Camera
- **Mount:** Solar tracking mount
- **Capture Method:** High-frame-rate video recording

The SolarMax II's hydrogen-alpha (H-alpha or *Hα*) filter revealed remarkable solar surface detail, including chromospheric texture, prominences along the solar limb, and active regions. These features provided a dramatic backdrop for the fleeting silhouette of the ISS.

The Transit

At the predicted time, the ISS crossed the solar disk in just **0.62 seconds**. Despite its brief duration, the high-speed video captured multiple frames showing the station's silhouette against the Sun.

The processed image reveals the ISS appearing repeatedly across the solar disk, illustrating its trajectory during the transit. The station's recognizable shape, including its solar arrays, can be distinguished in the individual frames.

The image also showcases several solar features visible at the time of observation:

- Chromospheric mottling and filamentary texture
- Small sunspot groups near the center-right of the disk
- Prominences extending beyond the solar limb
- Fine hydrogen-alpha surface detail across the entire solar disk

Image Processing

The final composite was created by extracting and aligning selected frames from the original high-speed video sequence. Individual ISS positions were combined into a single image to illustrate the complete transit path across the Sun.

The resulting images demonstrate the effectiveness of high-speed solar imaging techniques for capturing extremely brief astronomical events.

At this link, you can watch a video covering the entire capture process (the video is in Spanish, but you can use the English subtitle translation*): https://www.youtube.com/watch?v=3QwohqlsAvI

* To turn on English subtitles on YouTube, click the **CC** button in the video player, then click the **Settings** (gear) icon to select **Subtitles/CC** and choose **English**.

A Rare Combination of Astronomy and Human Spaceflight

Solar transits of the ISS offer a unique intersection between solar astronomy and human space exploration. While the Sun provides an ever-changing backdrop of dynamic activity, the ISS represents humanity's continuous presence in low Earth orbit.

Capturing both in the same image requires careful preparation, precise timing, and a measure of good fortune. The fact that the entire event lasted less than a second makes each successful observation especially rewarding.

The transit of April 18, 2026 serves as a reminder that even the briefest astronomical events can reveal remarkable detail when recorded with modern imaging equipment and careful planning.

Image Information

Object: International Space Station Solar Transit
Date: April 18, 2026
Time: Approximately Noon (Local Time)
Transit Duration: 0.62 seconds
Location: New Jersey Astronomical Association (NJAA)
Telescope: Coronado SolarMax II H-alpha Telescope

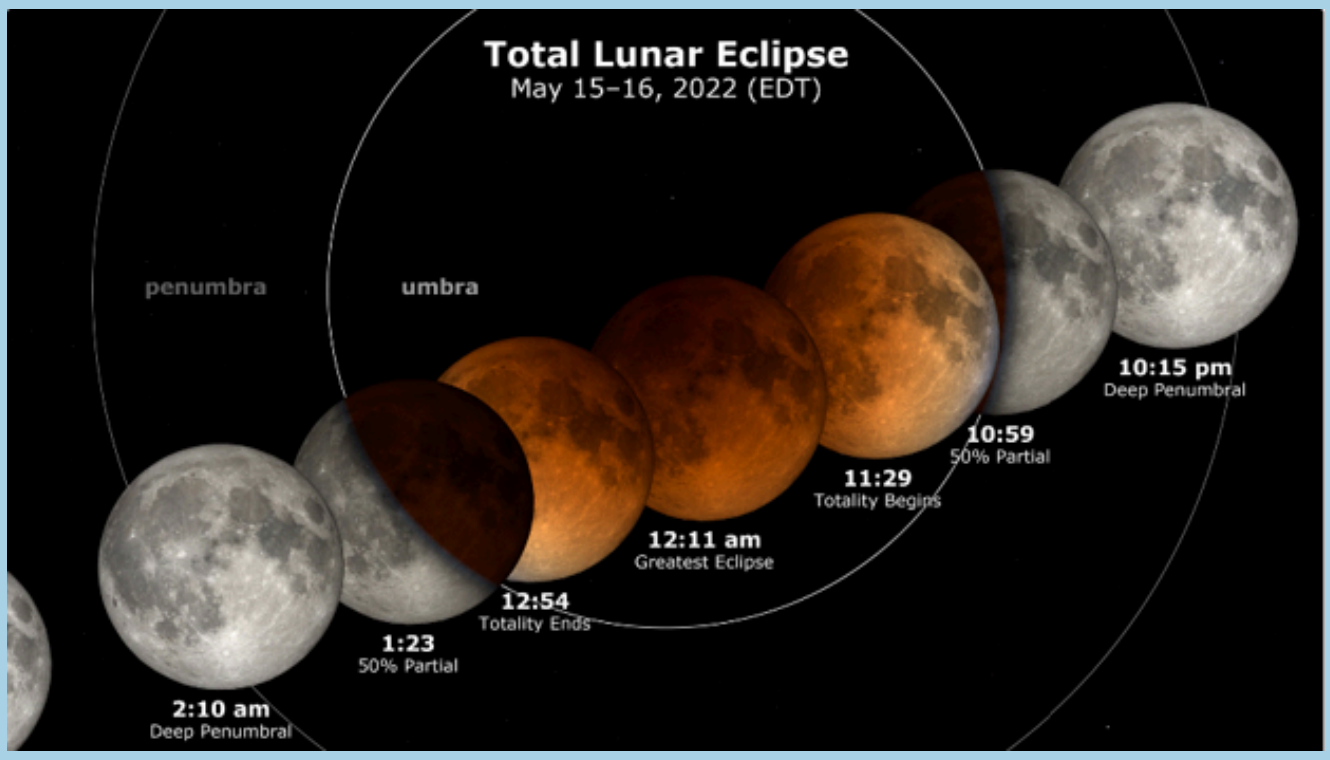
Ancient Astronomy - Aristarchus of Samos (310-230 BCE): Measuring the Cosmos (Part 1 of 3)

By Brian Della Pesca

Aristarchus of Samos began his attempt to measure objects in the night sky by first examining the relative sizes of the Earth and the Moon. This was an important step toward understanding the scale of the cosmos. The only tools available to him were careful observation, geometry, and simple instruments for measuring angles in the sky.

Geometry works well with ratios. Rather than measuring objects in feet or miles, one object can be measured relative to another. Aristarchus realized that a lunar eclipse provided an opportunity to compare the sizes of the Earth and Moon.

He observed that it takes the Moon approximately three hours to pass through the Earth's shadow during a lunar eclipse. Since the Moon moves across the sky by roughly one Moon-diameter in about an hour, he could estimate the width of the Earth's shadow in terms of Moon diameters.



The Earth's shadow is always round during a lunar eclipse, providing further evidence that the Earth is a sphere, a concept already accepted by many Greek scholars of the time. Aristarchus also concluded that the Sun was much farther away than the Moon and significantly larger than previously believed. Because the Moon is relatively close to Earth, the Earth's shadow at the Moon's distance is comparable in size to Earth itself.

By carefully observing lunar eclipses, Aristarchus estimated that about 2.5 Moon diameters fit across the Earth's shadow. He concluded that the Moon's diameter was approximately one-third that of the Earth.

Modern measurements show that the Moon's diameter is about 27 percent of Earth's diameter. While Aristarchus's estimate was not exact, it was remarkably close considering the limited tools available more than 2,200 years ago.

This was one of the earliest scientific attempts to measure the size of a celestial object beyond Earth. Aristarchus demonstrated that celestial objects could be measured using observation, logic, and geometry. His work helped establish that the universe was not beyond human understanding and could be studied quantitatively. *To be continued*

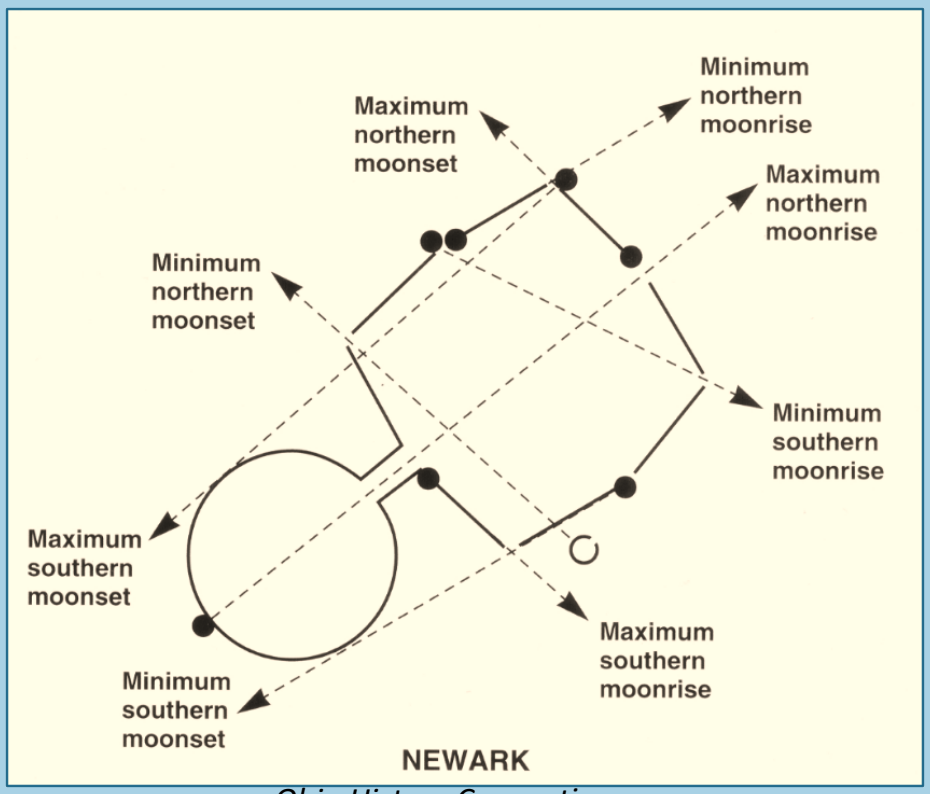
Hopewell Earthworks Reveal Ancient Lunar Observations

By Joe Link

Star parties, where people gather to view the wonders of the cosmos, are a fun and educational way to appreciate the night sky. Interest in the heavens appears to have been around longer than we think. Thousands of years before the invention of telescopes, people gathered in large numbers in the Midwest to view the movement of the Moon using the only resource commonly available — earthen mounds.

On a recent trip to Ohio, I visited a portion of the Hopewell Earthworks, a group of eight sites around Ohio River tributaries, near present-day Columbus, where native people built mounds to define large spaces for gatherings and, it's hypothesized, to chart the course of the Moon.

Two of the best-preserved sites are in Newark, Ohio, about 30 miles east of Columbus. They are the Great Circle, where an earthen wall as much as 16 feet high defines a 26-acre space, 1,200 feet in diameter. The other is called the Octagon Earthworks and is made up of two sections, a circle of 20 acres that's connected to a giant Octagon with earthwork walls enclosing 50 acres. A visitor standing inside the earthworks would have difficulty seeing all the mounds that comprise the walls.



Ohio History Connection

It's the Newark Octagon that holds the most interest for astronomy buffs. Research in the 1980s from two scientists, Ray Hively and Robert Horn, showed that the walls of the octagon align with key phases of the moon. Drawing a line through the center of the octagon aligns with the northern-most rise of the moon, an event that occurs only every 18.6 years. Other walls of the octagon align with other lunar events in that cycle, including the minimum northern moonrise, maximum and minimum northern moonsets, the maximum and minimum southern moonrise, and the maximum and minimum southern moonsets.

Little is known about the people who built these mounds or what they were called. The Hopewell name is borrowed from the surname of a farmer who lived near one of the sites in the 19th Century. Archeologists suggest the original builders occupied the central Ohio region for only about 400 years, beginning 2,000 years ago.

They hypothesize that this was an era when native people foraged and farmed before the domestication of corn and that they lived in small groups that were not large enough to count as villages. Yet somehow, they had the time, interest and patience to follow the progress of the moon for generations so that they could acquire enough knowledge to design their octagon structure around the lunar cycles.

While they lacked technology to build telescopes, they excelled in soil science. The mounds were constructed with a variety of soils layered in a way to provide stability and drainage.

These mounds were not just of local interest. Artifacts found at the sites indicated that visitors came from distant points in North America, possibly to attend ceremonies within the earthworks. For example, obsidian has been found at the site that could be traced to present-day Wyoming while artifacts made from copper could be traced from ore deposits in Canada and North Carolina. Seashells from the Gulf of Mexico, mica from the Blue Ridge Mountains and fossilized sharks' teeth likely from Chesapeake Bay were also discovered at the site.

The reach and importance of the mounds prompted UNESCO to declare the mounds a World Heritage Site in 2023. According to UNESCO, "Hopewell Ceremonial Earthworks comprises highly complex masterpieces of landscape architecture. They are exceptional amongst ancient earthworks worldwide not only in their enormous scale and wide geographic distribution, but also in their geometric precision."

As the region's population grew in the 1700s and 1800s, some lucky events saved the Great Circle and the Octagon earthworks from destruction. The Great Circle was used for Ohio State fairs in the 1800s, and the Octagon Earthworks were the site of training camps for Civil War soldiers, even as the city of Newark grew to surround the sites. Eventually, the interior of the Octagon Earthworks was made the site of a golf course, land now reclaimed by the Ohio History Connection.

Some of the other six sites have not been well preserved. The High Bank earthworks, 64 miles from Newark, also has sides that correspond to lunar cycles. Farming over the years eliminated the mounds at this site, but their outline can be detected with ground-penetrating radar.

Why was the Hopewell culture so short-lived? Dr. Bradley Lepper, an archeologist who is curator of the Newark Earthworks, told a group visiting the site in April that the 400-year period marked a sweet spot where an abundance of hunting and early farming led to a culture that had leisure time over generations to study the movements of the Moon. A lack of conflict detected during the period possibly enabled safe travel from far reaches of the North American continent to the earthworks, leading to the possibility of large gatherings. However, as populations grew, non-hierarchical settlements gave way to villages and more extensive farming. The demand for land for farming corn is suggested to have altered the local culture and interest in the earthworks waned until their purpose was ultimately forgotten.

For more information on the Hopewell Ceremonial Earthworks, click here.

NJAA Thanks DwarfLab for Generous Donation Supporting Astronomy Outreach

By Brian Della Pesca

The New Jersey Astronomical Association is proud to recognize and thank DwarfLab for their generous donation and support of NJAA's astronomy outreach and educational mission. Sue Hsu from Dwarflab facilitated a donation of a Dwarf III telescope to the NJAA for use with outreach events. They also offered a 5% discount code on Dwarflab merchandise at their site. The code for our members is **NJAA** during checkout.

As a volunteer-run organization dedicated to bringing astronomy to the public, NJAA depends on the support of members, volunteers, and community-minded organizations that share our passion for science education and public engagement. DwarfLab's contribution will help NJAA continue providing public observing programs, educational presentations, and outreach events.

DwarfLab has become well known within the astronomy community for helping make astrophotography and observational astronomy more accessible through innovative smart telescope technology. Their support reflects a shared commitment to expanding opportunities for people to experience the night sky and engage with astronomy in new and exciting ways.

Technology continues to play an increasingly important role in astronomy outreach. Imaging systems allow visitors to observe deep-sky objects with enhanced detail and provide accessibility opportunities for individuals who may have difficulty using traditional eyepiece observing methods. These systems also help introduce newcomers to astronomy by making celestial objects easier to locate and view in real time.

NJAA is deeply appreciative of DwarfLab's generosity and their support of public astronomy education. Partnerships like these help ensure that NJAA can continue its mission of inspiring the next generation of astronomers, scientists, and lifelong learners. On behalf of the entire organization, thank you to DwarfLab for supporting the New Jersey Astronomical Association and helping us bring the universe a little closer to the public.

NJAA "Rocks from Space" Meteorite Collection

By Don Holtaway

The "Rocks from Space" collection of meteorites and impactites are on display at the Paul Robinson Observatory. Please come and see this beautiful and extensive collection during our open house hours!

There is a display case that is dedicated to impactites, with 9 specimens, including Libyan Desert Glass, two types of Tektites, a Shatter Cone, Impact Breccias, and melted rocks. These are samples of how the Earth's rocks and soil are altered by the impact of meteorites, which cause extreme heat and pressure on impact.

A second display case, with 12 specimens, shows the typical characteristics of meteorites. These include examples of fusion crust, "oriented" meteorites (that exhibit evidence of stable orientation while falling, including thumbprintlike regmaglypts), "shrapnel" (that results when a meteor explodes while falling), and Widmanstätten patterns and nickel-iron flecks visible on the exposed surfaces of iron meteorites that someone has sawed open and polished.

The main display case contains two dozen specimens of meteorites from 18 falls, each with its own story. One of the highlights is a Brenham Pallasite meteorite slice that has gorgeous olivine [$(Fe,Mg)_2SiO_4$] crystals imbedded in an iron-nickel matrix. This meteorite slice is mounted in a backlite box, with the backlight slowly pulsing on and off to show the beautiful olivine crystal distribution. Another example is a Gold Basin meteorite (from Arizona), and a Gold Basin thin section specimen (about 30 microns thick) mounted on a microscope slide. A macrophotograph of this thin section taken with polarized light shows the different minerals and their structures. It also shows tiny chondrules in the structure, with a very good example of one that's about 0.8mm wide, with some smaller ones around it. We also have a Campo del Cielo meteorite that is 4.5 billion years old that you can hold in your hands, this will be the oldest object you will ever hold!

In future issues of the NJAA Journal, we will explore the collection in more detail. Until then please come to the Paul Roberson Observatory during our open houses on Saturdays and Sundays and see first-hand the "Rocks from Space – The New Jersey Astronomical Association Meteorite Collection", and hold a 4.5 billion-year-old meteorite in your hands!

How I Caught a Photo of a Rare Planetary Conjunction

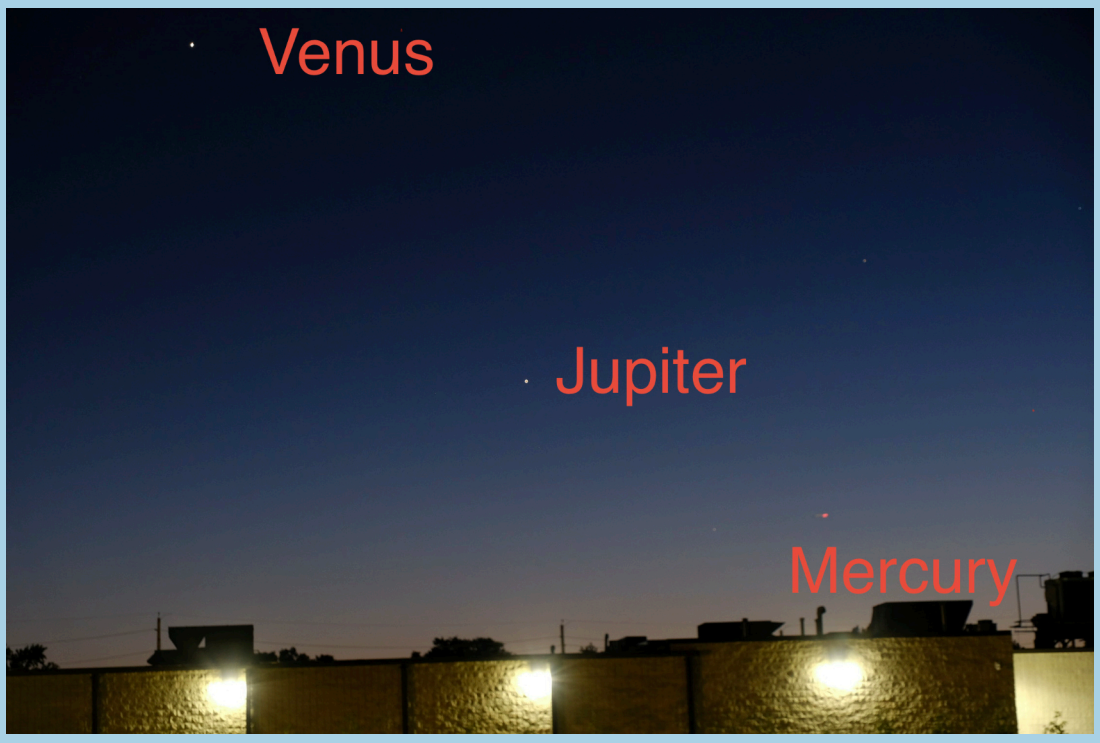
By Joe Link

Multiple planets lining up in the night sky doesn't happen that often, so when three planets appeared in a row in mid-June, it was a spectacle worth watching.

In early June, two of the brightest planets in our solar system, Venus and Jupiter, appeared close together in what astronomers call a planetary conjunction. As the days went on, Jupiter dropped to a lower position in the sky. But then in mid-month, tiny Mercury also appeared in the sky, below Jupiter, and the three planets were visible in almost a straight line.

The planets orbit the sun in the same plane, but with different orbital periods. Occasionally, their orbital paths appear to line up in a row. When that happens, we can see two planets adjacent to one another, both illuminated by the sun. It's less common when three planets line up.

I couldn't see the conjunction from my home because tall trees blocked the view on the horizon. On June 18, I drove around my northern New Jersey area looking for a spot where I'd have an unobstructed view. My search took me to a nearly empty parking lot for an office building behind our local ShopRite, not a glamorous site, but one with a good view of the evening sky.



I waited with my digital SLR camera until just after sunset. Sure enough, there was Venus shining in the sky, but thin clouds on the horizon blocked my view of Jupiter and Mercury. Undaunted, I vowed to try again the next night. This time my wife Janet accompanied me, anxious to see the conjunction that I had been talking about. The sky was free of clouds, and I could clearly see Venus and Jupiter. But where was Mercury? It was probably hidden behind some haze on the horizon. Did I just see it wink through the haze? I wasn't sure. I set up my camera and tripod and began shooting dozens of pictures in the hope that the camera would capture more than I could see. After about 45 minutes I knew Mercury would be too close to the horizon to continue, so we packed up and went home.

It wasn't until I got home and uploaded my photos to my laptop that I saw success. Out of all the photos, only two revealed Mercury peeking through the haze. The best one is shown here. I felt so lucky!

Don't Miss These Coming Events!

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The NJAA Journal is the quarterly publication of the New Jersey Astronomical Association.

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