NIGHTFALL

A PUBLICATION OF THE HUACHUCA ASTRONOMY CLUB

MAY 2022

MAY PRESIDENT'S NOTES

April was a busy month for astronomy. We are all benefiting from the near daily pictures of the sun's activity and the planet conjunction plus the galaxies, and nebulae that have been the foundation of the sharing from members posted on our forum. Congrats to those who are catching the images first hand. It is exciting to have so many astronomical opportunities for both early riser and night owl astronomers.

At the April HAC meeting, we heard from Mark Trueblood on his work locating and tracking Near Earth Objects and the critical need to increase the funding to do such research to monitor and track potentially dangerous objects passing near the earth. Mark's presentation will be posted on our website. We also recognized Ted Forte for his 10 years of service to HAC. Ted not only serves as the HAC Treasurer, NASA Ambassador, Coordinator of Outreach programs and major community media connection. He also serves as our representative on the Board of the University South Foundation Board, who own the Patterson Observatory, along with Jim Reese and Penny Brondum. Ted wears so many Astronomy related hats it is hard to numerate all of them but HAC is a grateful recipient of his ongoing time and effort.

Thank you to all the HAC volunteers who support our community outreach. We started the month at Karchner Caverns followed by a Christian school group then Earth Day at Veterans Park in Sierra Vista. The sun was a spectacular target with the many spots and prominences to view. The nights were clear and comfortable and early enough to not be plagued by the smokey skies.

Most of our HAC activities in May will occur before this newsletter is published. The Public night May 5 has 80 people signed up. We continue to request signups to avoid overcrowding at the telescopes. May 7th is National Astronomy Day and HAC volunteers will be at the Sierra Vista Library from 10 – 2 looking at the Sun. Please come and bring your scope. There are other great events during May for HAC astronomers so check the HAC calendar and watch the HAC forum for notices.

Moon phases for the month of May

Call for Refreshment Volunteers

For years at our monthly HAC meetings Katherine Zellerbach has supplied the goodies and refreshments. We all have enjoyed her continued generosity during the break between the speaker and general meeting. Katherine is hoping that others will take over this job since she is getting busier in her job.

The request for volunteers was made at the April meeting. Lollie Yancey volunteered to bring goodies to the May meeting. If you are interested in providing treats and refreshments for our monthly meetings either on a one-time or ongoing basis contact Karen Madtes at ckmadtes3@yahoo.com.

Starblast Telescope

Huachuca Astronomy Club acquired a new StarBlast 4.5” 144mm tabletop telescope which was donated to the Sierra Vista library. Susan Abend, Librarian, said this addition will allow more of the library members to enjoy the wonders of the night sky. This is the third telescope HAC has donated to the SV Library.

HAC Swap Meet a Success

Over the course of the last two years HAC has been gifted with telescopes and accessories by members and their estates which had been stored in the Patterson. We had telescopes, mounts, books, cameras and other accessories. April 23rd, we held an Astronomy Swap Meet. We were able to find new homes with excited astronomers for 15 telescopes plus accessories and books. HAC earned over $5,200 from the sales. The funds raised during the swap meet will be used to enrich student outreach, donate additional telescopes to local libraries and support USF Scholarships at the College of Applied Science and Technology.

The Swap Meet Committee (Karen Madtes, Marion Goode and Penny Brondum) want to thank Ted Forte, David Roemer, Thomas Brondum and Glen Sanner for their help in pricing, organizing, handling sales and general all-around support of the Swap Meet. Their help was vital to its success. And of course, thank you to the members who traded, sold or acquired Astronomy treasurers. Enjoy the view.

Just a few of the HAC telescopes set up for the for the Swap Meet

David Roemer and Thomas Brondum set out books at he Swap Meet

Ted Forte at Earth Day in Veteran’s Park

Apr 23rd Ted Forte presented David Roemer with The Astronomical League's Planetary Nebula Program Imaging Award. HAC members have seen many of his planetary nebula (PN)images. David has been sharing PN images (along with comets and planets and galaxies etc.) frequently. He exceeded the requirements for the award imaging 109 objects (90 is the requirement). David was just the 21st person to complete the PN Imaging program.

Welcome Our New Members

New members joining in this past month include Mitch Cherbavaz of Bisbee who joined the club at the April meeting and Dean Frazeur of Hereford who joined right after the meeting. Also joining in April was Hannah Saville of Sierra Vista. And finally, Pat Birck of Hereford joined at the telescope swap meet. Welcome, we're glad you joined.

Thank you to our Outreach Volunteers!

HAC recently received a letter from the Astronomical Society of the Pacific which read in part: "Congratulations from the NASA Night Sky Network on your organizations' s incredible dedication to outreach during 2021! … NASA, the Jet Propulsion Lab, and the Astronomical Society of the Pacific deeply admire your hard work and commitment to education"

The congrats are well deserved. Thirty-five HAC volunteers participated in one or more of the approximately 70 outreach events we conducted in 2021. The top ten performers devoted an average of 40 hours to the effort and attended about 12 events each. For a year marred by pandemic concerns, that is a remarkable achievement!

2022 is shaping up to be another extraordinary year for outreach. These events help to educate, entertain, and inspire. They promote our club, grow our membership, and foster good will in our community. They are essential to the survival of our hobby and we couldn't do it without our dedicated volunteers. So, well done Hac – keep up the good work.

Astronomy Day May 7

Saturday, May 7 is National Astronomy Day. We will set up for sidewalk astronomy at the Sierra Vista Library from 10 am until 3 pm

At the May Meeting

The May meeting of the Huachuca Astronomy Club will be held at 7pm, on May 13 in room A102, Cochise College Downtown Campus, 2600 E Wilcox Road. Our speaker will be Vince Sempronio, who will give a presentation on occultation timings.

Lunar Eclipse Watch

The Patterson Observatory will have an open house eclipse watch for the total lunar eclipse occurring on Sunday May 15. Doors open to the public at 7pm. HAC members are requested to set up telescopes for the event. Moon rise is just before 7 p.m. MST, and it will already be in the penumbral shadow of the Earth. The visible portion of the eclipse starts about 7:29 p.m. The moon will be totally eclipsed by 8:29 p.m. with mid eclipse at 9:13 p.m. Totality ends at 9:54 p.m.

Patterson After School Event

We will host kids from the Boys & Girls Club of Sierra Vista at the Patterson Observatory on Wednesday May 25 starting at 2:30pm to tour the facility and view the sun. HAC volunteers are requested to help host the event and set up solar telescopes.

Science at the Patterson

By Vince Sempronio

March 10th, 2022. The evening began as a typical Public Night at the Patterson with HAC members setting up scopes awaiting the arrival of visitors anxious to observe objects in the sky.

As Public Night progressed and finally concluded, the clock was counting down to an event so dim that none of the telescopes in use that night could see it, that is, except for the 20" Patterson. The event, the occultation of 13.9th magnitude star (UCAC 557-011694) by the 14.9th magnitude asteroid (586) Thekla would occur around 9:15pm.

Occultation of stars by asteroids are not rare, they happen by the 100's around the world each night. The availability of them depends on the size of the telescope that is used. The larger the telescope, the dimmer the stars that are viewable, which means a greater number of events become observable. Compared to an 8" telescope, the Patterson gathers 6.25 times the amount of light, which translates into seeing stars 2.5 magnitudes fainter. What is uncommon, is how infrequently an occultation will occur from a fixed location, such as, in this case, from the Patterson Observatory. As an example, there are over 20 events in

May 2022 that the Patterson could observe. It was just a coincidence that there was an occultation visible from Patterson the evening of a Public Night, and at a time soon after Public Night finished.

Many days before, using "OccultWatcher", one of the occultation prediction applications I use, indicated that the (586) event would be visible from my home. Asteroid occultations mimic an eclipse of the Sun in that they create a shadow path on the ground, the same way a solar eclipse creates a path of totality. Sierra Vista was well within the shadow path of this event as the Northern limit was up near Whetstone and the southern limit down in Mexico. See (Figure 3)

I then had to work out if it was possible to observe (586) using my Celestron C8 (my "goto" scope of choice)? The factors I use to decide whether I will attempt an observation are based on the magnitude of the merged star/asteroid, the location of the star in the sky, the time (is twilight an issue), the phase and angular distance between the target star to the moon, the exposure time, and finally, how far I might have to travel.

After completing my analysis, I concluded that the event would be a difficult observation for my equipment, but an easy target for the Patterson. The Patterson, being so close to my home was well within the shadow limits of the event, albeit slightly closer to the Northern edge.

Not having enough experience using the Patterson scope to operate it on my own, I reached out to Ted Forte to inquire if he would be willing to help with the observation. Ted was amenable to the idea, and after a few back-and-forth emails, the stage was set.

Leading up to the event, there were some unknowns to consider. The Patterson scope is used mostly for public outreach (2" eyepieces) but is also used with an imaging camera used by Tom Kaye for his science work.

The equipment I use consists of a low-light camera with a 1.25" eyepiece tube, a video time inserter (VTI), a dongle that converts the camera output to a digital signal, a 12V power source, and a laptop to capture the video stream.

The unknowns and outcomes we found were:

Would the telescope achieve focus using the occultation camera?

> My imaging camera had never been tried on the Patterson before, so could we obtain focus? Well, as it turned out, yes! The camera behaved much like an eyepiece, requiring very little movement of the focuser drawtube. The camera, with the 1.25" tube did require that we use a 2" to 1.25" eyepiece adapter on the focuser.

Would a focal reducer work with the camera on the scope?

> I was concerned about the narrow field of view (FOV) of the Patterson. The scope has a 162" focal length, so at prime focus this translates to a 3.6'x2.9' FOV in the occultation camera. Installing the 0x5x focal reducer on the eyepiece tube of the camera quadrupled the FOV area to 7.2'x5.8' and in use didn't show any signs of coma or other aberrations. The focal reducer converted the scope into a 20" f4.1!

Would the field of view (FOV) be large enough to identify the target star?

> I plotted a star map based on the use of the focal reducer (Figure 1) and the field (outlined in cyan) showed a bright 9th magnitude star flanked by two 11th magnitude stars all very close to the target star (show with crosshairs). I knew from experience that if we could find those stars, we could easily identify the target star. The simulation was correct, the star field in the camera (Figure 2) closely matched the star map.

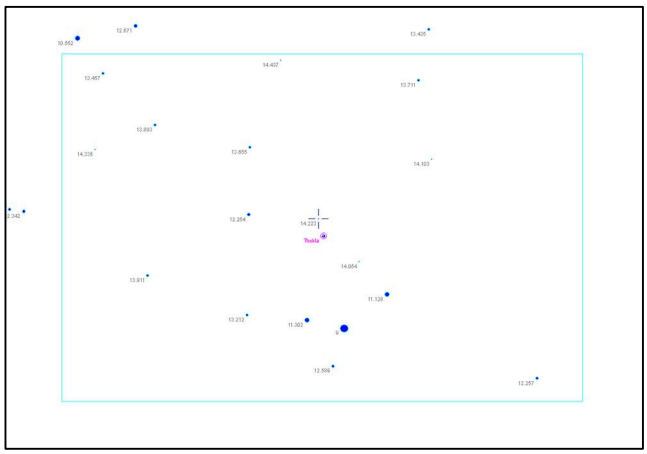


Figure 1

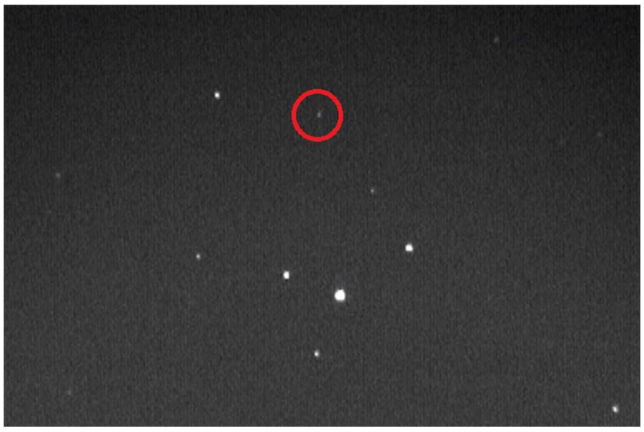


Figure 2

Would the VTI be able to obtain a GPS fix though the metal dome of the observatory?

> The slit on the dome was open, of course, and since the GPS receiver in the VTI only requires a few satellites to obtain a good time fix, it worked without an issue. Although the VTI can also display the GPS coordinates, it is better to use an app on a

modern smartphone, which is more sensitive and accurate.

Would we be able to find the target star using the Patterson's control software?

The software used to point the telescope didn't have a reference to the target star in its library, so Tom Kaye came by to add the star to the software's data set so that the scope could point to it. He stayed for the remainder of the event as did Marion Goode who hung around after Public Night completed.

Would we be able to image the star using a short enough exposure?

Why is exposure time a concern? Occultation events don't last long. (586) had a maximum duration of 5 seconds, which is considered longer than most, but the maximum duration occurs only on the center line of the event path (Figure 3). The telescope icon represents the location of the Patterson Observatory which is about 3/4th of the way from the center line (green) to the northern shadow limit line (blue). If the predicted path is accurate, then we would expect a much shorter duration at Patterson since our chord across the cross section of the asteroid is closer to the edge of the asteroid (think of lines of latitude approaching the pole). Based on our observing location, I estimated the event to be about 2 seconds. Based on that estimate, I could then calculate the maximum exposure time needed to collect enough time data to qualify as a successful observation. The maximum exposure is about 1/3rd the estimated duration, so the maximum exposure time for the camera I use for a 2 second event is 640ms. Based on the magnitudes and the proximity of the Moon, I estimated that we would need an 80-160ms exposure time. It turned out that a 160ms exposure was needed, still far less than the 640ms maximum.

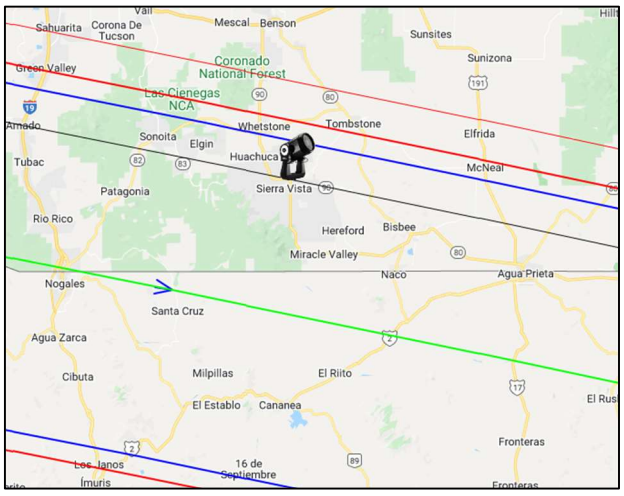


Figure 3

My equipment requires 12VDC and although there was a cable up near the eyepiece on the telescope that probably was 12VDC, I wasn't going to risk plugging an unknown power source into expensive equipment, and since we didn't have a voltmeter handy, I opted instead to use my own battery brick. I found some space at the back end of the scope, behind the primary mirror cell to stow the power brick as well as the VTI. The only cable I needed to run to the observing floor was the USB cable from the video capture dongle to my laptop.

The setup went well and we had everything set up with time to spare. Although I didn't start the recording till a minute before the event, we were able to see the dim asteroid slowly approaching the target star on the laptop screen. The asteroid was barely visible once it covered the target star as seen in Figure 4.

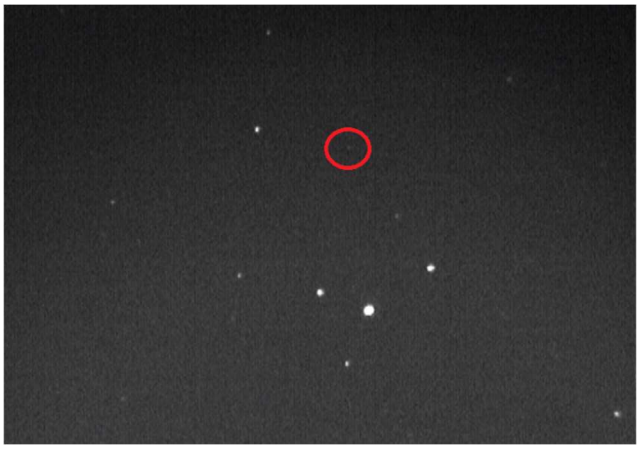


Figure 4

I wish I had a recording of the reactions of everyone when we saw the star blink out and then reappear 2.24 seconds later.

After each observation, the recorded video file is processed to turn the video recording into useable data. The output of that process is a file that contains time stamped data points that when graphed, look like the (586) event in Figure 5.

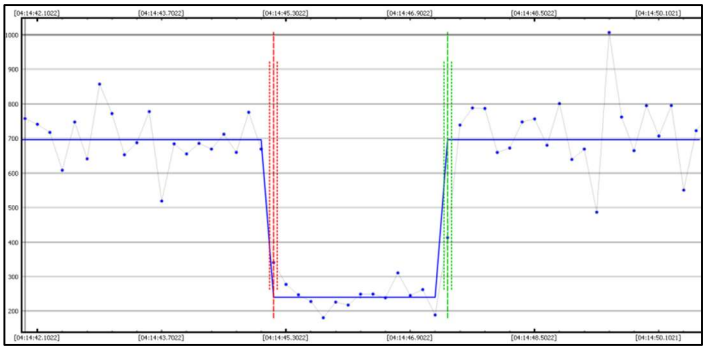


Figure 5

The vertical graph represents the relative intensity (not magnitude) with each dot being the intensity of the light in the area of the target star and asteroid. The star and asteroid, near to the event time are so close together that they appear as one. The horizontal axis is time with each dot spaced at the duration of the exposure, 160ms in this case. The center vertical red line is the time of the

disappearance while the center green is the reappearance time. The other lines are the error bars. The amount of dip in the intensity is based on the difference in brightness between the star and the asteroid (combined) and the star itself. The amount of dimming was measured by the software to be 1.1 magnitudes. If the asteroid had been dimmer, then the dip in the data would be greater.

In conclusion, it was a good test of the capabilities of the Patterson and based on the results, there will be other events that where scope can be used. NOTE: at the time of this writing, another event was observed using the Patterson.

It is always great when a plan comes together!

For those who are detailed minded, here are some technical details of the event.

Event: 586 Thelka occults UCAC 557-011694
Date: March 11th, 2020 UT, Disappearance: 04:14:45.14, Reappearance: 04:14:47.38
Predicted Event Time: 04:14:47 (+/-) 1.5s
Maximum Duration: 5.0s, Observed Duration: 2.24s, SNR: 5.39 (very good! Bigger is better)
Combined Magnitude: 13.5 (the brightness the two objects appear just before the event)
Magnitude Drop: 1.1 (the amount the intensity drops when the event occurs)
Asteroid: 586 Thelka (mag 14.9, diameter 97km)
Star: UCAC 557-011694 (mag 13.9, RA 04h 56m 06s, DEC +21d 23m 59s)
Constellation: Taurus, Sky Location: 46 degrees in the Western Sky
Sun: -36 degrees, Moon: slightly gibbous at 14 degrees at 60W

(Figure 6) is a photo taken by Ted Forte showing the occultation camera attached to the Patterson scope.

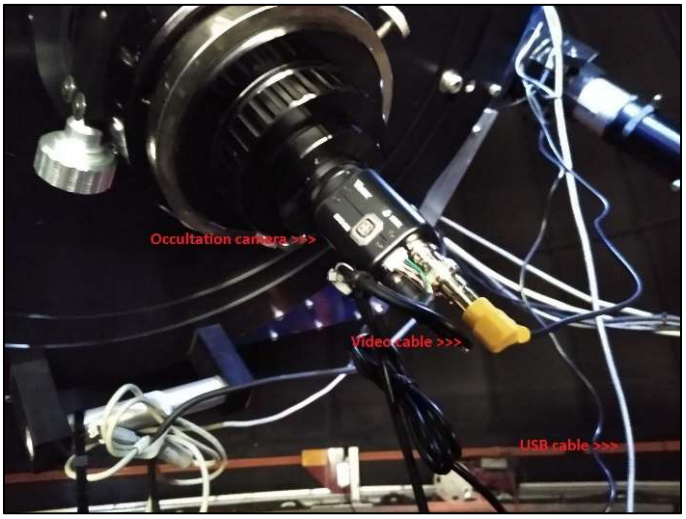


Figure 6

The yellow connector is the video-out cable that snakes its way to the VTI. The gray cable running from top to bottom to the right of the video cable is the USB cable to the laptop.

(586) has been observed before. Including this event there have been 10 observed occultations with a total of 15 positive events.

In closing, this was the dimmest star I had attempted to observe to date, and I believe the Patterson can be a good platform for future events, at least those that I can't capture using my current equipment. On as side note, I've been thinking about using the Patterson to image Pluto this summer when it is at opposition. The video equipment is capable enough, and I may even try to image it using my C8.

Our Two-Site Go-To Messier Marathon

By Ken Winters & Dave Garrett

Springtime is an amazing time of year and for amateur astronomers it brings the potential for completing a "Messier Marathon"—attempting in one night to visually observe by telescope all 110 objects in the catalog named after Charles Messier, the famed 18th century French astronomer. Completing a Messier Marathon is possible each year during March to early April as the Sun is moving between Pisces and Aquarius where there are no Messier objects.

Messier discovered about 40 of the 110 objects in the modern Messier Catalog. The catalog includes 40 galaxies, 29 globular clusters, 27 open clusters, 7 nebula, 4 planetary nebula, 2 stellar asterisms and 1 supernova remnant.

Dave Garrett and Ken Winters are both HAC members who live in the same neighborhood (just east of Highway 92 near the southern end of the Huachuca Mtns) and enjoy observing together. Last year we discussed trying to complete a Messier Marathon but high winds and intermittent clouds prevented that from happening. This year we were determined to try again and selected the first weekend in April (the night of April 2-3, 2022). We agreed that we would do a "go-to" telescopic approach since neither of us is experienced in "star hopping". We used the HAC Messier Marathon Sequence & Checklist to guide us through the Messier objects—an observing aid we highly recommend. The plan was set but our observing location presented one major challenge: the Huachuca Mtns to the west block about 20-30 degrees of our sky at dusk, making observing the objects in the western sky impossible.

Dave came up with the idea of driving up to Montezuma Pass to get the early objects: M77, M74, M33, M31, M32, M110 and M34. The main challenge would be observing the faint galaxies M77, M74 & M33 before they set. So, we took advantage of Dave's nighttime mountain driving experience and set up his AP Starfire 130mm refractor on an encoder-equipped Disc Mount at the Pass (see photo to left). The setting sun was beautiful, the winds were calm, and the sky was clear except for some low clouds on the western horizon. As the twilight darkened, Dave completed aligning his scope, and we began the "push-to" portion of our "go-to"

Messier Marathon—we were able to identify 5 of the first 7 objects. Only faint M77 and M74 eluded us. Before leaving, we added M45 and M79 just to give us enough time to get to our home observing site, where earlier in the day we had set up two "go-to" scopes—Dave's Mewlon 210mm on an AstroPhysics 1100 GTO EQ mount and Ken's Celestron 11in HD SCT on a CGX-L EQ mount (see photos below).

Back at the home observing site we began tackling the rest of the Messier list with the "go-to" scopes. To confirm objects, we compared the view in both scopes before checking them off. Starting with the Orion Nebula, we progressed rapidly through the star clusters and galaxies in Orion, Canis Major, Gemini, Auriga, Leo and the greater Ursa Major neighborhood. Towards midnight we were working our way through the Virgo galaxy cluster where using "go-to" scopes and comparing the views made this challenging area much easier to complete—we both acknowledged how difficult a "star-hopping" approach to the Messier Marathon would be (maybe in the future…).

After a snack and a nap, we resumed around 2AM with the numerous globular clusters in Ophiuchus and worked through the clusters and beautiful nebula in the Sagittarius area. We made rapid progress and were able to take another much-needed brief nap around 3AM while waiting for the final 12 objects in Aquarius, Cassiopeia & Capricornus to rise over the Mule Mtns. Just before 4AM those final objects were high enough for us to observe and by 4:15AM we finished with M30, a GC on the eastern side of Capricornus and the final Messier object in the sequence. Our amazing night was capped off by observing the lovely alignment of Venus, Mars, and Saturn in the eastern sky as dawn began.

We were tired, but elated, having completed our first Messier Marathon. We identified 108 of 110 objects. We both agreed that we had learned much about the variety and beauty of the objects in the Messier Catalog. We made a mental note to bring a telescope with more aperture for M77 & M74 next time. With that, we gave each other a high-five, covered our telescopes, agreed that we would do this again next year, and headed home to bed—an observing night to remember!

A special thank you to Ted Forte for his very helpful review and edits.

Dave with his Mewlon 210 on AP 1100GTO mount

Ken with his Celestron 11HD on CGX-L mount

NASA Night Sky Notes May 2022

This article is distributed by NASA Night Sky Network

The Night Sky Network program supports astronomy clubs across the USA dedicated to astronomy outreach. Visit nightsky.jpl.nasa.org to find local clubs, events, and more!

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

David Prosper

Have 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

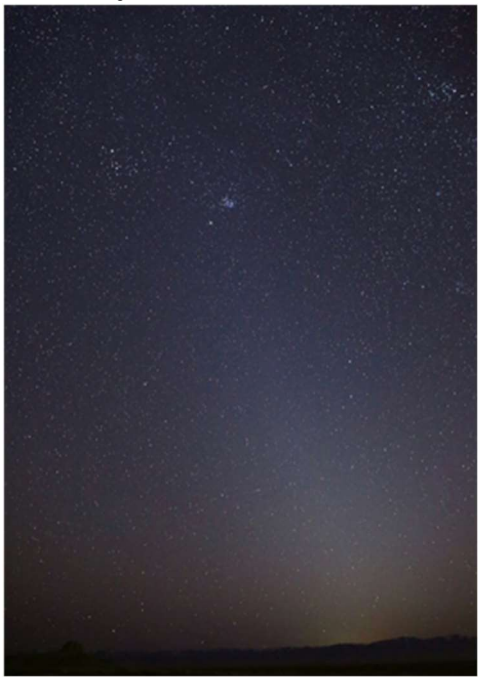
a wonderful sight, but the beautiful photos and videos shared online are often misleading. For most observers not near polar latitudes, auroral displays are relatively rare and faint, and without much structure, more gray than colorful, and show up much better in photos. However, geomagnetic storms can 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 Aurorasaurus citizen science program at aurorasaurus.org

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: go.nasa.gov/3uV3Yj1

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 reflected sunlight from interplanetary dust orbiting in the plane of our solar system, 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! Read more about their serendipitous discovery at: go.nasa.gov/3Onf3kN

Curious about the latest research into these night lights? Find news of NASA's latest discoveries at nasa.gov

Comet NEOWISE flies high above a batch of noctilucent clouds in this photo from Wikimedia contributor Brwynog.
License and source CC BY-SA 4.0
https://commons.wikimedia.org/wiki/File:Comet_Neowise_and_noctilucent_clouds.jpg



The zodiacal light extends into the Pleiades, as seen in the evening of March 1, 2021 above Skull Valley. Utah. The Pleiades star cluster (M45) is visible near the top.
Credit and source: NASA/Bill Dunford
.https://www.flickr.com/photos/gsfc/51030289967

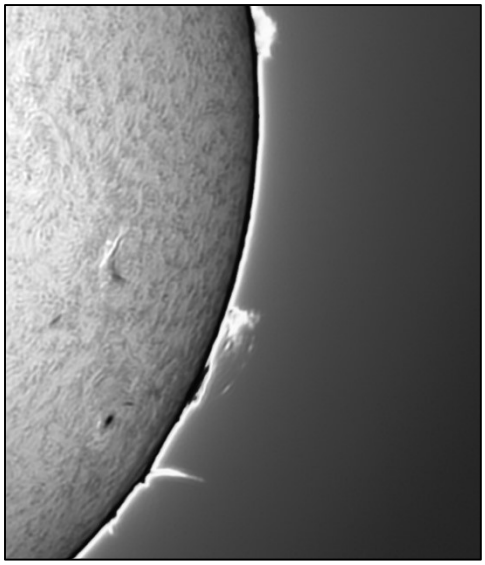
A sampling of some of the various patterns created by aurora, as seen from Iceland in 2014. The top row photos were barely visible to the unaided eye and were exposed for 20-30 seconds; in contrast, the bottom row photos were

exposed for just 4 seconds- and were clearly visible to the photographer, Wikimedia contributor Shnuffel2022.

Pictures by HAC Members

Moonbow by Rowland's granddaughter
Cumberland Falls State Park, Kentucky

Sun with Solar Prominences by Max Mirot



Moon, Venus, and Jupiter by Karen Madtes

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For more information on products and contact information, their websites are:

Farpoint Astronomy http://www.farpointastro.com/

Starizona http://starizona.com/

HAC May-Jun 2022 Calendar of Events

SU	MO	TU	WE	TH	FR	SA
May 1 Jupiter/Venus Conjunction	**2**	**3**	**4**	**5** Patterson Public Night 7:30PM Eta Aquariid Meteors	**6** Eta Aquariid Meteors	**7** Astronomy Day Sierra Vista Library 10a-3p Eta Aquariid Meteors
8 **5:21 PM** 	**9**	**10**	**11**	**12**	**13** **HAC Meeting 7PM Room A102**	**14**
15 **9:14 PM** Lunar Eclipse Watch Patterson Obs. 7PM	**16**	**17**	**18**	**19**	**20**	**21** 
22 **11:43 AM**	**23**	**24** Mars, Jupiter, and Moon	**25** Boys & Girls Club at Patterson 2:30PM	**26**	**27**	**28**
29	**30** **4:30 AM** 	**31**	**Jun 1**	**2**	**3**	**4**
5	**6**	**7** **7:48 AM**	**8**	**9** Patterson Public Night 8:00PM	**10**	**11**
12	**13**	**14** **4:52 AM**	**15**	**16**	**17** **HAC Meeting 7PM Room A102**	**18**
19 	**20**	**21** Summer Solstice 2:14 AM	**22**	**23**	**24**	

All times local MST

Join **HacAstro** to keep up to date with all of the Huachuca Astronomy Club events

Send an email to: HACAstro+subscribe@groups.io

Watch the group for notice when in person events and meetings will resume