The Lunar Observer

A Publication of the Lunar Section of ALPO

David Teske, editor
Coordinator, Lunar Topographic Studies Section Program

SEPTEMBER 2024

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Lunar Reflections

A warm greeting to all readers. Hoping that this issue of *The Lunar Observer* finds you doing well. This month marks my (you guessed it) 5th year of editing *The Lunar Observer*. It has been a great pleasure to put together our little newsletter! It is so fun and interesting to hear from like-minded people from across the globe. It gives me great faith in humanity that we the people can all get along so well! Lets keep it up. Thank you so very much to all of our contributors over the years. Contributors have sent in wonderful images, drawings, articles and reports about our nearest neighbor in the cosmos. Thank you to each of you!

Many thanks to Jim Tomney, who has updated the ALPO website. With this, there are a few things we must follow on your images. **Please keep images to 400 kB or less**. Also, PLEASE be careful on dates! **A date of 10/12/2023 means October 12, 2023 to me, not December 10, 2023.** If there is reason for doubt, PLEASE write out the date (October 12, 2023). Observations with incorrect data is pretty worthless.

September 14, 2024 is the International Observe the Moon Night. A holiday in our honor! Get those telescopes out and get your friends, family and neighbors out to observe the Moon!

Please remember to follow the future Focus-On topics and gather observations of these features. Next up is the very interesting Archimedes. Observations are due to Alberto and myself by October 20, 2024.

Clear skies,

-David Teske

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Online readers, click on images for hyperlinks

Lunar Topographic Studies

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Observations Receive

Name	Location and Organization	Image/Article
Alberto Anunziato	Paraná, Argentina	Images of Plato, drawings of Mare Nectaris (2), Article *The Mound Area East of Cyrillus* and *Focus-On article Aristoteles and Eudoxus: Similar and Different.*
Sergio Babino	Montevideo, Uruguay	Images of Aristoteles and Theophilus (2).
Jon Bosley	White Dwarf Observatory, Central Texas, USA	Images of Aristoteles and Eudoxus(3).
James Brunkella	Thousand Oaks, California, USA	Images of Aristoteles (3).
Ariel Cappelletti	Córdoba, Argentina, SLA	Image of Aristillus.
Francisco Alsina Cardinalli	Oro Verde, Argentina	Images of Aristoteles (2) and Eudoxus.
Jairo Chavez	Popayán, Colombia	Images of the crescent Moon 4%, Waxing Crescent Moon 9%, First Quarter Moon, Waxing Gibbous Moon 69%, 82%, 94%, 98% and the Full Moon.
Maurice Collins	Palmerston North, New Zealand	Images of 8.9 day-old Moon,, 15.8 day-old Moon, Plato, Straight Wall and Archimedes
Massimo Dionisi	Sassari, Italy	Images of Aristoteles and Eudoxus (6).
Walter Ricardo Elias	Oro Verde, Argentina	Images of Arzachel, Hyginus, Mons Piton and Theophilus.
Diego Ferradans	Villa María, Argentina	Image of Theophilus.
István Zoltán Földvári	Budapest, Hungary	Drawings of Luther, Maskelyne and Rothmann
Lawrence Garrett	Fairfax, Vermont, USA	Image of the smoky Moon.
Desiré Godoy	Oro Verde, Argentina	Image of Aristoteles.
Marcelo Mojica Gundlach	Cochabamba, Bolivia, SLA	Images of Vallis Alpes and Aristoteles.

Lunar Topographic Studies

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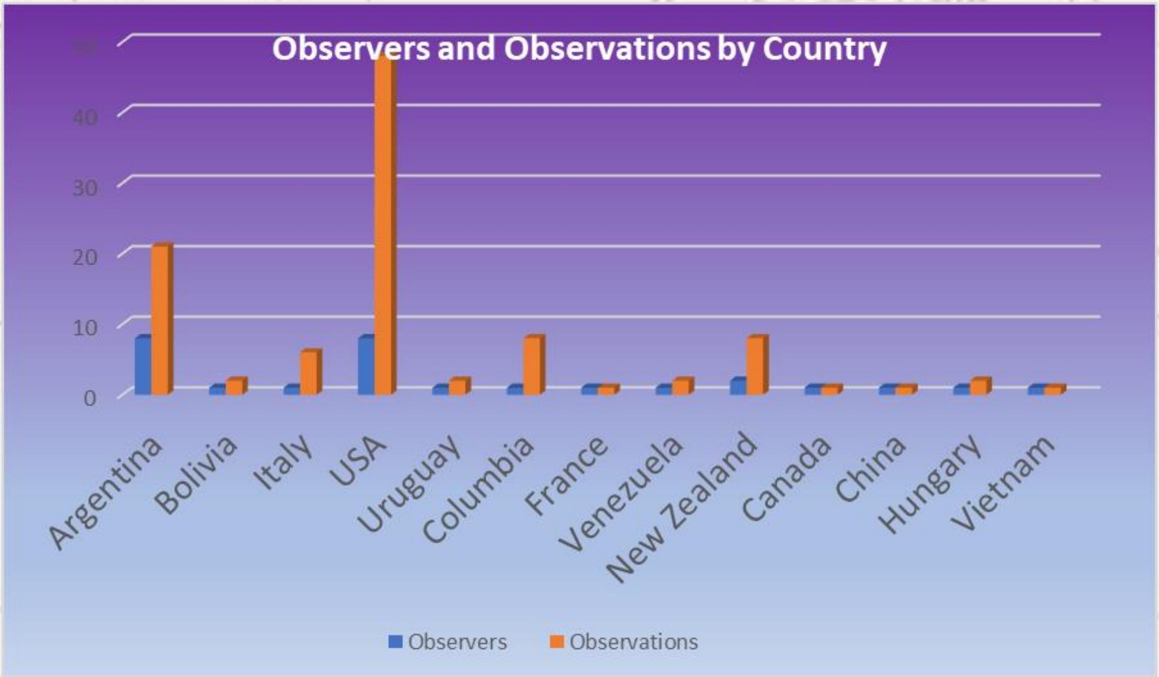
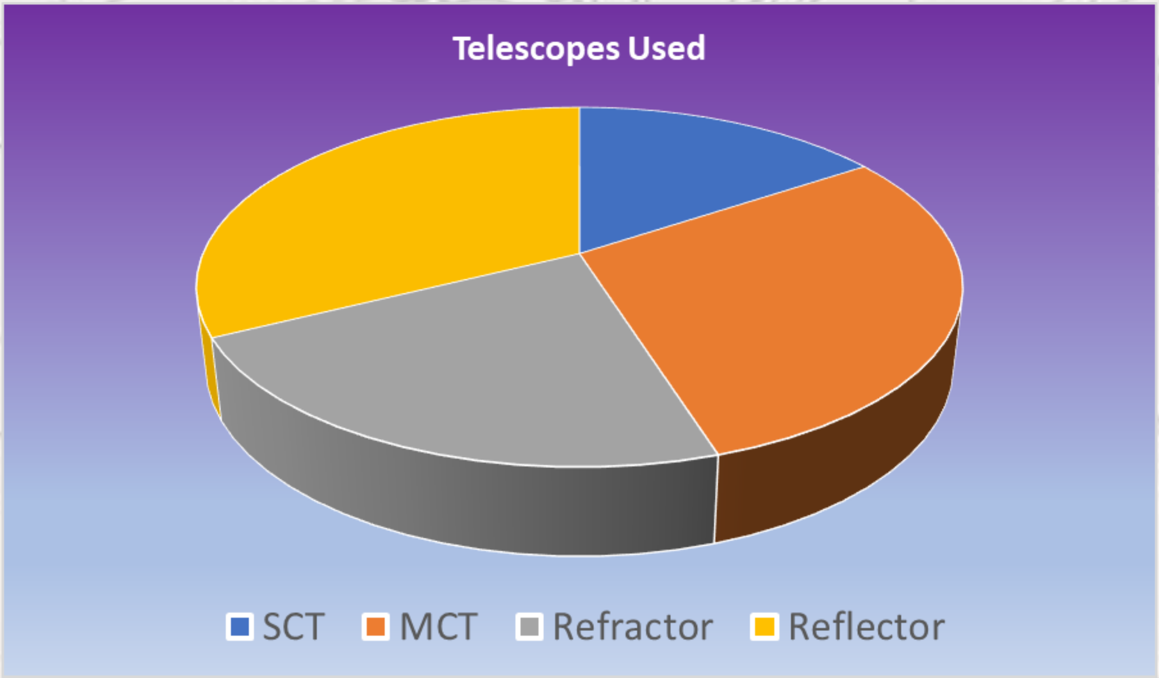
Observations Received

Name	Location and Organization	Image/Article
Anthony Harding	Northeast Indiana, USA	Article and image *Neat Clair-Obscure Effect South of Taylor A,* images of Clavius and Tycho, Mare Crisium, the Waning Gibbous Moon and Eratosthenes to Aristoteles.
Philippe Heully	Mayenne, France	Drawing of Aristoteles.
Rik Hill	Loudon Observatory, Tucson, Arizona, USA	Article *Moretus Near the Pole*, images of Aristoteles and Eudoxus (15).
Eduardo Horacek	Mar del Plata, Argentina	Images of Aristoteles (6).
Mike Karakas	Winnipeg, Manitoba, Canada	Image of Aristarchus and Eudoxus.
KC Pau	Hong Kong, China	Image of Sinus Iridum.
Jesús Piñeiro	San Antonio de los Altos, Venezuela	Images of Plato and Eudoxus.
Robert Reeves	San Antonia, Texas, USA	Article and 6 images Does Mare Tranquillitatis Lie in a Basin?
Gregory Shanos	Sarasota, Florida, USA	Images of Aristoteles and Eudoxus, article and 4 images *Lunar X and V August 11, 2024,* article and image *That's No Moon* and article with 2 images *Lunar Conjunction of Saturn.*
Fernando Surá	San Nicolás de los Arroyos, Argentina	Image of Plato.
David Teske	Louisville, Mississippi, USA	Images of Aristoteles (6).
Larry Todd	Dunedin, New Zealand	Images of Aristoteles (2).
Tiến Ngô Trần	Ho Chi Mihn City, Vietnam	Image of Aristoteles and Eudoxus.

September 2024 *The Lunar Observer*
By the Numbers

This month there were 103 observations by 28 contributors in 13 countries.





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INTERNATIONAL
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SEPTEMBER 14, 2024
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Lunar X Predictions for 2024

40°N-75°W, Eastern Time Zone

Date, 2024	358° Colongitude	Altitude/Azimuth	Cloudy Nights
January 18	5:15 am	–37° / 345°	4:05 am
February 16	7:40 pm	+66° / 236°	6:49 pm
March 17	10:22 am	–11° / 38°	10:10 am
April 15	11:08 pm	+43° / 268°	11:41 pm
May 15	11:01 am	–16° / 53°	12:13 pm
June 13	10:15 pm	+34° / 244°	11:49 pm
July 13	9:11 am	–43° / 58°	10:48 am
August 11	8:15 pm	+24° / 212°	9:31 pm
September 10	7:49 am	–65° / 65°	8:29 am
October 9	8:12 pm	+16° / 206°	8:09 pm
November 8	8:33 am	–49° / 79°	7:49 am
December 7	10:43 pm	+4° / 253°	9:36 pm

Note: The Lunar X is not an instantaneous phenomenon; rather, it appears and evolves over several hours, so the times above are fundamentally approximate and serve only as a guide. The ardent observer should look a little early to catch the initial visible illumination. A less-dramatic Lunar X against a fully illuminated background can still be seen at least several days later. Because of the Moon's nominal 29.5-day synodic period (phase-to-phase), favorable dates for a given location tend to occur on alternate months (unfavorable dates for 40°N-75°W are shaded gray in this table). The 358° colongitude value for the terminator reaching the Lunar X and making it visible (see this RASC paper) and the corresponding lunar altitude/azimuth for 40°N-75°W were determined with WinJUPOS, which is freeware linked from the WinJUPOS download page.

The Cloudy Nights comparative data, derived by a different method, was presented in this post.

Daylight Saving Time for 2024 begins on March 10 and ends on November 3. The listed times are EST/EDT as appropriate for the date.

Submitted by Greg Shanos.

Lunar X Predictions for 2024-2028

5 Year Lunar "X" and "V" Schedule * **					
	2024	2025	2026	2027	2028
Jan	18: 0830	6: 1645	25: 1630	15: 0015	4: 0830
Feb	16: 2345	5: 0800	24: 0730	13: 1530	3: 0015
Mar	17: 1400	6: 2300	25: 2145	15: 0600	3: 1500
Apr	16: 0300	5: 1300	24: 1100	13: 1930	2: 0430
					1: 1700
May	15: 1600	5: 0130	23: 2245	13: 0730	31: 0400
Jun	14: 0400	3: 1330	22: 0945	11: 1830	29: 1430
Jul	13: 1430	3: 0015	21: 2000	11: 0500	29: 0030
		1: 1100			
Aug	12: 0130	30: 2130	20: 0630	9: 1530	27: 1100
Sep	10: 1230	29: 0900	18: 1730	8: 0200	25: 2245
Oct	10: 0015	28: 2115	18: 0530	7: 1400	25: 1130
Nov	8: 1245	27: 1045	16: 1900	6: 0300	24: 0145
Dec	8: 0230	27: 0115	16: 0930	5: 1730	23: 1645

* All times are listed as the day of the month and then the hour in **UT**

** All times are approximations based on LTVT calculations. They are accurate to ± 1 hour.

Submitted by Greg Shanos.

Photographic Atlas of the Moon: A Comprehensive Guide for the Amateur Astronomer, Robert Reeves, Hardcover – September 1, 2024

Written by a dedicated selenophile (a person who loves the Moon), this guide to Earth's celestial companion is a non-technical narrative that quickly elevates the lunar novice to lunar authority.

Photographic Atlas of the Moon explains how the Earth and the Moon are locked together in a co-dependent embrace, each affecting the other in ways that impact our lives. The reader will learn in comprehensible, jargon-free language about the Moon we see, its orbit, its creation and the differing geologic details of the Moon, some of which can be seen with the naked eye. All the photographs in this lavishly illustrated book were taken by the author, an internationally recognized authority on celestial photography. Reeves has perfected image processing techniques that allow the amateur astronomer, using modest equipment, to exceed the quality of Earth-based professional lunar photographs taken during the Apollo era.

Although Reeves is an accomplished deep-sky photographer, his current passion is re-popularizing the Moon within the amateur astronomy community. Momentum is building for a manned return to the Moon to continue the exploration started over half a century ago. Photographic Atlas of the Moon will provide even the most novice reader with an understanding of the Moon and its allure so they can appreciate the upcoming explorations by NASA's Artemis lunar program.

https://www.amazon.com/Photographic-Atlas-Moon-Comprehensive-Astronomer/dp/022810498X/ref=rvi_d_sccl_1/136-6077595-9611424?pd_rd_w=NTjEa&content-id=amzn1.sym.f5690a4d-f2bb-45d9-9d1b-736fee412437&pf_rd_p=f5690a4d-f2bb-45d9-9d1b-736fee412437&pf_rd_r=7XZ4992GTVJKS0K7P4F5&pd_rd_wg=WEmPb&pd_rd_r=310acd54-2b8b-4d1c-a84a-abe0a3d2034f&pd_rd_i=022810498X&psc=1

Rik Hill of Tucson, Arizona, USA recently came across this article in a February 1952 issue of Sky and Telescope magazine. He thinks that this could be an interesting observing project for observers with smaller aperture telescopes. It is more of a project for Tony Cook's Lunar Geologic Change project. But give it a go! There is lots about the Moon we have yet to understand!

AN UNUSUAL EVENT IN ALPETRAGIUS

On the evening of November 19, 1958, I went up on the roof of the Newark Museum with a 4-inch reflector to select the site for an observing platform. So good was the seeing that I spent some time examining the moon, whose image was quite sharp at 195x. The moon was just past first quarter, the terminator being about two diameters of Alphonsus from the east wall of that crater.

At 22:00 Universal time, I suddenly noted that a portion of the shadow covering the floor of the nearby crater Alpetragius had faded. A few minutes before, this shadow had covered about two-thirds of the interior of the crater, with the central peak a bright spot on a black background. Now, however, about half the shadow had faded, and was replaced by a much lighter shade. I did not see any glow or haze in the crater. At 22:05 UT the shadow gradually darkened, reaching its former state in about 20 seconds.

During the past six years I have been observing the moon regularly, generally with larger apertures than four inches, but I never saw anything like this before. The fading of the shadow could not have been caused in our atmosphere, since formations surrounding Alpetragius were unaffected. It seems certain that the phenomenon was not caused within the telescope, as I let Alpetragius drift three times across the entire field of view during the interval from 22:00 to 22:05, without noting any change in appearance at any point. The explanation of the event is uncertain, and may require a comparison with analogous instances of change reported by other observers of our satellite.

RAYMOND J. STEIN
Newark Museum Planetarium
Newark 1, N. J.

Lunar Topographic Studies
Y

Lunar X and V August 11, 2024

Gregory T. Shanos

The Lunar X & V were visible on August 11, 2024 at 10:46pm local time or August 12, 2024 02h 46m Universal Time. The moon was at a 45% phase and only 18°above the horizon. The seeing was rather good however, the transparency was only average through thinning clouds and haze. The skies were completely overcast at sunset with the clouds rapidly thinning out as the evening progressed. This was the orientation of the moon as it was setting. A Meade 60mm 260mm f/4 refractor was tracking the moon on an inexpensive Orion EQ equatorially mounted tripod. A ZWO ASI 715MC one-shot color camera with Firecapture v2.7.14 was used to acquire the video with an MSI GF 65 gaming computer. The AVI video was processed using Autostakkert 4.0.11 beta and Registax 6.1.08. Further sharpening and processing in Photoshop CS4. Image by Gregory T. Shanos, Longboat Key, Sarasota, Florida.

The Lunar X (also known as the Werner X) is a claire-obscure effect in which light and shadow creates the appearance of a letter 'X' and 'V'. The Lunar X forms from the rim of the craters Blanchinus, La Caille and Purbach. The X is visible beside the terminator about one-third of the way up from the southern pole of the moon. The Lunar V forms along the northern part of the terminator near the crater Ukert.

Single snapshot of the Lunar X & V through the Seestar S50 at 2024-08-12 01h 38m UT- no post processing. Note the thinning clouds with haze are evident in this photograph. The "X" and "V" are visible along the terminator.

Lunar Topographic Studies
Lunar X and V August 11, 2024

Single snapshot at 2X digital enlargement of the Lunar X & V through the Seestar S50 at 2024-08-12 01h 39m UT- no post processing. The “X” and “V” are more readily visible along the terminator.

Lunar Topographic Studies
Lunar X and V August 11, 2024

Single snapshot at 4X digital enlargement of the Lunar X & V through the Seestar S50 at 2024-08-12 01h 40m UT- no post processing. The "X" and "V" are easily visible along the terminator.

Lunar Topographic Studies
Lunar X and V August 11, 2024

Neat Clair-Obscure Effect South of Taylor-A

Anthony S. Harding Jr.

Of course, the lunar X and lunar V are well-known Clair-Obscure effects on the Moon. The play of light and shadow makes for some very interesting sights on our satellite during its ever-changing phases, and continually creates strange and entertaining illusions for us to enjoy. The human mind is always eager to seek patterns in what is perceived.

While capturing lunar footage on the morning of July 27th, 2024 (UT), just such an unexpected illusion grabbed this observer's attention—what at first glance appeared to be a "V" shape on the sunset terminator, tilted onto its side, with a small crater resting in the groove. The "V" shape appeared to open toward the darkness—or point toward the light, depending on how you regard it. This piqued my curiosity!

It was first spotted at the eyepiece while lining up for photos of the Moon, and was stumbled upon completely by accident. The Moon stood only 14.7 degrees above the horizon at the time, so the image quality is not as good as it might have otherwise been. A cropped picture of this area is presented in Image 1.

Image 1: Clair-Obscure Object Detected on 2024-07-27-0531
(With circle showing position of effect.)

Equipment Details: Celestron C6N Newtonian, Meade LX85 Go-To Mount, ASI 290MM Camera, No filters, Exposure 4.992 ms, Gain 110, 30% of 2136 frames stacked, Footage captured and stacked in ASI Studio, Wavelets applied in Registax

Site Details: NE Indiana, Local elevation 262.433 meters, Colongitude: 164.904 degrees, Lunar illumination: 59.825%, Moon 14.7 degrees above horizon, Seeing 5/10, Transparency 4/6

The first resource consulted for identification was the LTVT. However, no clear identification was found there. Next, Rükl's Atlas of the Moon showed the general area on charts 45-46, and indicated that the Taylor group of features may be responsible. Referring to the Virtual Moon Atlas, the area did not seem to immediately indicate the shape that was observed. However, using this allowed a more exact location to be ascertained. The notated picture obtained with the VMA is presented in Image 2.

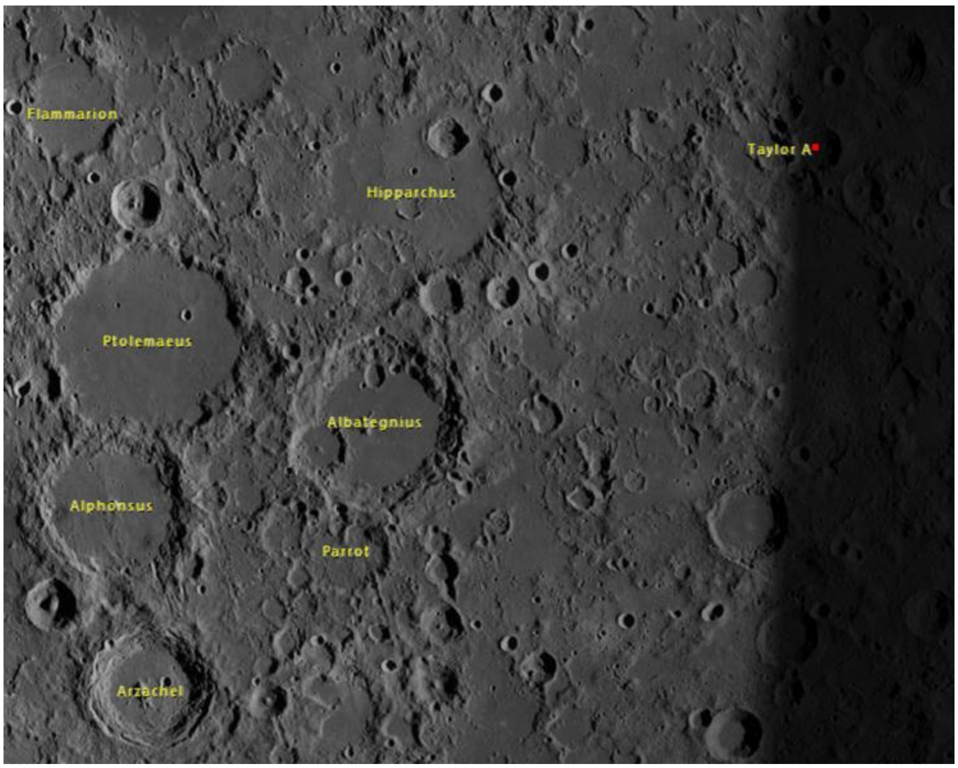


Image 2: Virtual Moon Atlas Image of Area
(With other labeled craters to assist with identification.)

Apart from a difference in image rotation, the location of the anomaly appears to be accurate. Aha! At least it was getting narrowed down. More careful examination led to the conclusion that the effect was in the vicinity of Taylor-A and Taylor (to the south of Tailor-A and to the west of Taylor).

Some research was then conducted to determine if this effect is already known and catalogued, but none of the resources consulted (Wikipedia, The-Moon.us wiki, and others) indicated anything near the target area. A search conducted using the LROC Quickmap revealed that the northern portion of the "V" was formed by the southern rim of Taylor-A. Two apparently unnamed depressions stand adjacent to this rim on the southern side, one of which being responsible for the apparent crater position in the groove of the "V." When an extreme zoom was applied to the captured image (Image 1) it was clear that this spot is not actually circular, but rather a bit irregular in shape. Again, the LROC Quickmap data confirmed this. The southern arm of the letter was formed by the peak of a ridge running south from Taylor-A and disappearing into darkness due to decreasing height. A very small portion of Taylor-D can be seen at the very end of this arm in Image 1.

The LROC Quickmap was then consulted to determine if terrain elevations were indeed present along the arms of the "V." The results are indicated in Image 3 and Image 4.

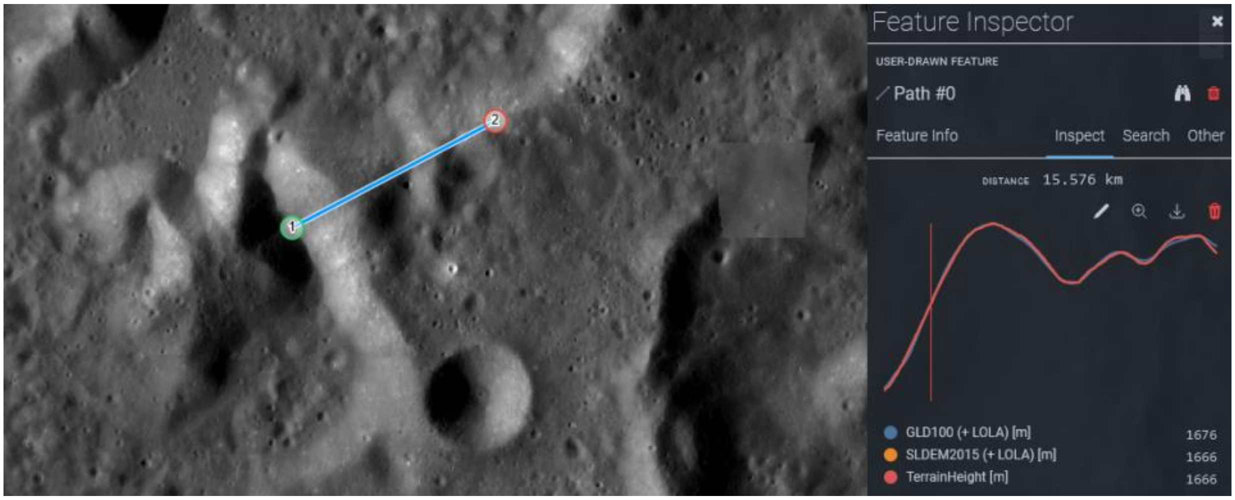


Image 3: Terrain elevations along northern arm of anomaly.

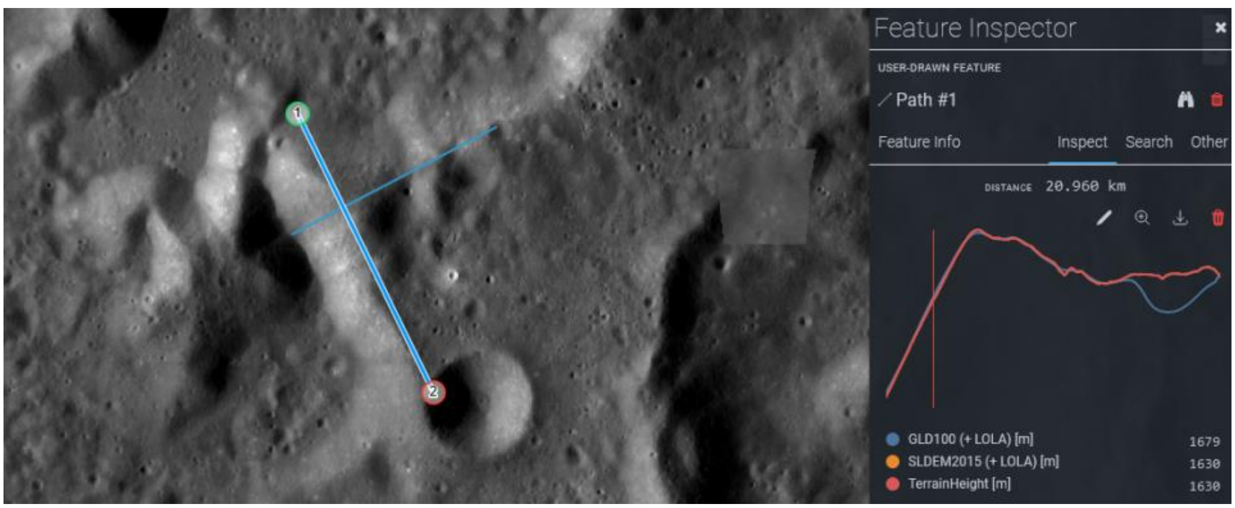
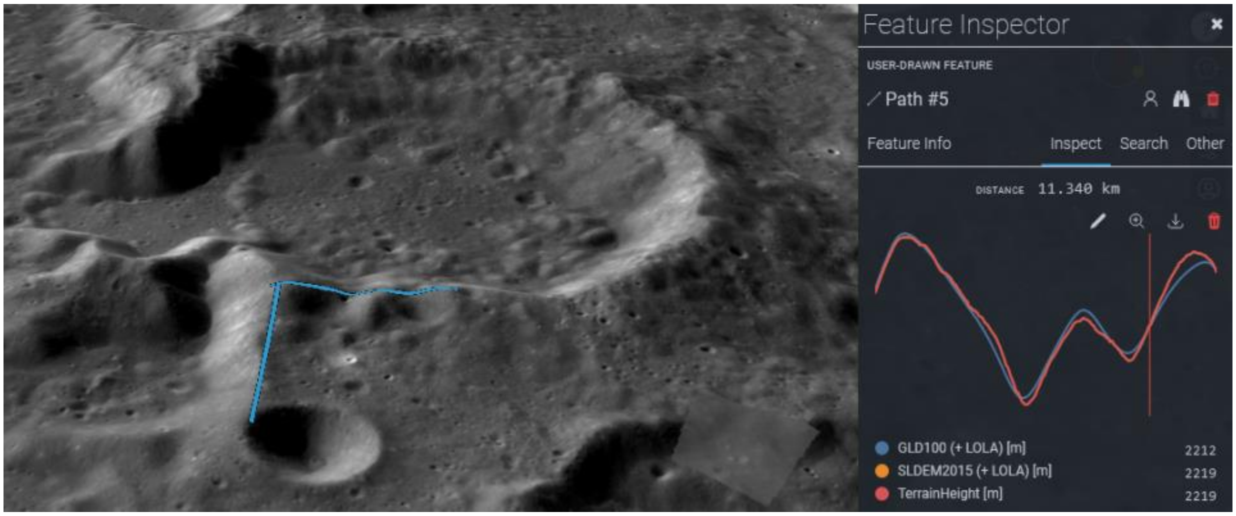
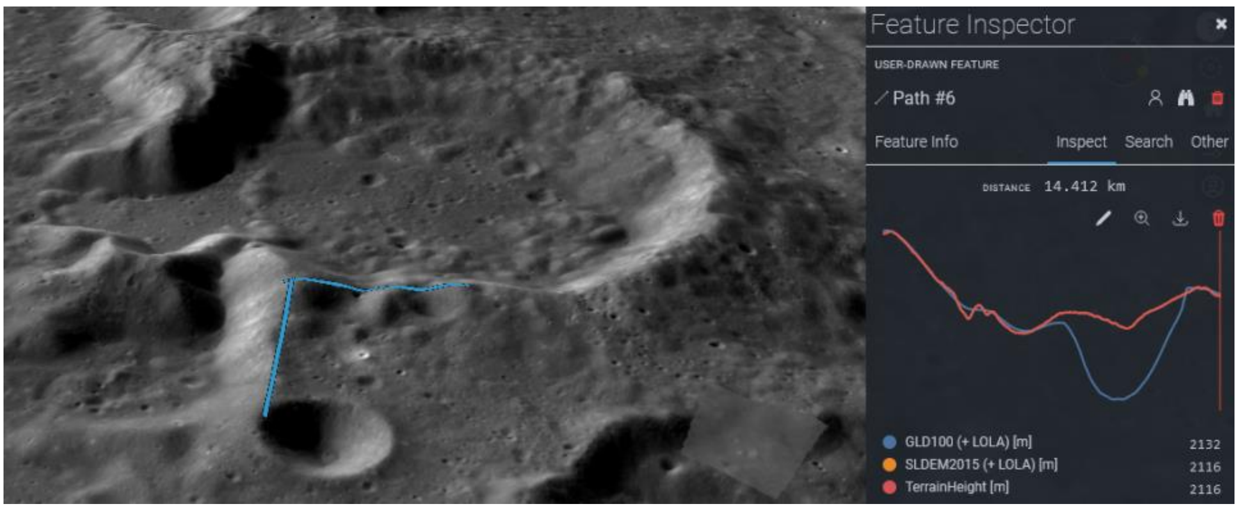


Image 4: Terrain elevations along southern arm of anomaly.

This elevation data also suggested that both of the arms of the effect lie at greater elevation and would be capable of catching the last of the failing sunlight. The last bit of confirmation was obtained by using the LROC Quickmap 3D rendering option to get an oblique angle on the area. Image 5 and Image 6 show this view, along with terrain elevation data.



<u>Image 5:</u> LROC 3D Rendering of Area (N-NW View Angle)
(Elevation information for along the northern arm of the feature)



<u>Image 6:</u> LROC 3D Rendering of Area (N-NW View Angle)
(Elevation information for along southern arm of the feature)

The LROC Quickmap data appears to be in good agreement with the captured footage and what was seen at the eyepiece. Since no existing reference for it could be readily found, I am assigning it a provisional name: "The Taylor Sideways V." The author is very interesting in seeing if other observers are able to reproduce this effect.

<u>Tools and References—</u>

<u>LTVT</u>—
Jim's Lunar Terminator Visualization Tool
Version 0.21.4
Copyright Jim Mosher and Henrik Bondo 2006-2024

Atlas of the Moon—
Antonin Rükl
Edited by Dr. T.W Rackam
Kalmbach Publishing, 1992
Copyright © 1990

Virtual Moon Atlas—
AtLun 8.2.2023/05/02 12:05:59
Lazarus 2.2.4.0 Free Pascal 3.2.2 Win32-i386-mswindows
Copyright © 2002-2023 Christian Legrand, Patrick Chevalley

The-Moon.us wiki—
Listing of known lunar clair-obscur effects
http://the-moon.us/wiki/Clair-obscur

LROC Quickmap—
Shows area under examination
https://quickmap.lroc.asu.edu/?prjExtent=312631.215426%2C-262730.1997271%2C706846.6887972%2C-76293.9010149&showTerrain=true&queryOpts=N4XyA&isCesiumEntityDetailsEnabled=true&showCompass=true&trailType=1&wideTrail=true&layers=NrBsFYBoAZIRnpEBmZcAsjYIHYFcAbAyAbwF8BdC0yioA&proj=10

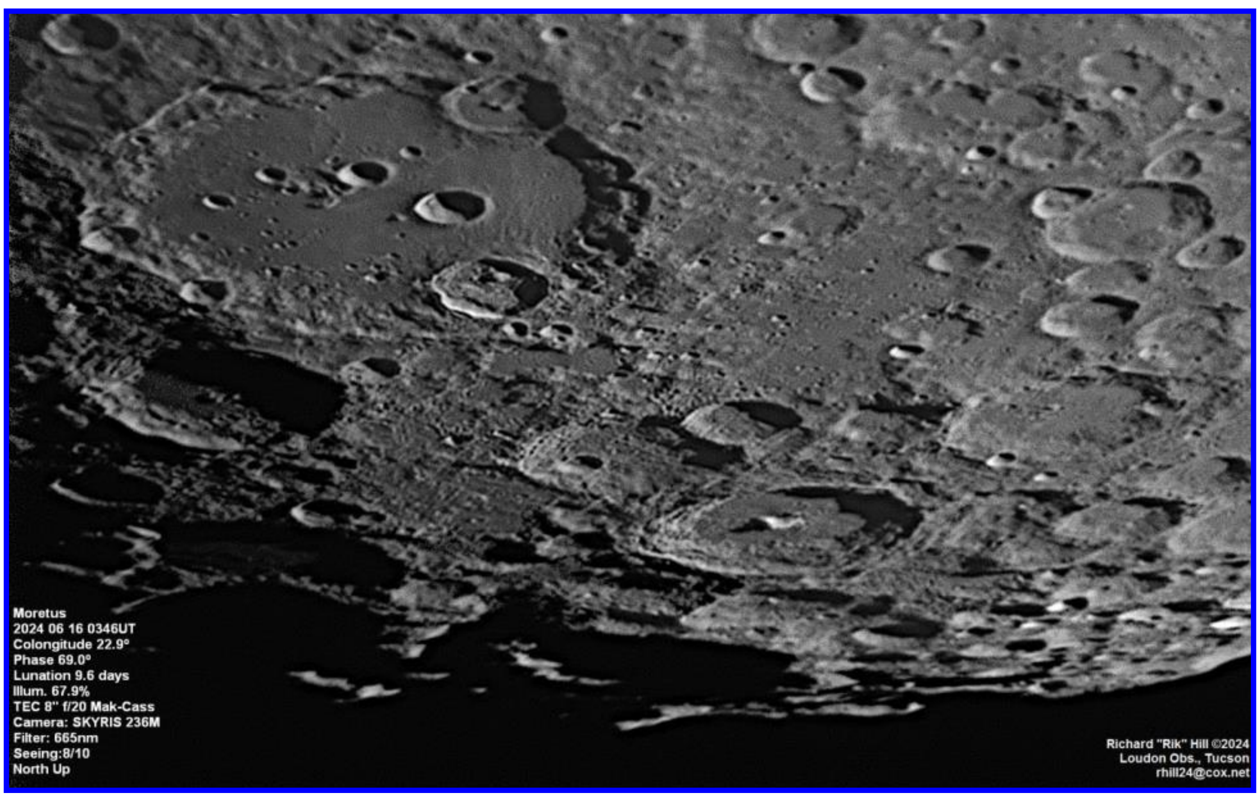
Moretus Near the Pole

Rik Hill

This image has the distraction of Clavius (231km dia.), the large crater in the upper left corner with distinctive line of smaller craters on its floor, decreasing in size as they curve to the left. The largest one, and least round, on the Clavius crater wall at bottom is Rutherfurd (56 km) with its ejecta splash spread out on the floor of Clavius to the north. Going counterclockwise on the broad rim of Clavius we come to another similar sized crater Porter (54 km). These latter two are very different ages with Porter being pre-Imbrian (3.85-4.5 billion years old) and Rutherfurd being Copernican (1.1 b.y. to present) while Clavius itself is Nectarian (3.92-3.85 b.y.) in age. This seems to be a bit contradictory as it indicates that Porter is older than the crater on whose walls it was formed! Below and adjacent to Clavius is Blancanus (109 km) half filled with shadow. Moving to the right we come to a nicely circular crater with terraced walls and a central peak. This is Moretus (117 km), the most identifiable crater nearest the South Pole from our vantage point. Beer & Madler considered the central peak of this "walled plain" to be "the loftiest central mountain on the entire moon." Quite a claim and I'm not sure it is borne out with recent spacecraft measurements. Though close, Moretus, with a lunar latitude of just over 71°, is still far from the pole. However, this image was captured at an unfavorable libration for the south.

Just below Moretus is the strongly foreshortened crater Short (51 km), no pun intended. Between Moretus and Clavius is the poorly defined crater Gruemberger (97 km) overlain as it is with ejecta from Moretus and several of the other nearby younger craters. Cysatus (51 km) is the smaller crater just to the right and on top of Gruemberger. Then going further to the right of Moretus is another fairly large crater Curtius (99 km) with a very well-defined crater Zach (68 km) above it.

Below and left of Moretus is a large pool of dark overlapping ovals. The upper lobe of this pool is the crater Newton D that overlaps Newton (62 km) to the south, which in turn overlaps another crater a little closer to the pole, Newton G. At the bottom of this pool of black, on the limb, is a bright rampart. This is the mutual wall of two craters Newton G and Newton A over our horizon and even further to the south. It is a very high plateau well shown on the USGS 1:1 million-Scale Maps of the Moon. This is as close to the pole as we can get here, still only -80°.



Lunar Topographic Studies
Moretus Near the Pole

Does Mare Tranquillitatis Lie in a Basin?

Robert Reeves

The question asked by the title has intrigued me for a long time. Traditional thinking is that all the near side maria lie within massive Nectarian or Pre-Nectarian impact basins that are well below the mean lunar elevation. For years, I assumed that due to its basic figure-eight shape, Mare Tranquillitatis lies within two shallow adjoining basins. Recently, it has been proposed that Tranquillitatis may not lie in a basin at all. I remain skeptical of that for two reasons. First, Tranquillitatis is confined by a finite shoreline that outlines shallower territory. Second, ghost craters are visible within Tranquillitatis, indicating craters formed on an older surface lower than the current basalt plains.

An approximation of the pre-mare elevations within Tranquillitatis can de deduced by looking at the ghost basin Lamont near the western shore, the ghost craters Aryabhata and Maskelyne F near the eastern shore, and larger unnamed ghost craters near the northern shore. The 95-kilometer inner ring of Lamont is marked only by wrinkle ridges. Its original unburied rim can easily be assumed to be at least a kilometer in elevation, but it is now totally unseen. The ghost craters Aryabhata and Maskelyne F are 22 and 20 kilometers wide, respectively. Comparing their expected rim height to other fully exposed similar sized craters like Flamsteed and Lichtemberg, we find that Aryabhata and Maskelyne F are covered with at least 200 meters of basalt. Clearly, the western side of the basin (or basins) cradling Tranquillitatis is deeper than the eastern side, but it does represent a depression under the mare surface.

An argument against the twin basin concept is the higher elevation of Tranquillitatis compared to neighboring maria. The mean elevation of the plains of Tranquillitatis stands over a half a kilometer higher than Mare Fecunditatis to the southeast and more than a kilometer higher than Mare Serenitatis and Nectaris to the north and south.

The surface elevation of each maria was determined by referring to the LROC Quickmap tool to access laser altimetry data and examine the average elevation across a 10-kilometer swath of smooth territory on each quadrant of the maria, then averaging those four figures. The results show the following maria elevations:

Mare Serenitatis	-2725 meters
Mare Tranquillitatis	-1390 meters
Mare Fecunditatis	-2017 meters
Mare Nectaris	-2685 meters

Within the straits that merge Tranquillitatis to Serenitatis, Fecunditatis, and Nectaris there is a clear decline in elevation as the basalts cascade from Tranquillitatis into the adjoining lower lying maria. Tranquillitatis was once a hotbed of volcanic activity was shown by Rima and Rupes Cauchy and the Cauchy domes on northeastern Tranquillitatis and the huge Arago domes on western Tranquillitatis. The massive 75-kilometer-wide volcanic Gardner megadome also lies on the northern shore of Tranquillitatis.

One, but not the only, conclusion that can be drawn from these geologic factors is that Mare Tranquillitatis does lie within a basin, and perhaps two side-by-side basins, that have a higher elevation than the other nearby large basins. Additionally, high volcanic activity filled up the natural capacity of these basins and lavas overflowed the shallow Tranquillitatis basin and spilled across the straits into the lower elevation nearly maria.

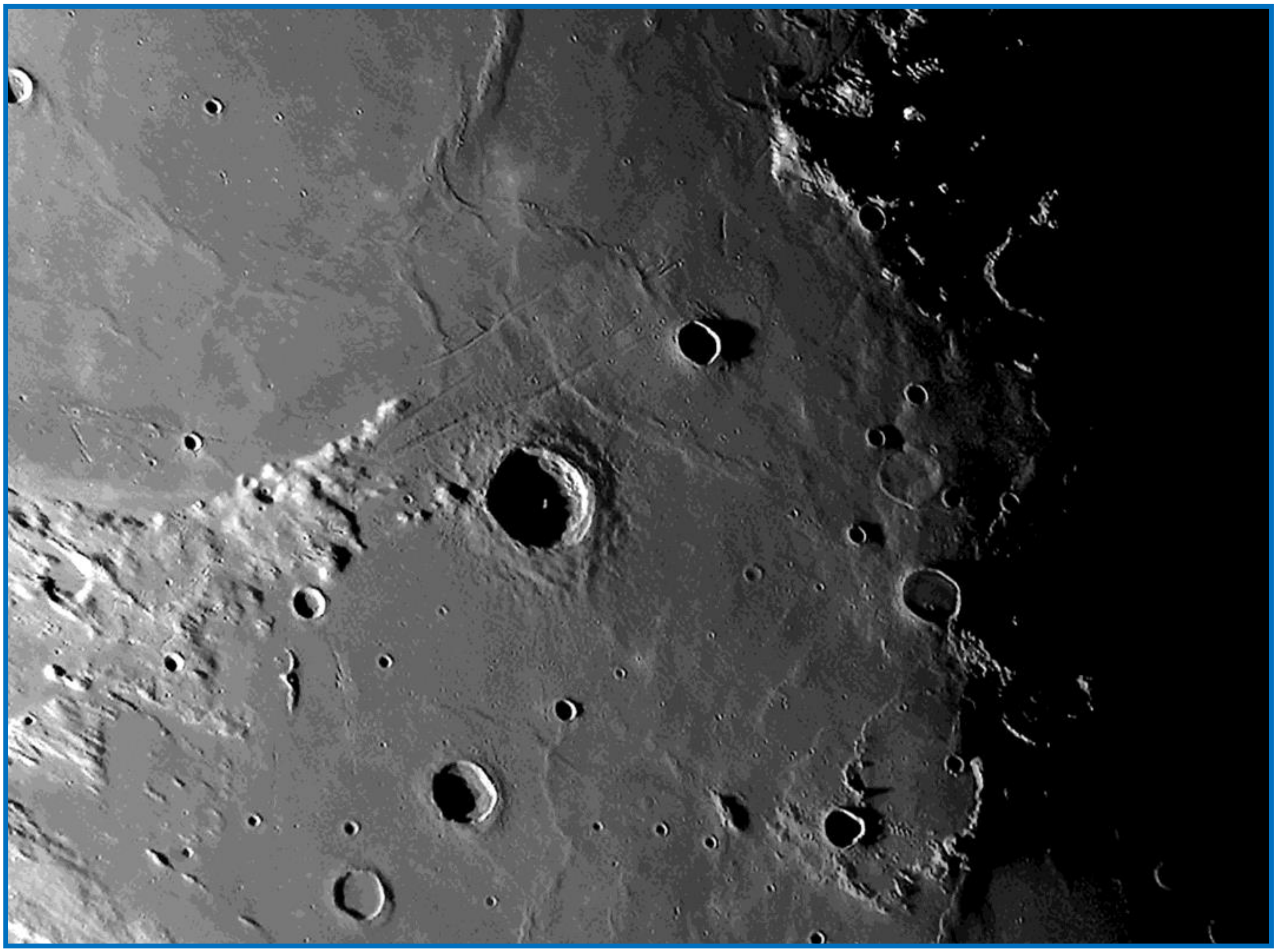
One, but not the only, conclusion that can be drawn from these geologic factors is that Mare Tranquillitatis does lie within a basin, and perhaps two side-by-side basins, that have a higher elevation than the other nearby large basins. Additionally, high volcanic activity filled up the natural capacity of these basins and lavas overflowed the shallow Tranquillitatis basin and spilled across the straits into the lower elevation nearly maria.

Mare Tranquillitatis Robert Reeves.jpg

Mare Tranquillitatis presents a roughly figure-eight shape and its basalts merge through straits joining it with Mare Serenitatis to the north, Mare Fecunditatis to the southeast, and through Sinus Asperitatis connecting it to Mare Nectaris at the south. All photos by Robert Reeves.

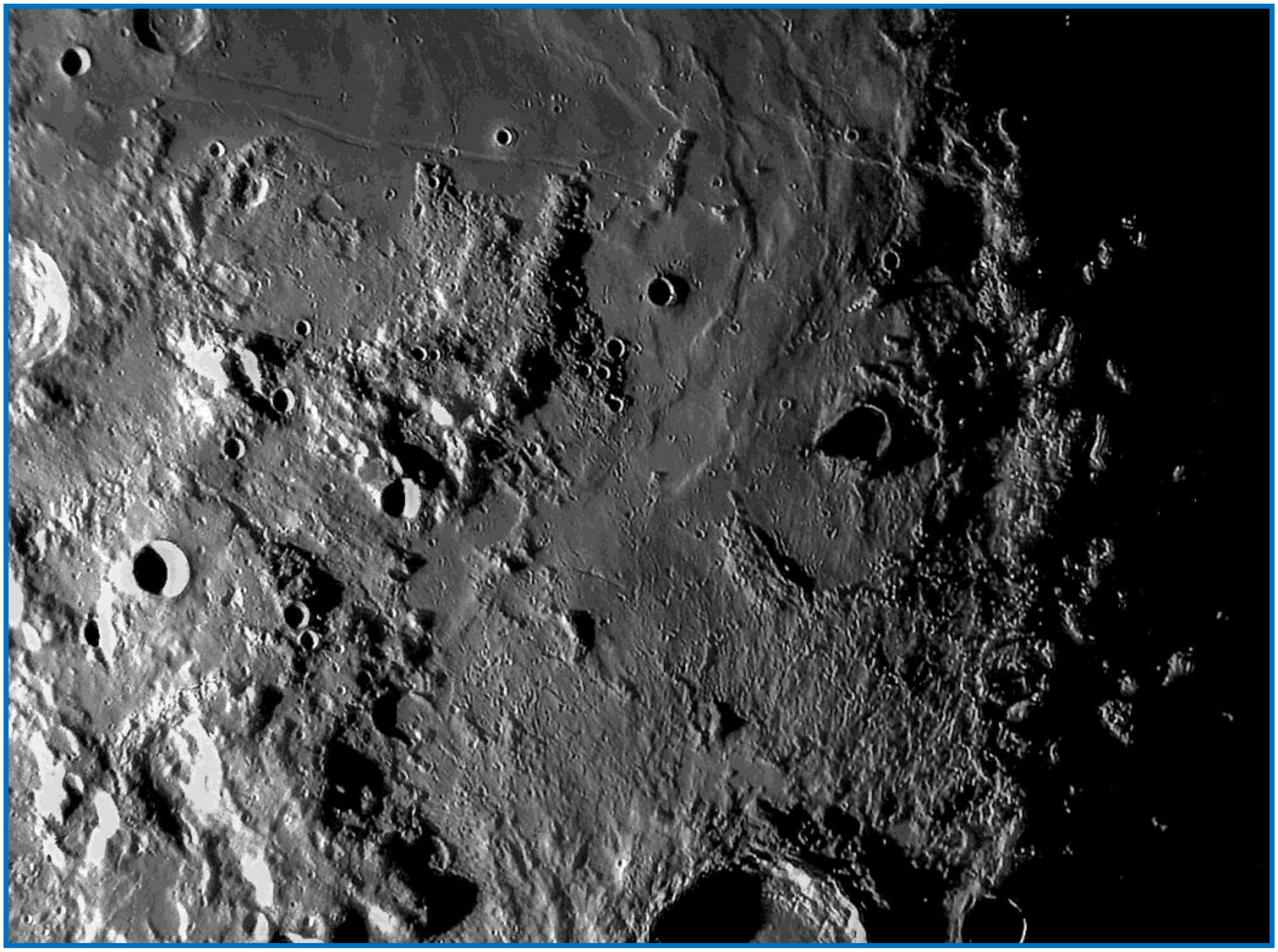
Lunar Topographic Studies

Does Mare Tranquillitatis Lie in a Basin?



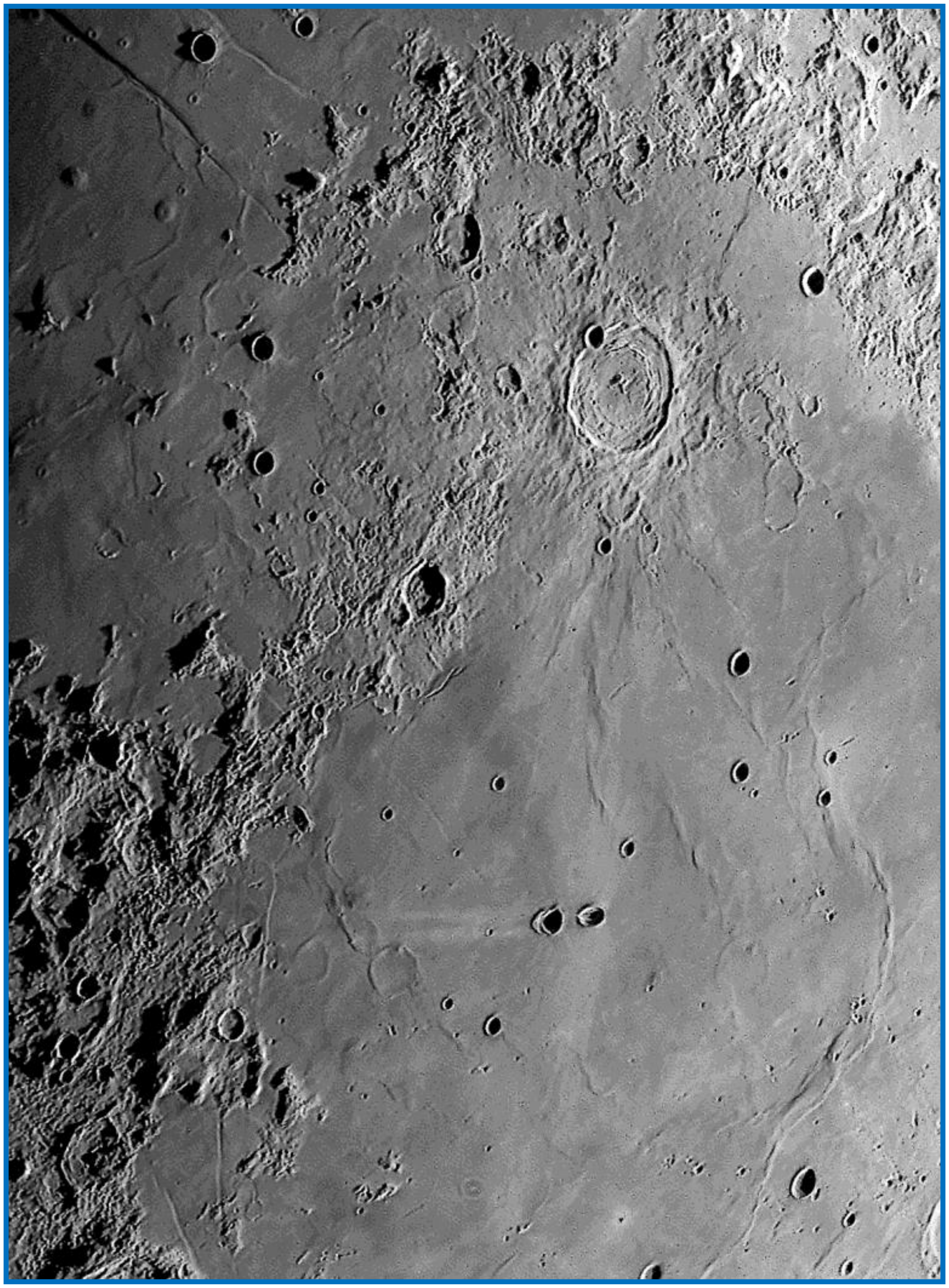
Serenitatis-Tranquillitatis Robert Reeves.jpg

Plinius crater on the left and Dawes crater on the right now stand like forts protecting the 190-kilometer-wide strait between Promontorium Archerusia at the southwest and Montes Argaeus on the northeast. Imbrium Epoch lava flowed through the strait from Mare Tranquillitatis into Mare Serenitatis at the north. Curiously, the width of the strait is not level. The downhill slide from Tranquillitatis to Serenitatis drops 600 meters on a line through the south of the strait, 500 meters in the middle, and changes a full kilometer drop in elevation passing through the north side of the strait. A wrinkle ridge and parallel rilles cross the Serenitatis-Tranquillitatis strait. The southernmost channel of the multiple Rima Plinius complex is 150 meters deep across its 130-kilometer span. The rilles bridge the north and south peninsulas of the unnamed strait and suggest the buried southeastern rim of the Serenitatis Basin partially collapsed under the basalt mass and created fractures that in turn formed the rilles. The presence of a wrinkle ridge at the mouth of the strait suggests the shifting of basalt from higher elevation Tranquillitatis to lower elevation Serenitatis was a slow process, allowing the shifting basalt to buckle and create the shallow wrinkle ridge. Plinius and Dawes craters date from the Eratosthenian and Copernican Epochs and formed between three and one billion years after their host basalt field solidified.



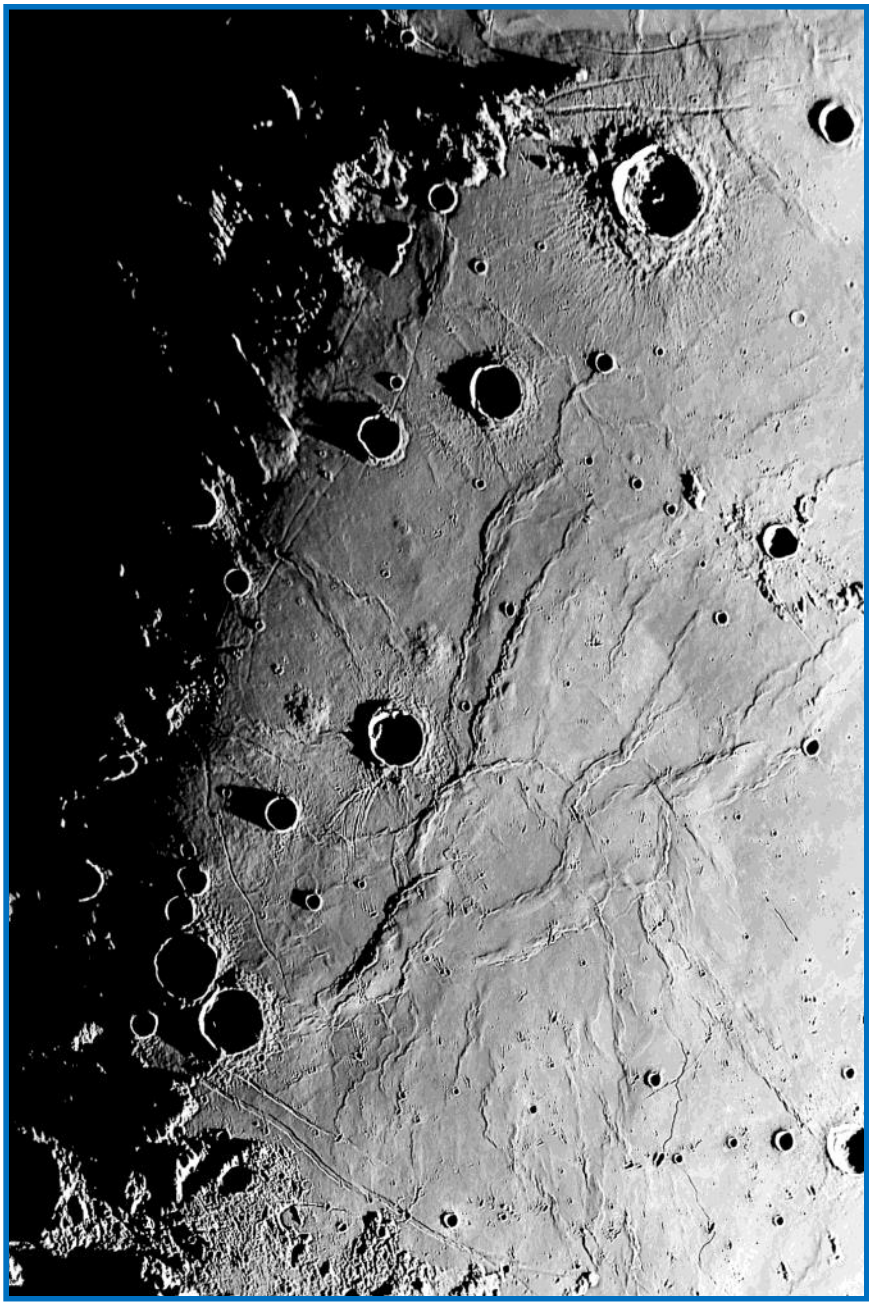
Sinus Asperitatis Robert Reeves.jpg

At the image center, the curious 23-kilometer-wide pear-shaped crater Torricelli lies within the larger 87-kilometer-wide ghost crater Torricelli R. Both craters lay within Sinus Asperitatis, the "Bay of Roughness", a channel that forms the strait between Mare Tranquillitatis and Mare Nectaris. Sinus Asperitatis is now thought to lie within the Asperitatis impact basin which created a natural channel joining Mare Tranquillitatis with lower elevation Mare Nectaris. The low sun elevation accentuates wrinkle ridges created when the lava flows encountered preexisting Torricelli R. The lava flows spilling through Sinus Asperitatis flowed into preexisting Torricelli R and rendered it a ghost crater, showing the impact creating Torricelli R occurred prior to the Imbrium Epoch lava flows that flooded Sinus Asperitatis. Pear-shaped Torricelli itself rests atop the basalt within Torricelli R and thus must have formed after the volcanism ceased. The ground surge from the creation of Theophilus crater scars southern Sinus Asperitatis.



Taruntius Messier Robert Reeves.jpg

The 56-kilometer-wide floor-fractured crater Taruntius lies in the 100-kilometer-wide strait joining Mare Tranquillitatis with Mare Fecunditatis. The strait has no name but is bounded on the south by Montes Secchi and an unnamed ridge at the north. The transition from Mare Tranquillitatis to lower elevation Mare Fecunditatis descends 600 meters, the shallowest between Tranquillitatis and its maria neighbors, and presents a smoother transition than the other two straits.

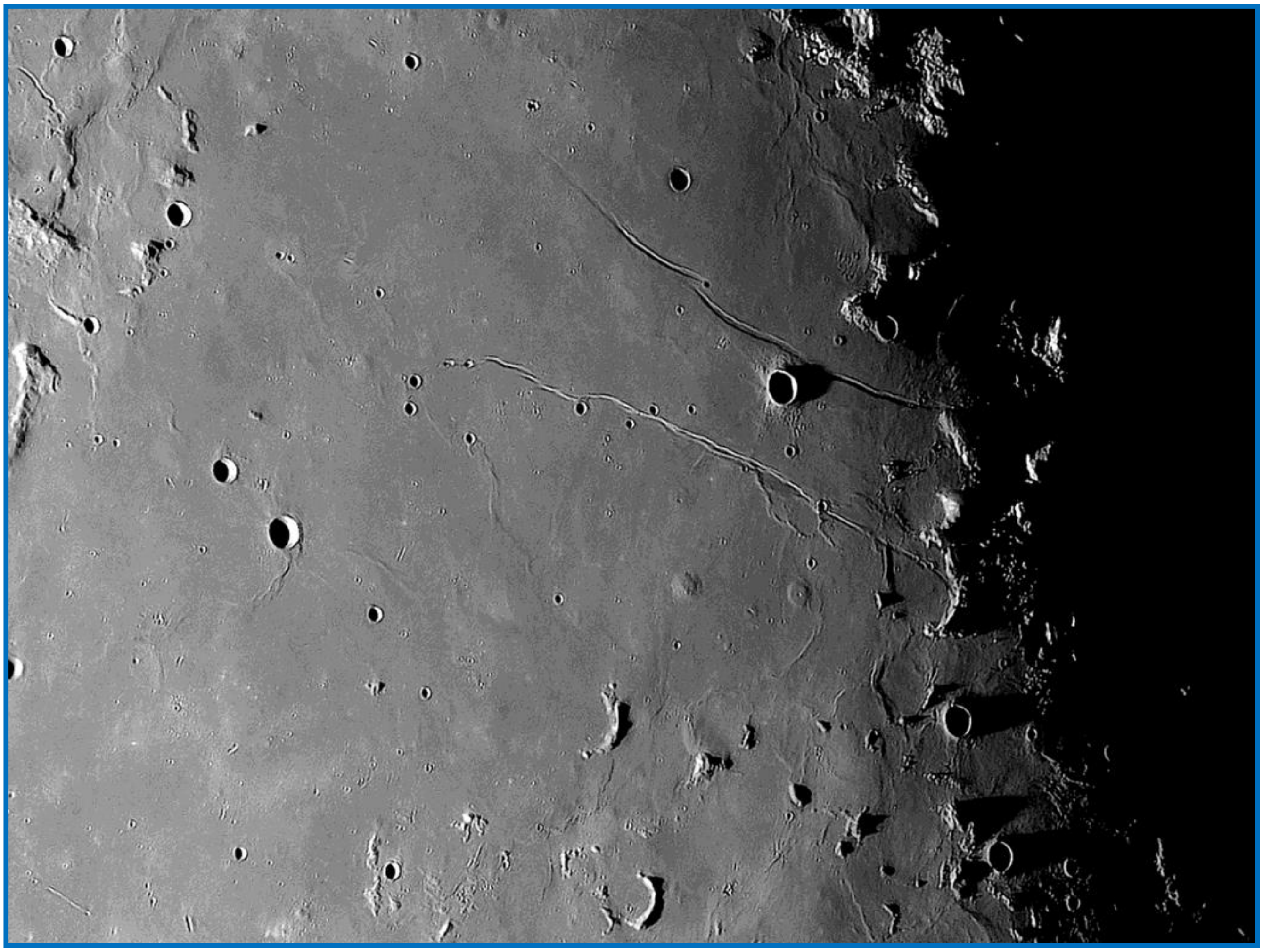


Lamont Robert Reeves.jpg

The depth of the basalt in western Mare Tranquillitatis is demonstrated by the spider-like apparition of Lamont. The high degree of ancient regional volcanic activity is demonstrated by the large Arago volcanic domes west and north of Arago crater. Located north of the Apollo 11 landing site, Lamont's status has transitioned from ghost crater to ghost basin. Lamont reveals itself by buckling up a circular wrinkle ridge over the buried crater rim laying very close to the surface. Arcs of an outer 130-kilometer-wide ring surrounding the intact 90-kilometer inner ring indicate the feature is a double ringed impact basin. The lack of visible crater rim implies the depth of the basalt at Lamont's location is well over a kilometer above the original surface that Lamont formed on prior to Imbrium Epoch volcanism. The complexity of the lava flows and resulting basalt field on eastern Tranquillitatis is also shown by strange radial wrinkle ridges extending 250 kilometers from Lamont.

Lunar Topographic Studies

Does Mare Tranquillitatis Lie in a Basin?



Rima Rupes Cauchy Robert Reeves.jpg

The parallel streaks of Rima and Rupes Cauchy, two volcanically formed features that while superficially appearing similar, are two different types of geologic feature, thus underscoring the volcanic nature of the region. Rima Cauchy, north of 13-kilometer-wide Cauchy crater, is a graben, or land that slumped between parallel faults created by the upward thrust of a volcanic dyke. Spanning 180 kilometers in length and up to three kilometers wide in places, Rima Cauchy is only about 50 meters deep. South of Cauchy crater lies 170-kilometer-long Rupes Cauchy, a scarp that drops 300 meters from north to south and formed by collapse on one side of a fault line. Two prominent volcanic domes lie south of Rupes Cauchy and six more extend to the west. Further evidence of the regional volcanism is seen in the ghost craters Aryabhata and Maskelyne F dotting the image lower center.

Robert Reeves is the author of Photographic Atlas of the Moon, released by Firefly Books on September 1, 2024, and available in book stores and Amazon.

Lunar Topographic Studies

Does Mare Tranquillitatis Lie in a Basin?

That’s No Moon

Gregory T. Shanos

The Blue Supermoon occurred at 2:26 p.m. EDT (18h 26m UT) on Monday, August 19, 2024, when the moon was 100% fully illuminated. However, it was daytime from my location and the moon had not yet risen. This image was taken on August 19, 2024 at 11:48pm local time or August 20, 2024 at 3h 48m UT when the moon was full at 99.7% phase and only 37°above the horizon. The seeing was rather good however, the transparency was only average through thinning clouds and haze. This was the orientation of the moon as it was rising. A Meade 60mm 260mm f/4 refractor was tracking the moon on an inexpensive Orion EQ equatorially mounted tripod. A ZWO ASI 178MM monochrome camera using Firecapture v2.7.14 to acquire the video using an MSI GF 65 gaming computer. The SER video file was processed using Autostakkert 4.0.11 beta and Registax 6.1.08. Further sharpening and processing in Photoshop CS4. Image by Gregory T. Shanos, Longboat Key, Sarasota, Florida.

“That’s no Moon” said Obi Wan Kenobi when he first saw the Death star in Star Wars- A New Hope. Well, this is no “ordinary” moon; it is a rare blue supermoon moon!

On average the moon is 238,855 miles (384,400 km) from Earth. Since its orbit is elliptical, at its farthest point, known as apogee, the moon is 252,088 miles (405,696 km) distant. At its closest point, or perigee, the moon is 225,623 miles (363,105 km) away.

A supermoon refers to any full moon that occurs when the moon is within 90% of its closest approach to Earth. The supermoon is 7% larger and 14% brighter than a typical full moon. Another reference states that a supermoon can appear up to 14% larger and 30% brighter compared to a typical full moon. I state both references for completeness. Either way, a supermoon is both larger and brighter than a typical full moon.

A supermoon requires two key alignments to occur. The moon needs to be at its closest approach, or perigee, to the Earth in its orbit. The moon also needs to be at full phase, which happens every 29.5 days when the sun fully illuminates the moon. Therefore, supermoons can only happen a few times a year because the moon's orbit changes orientation while the Earth orbits the sun – that is why we don't see a supermoon every month. Serendipitously, there will be four supermoons in a row this year on August 19th, September 17th, October 17th, and November 15th. See figure 1. I intend to observe and image all of them weather permitting.

What is a blue moon? Blue in this case does not refer to color. There are two types of blue moons: seasonal and monthly. A seasonal blue moon occurs when there are four full moons in a single season (on this occasion, summer). When this happens, the third of the four is considered a blue moon. The second definition, which arose from a misunderstanding of the original, is the monthly blue moon, referring to the second full moon in a single calendar month. The August 19, 2024 blue moon is of the seasonal variety. The next monthly Blue Moon occurs on May 31, 2026. After that, there will not be another Blue Supermoon Moon (under the seasonal definition) until Aug. 20, 2032.

To paraphrase Obi Wan Kenobi: That's no ordinary moon- it's a Blue Supermoon!

Figure 1: According to data from Fred Espenak's guide, the four supermoons of 2024 will be as follows:

Name	**Date and time**	**Distance from Earth**
Sturgeon Moon	Aug. 19 at 2:26 p.m. ET (1826 GMT)	224,917 miles (361,970 km)
Harvest Moon	Sept. 17 at 10:34 p.m. ET (0234 GMT on Sept 18)	222,131 miles (357,486 km)
Hunter's Moon	Oct. 17 at 7:26 a.m. ET (1126 GMT)	222,055 miles (357,364 km)
Beaver Moon	Nov. 15 at 4:29 p.m. ET (2129 GMT)	224,853 miles (361,867 km)

References:
Daisy Dobrijevic *Supermoon: what is it and when is the next one?* August 13, 2024 Space.com

Doyle Rice *Monday's rare super blue moon is a confounding statistical marvel* USA TODAY August 17, 2024

Daisy Dobrijevic *Why is a 'once-in-a-decade' Supermoon Blue Moon happening twice in 2 years?* August 17, 2024 Space.com

Carlyn Kranking *A Rare 'Super Blue Moon' Will Be Visible Monday Night: What Does That Mean?* Space.com August 17, 2024

Daisy Dobrievic *The Supermoon Blue Moon is coming. Here's what to expect.* Space.com August 18, 2024

Daisy Dobrievic *The Supermoon Blue Moon rises today. Here's what to expect.* Space.com August 19, 2024

Daust Dobrijevic *Supermoon Blue Moon 2024: Top photos from around the world* Space.com August 20, 2024

Lunar Topographic Studies
That's No Moon

The Mound Area East of Cyrillus

Alberto Anunziato

One of the areas of the near side of the Moon that interests me the most is the solitary, unnamed wrinkle ridge running between Beaumont and the east wall of Theophilus, which is part of one of the inner rings of the Nectaris basin, inside Mare Nectaris. In the July 2022 (“Some details on a wrinkle ridge in Mare Nectaris) and June 2023 (“The topography of an irregular wrinkle ridge in Mare Nectaris”) issues we dealt in some detail with its topographic components and highlighted the peculiarity that there was what seemed to be a parallel elevation that looked, quite evidently, like a second ridge, to the east. This second ridge is not included in the LRO Quickmap wrinkle ridge catalogue, and it would actually be a series of small elevations in a rather irregular relief, as we argued in “A true wrinkle ridge and a false one” of May 2023. Now, as we will see in the following images (most of which belong to said texts) it is extremely interesting how this area on the western shore of Mare Nectaris changes its appearance with the illuminations and the resolving power of the observation instruments. With this fourth text I intend to close this little obsession, starting from discovering the geological definition of this area, while I was documenting myself for the writing of the text on Mare Nectaris in the Focus-On Section of the July 2024 issue. **IMAGE 1** corresponds to my last observation of the area, as you will see a second elevation that runs between Beaumont N and Theophilus that casts a thin shadow and reflects a little sunlight on its eastern edge.

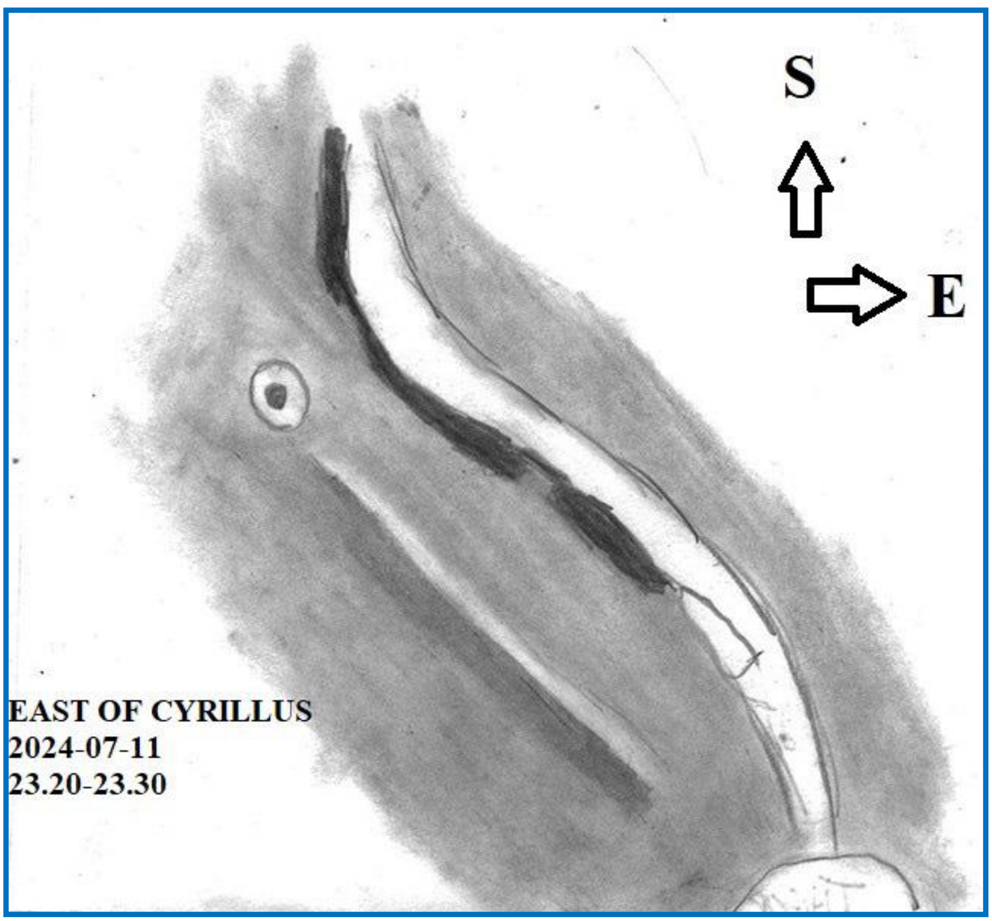


***Image 1, Mare Nectaris**, Alberto Anunziato, Paraná, Argentina . 2024 July 11 23:20-23:30 UT. Meade EX105 Maksutov-Cassegrain telescope, 154x.*

This is what can be seen in **IMAGE 2** (which belongs to Diego Ferradans, whom we pay tribute to and miss for his recent death), a much gentler and less steep elevation. Now, if we look at **IMAGE 3**, which belongs to the Photographic Lunar Atlas for Moon Observers by Kwok Pau, page 176 (Volume 1), we recognize (thanks to the oblique illumination) a very tortuous relief to the east of the wrinkle ridge (of which we only see the upper part), elevations wide enough to have craters on their upper part, separated by gorges. Looking a little more closely, there seems to be a pattern of shadows within that chaotic relief, which we mark with arrows, and which, seen with less resolution through my small telescope, may seem like an elevation that is nothing more than a simplification of that chaos, like IMAGE 1.

Image 2, Theophilus, *Diego Ferradans, Villa María, Argentina. 2020 March 29 22:18 UT. 200 mm Newtonian reflector telescope, Xiaomi Redmi Note 7 camera.*

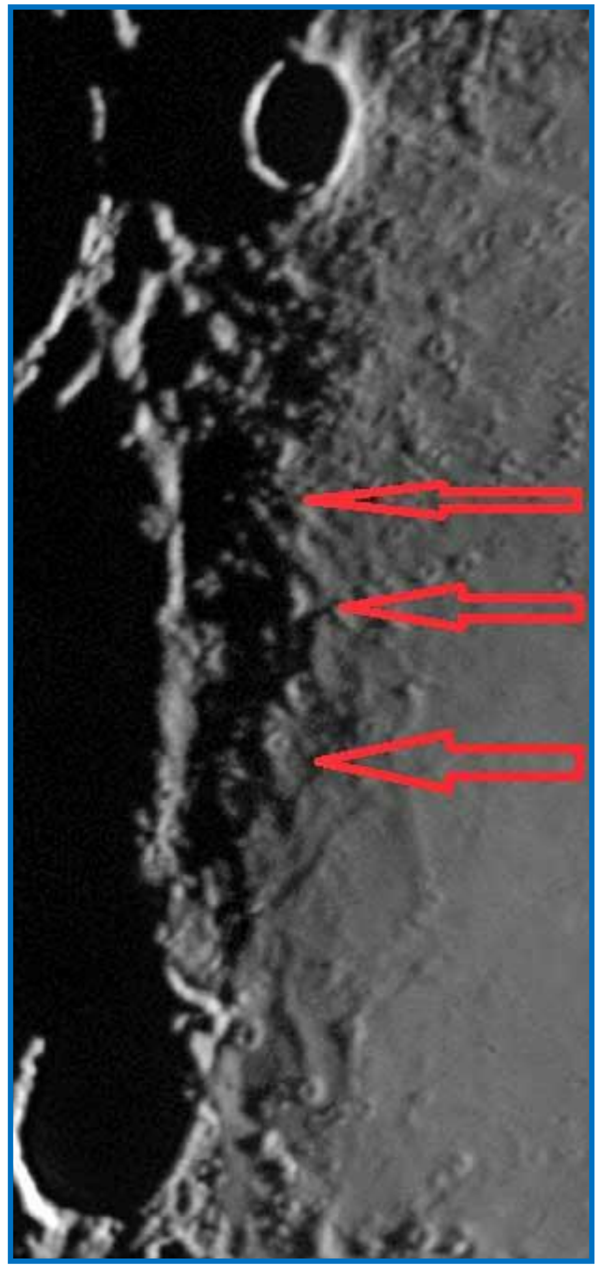


Image 3, Mare Nectaris, *Photographic Lunar Atlas for Moon Observers by Kwok Pau, page 176 (Volume 1).*

Now, in the May 2023 text I referred to **IMAGE 4** and my record of how “the parallel height shines less intensely and casts a less dark and peaked shadow, as if said parallel height were composed of small elevations. In my observation notebook I noted that it seemed as if there were “crumbling rocks” at the foot of the height. I know, it would be impossible to observe that level of detail, but that was the appearance.”

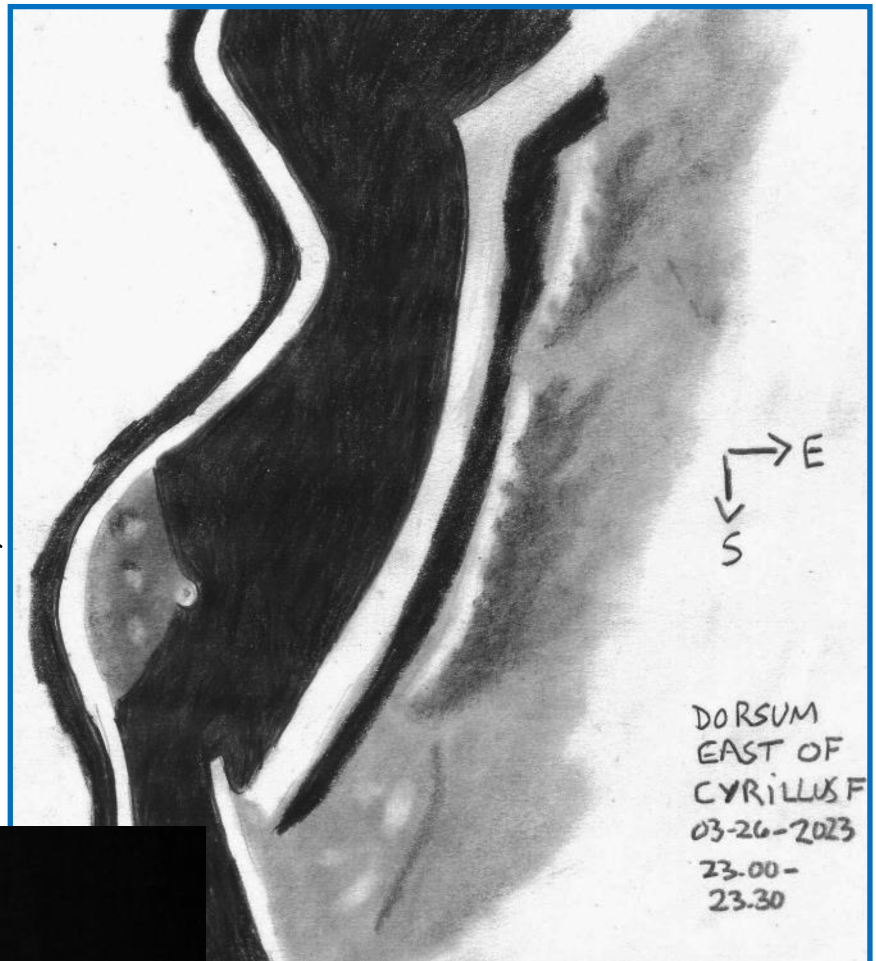


***Image 4, Mare Nectaris**, Alberto Anunziato, Paraná, Argentina . 2023 March 26 23:00-23:30 UT. Meade EX105 Maksutov-Cassegrain telescope, 154x.*

Reading about Mare Nectaris, as I said, for the Focus-On sections, I found an image of the zone by the Apollo 16 mission (**IMAGE 5**). Theophilus is the crater in shadows in the center. According to Paul Spudis (The Geology of Multi-Ring Impact Basins, Cambridge University Press, Cambridge, 1993, page 178): “The morphology of basin deposits is controlled by the energy of its environment of deposition. Near the rim of the basin, late -stage excavation is low-energy and units display hummocky, dune-like morphology”, which is precisely the description of this zone, near the edge of the basin, east of Cyrillus. In the “Apollo 16 Preliminary Science Report”, published by NASA in 1972, our zone is referred as a geological unit of “hummocky material”: “Elston suggested two possibilities, volcanic or basin-related material. The Apollo 16 photographs convincingly favor the second interpretation. The unit resembles the sharply hummocky material that occurs mainly between the Rook and Cordillera rings of Orientale Basin and in radial toughs on and beyond Montes Cordillera (…) The origin of this material remains uncertain: it may be basin ejecta, bedrock fractured during basin formation, or slump material, but almost certainly is related to the formation of the Nectaris Basin” (page 507).

***Image 5, Theophilus,** Apollo 16.*

The area marked with an arrow in the Apollo 16 image is within the mounds area and there seems to be a kind of elevation that, if we zoom in, becomes much less evident. That is, with lower resolution the visual data are arranged in the image of an elevation (which objectively exists, as can be verified with the data from the LOLA altimeter of the Lunar Reconnaissance Orbiter Quickmap), while if the resolution is increased the true geological nature of the area appears, an area of dunes generated by the material ejected when the Nectaris basin was formed. This is confirmed by what is actually the best image of the area (**IMAGE 6** and its detail **IMAGE 7** (by Sergio Babino from Uruguay), which we used previously, but which, with what we learned at Spudis and in the Apollo 16 Report, is much better interpreted (it is impressive how sharp it is). Finally, we can conclude that within this chaotic area of mounds related to the distant formation of the Nectaris basin, there is an elevated area that looks like a miniature ridge. What is incredible is that, with a small telescope, near the terminator, one can observe such a geologically interesting area, with such small topographic units and of such geological age.

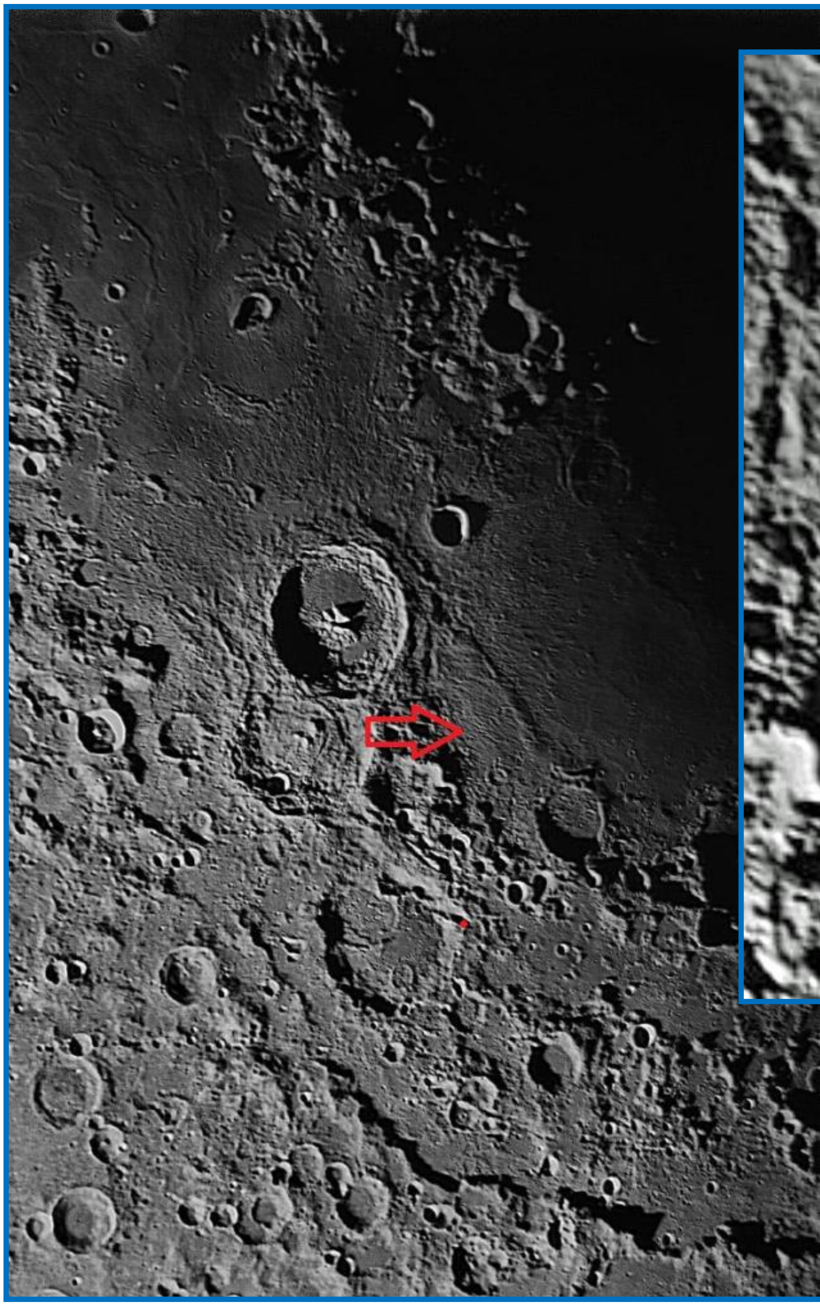


Image 6 (left) and image 7 (above), Theophilus, *Sergio Babino, Montevideo, Uruguay, SLA-LIADA. 2020 March 14 04:49 UT. 203 mm catadrioptic telescope, ZWO ASI174MM camera. Image 7 is a close-up of image 6.*

Lunar Conjunction of Saturn

Gregory T. Shanos

A lunar conjunction of Saturn was visible on August 20, 2024, from the continental United States. The sky conditions were less than ideal with thinning and thickening clouds obscuring the view throughout the night. However, I was successful in imaging the conjunction with the ZWO Seestar S50 smart scope. Overall, the event was a success.

Focus On: Archimedes and Eudoxus: Similar and Different

Alberto Anunziato

This time, the Focus-On Section deals with an area which border with features we have previously visited in previous months, such as Mare Frigoris and Lacus Mortis. Several images will be repeated, in which this duo of similar, but different, craters appear: "Aristoteles (87 km) and Eudoxus (67 km) form a prominent duo striking to observe through any telescope. The pair are visible whenever they are illuminated by the Sun, even through binoculars, since both take the form of well-defined light-colored rings under a high illumination" (Grego). **IMAGES 1 to 4**.

Image 1, Aristoteles, *Desiré Godoy, Oro Verde, Argentina. 2019 November 08 01:36 UT. 200 mm Newtonian reflector telescope, QHY5-LII-M camera.*

Image 2, Mare Tranquillitatis, *David Teske, Louisville, Mississippi, USA. 2024 June 14 02:31 UT, colongitude 355.8º. 127 mm refractor telescope, 1.5x barlow, IR block filter, ZWO ASI120MM/S camera. Seeing 8/10.*

Focus On: Lunar Topographic Studies

Aristoteles and Eudoxus: Similar and Different

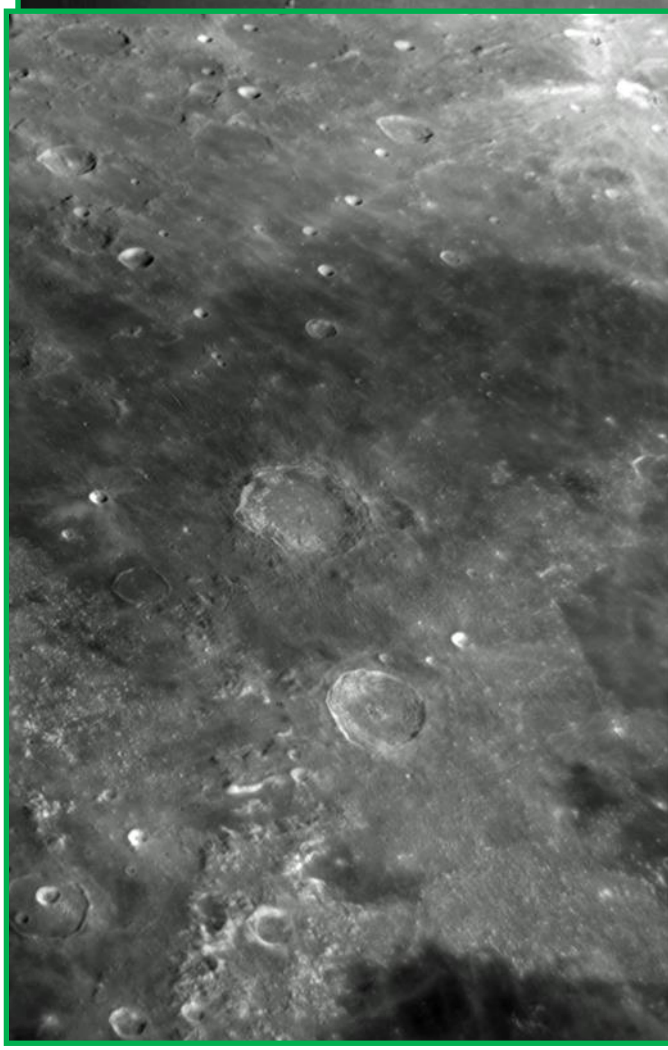


Image 3, Plato, Aristoteles and Eudoxus, *Fernando Surá, San Nicolás de los Arroyos, Argentina. 2022 January 12 01:50 UT. 127 mm Maksutov-Cassegrain telescope, CPL Sbony filter, Canon Rebel T7i reflex camera.*

Image 4, Aristoteles, *Francisco Alsina Cardinalli, Oro Verde, Argentina. 2024 July 14 23:12 UT. 203 mm Newtonian reflector telescope, IR Pass SvBony SV183 685nm filter, QHY5L-II-M camera.*

Wood (2004) calls them Frigid Buddies, since they are two of the largest young craters in the north region of the near side of the Moon and are located on the eastern edge of Mare Frigoris. We said that they are similar and different. Let's look at the similarities first. Both have terraced walls, hilly floors with smooth material, perhaps impact melt **(IMAGES 5 to 10).**

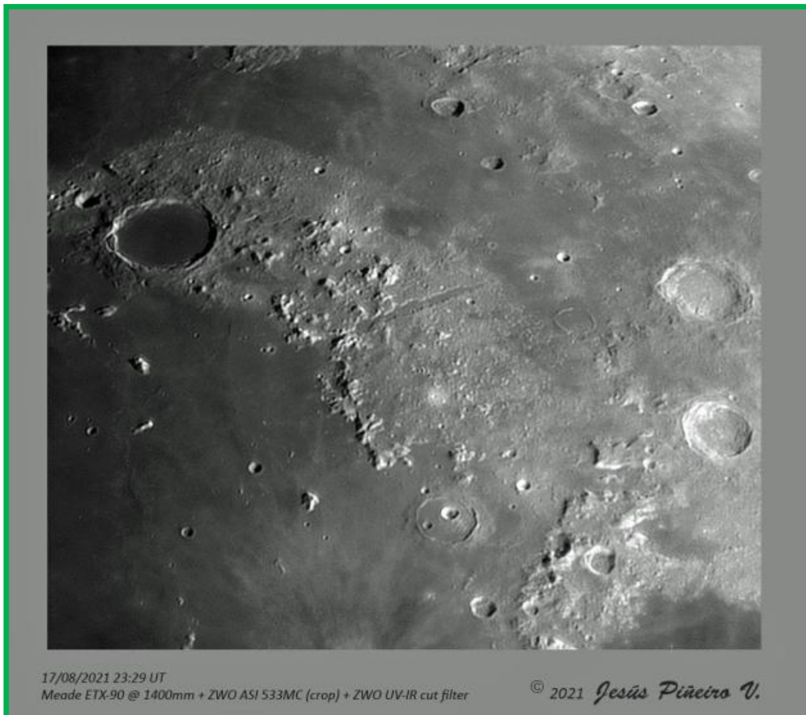


Image 5, Plato, *Jesús Piñeiro, San Antonio de los Altos, Venezuela. 2021 August 17 23:29 UT. 90 mm Maksutov-Cassegrain telescope, Astronomik L2 UV-IR cut filter, ZWO ASI 533 MC camera.*

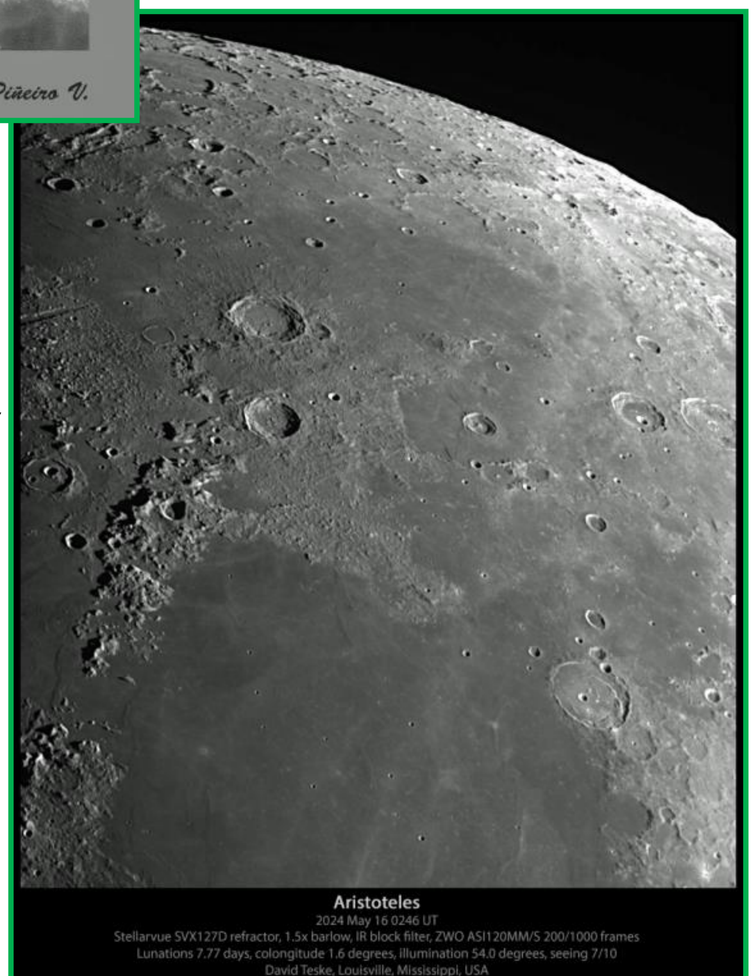


Image 6, Aristoteles, *David Teske, Louisville, Mississippi, USA. 2024 May 16 02:46 UT, colongitude 1.6º. 127 mm refractor telescope, 1.5x barlow, IR block filter, ZWO ASI120MM/S camera. Seeing 7/10*

Focus On: Lunar Topographic Studies

Aristoteles and Eudoxus: Similar and Different

__Image 7, Aristoteles__, Larry Todd, Dunedin, New Zealand. 2021 November 12. OMC 8 inch Maksutov-Cassegrain telescope

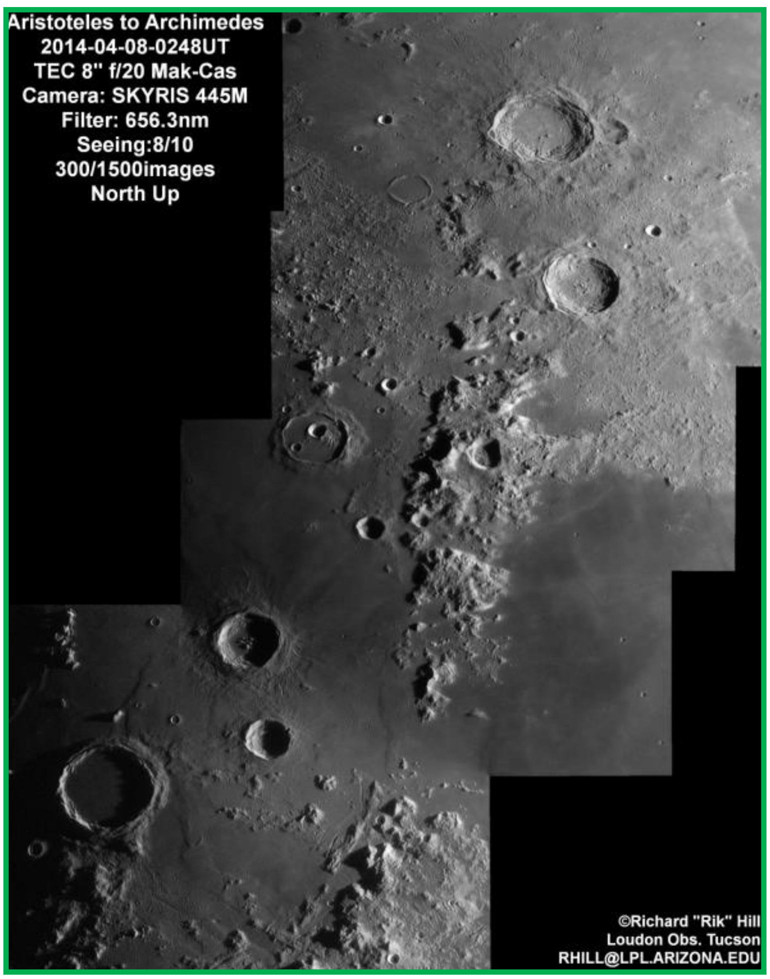


__Image 8, Aristoteles to Archimedes__, Richard Hill, Loudon Observatory, Tucson, Arizona, USA. 2014 April 08 02:48 UT. TEC 8 inch f/20 Maksutov-Cassegrain telescope, 656.3 nm filter, SKYRIS 445M camera. Seeing 8/10.

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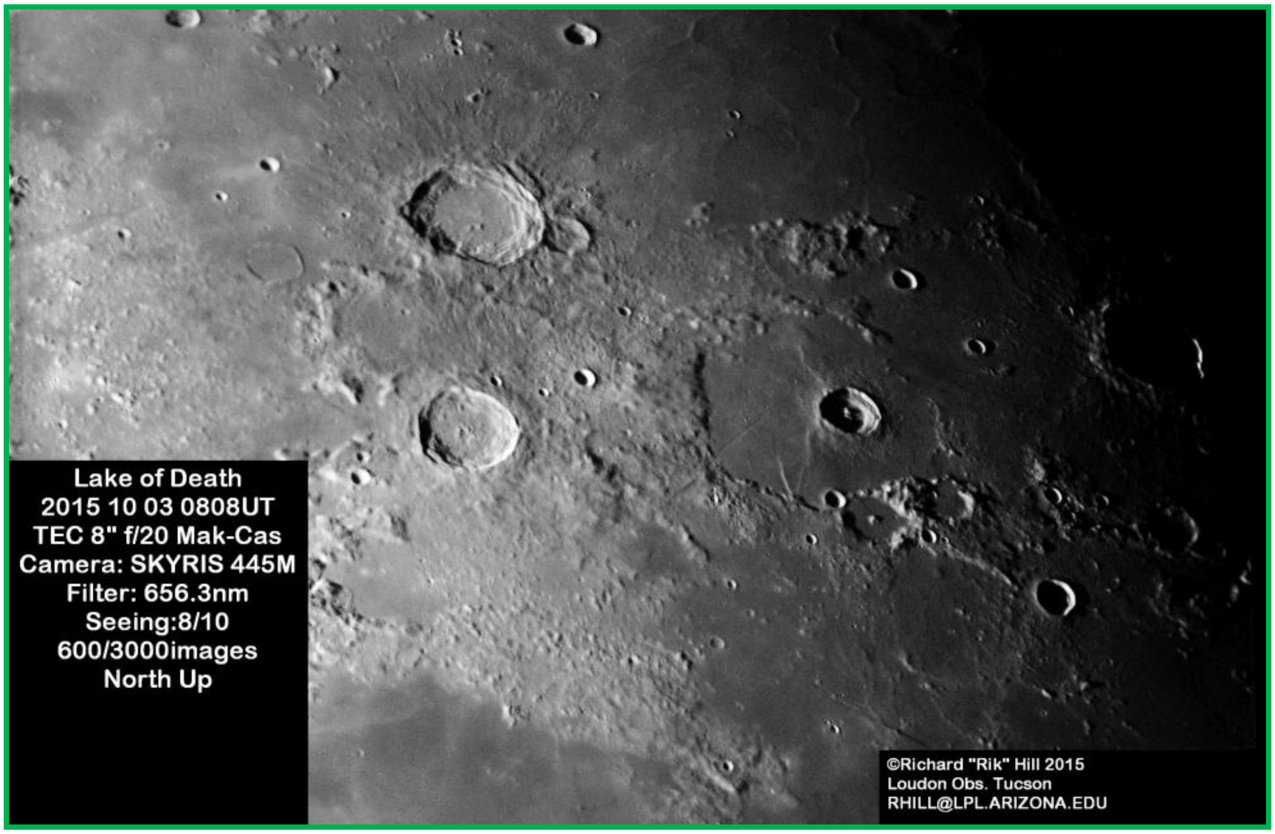


***Image 9, Lake of Death**, Richard Hill, Loudon Observatory, Tucson, Arizona, USA. 2015 October 03 08:08 UT. TEC 8 inch f/20 Maksutov-Cassegrain telescope, 656.3 nm filter, SKYRIS 445M camera. Seeing 8/10.*

***Image 10, Eudoxus and Aristoteles Sunset**, Eduardo Horacek, Mar del Plata, Argentina. 2024 January 30 07:57 UT. 150 mm Maksutov-Cassegrain telescope, Canon EOS Rebel T5i camera.*

Focus On: Lunar Topographic Studies
Aristoteles and Eudoxus: Similar and Different

Seeing these images, one question arises: "Which is youngest? The larger crater has radial ejecta and secondary craters on nearby Mare Frigoris (…) Because Eudoxus formed on rubbly Imbrium ejecta, its secondary craters are harder to recognize. The US Geological Survey assigns Eudoxus a stratigraphic age of Copernican, whereas Aristoteles is Eratosthenian. This means that Eudoxus is younger than 1.1 billion years old, and Aristoteles is somewhere between 1.1 and 3.2 b.y. old. Since both craters have about the same number of superposed (subsequent) impact craters, the two craters must be very near the Copernican-Eratosthenian boundary, with one slightly older and the other slightly younger" (Wood, 2004). That is to say, our craters are very close in time, geologically speaking.

Let's start with the largest and oldest, Aristoteles. Peter Grego lists the main characteristics of Aristoteles: "slightly polygonal outline". As seen in **IMAGES 11 and 12**, the east wall is the most rounded, the north and south walls are fairly straight, and the edge of the west wall appears to be two intersecting straight lines, although the interior terraces soften the design. "Broad inner walls that display some of the most extensive terracing in any crater on the Moon", as we can see in **IMAGES 13 to 15**.

Image 11, Vallis Alpes, *Marcelo Mojica Gundlach, Cochabamba, Bolivia, SLA. 2020 April 30 23:30 UT. 6 inch Skywatcher Maksutov-Cassegrain telescope, ZWO ASI 178B/W camera.*

Image 12, Eudoxus, *Francisco Alsina Cardinalli, Oro Verde, Argentina. 2018 October 15 23:47 UT. 203 mm Newtonian reflector telescope, QHY5L-II-M camera.*

Focus On: Lunar Topographic Studies

Aristoteles and Eudoxus: Similar and Different

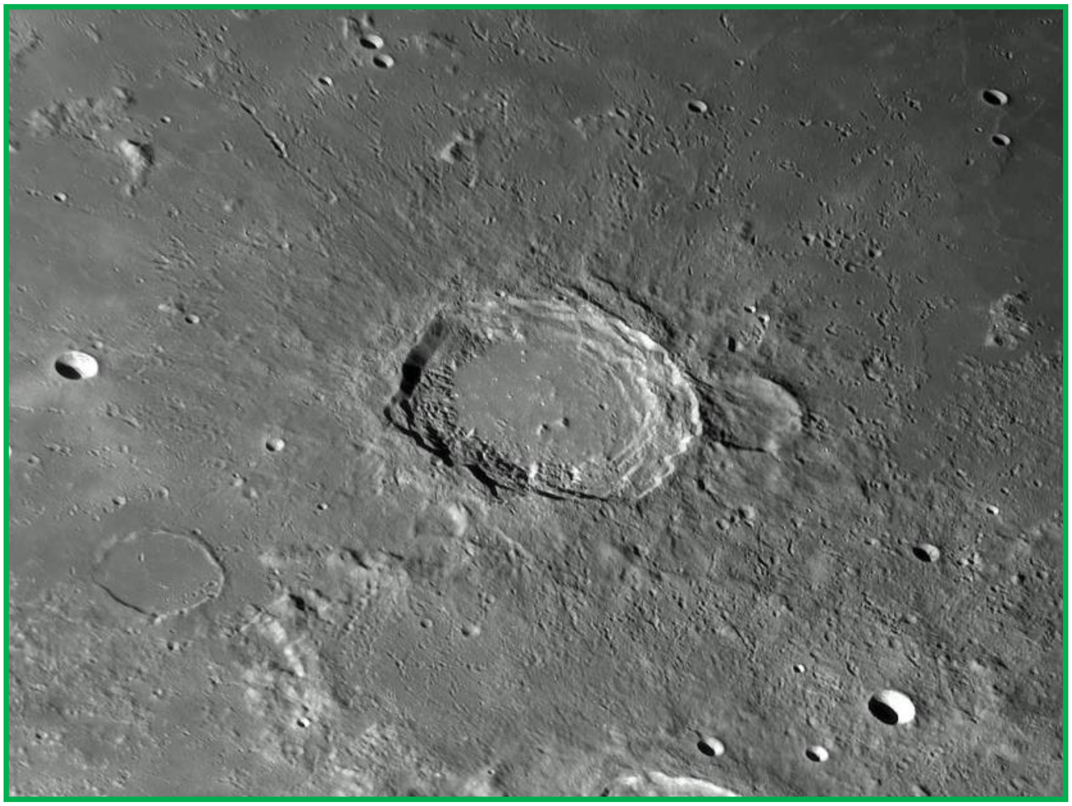
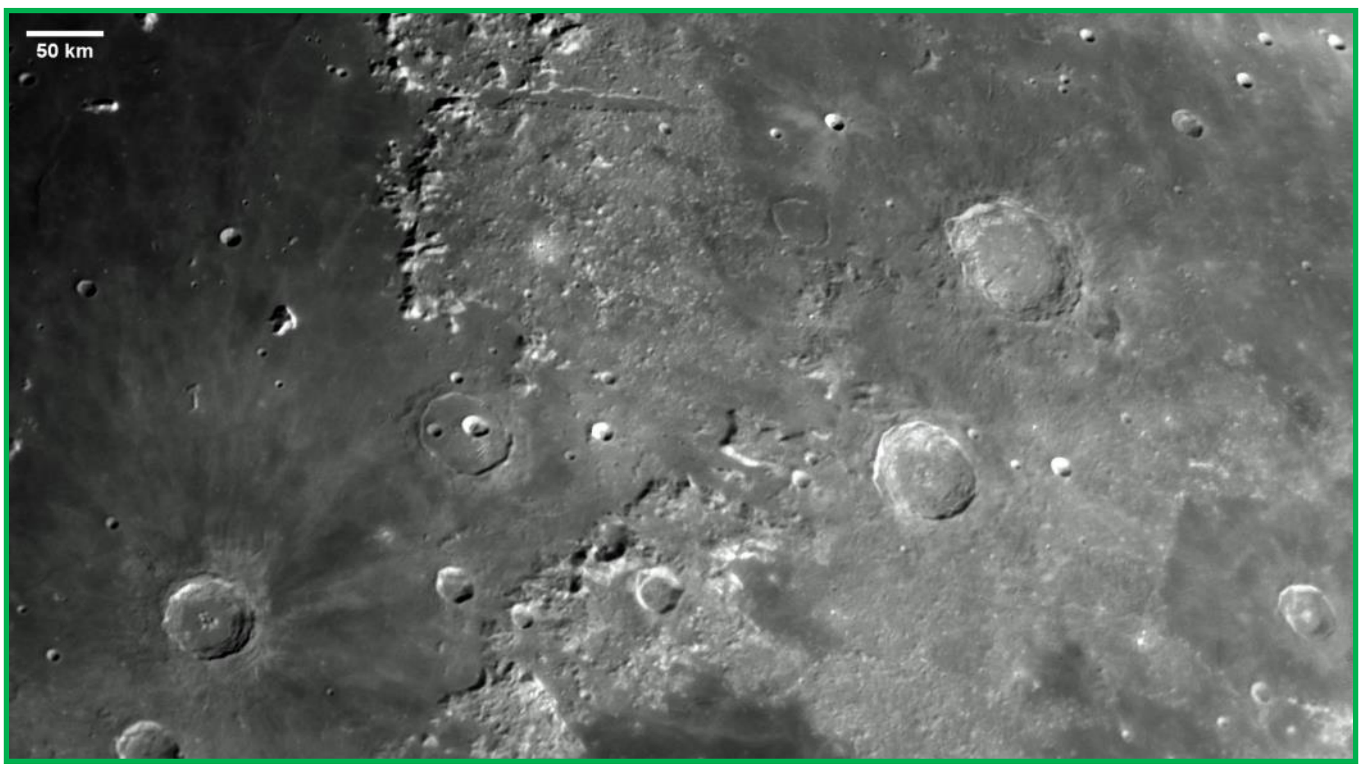


Image 13, Aristoteles, *Jon Bosley, White Dwarf Observatory, Centra Texas, USA. 2024 June 25 04:30 UT. 457 mm reflector telescope, 3.5x barlow, 610 nm filter, Player One Apollo-mini 429 camera.*

Image 14, Aristillus, Cassini, Montes Caucasus, Eudoxus and Aristillus, *Ariel Cappelletti, Córdoba, Argentina, SLA. 2020 October 26 23:40 UT. 254 mm Newtonian reflector telescope, QHY5III 462C camera.*



Focus On: Lunar Topographic Studies
Aristoteles and Eudoxus: Similar and Different

***Image 15, Aristoteles,** Francisco Alsina Cardinalli, Oro Verde, Argentina. 2022 October 03 01:50 UT. Celestron 11 inch Schmidt-Cassegrain telescope, 685 nm filter, QHY 5L-II M camera.*

Looking at the wonderful images provided by our observers, I was able to notice for the first time a peculiarity of the interior walls of Aristoteles: the terraces are asymmetrical: the east wall has wide, gently sloping terraces, the north and south walls are similar but with narrower terraces, and the west wall presents a rather chaotic panorama, with a considerable difference in height between the edge and the lower terraces. This would indicate a process of collapse, which would be confirmed by the triangular cut observed in the center of the west wall, similar to Plato's famous triangle **(IMAGE 16):** "The rim crests are scalloped with a plateau on the southwestern rim" (Garfinkle). In this regard, says Charles Wood (2005): "The wall of Aristoteles varies from place to place. In the south it exhibits a classic set of five or so terraces that step down all the way to the floor. On the west (left) there is a single large scarp and a jumble of hills, really mountains, below. The eastern wall is obviously affected by the overlapped crater Mitchell". In The Modern Moon, Woods, confirm our impressions: "Aristoteles' rim is clear-cut, and displays a scalloped effect (seen in many other large-impact craters of a similar size) caused by large units of rock that have broken away from the wall and slid down it to some extent".

***Image 16, Aristoteles**, Richard Hill, Loudon Observatory, Tucson, Arizona, USA. 2008 June 11 03:07 UT. Celestron 14 inch Schmidt-Cassegrain telescope, 2x barlow, UV/IR block filter, SPC900NC camera. Seeing 8/10.*

We continue with the description of Peter Grego: “The crater’s floor is depressed below the mean level of the surrounding terrain (…) relatively smooth, apart from two mountain peaks that protrude from its southern floor”. The two strangely small and off-center peaks inside Aristoteles can be seen in **IMAGE 16**. Here's how Elger describes them: “peaks, rising to nearly 11,000 feet above the floor, one of which on the E., pertaining to a terrace, stands out as a brilliant spot in the midst of shadow when the interior is filled with shadow”. If we look at **IMAGES 17 to 19** we can confirm what Elger says: **IMAGE 17** shows that the central peaks are not very high (nor can they be seen), **IMAGE 18** shows the highest point inside Aristoteles, indicated by Elger, on the eastern terrace, and **IMAGE 19**, with the Sun a little higher, already shows the central peaks.

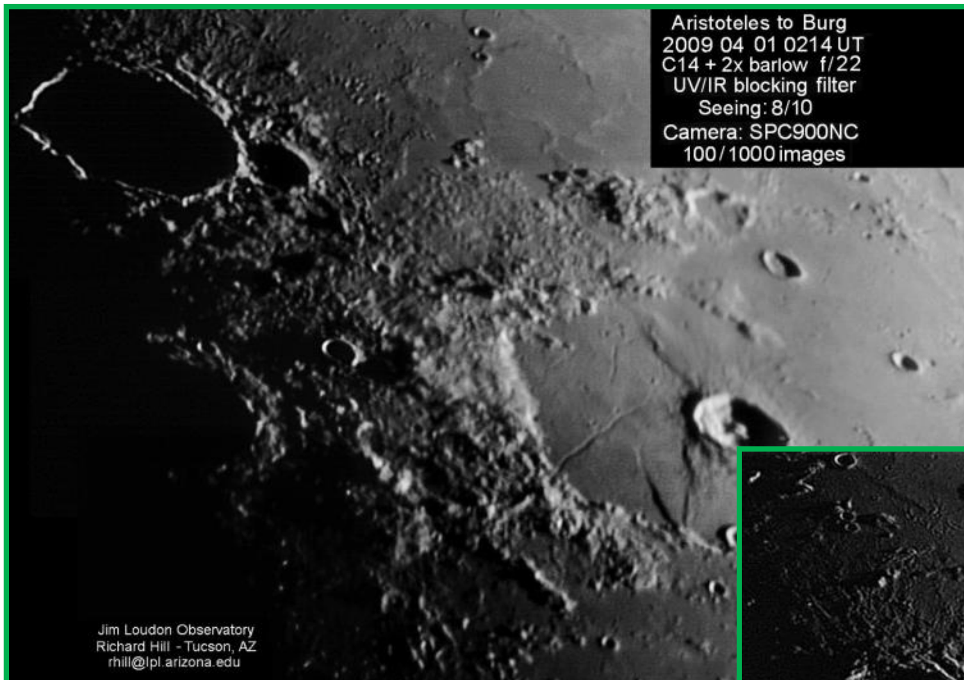


Image 17, Aristoteles to Bürg*, Richard Hill, Loudon Observatory, Tucson, Arizona, USA. 2009 April 01 02:14 UT. Celestron 14 inch Schmidt-Cassegrain telescope, 2x barlow, UV/IR block filter, SPC900NC camera. Seeing 8/10.*

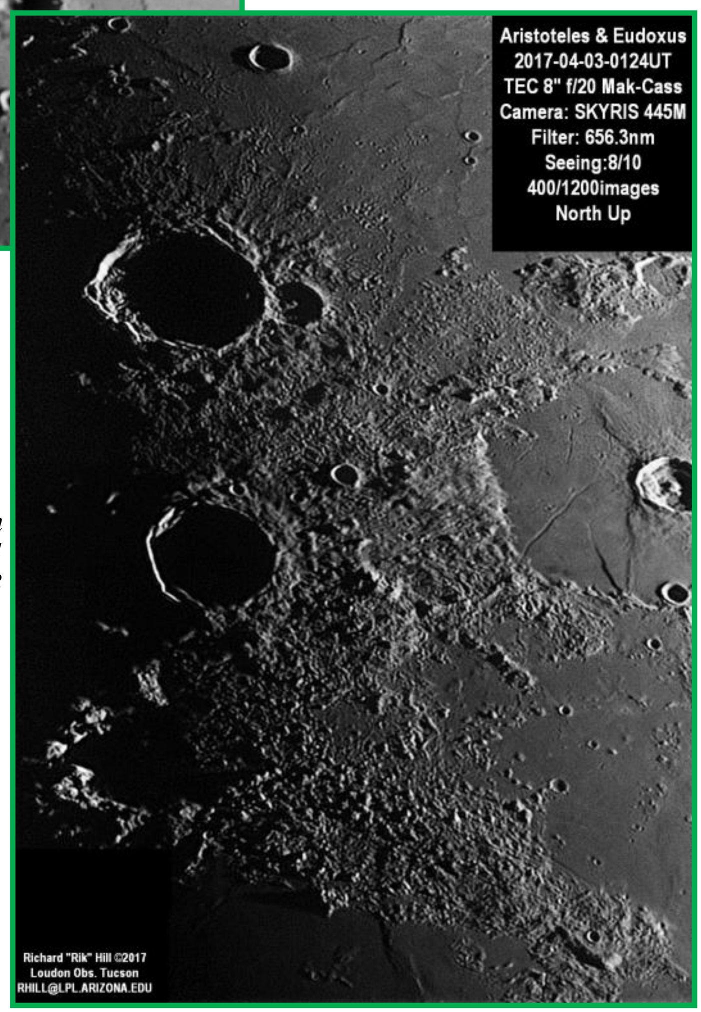


Image 18, Aristoteles and Eudoxus*, Richard Hill, Loudon Observatory, Tucson, Arizona, USA. 2017 April 03 01:24 UT. TEC 8 inch f/20 Maksutov-Cassegrain telescope, 656.3 nm filter, SKYRIS 445M camera. Seeing 8/10.*

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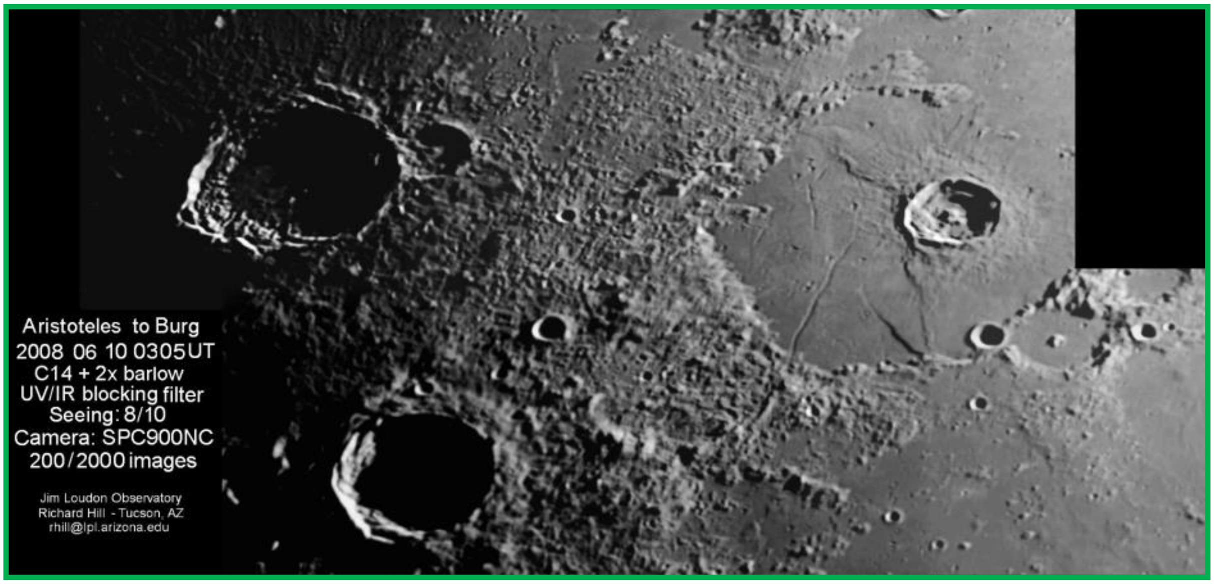

Image 19, Aristoteles to Bürg*, Richard Hill, Loudon Observatory, Tucson, Arizona, USA. 2008 June 10 03:05 UT. Celestron 14 inch Schmidt-Cassegrain telescope, 2x barlow, UV/IR block filter, SPC900NC camera. Seeing 8/10.*

Without a doubt, Aristoteles is not the typical Copernican crater because of how its interior looks. In "The Personal Moon", Wood classifies it as a Triesnecker-Type crater: "With a diameter of 87 km Aristoteles is a Tycho-type crater, but its interior looks more like a Triesnecker-style crater--instead of a strong central peak it has only a scattering of small hills. The rim of Aristoteles seems to be a combination of slumps and terraces as if the crater were a transition between the Triesnecker and Tycho types". Remember that a Triesnecker-Type crater is, according to the web www.the-moon.us : "scalloped-walled craters typically 15-50 km in diameter, with sub-angular or scalloped outline; broad often roughly concentric slump masses in wall with flat floor partially or completely obscured by slumped material; prototype Triesnecker". Wood's description can be seen, in different lighting, in **IMAGES 20 and 21**.

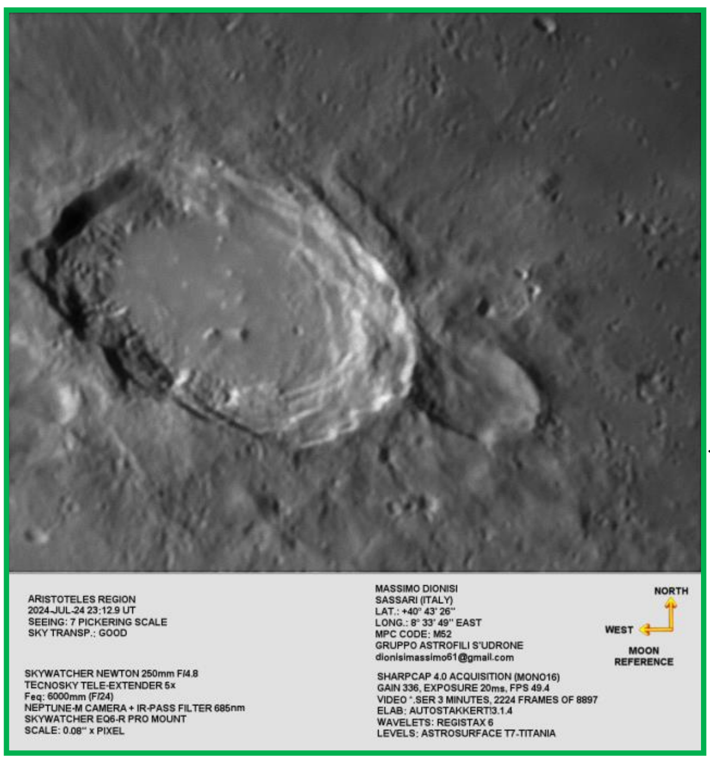

Image 20, Aristoteles, *Massimo Dionisi, Sassari, Italy. 2024 July 24 23:12 UT. 10 inch f/4.8 reflector telescope, Tecnosky Tele-extender 5x, efl 6000 mm, IR pass 685 nm filter, Neptune M camera. Seeing 7/10 Pickering Scale, transparency good.*

Image 21, Aristoteles, *Massimo Dionisi, Sassari, Italy. 2024 July 27 00:14 UT. 10 inch f/4.8 reflector telescope, 3x barlow, efl 3600 mm, IR pass 685 nm filter, Neptune M camera. Seeing 6/10 Pickering Scale, transparency good.*

In **IMAGE 21** we have a close-up of another of the features related to the relative youth (in geological terms) of Aristoteles: the chains of secondary craters and ridges radial to the main crater. Says Woods: "Under morning or evening illumination, a broad flange of impact structuring can be discerned in the crater's vicinity, this taking the form of a mass of radial ridges that extend from the rim to distances of up to 100 km" (**IMAGES 22 TO 26**).

Image 22, Aristoteles, *David Teske, Louisville, Mississippi, USA. 2023 November 20 00:04 UT, colongitude 352.6°. 60 mm refractor telescope, 1.5x barlow, IR block filter, ZWO ASI120MM/S camera. Seeing 8-9/10.*

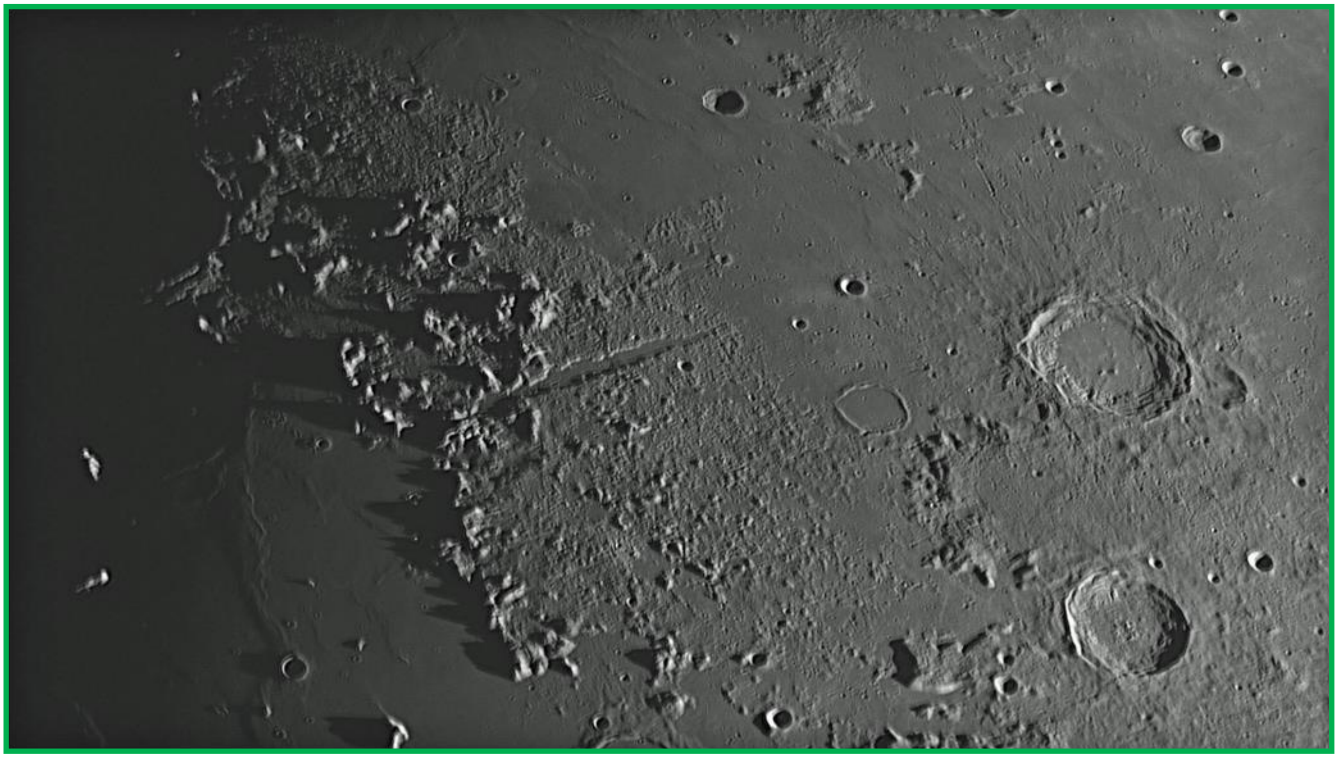

***Image 23, Aristoteles**, Larry Todd, Dunedin, New Zealand. 2022 October 03 09:18 UT. OMC 8 inch Maksutov-Cassegrain telescope.*

***Image 24, Eudoxus and Aristoteles**, Eduardo Horacek, Mar del Plata, Argentina. 2021 November 11 23:25 UT. 150 mm Maksutov-Cassegrain telescope, Canon EOS Rebel T5i camera. North is down, west is right.*

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Image 25, Plato, *Alberto Anunziato, Paraná, Argentina. 2020 September 27 00:06 UT. 180 mm Newtonian reflector telescope, QHY5-II camera.*

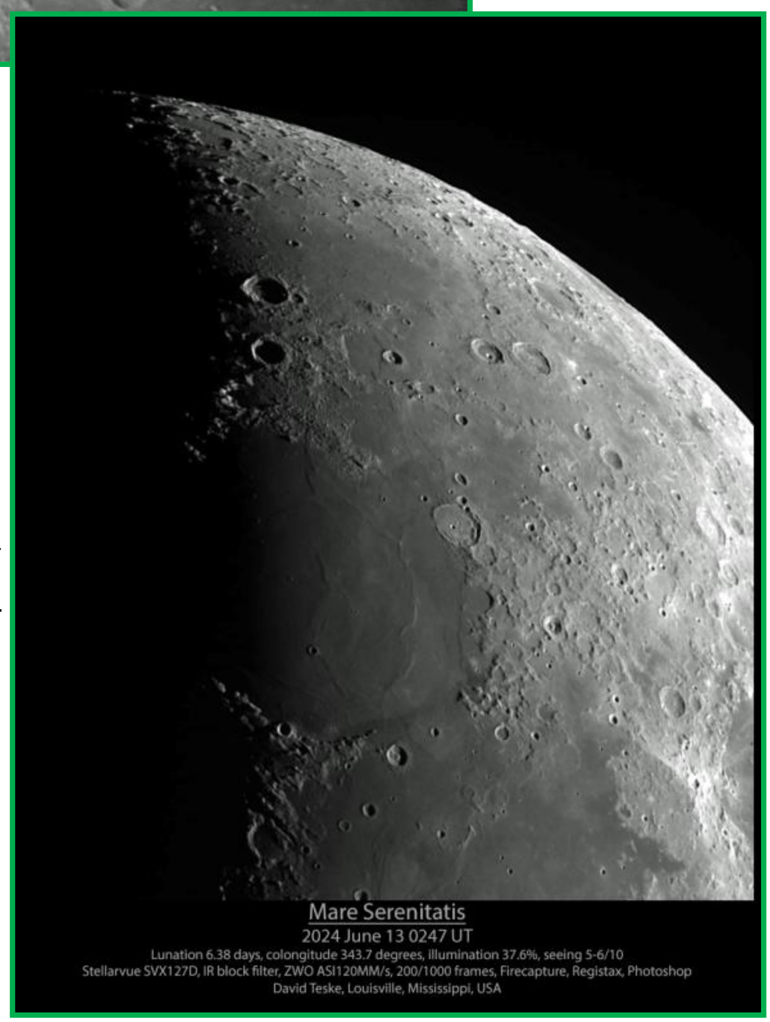

Image 26, Mare Serenitatis, *David Teske, Louisville, Mississippi, USA. 2024 June 13 02:47 UT, colongitude 343.7^{o}. 127 mm refractor telescope, 1.5x barlow, IR block filter, ZWO ASI120MM/S camera. Seeing 5-6/10.*

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This ejecta structure is asymmetrical: "Aristoteles has a wonderful field of aligned secondary craters to its north, but not many to the south" (Woods, 2007), as we can see in **IMAGES 27 and 28,** because of the later impact that formed Eudoxus. "Buried within this structure on the crater's eastern wall is Mitchell (30 km), a crater that predates Aristoteles and a good example of a smaller crater that is overlapped by a larger crater" (Wood, 2005). "good example of a smaller crater that is overlapped by a larger crater" (Wood, 2005). **IMAGES 29 and 30** illustrate very well the strange way in which Mitchell was pressed by the subsequent impact of Aristoteles. This is how Garfinkle describes Mitchell: "To the east of the crater Aristoteles is the partly overlain Imbrian-age crater Mitchell. The crater is about 32.15 km (19.97 miles) in diameter and 1040 m (3412 feet) deep. The western half of the crater is buried under the eastern wall and ejecta blanket of Aristoteles. The rugged floor is heavily pockmarked with bright Aristoteles secondary craters".

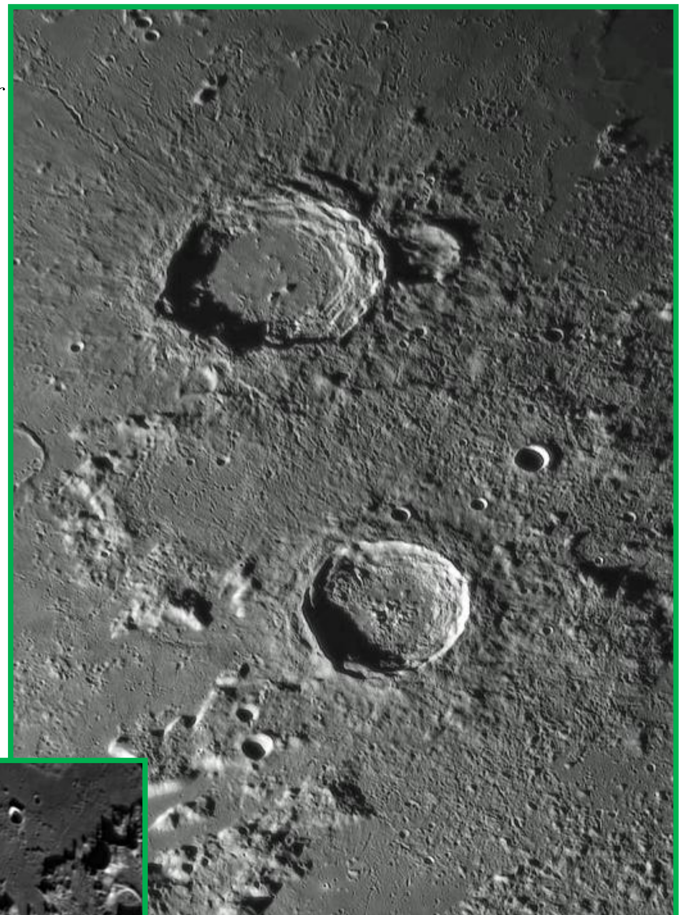

***Image 27, Aristoteles and Eudoxus**, Jon Bosley, White Dwarf Observatory, Centra Texas, USA. 2022 June 19 09:17 UT. 457 mm reflector telescope, 3x barlow, 610 nm filter, Player One Apollo-mini 429 camera.*

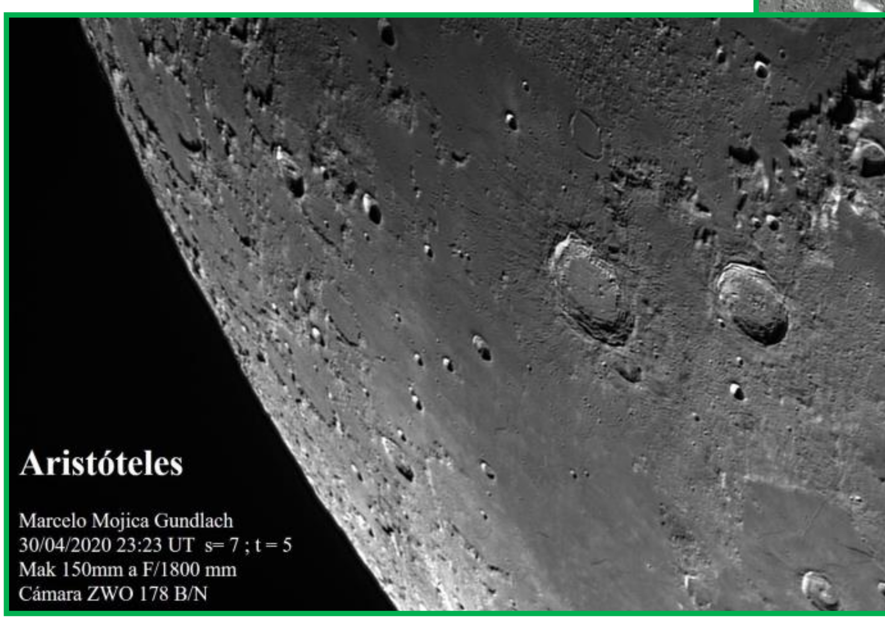

***Image 28, Aristoteles,** Marcelo Mojica Gundlach, Cochabamba, Bolivia, SLA. 2020 April 30 23:20 UT. 6 inch Skywatcher Maksutov-Cassegrain telescope, ZWO ASI 178B/W camera.*

Image 29, Aristoteles, *Sergio Babino, Montevideo, Uruguay. 2019 December 05 00:56 UT. 250 mm catadrioptic telescope, ZWO ASI174MM camera.*

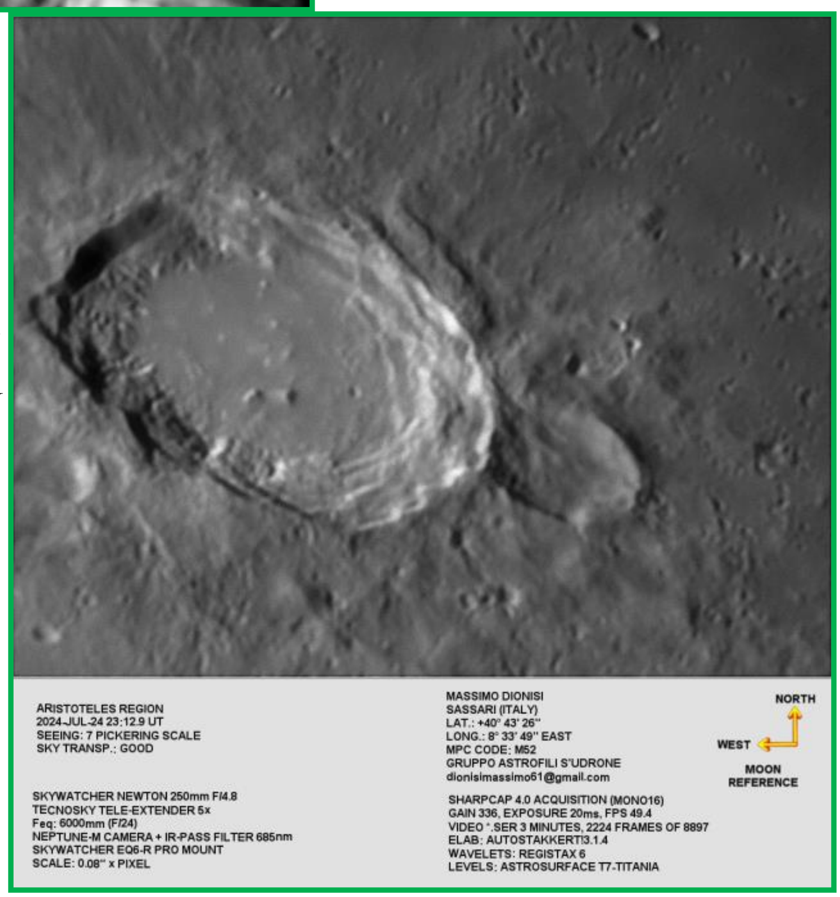

Image 30, Aristoteles, *Massimo Dionisi, Sassari, Italy. 2024 July 24 23:12 UT. 10 inch f/4.8 reflector telescope, Tecnosky Tele-extender 5x, efl 6000 mm, IR pass 685 nm filter, Neptune M camera. Seeing 7/10 Pickering Scale, transparency good.*

We close the description of Aristoteles with a magnificent view of this crater immersed in shadows, which even highlight the radial crests that make its ejection field so beautiful, in which we see a detail in one of the interior terraces of the east wall, the highest area of this wall, which begins to be illuminated by the rising sun, is a peak that according to Elger "stands out as a brilliant spot in the midst of shadow when the interior is filled with shadow. The formation presents its most striking aspect at sunrise, when the shadow of the E. wall just covers the floor, and the brilliant inner slope of the W. wall with the little crater on its crest is fully illuminated. At this phase the details of the terraces are seen to the best advantage. The arrangement of the parallel ridges and rows of hills on the N.W. and S.E. is likewise better seen at this time than under an evening sun".

Between Aristoteles and Eudoxus runs a mountainous line, or hills, which in principle would belong to the Caucasus Mountains (the northern segment of one of the rings of the Imbrium basin), however "the arc of peaks between Aristoteles and Eudoxus - looking like a fake Alexander - has a different character. They are rounder, softer and older looking, but too big to be part of the Imbrium ejecta that surrounds the Alpine Valley. If we want to understand every bit of lunar landscape we should have an interpretation for these hills (…) I suppose, without much conviction, that the hills are either an odd looking extension of the Caucasus or all that is left of an old crater" (Wood, 2007). In **IMAGE 32** we see that Montes Caucasus and the hills between Aristoteles and Eudoxus are similar but different (just as these craters are similar and different from each other). In **IMAGES 33 and 34** these hills shine quite brightly, while in **IMAGES 35 to 38** shadows help to perceive the rounded shapes of these intermediate hills. In **IMAGE 39 and 40** the play of light and shadow allows us to distinguish the highest areas and more details.

***Image 31, Aristoteles,** Philippe Heully, Mayenne, France. 2020 November 22, colongitude 349.5°. Sumerian Optics 406mm F/D 4.5 Dobsonian Optics, ES 14 eyepiece with Denkmeier binoviewers.*

***Image 32, Eudoxus and Aristoteles**, Eduardo Horacek, Mar del Plata, Argentina. 2023 November 20 23:45 UT. 150 mm Maksutov-Cassegrain telescope, Canon EOS Rebel T5i camera. North is down, west is right.*

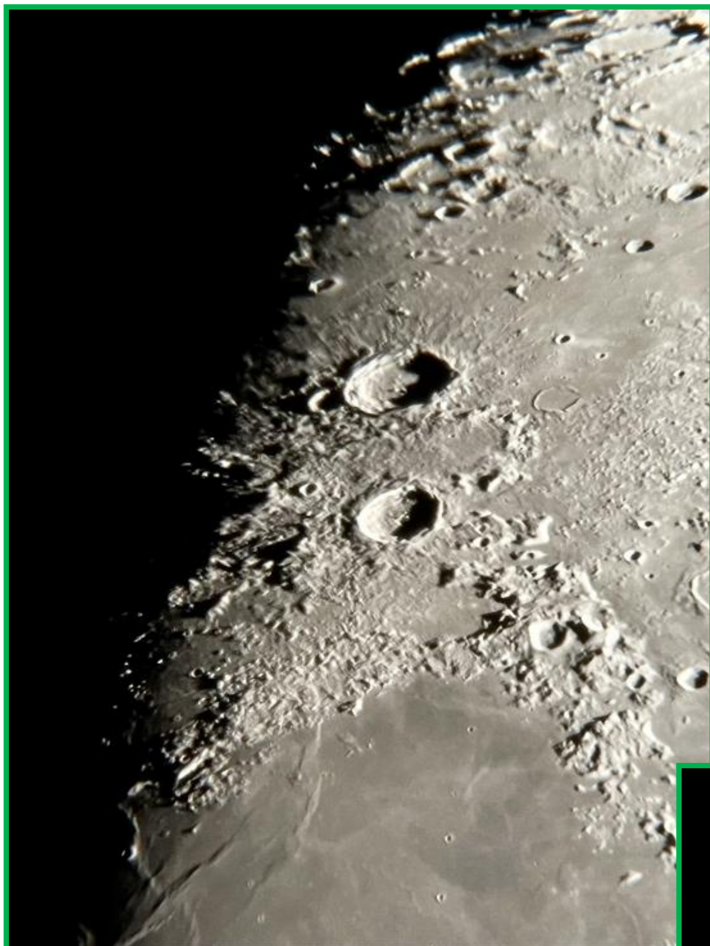

Image 33, Aristoteles and Eudoxus, *James Brunkella, Thousand Oaks, California. 2023 November 23 14:10 UT. 9 inch f/13 Intes Maksutov-Cassegrain telescope, iPhone 12 with iOptron adapter, 12 mm eyepiece.*

Image 34, Aristoteles and Eudoxus, *James Brunkella, Thousand Oaks, California. 2023 August 07 12:11 UT. 9 inch f/13 Intes Maksutov-Cassegrain telescope, iPhone 12 with iOptron adapter, 12 mm eyepiece.*

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***Image 35, Aristoteles and Eudoxus**, Tiến Ngô Trần, Ho Chi Mihn City, Vietnam. 2024 August 12 01:04 UT. 6.3 inch f/8 Newtonian reflector telescope on manual Dobsonian mount, fl 1280 mm, SVBONY 685 nm IR pass filter, IMC-3616UC camera. Seeing 3/10 Pickering Scale, transparency 4/6.*

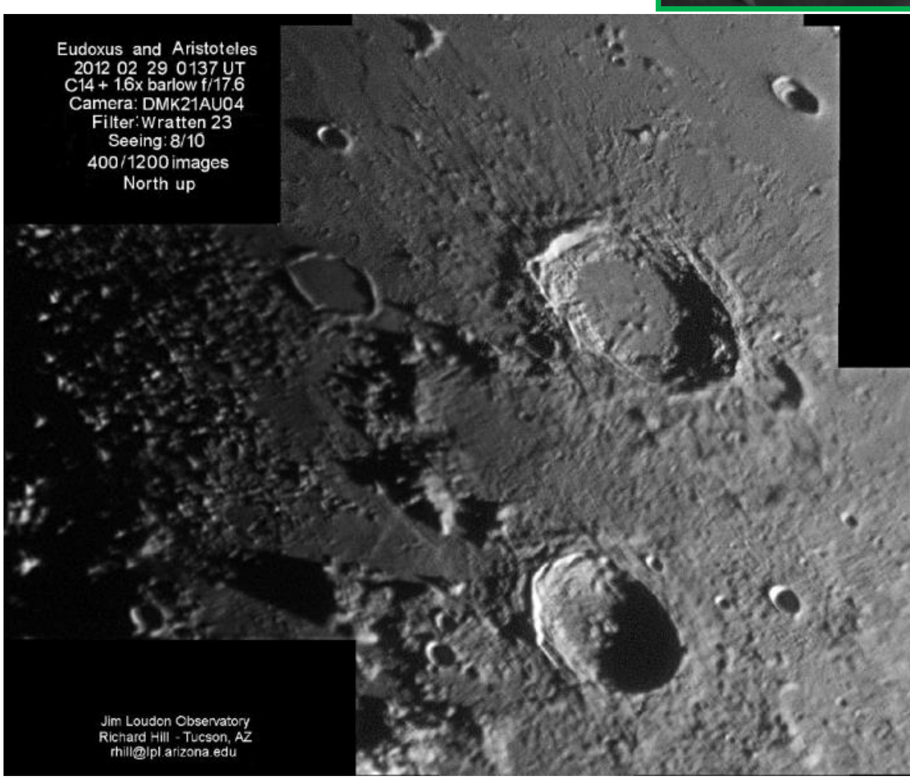

***Image 36, Aristoteles**, Richard Hill, Loudon Observatory, Tucson, Arizona, USA. 2012 February 29 01:37 UT. Celestron 14 inch Schmidt-Cassegrain telescope, 1.6x barlow, Wratten 23 filter, DMK21AU04 camera. Seeing 8/10.*

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Image 37, Aristoteles and Eudoxus, *Greg Shanos, Sarasota, Florida, USA. 2024 June 14 03:14 UT. Greg adds:* "The moon on June 14 2024 at 03h 14m UT or June 13, 2024 11:14 pm local time was at a 49% waxing phase and only 35 degrees above the horizon. The seeing was above average with clear skies. Image was taken with a Meade LX200GPS 8-inch ACF with an Optec Lepus 0.62X focal reducer. A ZWO ASI 178MM monochrome camera with an Optolong UV-IR cut filter along with Firecapture 2.7.14 were utilized to obtain the video. An MSI GF65 gaming computer was utilized to obtain the video and post-process. The AVI was aligned and stacked with Autostakkert 4.0.11 beta and Registax 6.1.0.8. Further processing in Photoshop CS4. Image by Gregory T. Shanos.

The craters Aristoteles and Eudoxus are located on the Southern edge of the Mare Frigoris. Aristoteles lies east of the Montes Alpes and to the north of the Montes Caucasus. Together, these two craters make a distinctive pair when observing with a small telescope. Aristoteles is approximately 87 km (54.1 miles) in diameter with a depth of 3.7 km (2.3 miles). The inner walls of Aristoteles are wide and terraced with two central peaks and a number of smaller hills. Aristoteles adjoins the small crater Mitchell to its immediate east. Mitchell is 30 km (18.6 miles) in diameter and 1.3 km (0.81 miles) in depth. The crater floor of Mitchell is rougher and more irregular than Aristoteles. Mitchell also features a low central peak and ejecta from Aristoteles. Eudoxus crater is 67 km (41.6 miles) in diameter and around 3.4 km (2.1 miles) in depth, and also lacks a central peak with only a group of low hills scattered about the central area. The walls of the crater are also terraced. Other features of interest include Mare Serenitatis, Mare Tranquillitatis, as well as the prominent craters Posidonius, Hercules, Atlas, Cepheus and Franklin."

Cropped Close-up from the above image. Aristoteles with the adjoining crater Mitchell is the top crater with Eudoxus being directly beneath.

Image 38, Aristoteles and Eudoxus, *Greg Shanos, Sarasota, Florida, USA. 2024 June 14 03:14 UT.*

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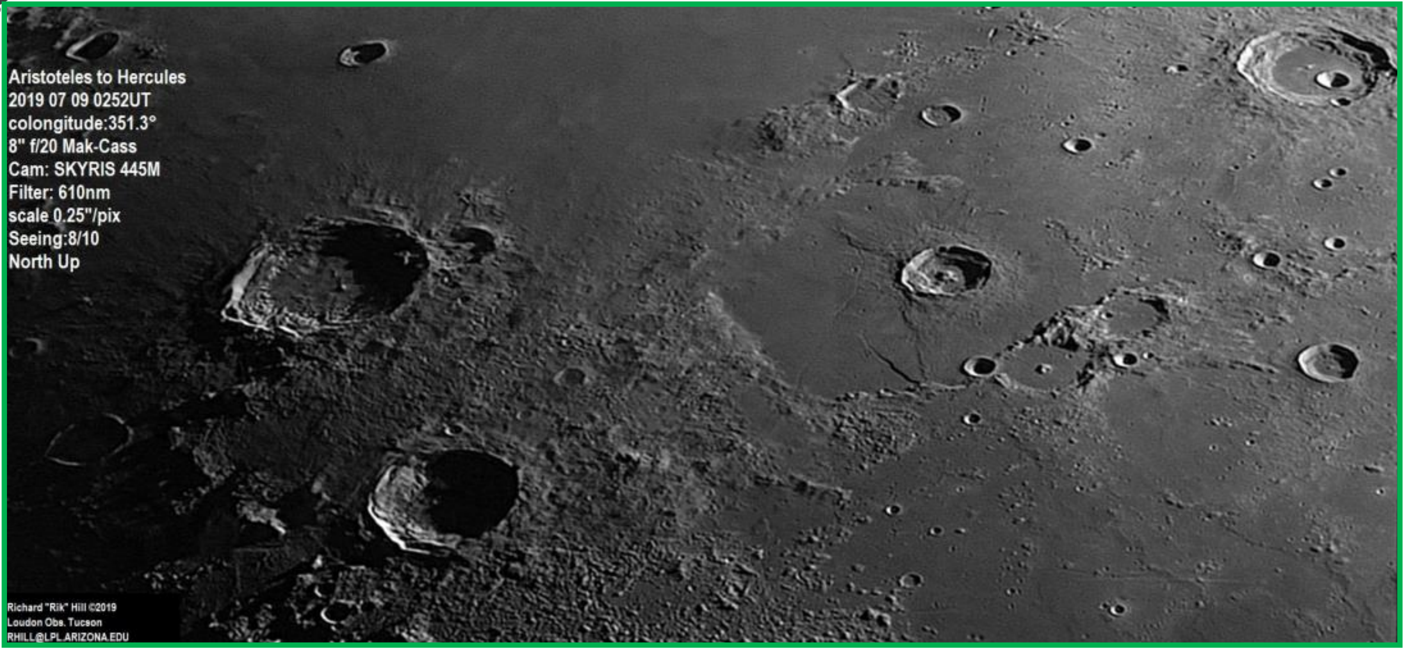
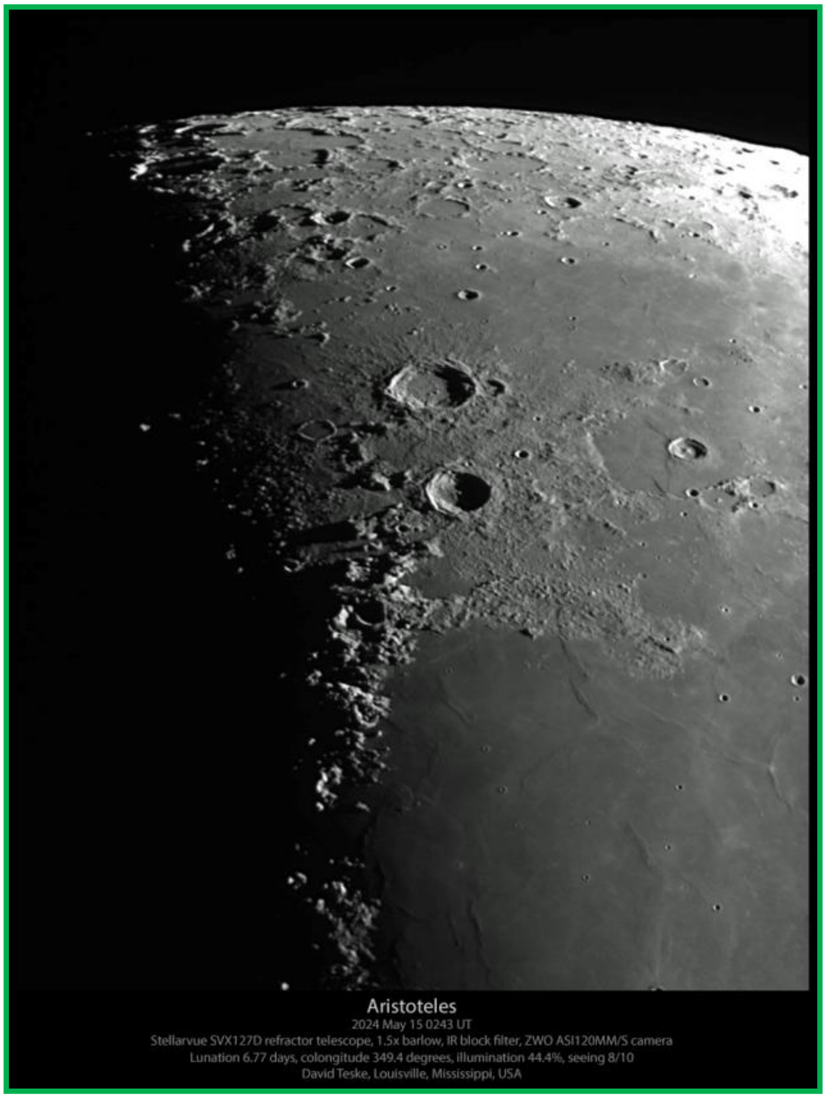


***Image 39, Aristoteles to Hercules**, Richard Hill, Loudon Observatory, Tucson, Arizona, USA. 2019 July 09 02:52 UT. Colongitude 351.3°. TEC 8 inch f/20 Maksutov-Cassegrain telescope, 610 nm filter, SKYRIS 445M camera. Seeing 8/10.*

***Image 40, Aristoteles,** David Teske, Louisville, Mississippi, USA. 2024 May 15 02:43 UT, colongitude 349.4°. 127 mm refractor telescope, 1.5x barlow, IR block filter, ZWO ASI120MM/S camera. Seeing 8/10.*



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Eudoxus seems to be similar to Aristoteles in a coincidental way, since "is also large enough to be considered a standard Tycho-type crater, but it too has unusual peak and rim structures similar to its larger neighbor" (Wood, The Modern Moon).

Grego help us once again to see the differences with Aristoteles: "Some 100 km to the south, Eudoxus makes an interesting near-neighbor. Although it resembles Aristoteles, close examination will show a number of subtle differences; while its internal terracing is slightly less complex, its floor is somewhat blockier. The impact structuring around Eudoxus is less grand, partly because of the preexisting rougher nature of the surrounding terrain, with more concentric rather than radial structure being evident". That the terraces of Eudoxus are rather smoother and "orderly" than those of its neighbor can be seen in **IMAGES 41 and 42,** which illustrate the following words of Garfinkle: "Its massive walls, rising more than 11,000 feet above the floor on the E., and about 10,000 feet on the opposite side, are prominently terraced, and include crater-rows in the intervening valleys, while their outer slopes present a complicated system of spurs and buttresses". In **IMAGE 43** we see the other features indicated by Grego: hummocky floor and less grand impact structuring, and the ones indicated by Garfinkle "central peak that has twin summits. The rim crests are sharp and rise in thick blocky ridges from the surrounding terrain (…) The ejecta blanket and secondary crater fields tend to be heavier to the north and south of the crater and less to the east and west. The secondary craters are a high-density mass to the south of the crater, with numerous crater chains and herringbone patterns of small craters"; and the features indicated by Elger: "a border much broken by passes, and deviating considerably from circularity (…) Neison draws attention to an area of about 1,400 square miles on the N.W. which is covered with a great multitude of low hills. W. of Eudoxus are two short crossed clefts, and on the N. a long cleft of considerable delicacy running from N.W. to S.E." Many of these features are highlighted with lower illumination and more contrast, as in **IMAGE 44 to 46** (especially the rather tall impact structure).

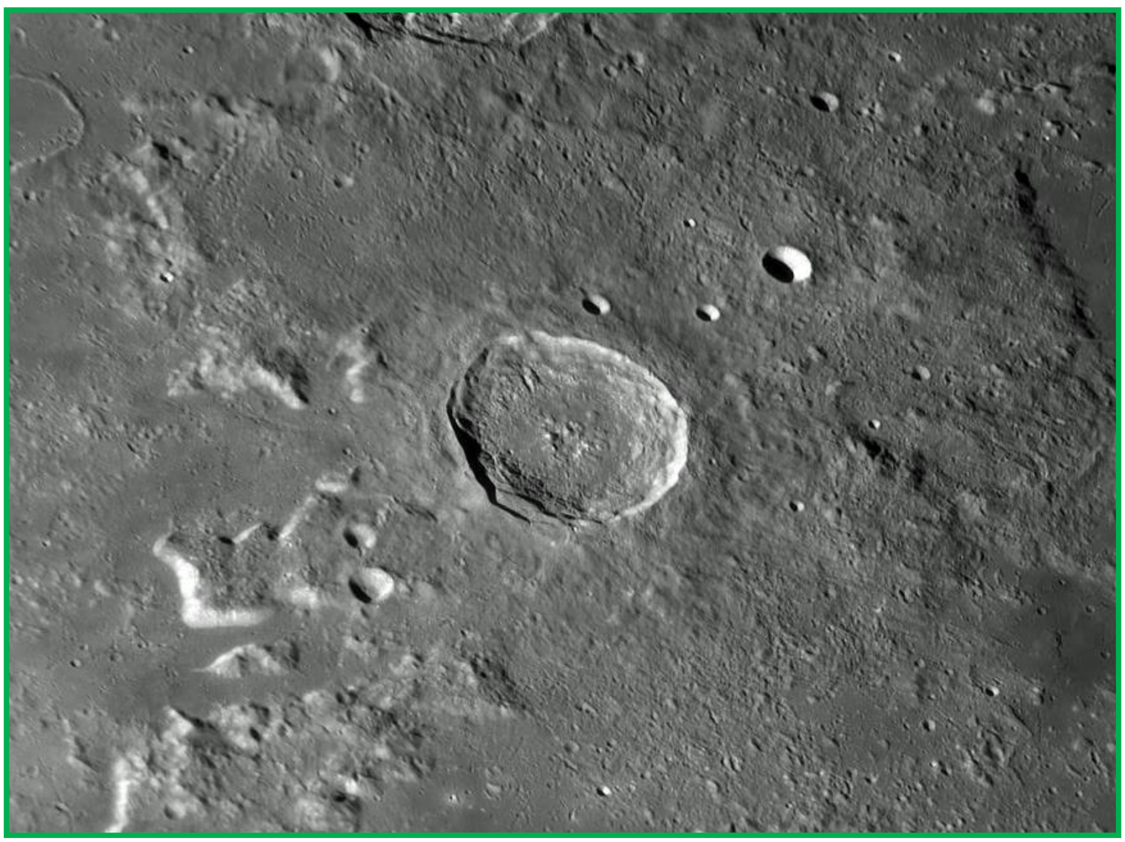

Image 41, Eudoxus*, Jon Bosley, White Dwarf Observatory, Centra Texas, USA. 2024 June 25 04:40 UT. 457 mm reflector telescope, 3x barlow, 610 nm filter, Player One Apollo-mini 429 camera.*

***Image 42, Aristoteles, Francisco** Alsina Cardinalli, Oro Verde, Argentina. 2022 October 03 01:50 UT. Celestron 11 inch Schmidt-Cassegrain telescope, 685 nm filter, QHY 5L-II M camera.*

***Image 43, Eudoxus,** Massimo Dionisi, Sassari, Italy. 2024 July 24 23:18 UT. 10 inch f/4.8 reflector telescope, Tecnosky Tele-extender 5x, efl 6000 mm, IR pass 685 nm filter, Neptune M camera. Seeing 7/10 Pickering Scale, transparency good.*

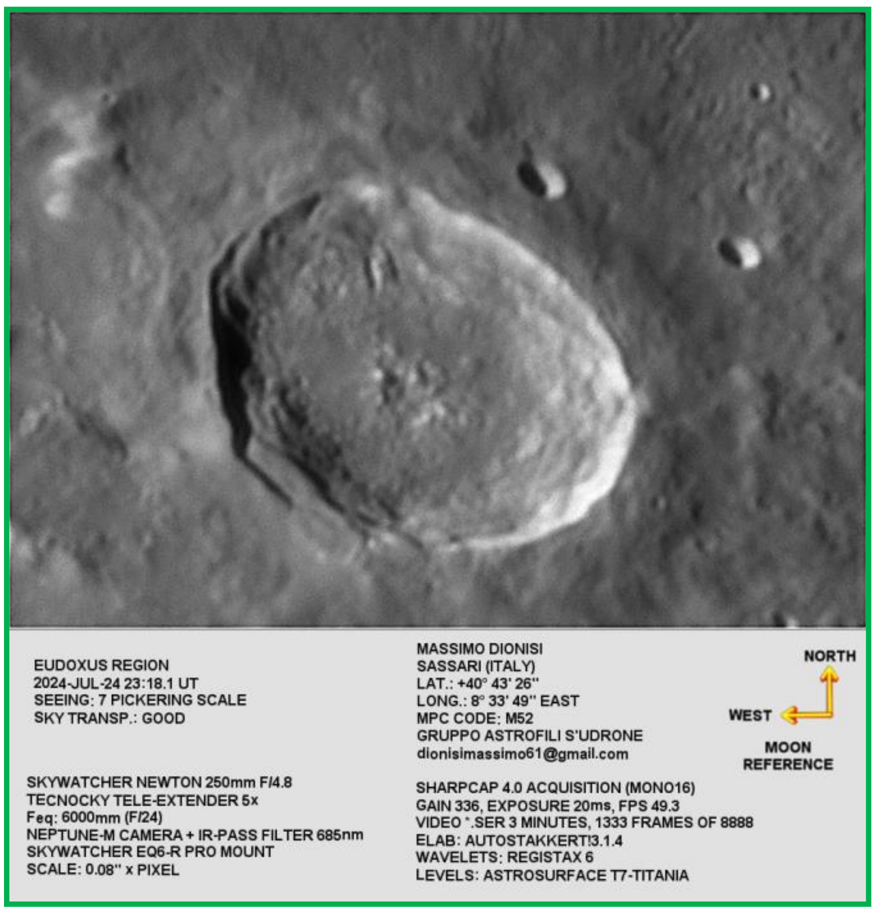

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Image 44, Eudoxus, *Massimo Dionisi, Sassari, Italy. 2024 July 27 00:17 UT. 10 inch f/4.8 reflector telescope, 3x barlow, efl 3600 mm, IR pass 685 nm filter, Neptune M camera. Seeing 6/10 Pickering Scale, transparency good.*

Image 45, Aristoteles, *Jesús Piñeiro, San Antonio de los Altos, Venezuela. 2021 December 10 22:42 UT. 254 mm Schmidt-Cassegrain telescope, Astronomik L2 UV-IR cut filter, ZWO ASI 462 MC camera. North is right, west is up.*

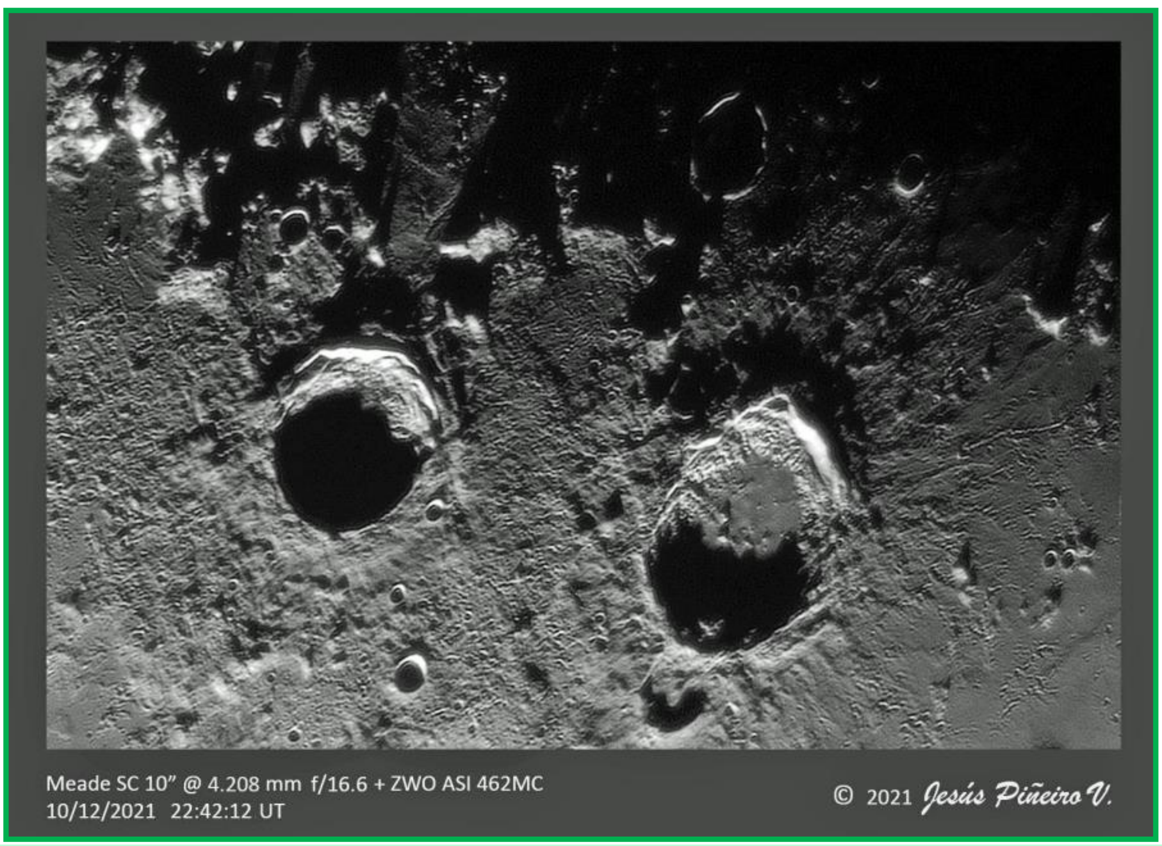


Image 46, Eudoxus, *Francisco Alsina Cardinalli, Oro Verde, Argentina. 2015 October 15 23:47 UT. 203 mm Newtonian reflector telescope, QHY5L-II-M camera.*

There is a rather interesting story regarding Eudoxus, which has a nice astronomical enigma, that we discuss in the March 2024 of the Lunar Observer ("The enigmatic wall of Trouvelot in Eudoxus"), an "enigmatic wall" Etiennne Trouvelot described (and sketch) as "a narrow thin bright thread crossing the southern part of the crater in a straight line (…) from wall to wall", which he described as some kind of wall (meaning some kind of a crest) (**IMAGE 47**). Nigel Longshaw has an alternative explanation: light from a "break straight and very deep in the W. wall of Eudoxus and which sunlight passing over this opening illuminated the bottom of the crater, and thus formed the straight luminous thread". In the December 2022 issue of The Lunar Observer (pages 65/66, corresponding to the "Lunar Geological Change Detection Program" section), our visual observation of Eudoxus appears analyzed by Tony Cook (Section Coordinator). The requirement came from the British Astronomical Association, from Nigel Longshaw and consisted of "detect bright spots and linear features within the shadow of the east wall at sunrise." Tony examines our report on the illuminated areas within the shadow in Eudoxus, comparing it with an earlier image by Brandon Shaw, as seen in **IMAGE 48.** As we can see, visually is possible to observe bright stripes, also photographical recorded, which, even if they don't match the bright line observed by Trouvelot, indicates a phenomenon that is repeated in every lunation, possibly related with a deep notch in the east wall, which can be seen clearly in **IMAGES 49 to 51**. The bands in the shadow of the east wall, which we suspect are related to internal relief, can be seen in **IMAGES 52 and 53,** and are perhaps discernible in **IMAGES 54 to 56**, while the jagged shadows of the east wall shadow in **IMAGE 57** are also related to internal relief. **IMAGE 58** shows illumination similar to what Trouvelot would have seen (which we do not see, except for a bright line, which is a terrace on the south wall).

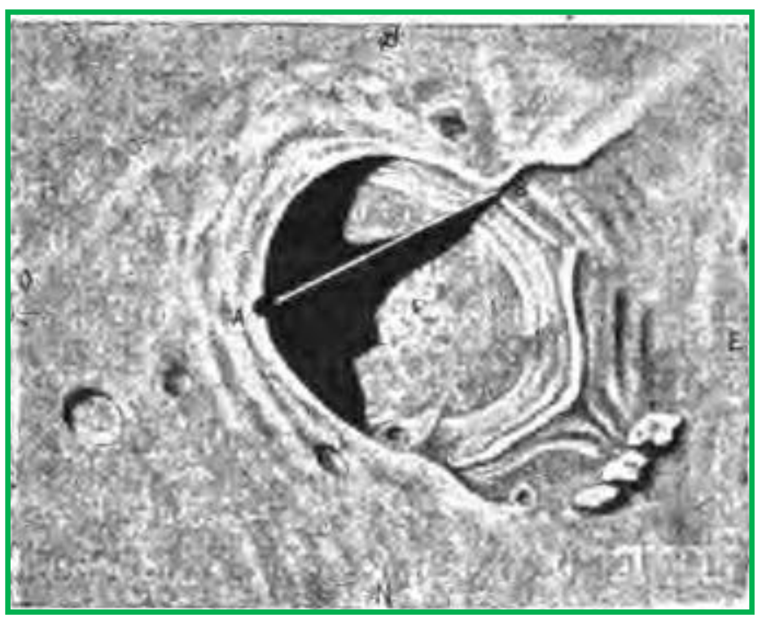


Image 47, *ETIENNE TROUVELOT, 1885*

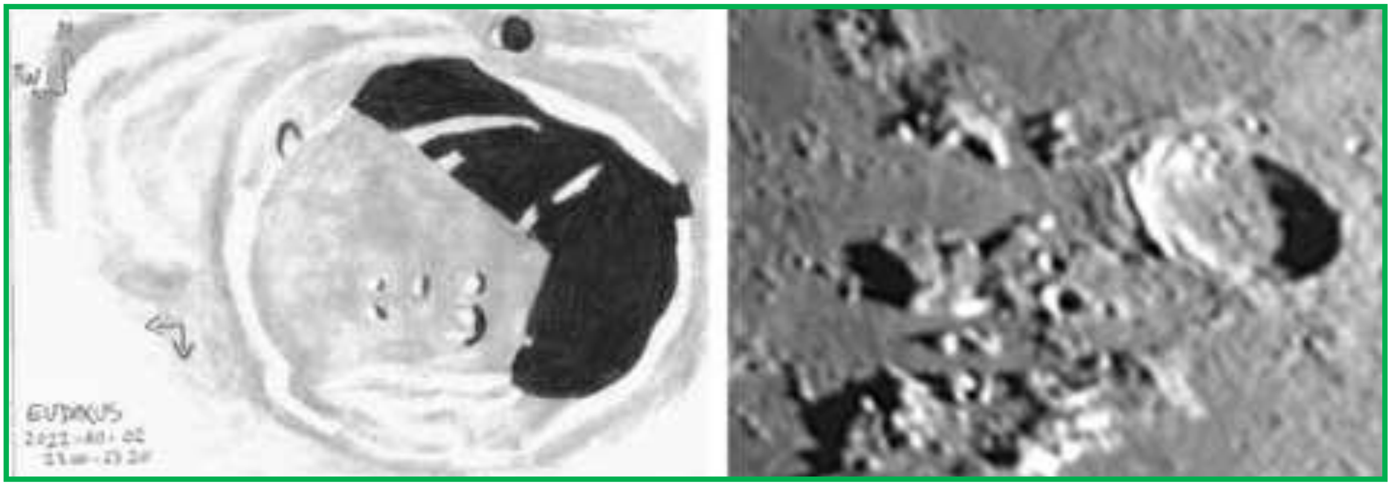
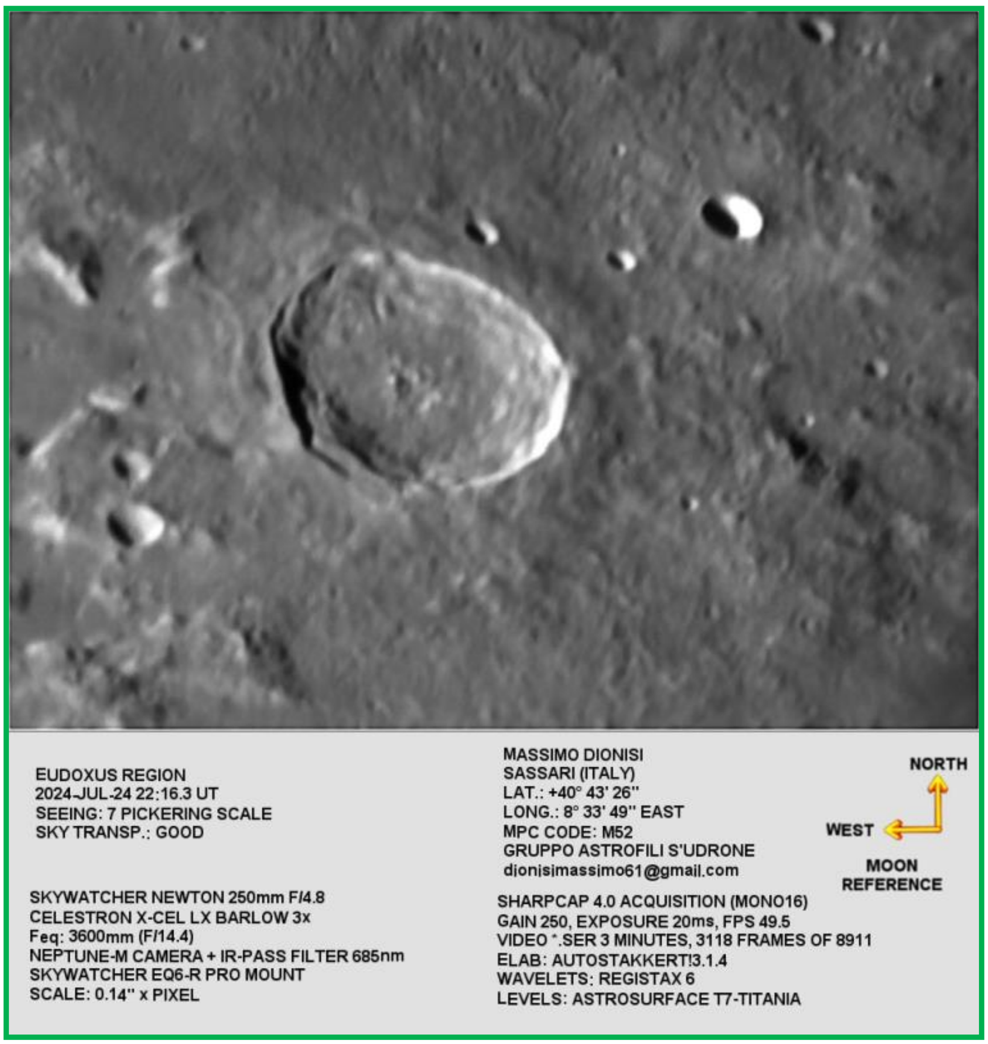


Image 48, *from The Lunar Observer March 2024.*

Image 49, Eudoxus, *Massimo Dionisi, Sassari, Italy. 2024 July 24 22:16 UT. 10 inch f/4.8 reflector telescope, 3x barlow, efl 3600 mm, IR pass 685 nm filter, Neptune M camera. Seeing 7/10 Pickering Scale, transparency good.*



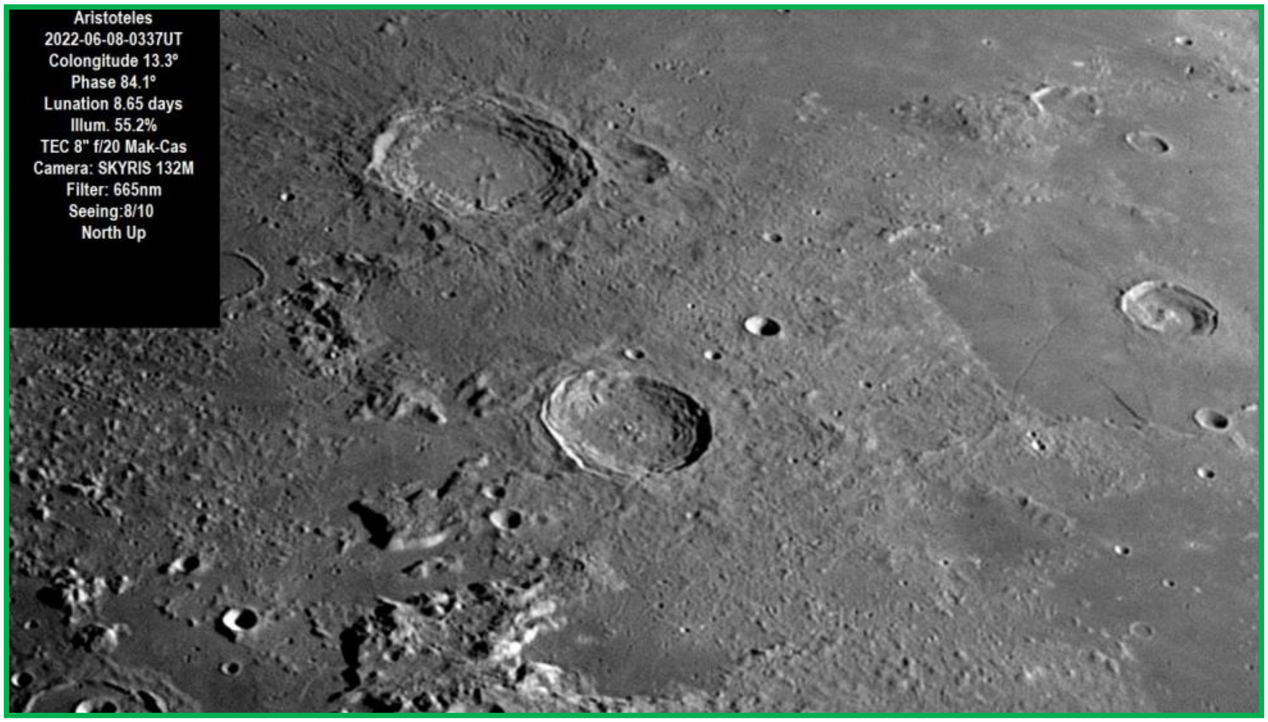


Image 50, Aristoteles, *Richard Hill, Loudon Observatory, Tucson, Arizona, USA. 2022 June 08 03:37 UT, colongitude 13.3°. TEC 8 inch f/20 Maksutov-Cassegrain telescope, 665 nm filter, SKYRIS 132M camera. Seeing 8/10.*

Image 51, Aristoteles to Hercules, *Richard Hill, Loudon Observatory, Tucson, Arizona, USA. 2017 March 08 02:08 UT. TEC 8 inch f/20 Maksutov-Cassegrain telescope, 665 nm filter, SKYRIS 445M camera. Seeing 8/10.*

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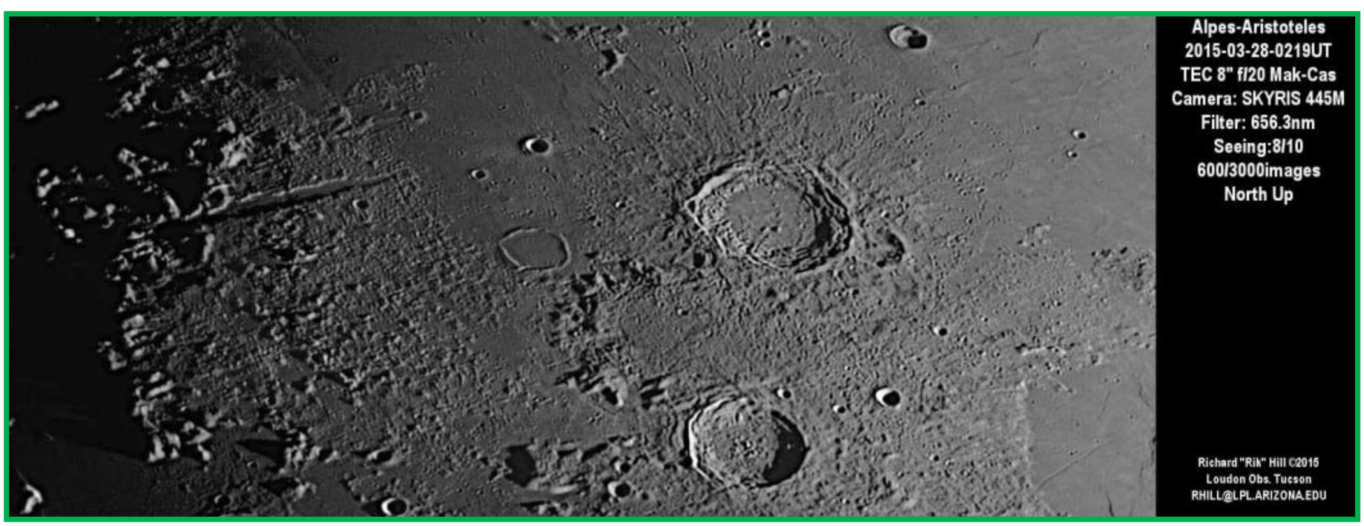
Image 52, Eudoxus and Aristoteles*, Eduardo Horacek, Mar del Plata, Argentina. 2024 July 13 23:11 UT. 150 mm Maksutov-Cassegrain telescope, Canon EOS Rebel T5i camera. North is right, west is up.*

Image 53, Alpes to Aristoteles*, Richard Hill, Loudon Observatory, Tucson, Arizona, USA. 2015 March 28 02:19 UT. TEC 8 inch f/20 Maksutov-Cassegrain telescope, 656.3 nm filter, SKYRIS 445M camera. Seeing 8/10.*



Focus On: Lunar Topographic Studies
Aristoteles and Eudoxus: Similar and Different

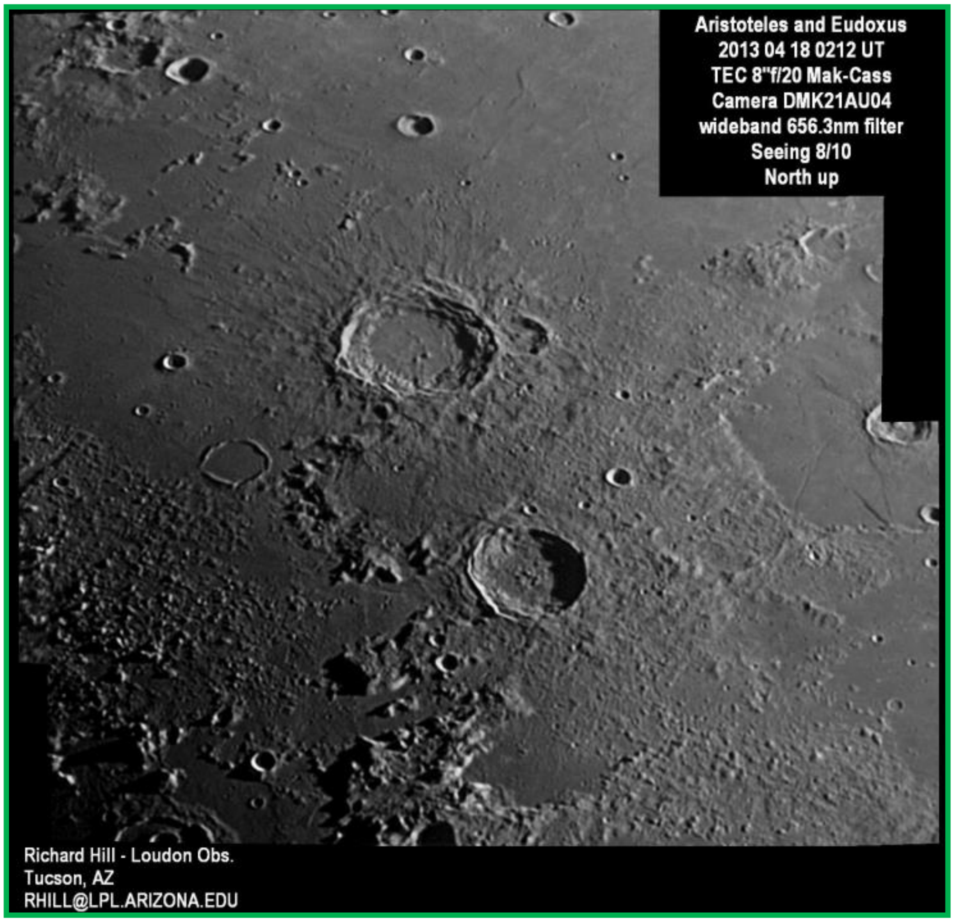


***Image 54, Aristoteles to Hercules**, Richard Hill, Loudon Observatory, Tucson, Arizona, USA. 2013 April 18 02:12 UT. TEC 8 inch f/20 Maksutov-Cassegrain telescope, 656.3 nm filter, DMK21AU04 camera. Seeing 8/10.*

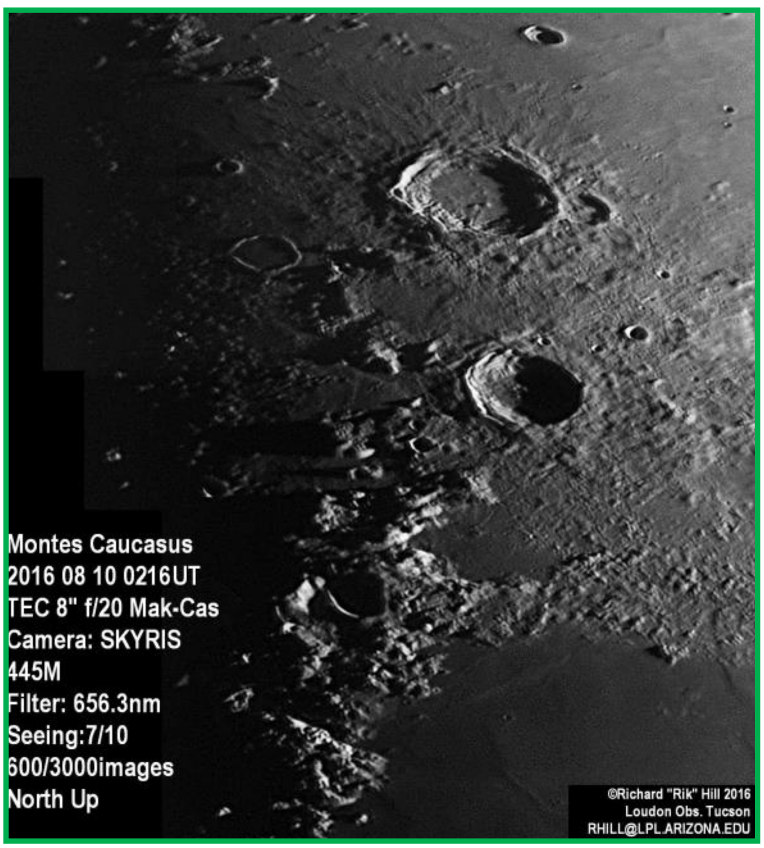


***Image 55, Montes Caucasus**, Richard Hill, Loudon Observatory, Tucson, Arizona, USA. 2016 August 10 02:16 UT. TEC 8 inch f/20 Maksutov-Cassegrain telescope, 656.3 nm filter, SKYRIS 445M camera. Seeing 7/10.*

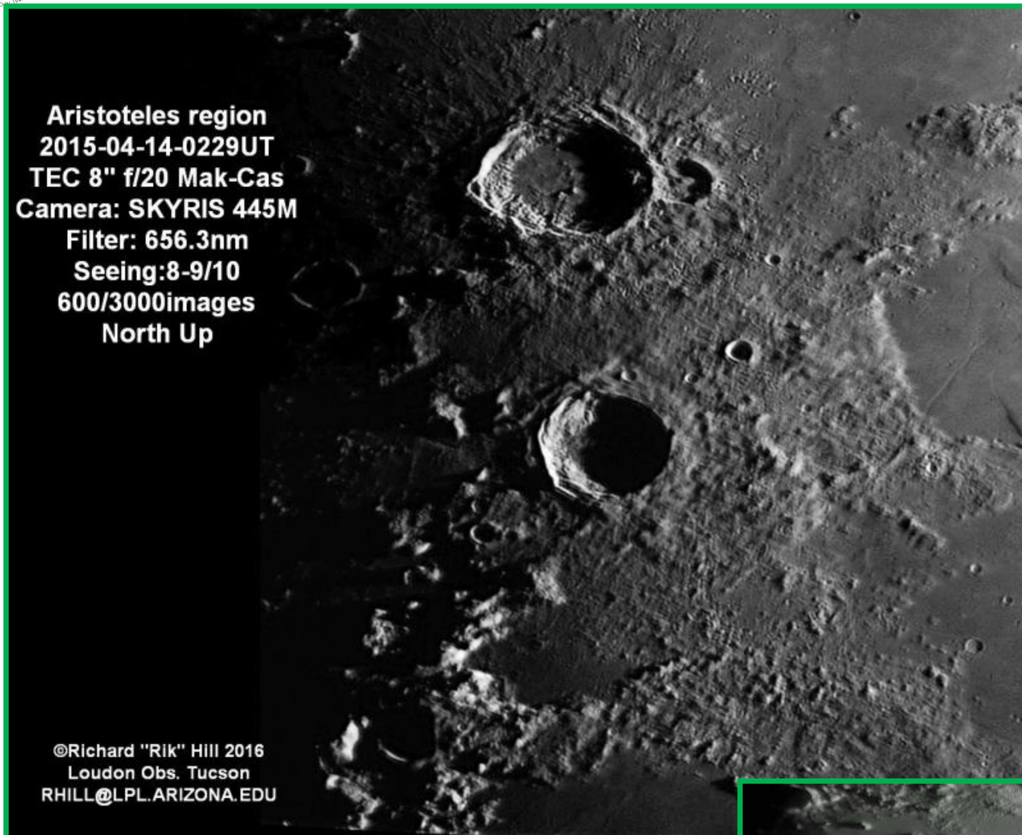


***Image 56, Aristoteles**, Richard Hill, Loudon Observatory, Tucson, Arizona, USA. 2015 April 14 02:29 UT. TEC 8 inch f/20 Maksutov-Cassegrain telescope, 656.3 nm filter, SKYRIS 445M camera. Seeing 8-9/10.*

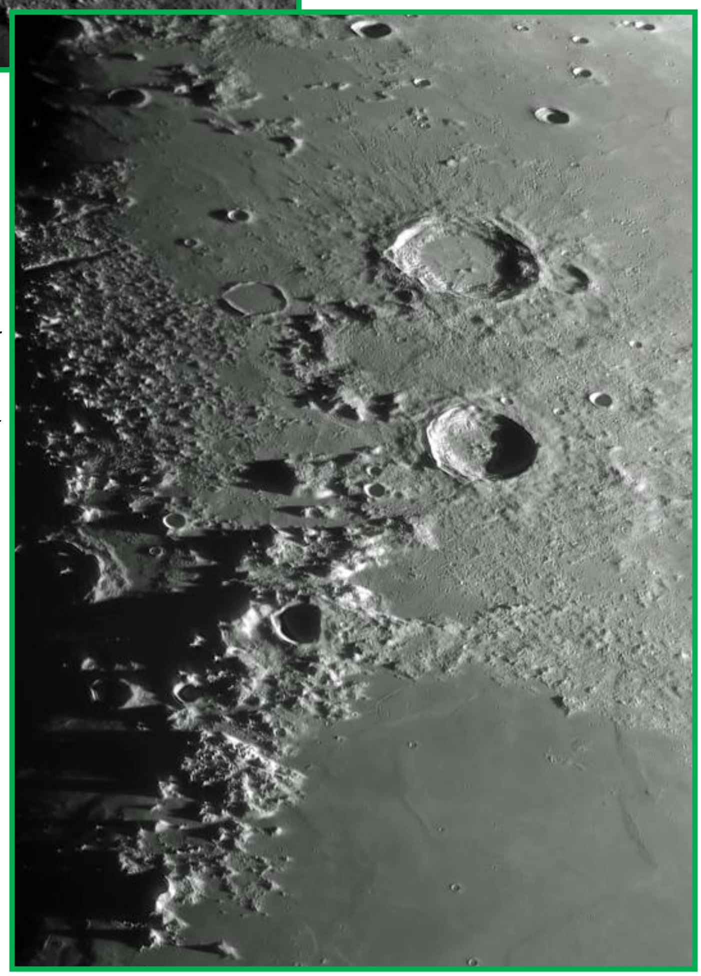
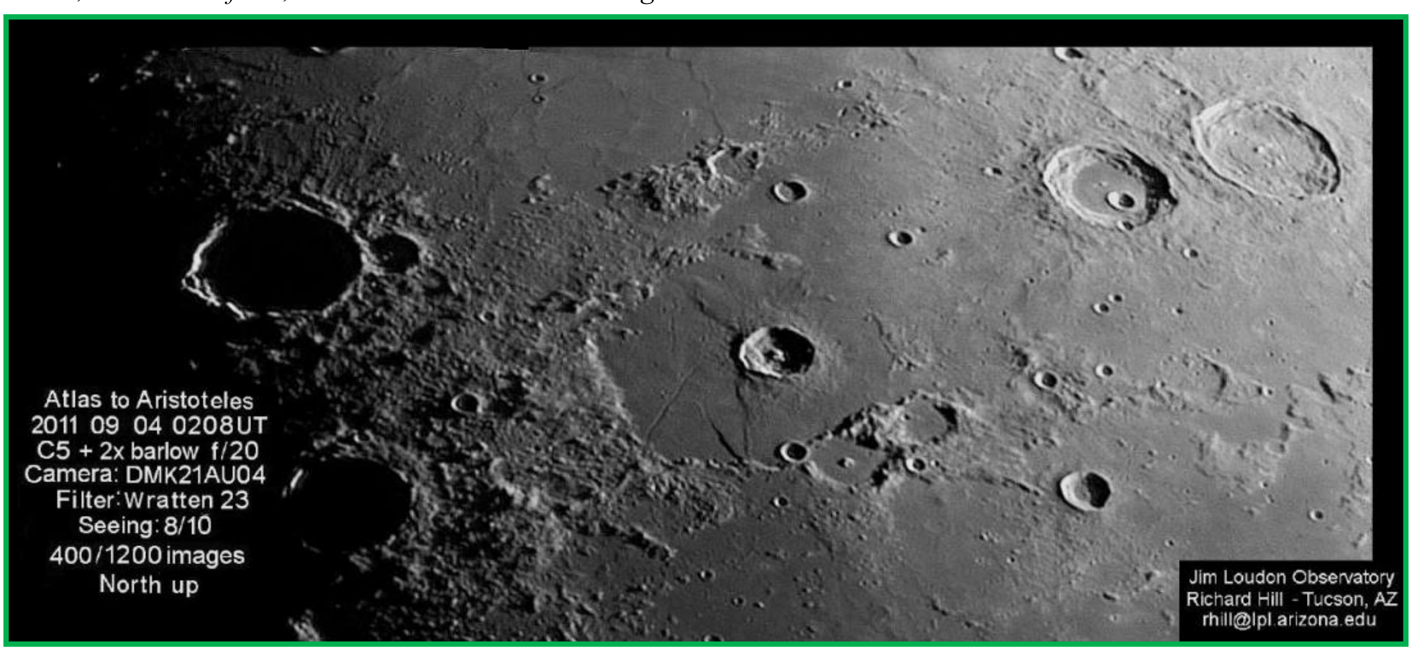


***Image 57 Aristoteles and Eudoxus,** Mike Karakas, Winnipeg, Manitoba, Canada. 2023 March 03 20:00 UT. Intes M809 Maksutov-Cassegrain telescope, f/10, Tele Vue 2x barlow, 642 nm IR pass filter, ZWO ASI174MM camera. Seeing 6/10.*

Image 58, Aristoteles and Eudoxus, *James Brunkella, Thousand Oaks, California. 2023 September 05 12:40 UT. 9 inch f/13 Intes Maksutov-Cassegrain telescope, iPhone 12 with iOptron adapter, 12 mm eyepiece.*

We close with images of Aristotle and Eudoxus at the terminator (**IMAGES 59 and 60**), but what is most interesting is how the peaks of the Caucasus Mountains look to the south, surrounding a lava bay (buried crater?) and resembling a pearl necklace (**IMAGES 61 to 63**).

Image 59, Atlas to Aristoteles, *Richard Hill, Loudon Observatory, Tucson, Arizona, USA. 2011 September 04 02:08 UT. Celestron 5 inch Schmidt-Cassegrain telescope, 2x barlow, Wratten 23 filter, DMK21AU04 camera. Seeing 8/10.*



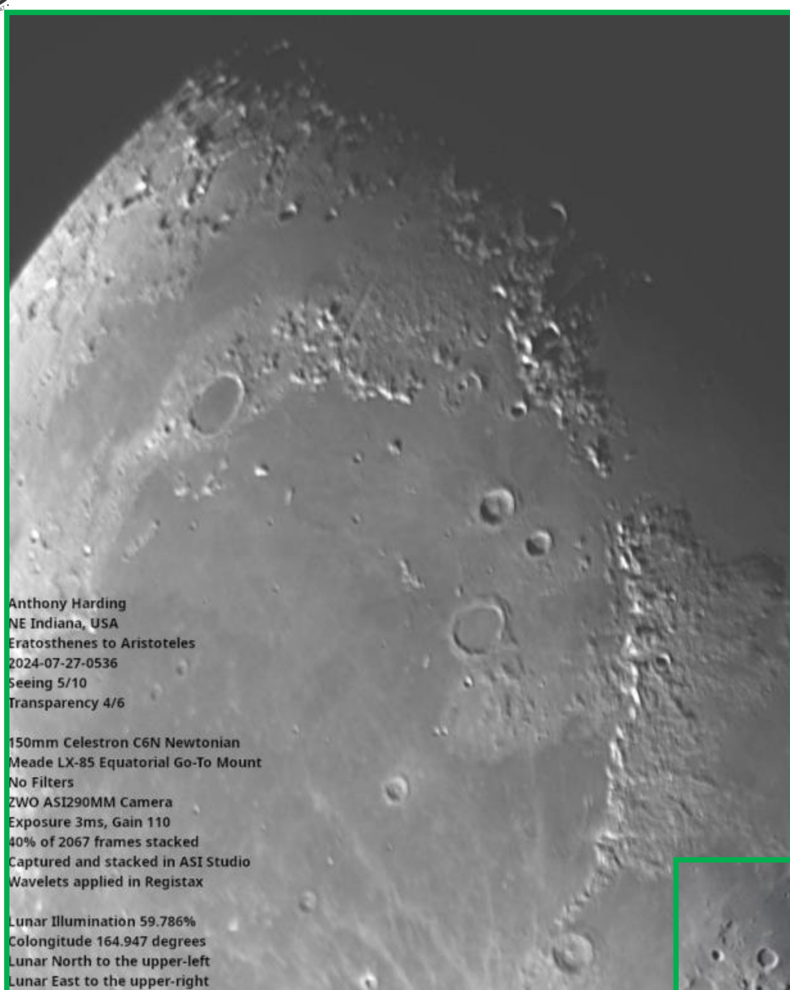


Image 60, Eratosthenes to Aristoteles, *Anthony Harding, NE Indiana, USA. 2024 July 27 05:36 UT. 150mm Celestron C6N Newtonian, Meade LX-85 Equatorial Go-To Mount, ZWO ASI290MM Monochrome Camera. Lunar north is to the upper-left, lunar east is to the upper-right. Seeing: 5/10, transparency: 4/6. Anthony adds*: "This shot was taken primarily to show the craters Aristoteles and Eudoxus sitting right on the terminator line. They appear just beyond the northern extremity of Montes Caucasus. The eastern rim of Eudoxus catches the light, creating a bright arc in the darkness just beyond the terminator, while Aristoteles is darker and appears to the north. Eratosthenes appears near the bottom of the image at the southern extreme of Montes Apenninus. The curving arc of mountains can be followed from there to the north-northeast, then across the gap between Mare Imbrium and Mare Serenitatis, and continued along Montes Caucasus to the terminator. The Moon was only approximately 15.6 degrees above the horizon at the time the footage was taken, so it is not as clear as might otherwise have been."

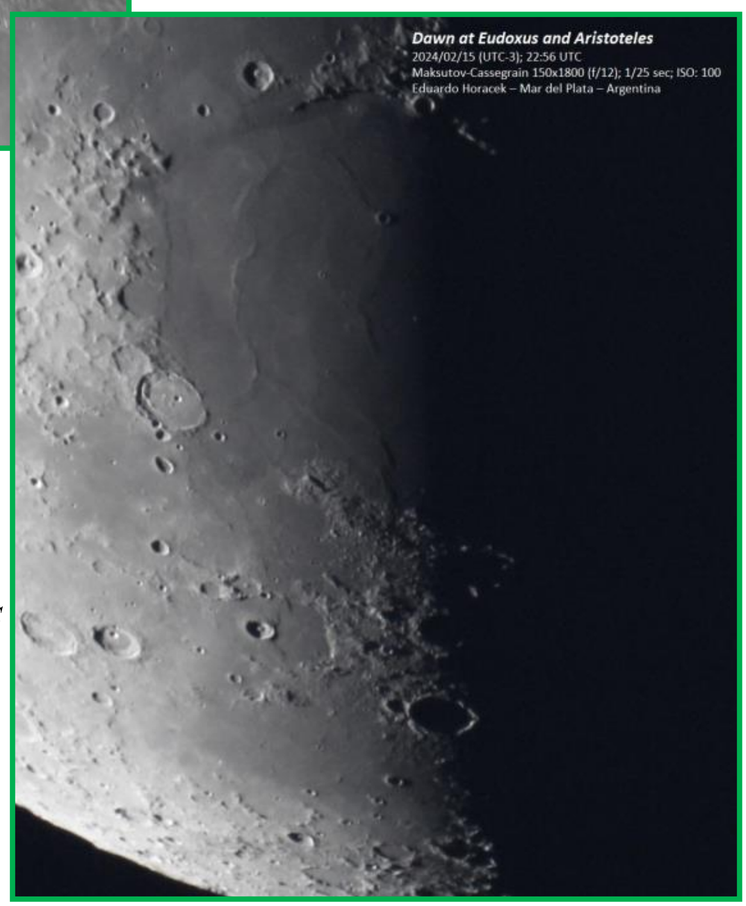


Image 61, Eudoxus and Aristoteles*, Eduardo Horacek, Mar del Plata, Argentina. 2024 February 15 22:56 UT. 150 mm Maksutov-Cassegrain telescope, Canon EOS Rebel T5i camera. North is down, west is right.*

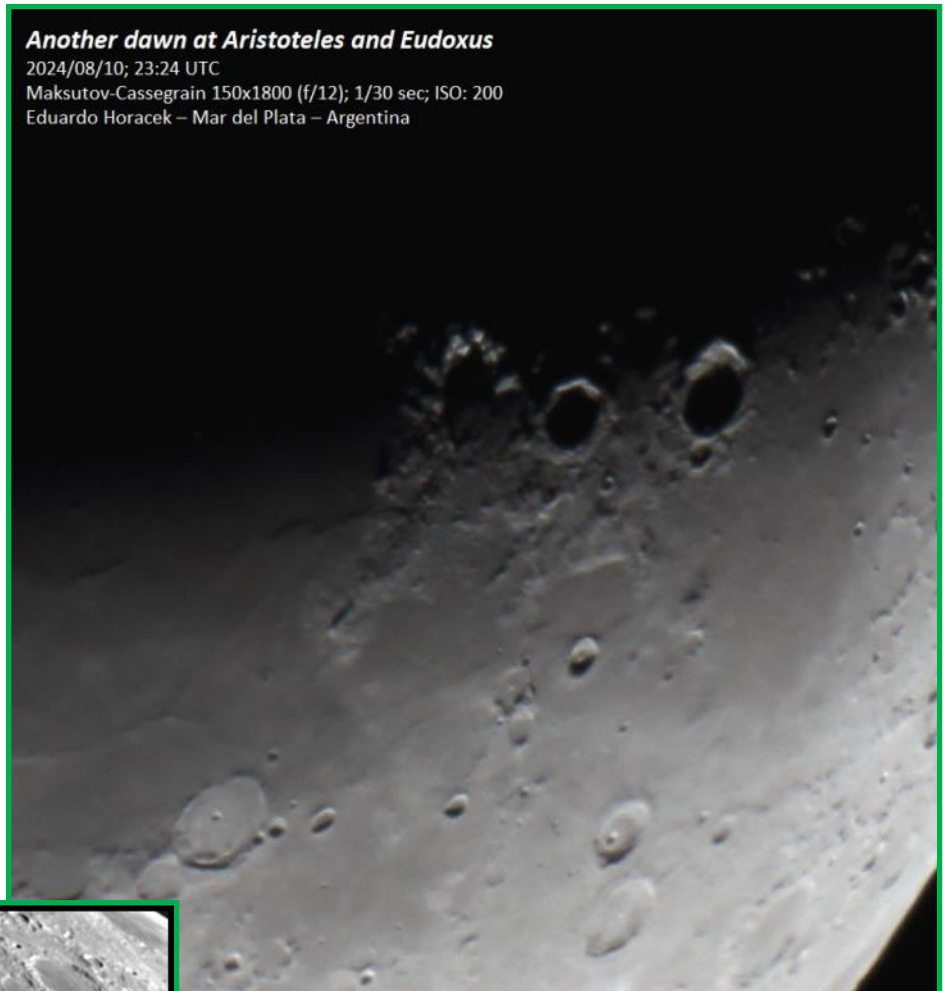
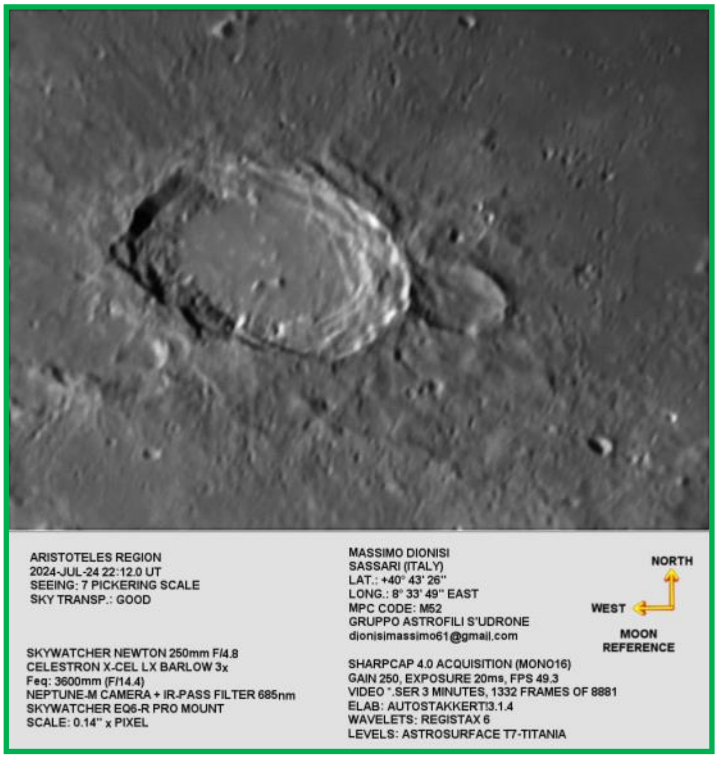


***Image 62, Eudoxus and Aristoteles**, Eduardo Horacek, Mar del Plata, Argentina. 2024 August 10 23:24 UT. 150 mm Maksutov-Cassegrain telescope, Canon EOS Rebel T5i camera. North is right, west is up.*

***Image 63, Aristoteles,** David Teske, Louisville, Mississippi, USA. 2023 December 19 00:24 UT, colongitude 345.3º. 60 mm refractor telescope, 1.5x barlow, IR block filter, ZWO ASI120MM/S camera. Seeing 6/10.*

Focus On: Lunar Topographic Studies
Aristoteles and Eudoxus: Similar and Different



Aristoteles, *Massimo Dionisi, Sassari, Italy. 2024 July 24 22:12 UT. 10 inch f/4.8 reflector telescope, 3x barlow, efl 3600 mm, IR pass 685 nm filter, Neptune M camera. Seeing 7/10 Pickering Scale, transparency good.*

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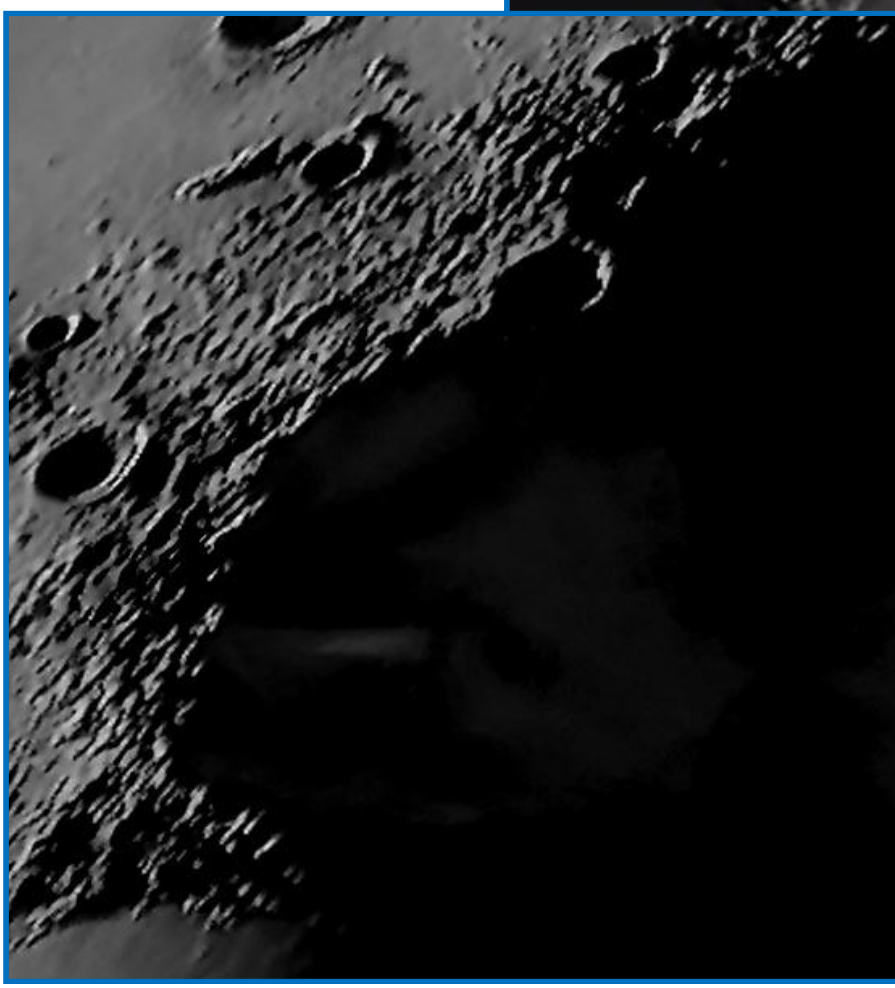
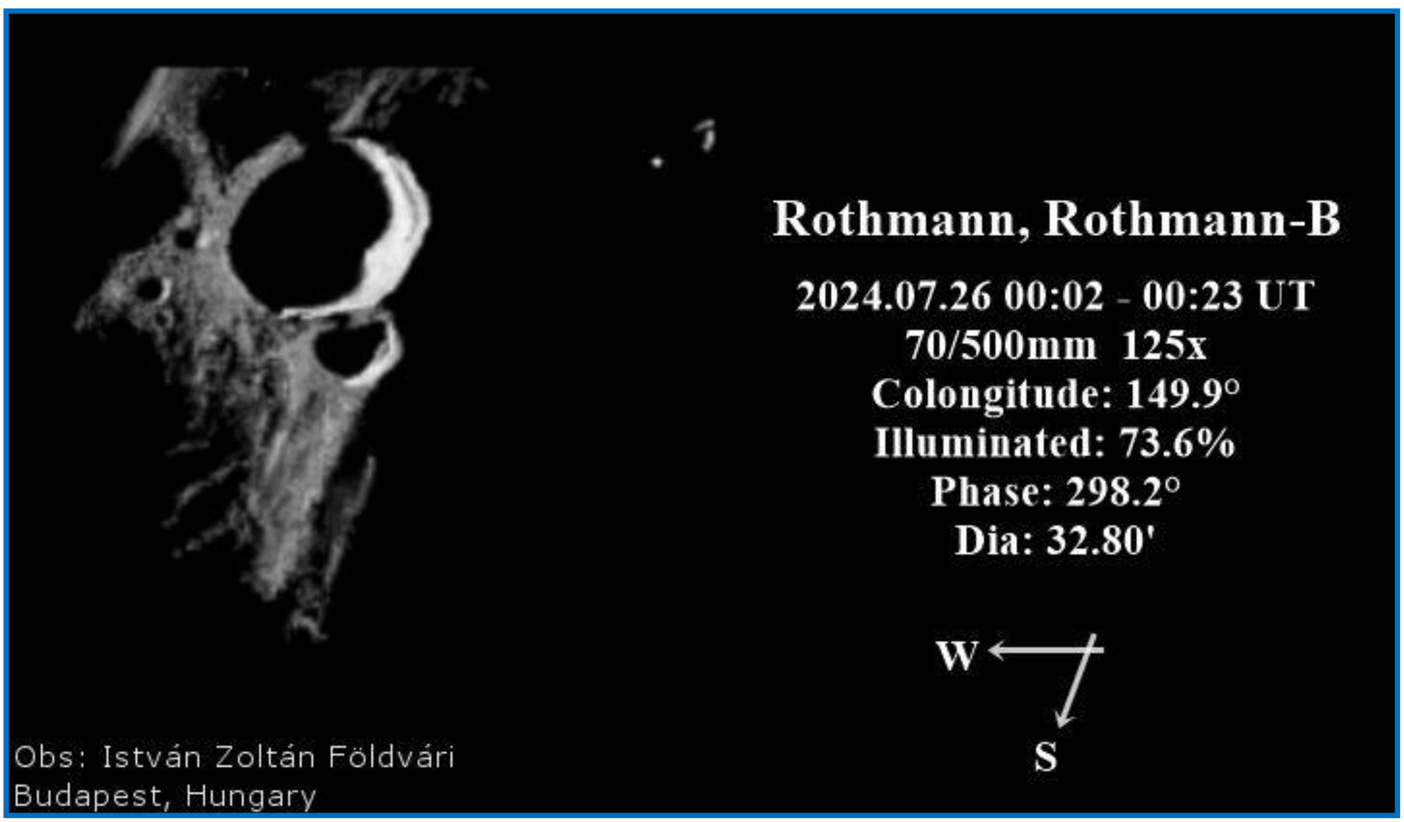
Arzachel, *Walter Ricardo Elias, Oro Verde, Entres Rio, Argentina. 2024 August 11 02:12 UT. SkyWatcher 150/750 mm reflector telescope, QHY 5II C camera.*



Sinus Iridum, *KC Pau, Hong Kong, China. 2018 April 10 21:01 UT. 250 mm f/6 Newtonian reflector telescope, 2.5x barlow, QHYCCD 290M camera. Note the last streak of sunlight on the floor of the Sinus.*

Hyginus, *Walter Ricardo Elias, Oro Verde, Entres Rio, Argentina. 2024 August 11 02:09 UT. SkyWatcher 150/750 mm reflector telescope, QHY 5II C camera.*

Rothmann and Rothmann B, *István Zoltán Földvári, Budapest, Hungary. 2024 July 26 00:02-00:23 UT, colongitude 149.9°. 70 mm refractor telescope, 500 mm focal length, 4 mm Vixen LV Lanthanum eyepiece, 125x. Seeing 8/10, transparency 3/6.*



Recent Topographic Studies

Mons Piton, *Walter Ricardo Elias, Oro Verde, Entres Rio, Argentina. 2024 August 12 01:49 UT. SkyWatcher 150/750 mm reflector telescope, QHY 5II C camera.*

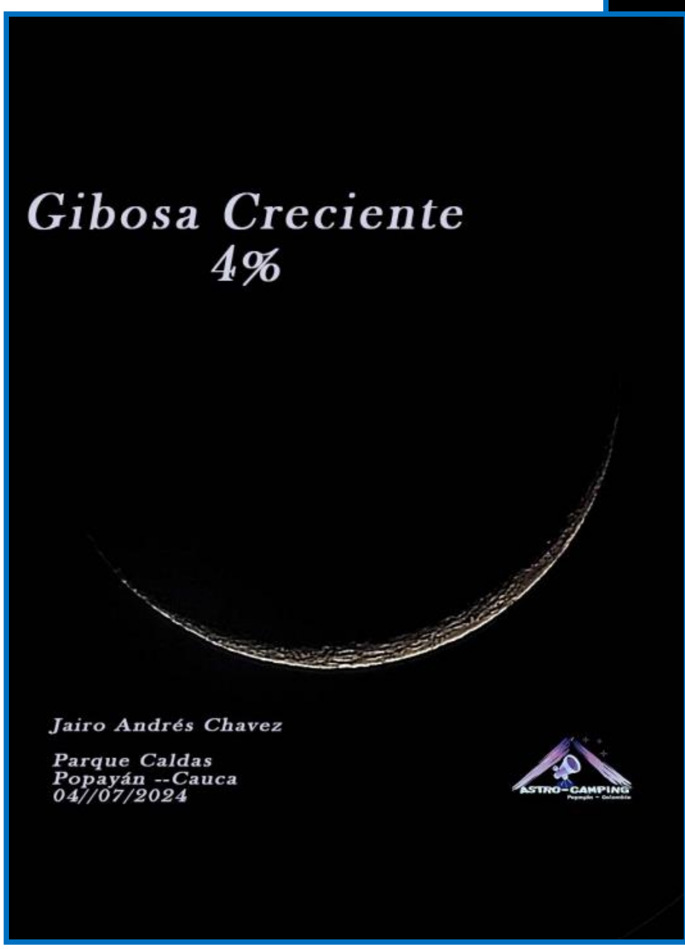
Plato, *Maurice Collins, Palmerston North, New Zealand. 2024 August 13 08:49 UT. Williams Optics FLT-110 mm refractor telescope, 3x barlow, QHY5III462C camera.*

Recent Topographic Studies

Theophilus, *Walter Ricardo Elias, Oro Verde, Entres Rio, Argentina. 2024 August 12 01:54 UT. SkyWatcher 150/750 mm reflector telescope, QHY 5II C camera.*

Mare Crisium *by Anthony Harding. Details on image. Anthony adds: "T*his zoomed-in shot shows Mare Crisium with the terminator neatly bisecting it. The Moon had only risen to 15.5 degrees above the horizon by this time. The shadows cast by the sunset lighting are superb here. The small but bright crater Proclus is seen just to the Mare's west, along with a line of brighter material apparently reaching to the west -northwest. To the north of Mare Crisium, Cleomedes, Burckhardt,

8.9 Day-Old Moon, *Maurice Collins, Palmerston North, New Zealand. 2024 August 13 08:30 UT. Williams Optics FLT-110 mm refractor telescope, QHY5III462C camera. North is down, west is right.*



Crescent Moon, 4%, *Jairo Chavez, Popayán, Colombia. 2024 July 04 23:31 UT. 311 mm Dobsonian truss reflector telescope, MOTO E5 PLAY camera.*

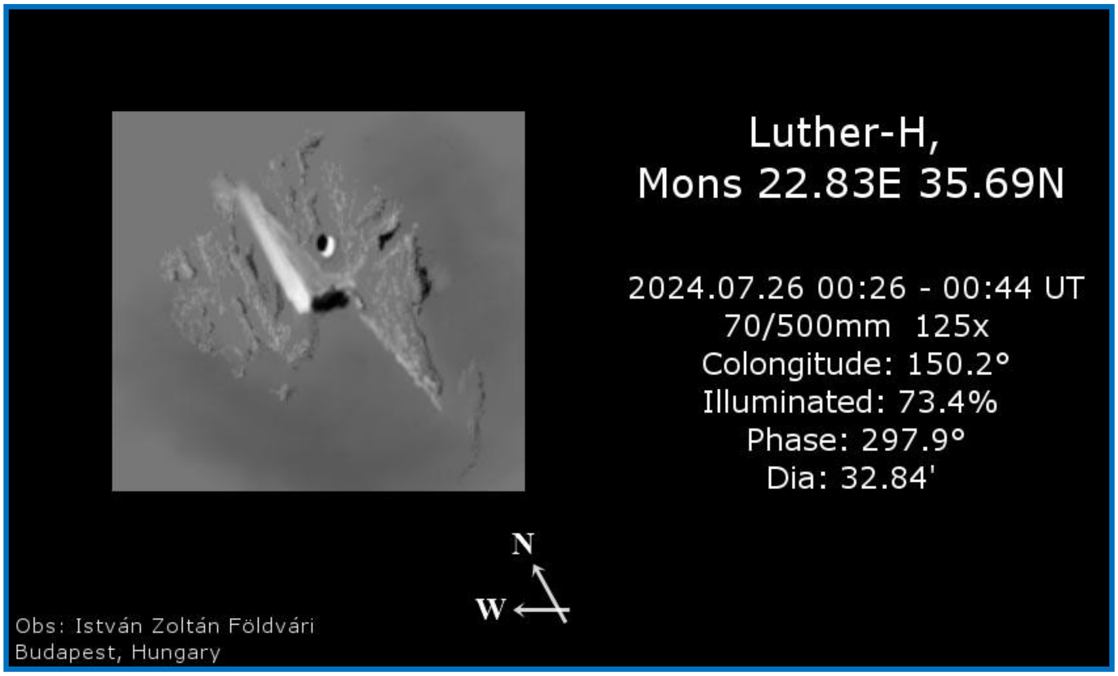
Recent Topographic Studies

Clavius and Tycho, *Anthony Harding, NE Indiana, USA. 2024 July 27 05:52 UT. 150mm Celestron C6N Newtonian, Meade LX-85 Equatorial Go-To Mount, ZWO ASI290MM Monochrome Camera. Lunar north is to the upper-left, lunar east is to the upper-right. Seeing: 5/10, transparency: 4/6. Anthony adds:* "The distinctive craters Clavius and Tycho appear in the lower-right quadrant of this image. The curved line of internal craters within Clavius are very easy to identify here. The smaller Tycho, with its central peak structure, is readily visible roughly to the north of Clavius. Despite the waning gibbous phase of the Moon, several of Tycho's rays can be seen, particularly to the southwest and northwest. The Moon lay only 18.6 degrees above the horizon when the footage was taken."

Waxing Gibbous Moon, 69%, *Jairo Chavez, Popayán, Colombia. 2024 July 15 23:56 UT. 311 mm Dobsonian truss reflector telescope, MOTO E5 PLAY camera.*

Recent Topographic Studies

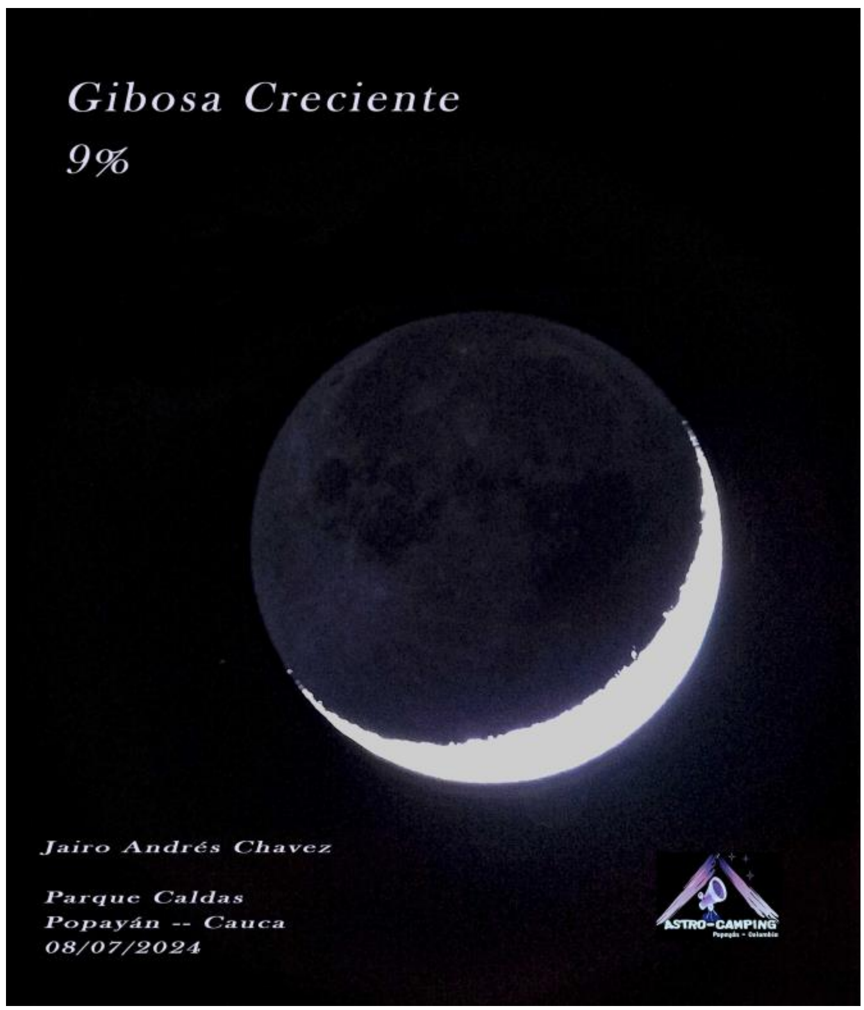
Luther H, *István Zoltán Földvári, Budapest, Hungary. 2024 July 26 00:26-00:44 UT, colongitude 150.2º. 70 mm refractor telescope, 500 mm focal length, 4 mm Vixen LV Lanthanum eyepiece, 125x. Seeing 8/10, transparency 3/6.*



Smoky Moon, *Lawrence Garrett, Fairfax, Vermont, USA. 2024 August 15 22:21 UT. Meade ETX90 mm Maksutov-Cassegrain telescope. The heavy forest fire smoke blanketing parts of North America caused this. Lawrence adds: "Last night's sun setting looked like science fiction beyond belief, like from another solar system! Last night's smokey moon cast faint shadows with local fog making the view again quite the thing".*

Recent Topographic Studies

Maskelyne, Maskelyne B, *István Zoltán Földvári, Budapest, Hungary. 2024 July 26 01:14-01:39 UT, colongitude 150.5º. 70 mm refractor telescope, 500 mm focal length, 4 mm Vixen LV Lanthanum eyepiece, 125x. Seeing 8/10, transparency 3/6.*



Waxing Crescent Moon, 9%, *Jairo Chavez, Popayán, Colombia. 2024 July 09 00:32 UT. 311 mm Dobsonian truss reflector telescope, MOTO E5 PLAY camera.*

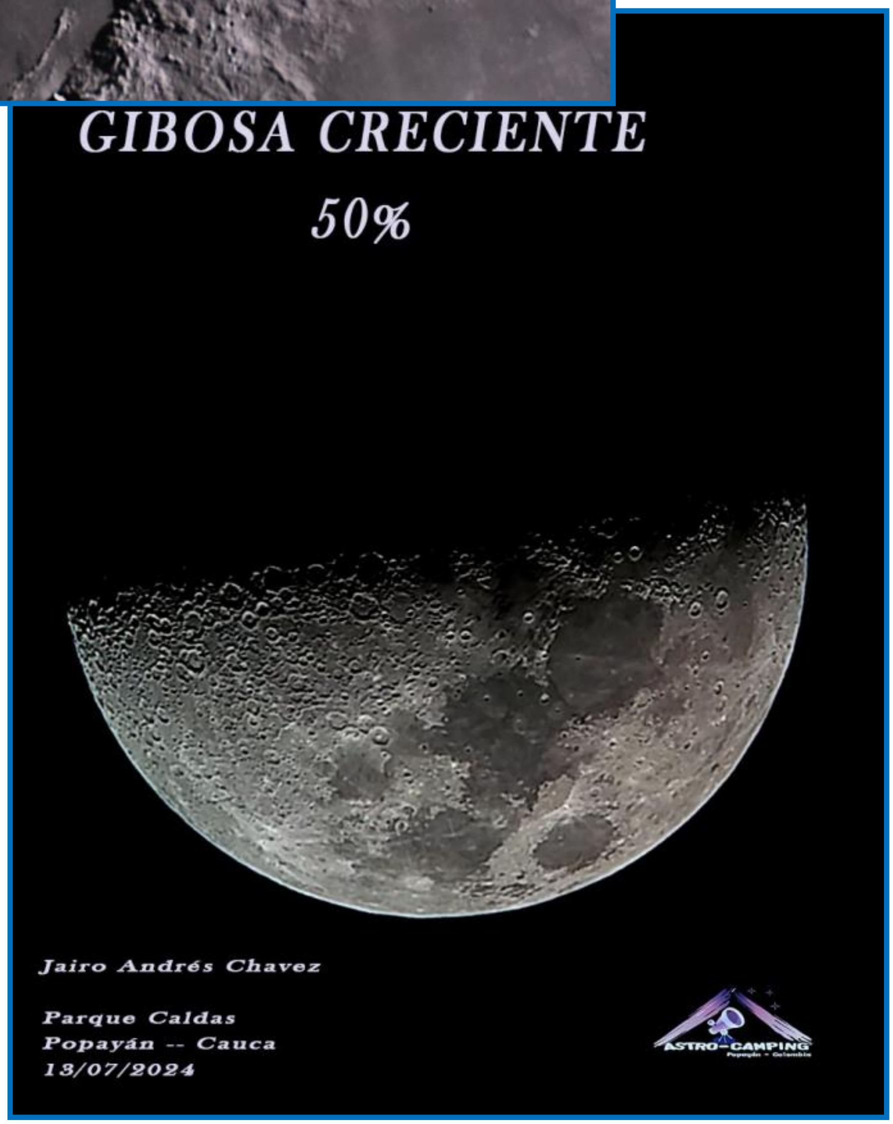
Recent Topographic Studies

Straight Wall, *Maurice Collins, Palmerston North, New Zealand. 2024 August 13 08:59 UT. Williams Optics FLT-110 mm refractor telescope, 3x barlow, QHY5III462C camera.*

Waning Gibbous Moon *by Anthony Harding. Details on image. Anthony adds: "*With this set-up, the full disc of the Moon couldn't quite fit on the camera sensor, but the relative clarity of the image is surprising, considering that the target was only 13.7 degrees above the horizon at the time. Tycho's ray system is wonderfully on display, stretching far from the originating crater. Mare Crisium in the northeast is bisected by the terminator; the sunset illumination creates some wonderful shadows in and around the basin. North of the Mare, the three craters Cleomedes, Burckhardt, and Geminus can be clearly identified. The crater Messala lies a little farther north, straddling the terminator. At the extreme upper edge of the image and lying adjacent to the terminator is an apparent black pit—Endymion."

Recent Topographic Studies

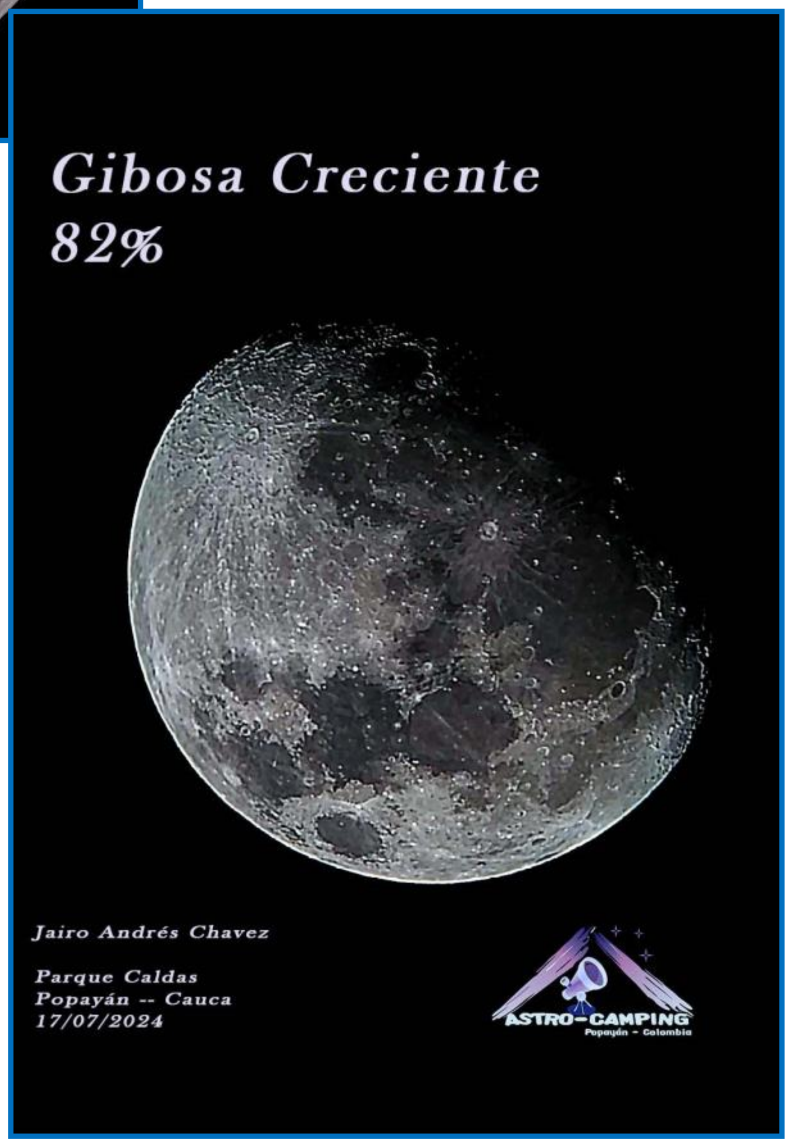
Archimedes, *Maurice Collins, Palmerston North, New Zealand. 2024 August 13 08:58 UT. Williams Optics FLT-110 mm refractor telescope, 3x barlow, QHY5III462C camera.*



First Quarter Moon, *Jairo Chavez, Popayán, Colombia. 2024 July 14 01:02 UT. 311 mm Dobsonian truss reflector telescope, MOTO E5 PLAY camera.*

Recent Topographic Studies

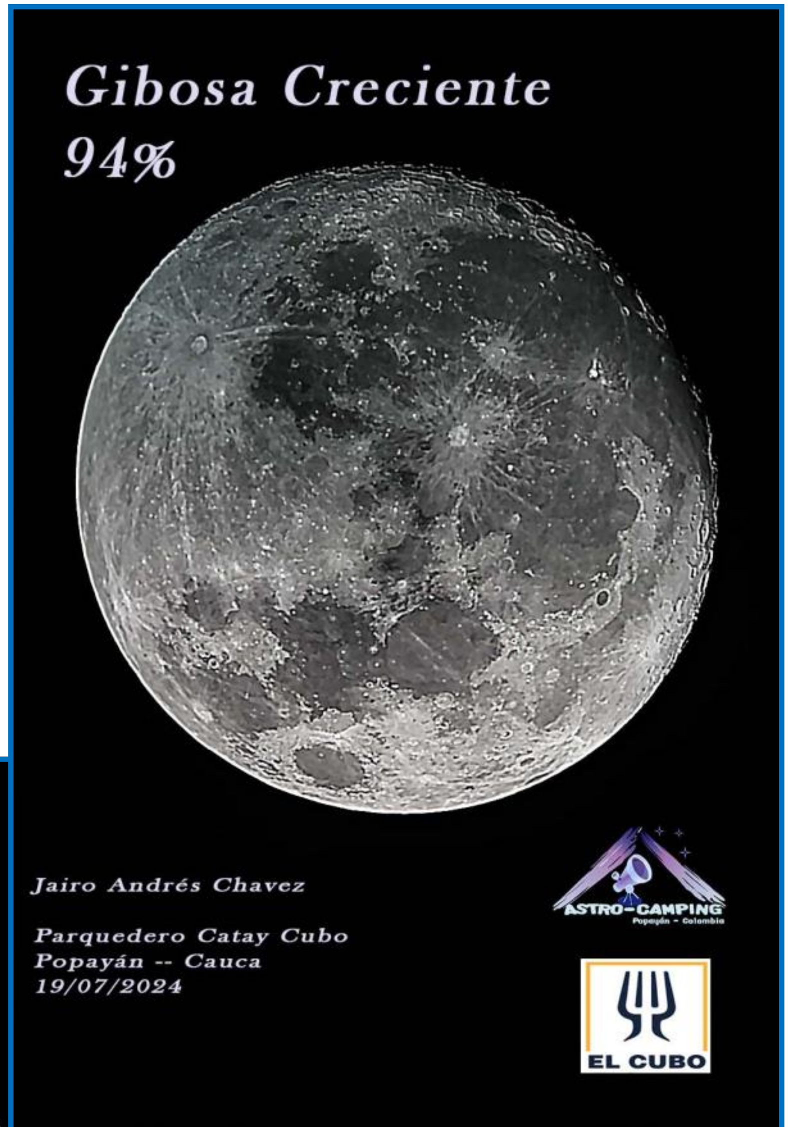
15.8 day-old Moon, *Maurice Collins, Palmerston North, New Zealand. 2024 August 20 08:47-08:55 UT. Skywatcher Espirit 80 mm ED refractor telescope, 3x barlow, QHY5III462C camera.*



Waxing Gibbous Moon, 82%, *Jairo Chavez, Popayán, Colombia. 2024 July 17 23:28 UT. 311 mm Dobsonian truss reflector telescope, MOTO E5 PLAY camera.*

Recent Topographic Studies

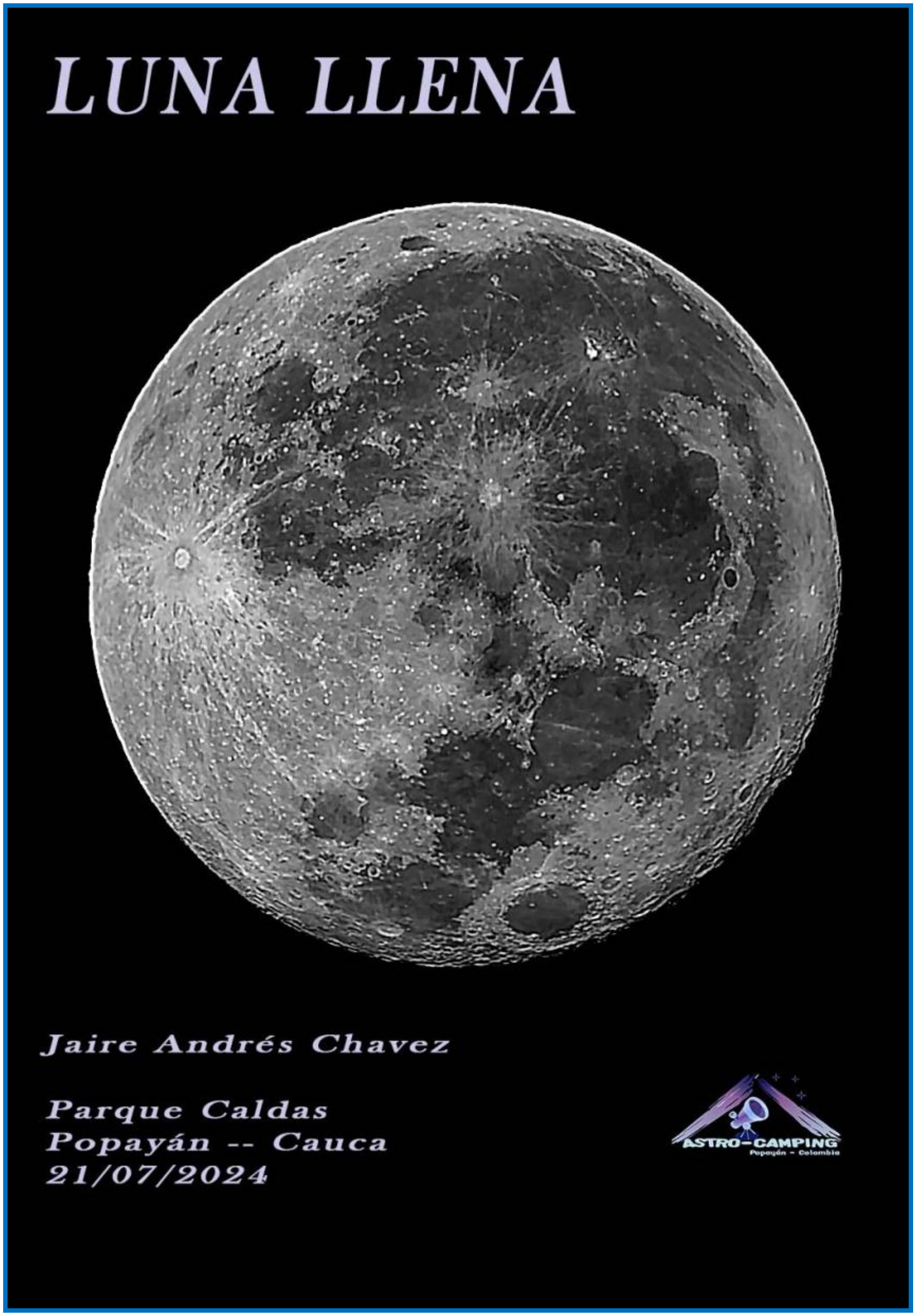
Waxing Gibbous Moon, 94%, *Jairo Chavez, Popayán, Colombia. 2024 July 19 23:28 UT. 311 mm Dobsonian truss reflector telescope, MOTO E5 PLAY camera.*



Waxing Gibbous Moon, 98%, *Jairo Chavez, Popayán, Colombia. 2024 July 21 00:58 UT. 311 mm Dobsonian truss reflector telescope, MOTO E5 PLAY camera.*

Recent Topographic Studies

Full Moon, 94%, *Jairo Chavez, Popayán, Colombia. 2024 July 22 01:51 UT. 311 mm Dobsonian truss reflector telescope, MOTO E5 PLAY camera.*



Recent Topographic Studies

Lunar Geologic Change Detection Program

Coordinator Dr. Anthony Cook- atc@aber.ac.uk
Assistant Coordinator David O. Darling -DOD121252@aol.com

2024 September

LTP Reports Received
No new LTP, or impact flash, reports have been sent in.

News: Nigel Longshaw has contacted me about discussion in last month's newsletter concerning the 1886 Nov 14th report by Lihou, as listed in the Cameron catalog:

Plato 1886 Nov 14 UT 21:45 Observed by Lihou (France?) "Brilliant band N-S, area marked G in NE was only slightly visible, poorly defined. Drawing (there were rays on the floor)." NASA catalog weight=3. NASA catalog ID #253. ALPO/BAA weight=ALPO/BAA weight=3.

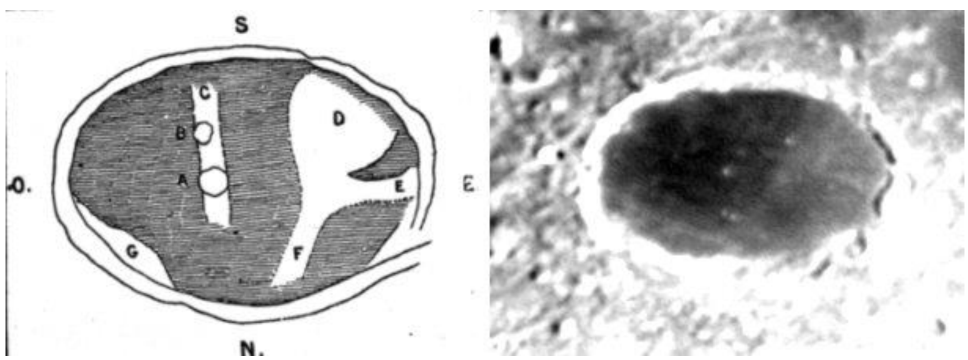


Figure 1. *Plato orientated with south towards the top.* ***(Left)*** *a sketch by Benjamin Lihou (Société scientifique Flammarion de Marseille) published in L'Astronomie in 1887).* ***(Right)*** *a highly contrast stretched view of the floor of Plato from an image by Brendan Shaw (BAA) taken on 2004 Sep 02 UT 23:21 – taken under similar illumination.*

Nigel managed to track down the relevant copy of L'Astronomie on the NASA ADS web site https://ui.adsabs.harvard.edu . Fig 1 (Left) shows Lihou's sketch and you can compare it to a modern-day image under identical illumination by Brendan Shaw (Fig 1 Right). Nigel comments about Lihou: *"He seems to show the area (D,E,F) which was named 'the sector' by observers in the 19th century. I suspect the feature he shows as light streak may be part of 'the trident', again named by selenographers of the time. This usually forms a three pronged, hence the name, arrangement of light steaks and usually appear together, I can't find any drawings where a single steak is shown in the middle of the floor as Lihou depicts. But observers have in the past shown N/S streaks across the floor of Plato – Beer and Madler and Elger I think. So Lihou might have experienced a particular prominence of one of these streaks at the time of his observation. Worth keeping on the database I think."*. All I can say with regard to Nigel's comments is that the N-S streak (labelled C) does not show up in Brendan's image and the craterlets B and A seem slightly too far to the south. F, D, E are sort of visible if you blur or squint your eyes and so to G maybe? Anyway, the fact that there is no white streak normally here for that selenographic colongitude is a good reason to retain this as a LTP of weight 3.

Rik Hill kindly emailed that, whilst browsing through some old Sky and Telescope magazines, he came across a LTP report in the Feb 1952 edition, concerning Alpetragius. On 1958 Nov 19 UT 22:00 Raymond J Stein, of the Newark Museum Planetarium, Newark, NJ, USA, saw, using a 4” reflector, that about two thirds of the floor was covered in black shadow, with the central peak appearing as a bright point inside the shadow. However, he later suddenly noted that about half of the shadow had faded into a much lighter shade. By 22:05 the shadow darkened again reaching its former black color after about 20 sec. He checked other features but they did not exhibit this effect and also let the Moon drift across the field of view in case it was an optical effect in the scope, but this made no difference. So maybe we should keep watch on Alpetragius from time to time, doing time lapse imaging, just in case the effect recurs?

Routine reports received for July included: Alberto Anunziato (Argentina – SLA) observed: Alphonsus, Aristarchus, Atlas, Beer, Burg, Gassendi, Linne, Mons Pico, Posidonius, Proclus, Ross D, Torricelli B, Vallis Alpes, and the western limb region. Bob Bowen (Newtown, UK – NAS) imaged: several features. Francisco Alsina Cardinalli (Argentina – SLA) imaged: Aristarchus, Bullialdus, Gassendi, and Plato. Tony Cook (Newtown, UK – ALPO/BAA) videoed the Moon in the Short-Wave IR (1.5-1.7 microns). Maurice Collins (New Zealand - ALPO/BAA/RASNZ) imaged: Aristarchus, earthshine, Gassendi, Schickard, and several features. Walter Elias (Argentina – AEA) imaged: Alphonsus. David Finnigan (Halesowen, UK – BAA) imaged: Archimedes, Pitatus, Plato and Ptolemaeus. Valerio Fontani (Italy – UAI) imaged: Geminus and Maurolycus. Chris Longthorn (UK – BAA) imaged: several features. Franco Taccogna (Italy – UAI) imaged: earthshine, Eudoxus, Maurolycus, Plato, Promontorium Agarum, and several features. Luigi Zanatta (Italy – UAI) imaged: Plato.

Note that I have included some BAA pooled observations in with this report.

Analysis of Routine Reports Received (July)

Maurolycus: On 2024 Jul 12 UAI observers Franco Taccogna and Valerio Fontani respectively obtained repeat illumination images of the following two events:

On 1971 May 01 at UT21:00-21:50 Staedke, Jorgensen (Berlin, Germany, x40 with filters) observed on Maurolycus a colored, luminous projection from the crater into and through the small crater on the north rim. Color of a dark candlelight then red. Length at diameter of small crater. a drawing was supplied. Cameron 1978 catalog ID 1293 and weight=2.

On 2012 Feb 28 R. Braga (Italy, Seeing III, Transparency very good, AOG 100mm) UT 19:45-20:00 noted that only the tip of the central peak was visible. Most of the crater was in darkness. When viewed through a red filter, the central peak was visible, but when viewed through a blue filter it was invisible. ALPO/BAA weight=2.

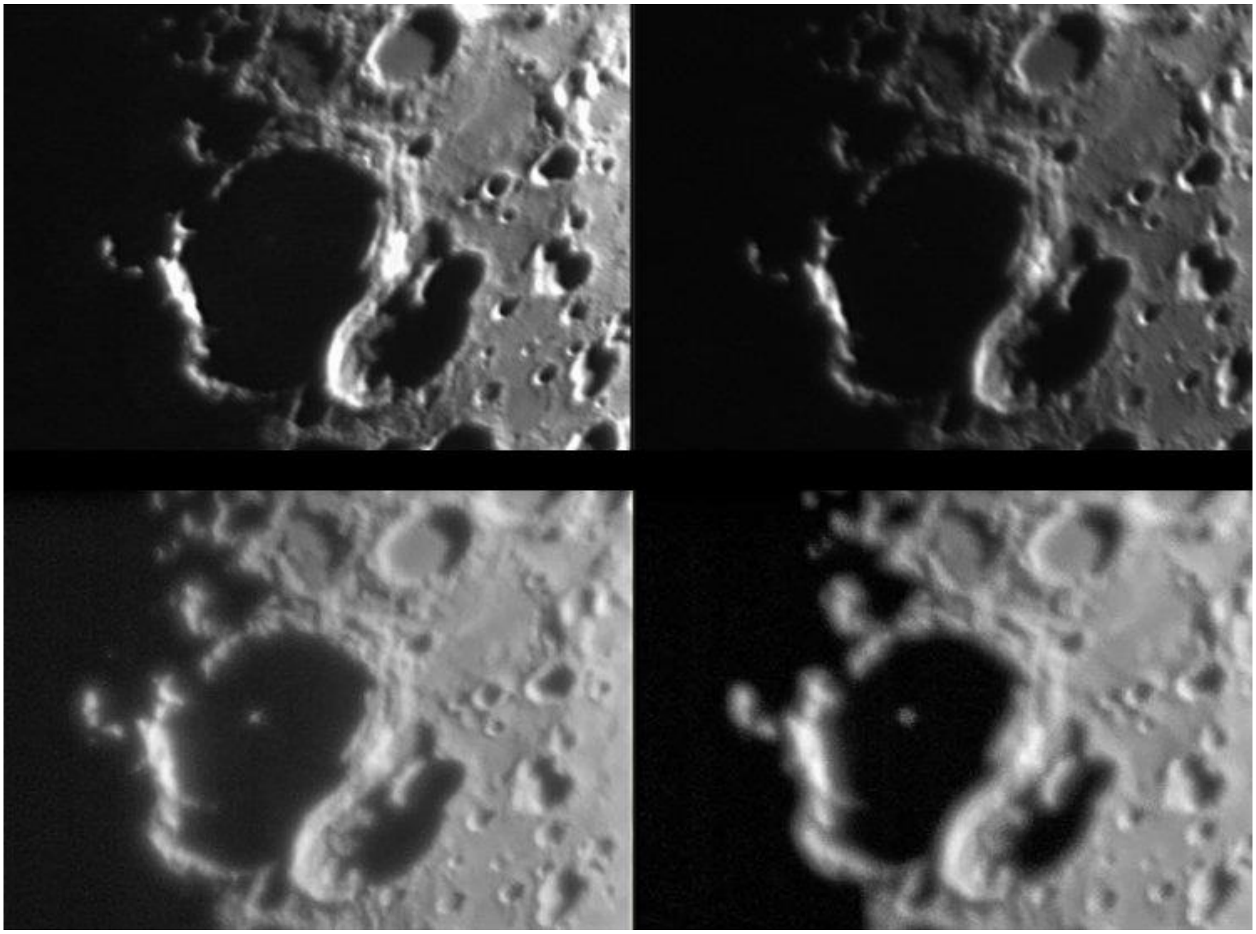


***Figure 2.** Maurolycus orientated with north towards the top, taken by UAI observers on 2024 Jul 12. **(Left Side)** Red filter images. **(Right Side)** Blue filter images. **(Top)** Images by Franco Taccogna taken at **(Left)** 1957 UT and **(Right)** 1959 UT. **(Bottom)** Images taken by Valerio Fontani at (Left) 20:32UT and **(Right)** 20:33 UT.*

Franco's images (Fig 2 top left and top right) do indeed show a projection from the crater into and through the small crater on the north rim, though it appears just to be the illuminated rim of a neighbouring crater and you have a choice of three, one on the W, NW and N if one is not too fussy about compass directions. There appears to be not much in the way of enhancement in red light though, so I think we shall leave the ALPO/BAA weight at 2 for now.

Valerio's images (Fig 2 bottom left and bottom right) confirm Raffaello Braga's description of the interior being shadow filled apart from a protruding central peak. The central peak does appear to be sharper and more noticeable in Valerio's image through a red filter – the blue one being slightly more blurred and less visible. Maybe this can explain the 2012 observation, namely red and blue light come to different focal points, and maybe that is the reason why the peak was not visible in blue light, especially if the peak was just emerging and fussy. I will lower the ALPO/BAA weight from 2 to 1.

Mons Pico: On 2024 Jul 17 UT 23:09 Francisco Alsina Cardinalli (SLA) imaged, and UT 23:20-23:25 Alberto Anunziato (SLA) sketched this mountain under similar illumination for the following report:

Pico 1976 Mar 12 UT 21:00? Observed by Findlay (England?) "A ray seen extended fr. mt. in SW (IAU?) direction -- likened to a hockey stick. (not seen in Pickering's photo atlas at col.=53 deg)." NASA catalog weight=3. NASA catalog ID #1430. ALPO/BAA weight=1.

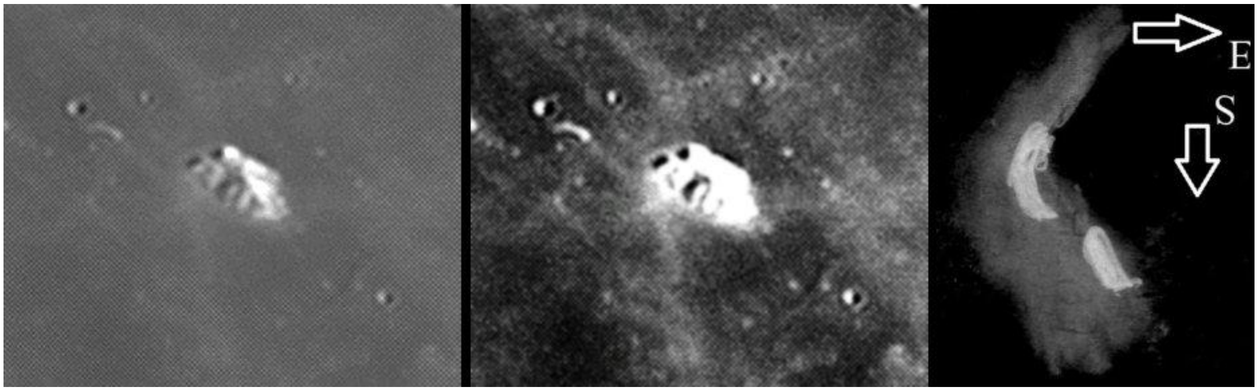


Figure 3: *Mons Pico with north towards the top on 2024 Jul 17.* ***(Left)*** *An image taken by Francisco Alsina Cardinalli (SLA) at 23:09 UT.* ***(Center)*** *A highly contrast stretched version of the image to bring out the rays in the mare.* ***(Top Right)*** *A sketch by Alberto Anunziato (SLA) made at UT 23:20-23:25 UT. This was obtained with a 105mm Maksutov-Cassegrain (Meade EX 105) and has been rotated and mirror image flipped so that the cardinal coordinate arrows were in the right direction.*

As we can see from Francisco's image (Fig 3 Left) Mons Pico does not look like a hockey stick shape itself. With a bit of contrast stretching, (Fig 3 Center) we can see many rays on the Mare Imbrium. There is quite a major one coming off the SW corner of the mountain and going SSE, but nothing resembling a hockey stick shape. Alberto's sketch (Fig 3 Right) of the mountain does show an "L" shaped structure, though it differs considerably to Francisco's image. Checking back through the archives, it appears that I made to visual observation, again under similar illumination, on 2004 Sep 25, and saw a hockey stick shape to the mountain (like what Alberto saw), but not a ray with that shape.

I also came across a (possibly) unpublished paper by Peter Foley and Patrick Moore (from the BAA Lunar Section archives), where they claim that a ray to the SW of Mons Pico was visible and quite bright (75% the brightness of Mons Pico in Mar 1976) from Feb 1976 onwards, but invisible before December 1975 (See Fig 4). They base this claim on a comparison of sketches made on or after Mar 1976 with earlier sketches and professional telescope photographs made prior to December 1975. Two other changes are also suggested on the NW corner, a shadow on the west wall and a shadow on the southern peak. We can see a bit of the SW ray that they are talking about in Fig 3 (center), but it is nowhere near as long or as bright as they were suggesting. It also shows up well in mineral overlays on the NASA Quickmap website, especially in Plagioclase (usually found in the crust), but also FeO, Olivine, and Orthopyroxine, which are all constituents of the mountain. I am not sure what happened about this BAA Lunar Section study? I do remember taking part myself, as did others, in sketching this 24km long (12 arc sec) mountain for many years, but I don't think any conclusions were drawn. As a quick test I decided to examine a Consolidated Lunar Atlas photo of the area, taken way back in 1965. Fig 5 actually disproves the notion that the SW ray appeared after 1976 because you can actually see it there! So, Foley and More were partly mistaken in their conclusion. I cannot comment on their reports of other changes, or the SW ray being very bright on perhaps one night, but a new feature it certainly is not!

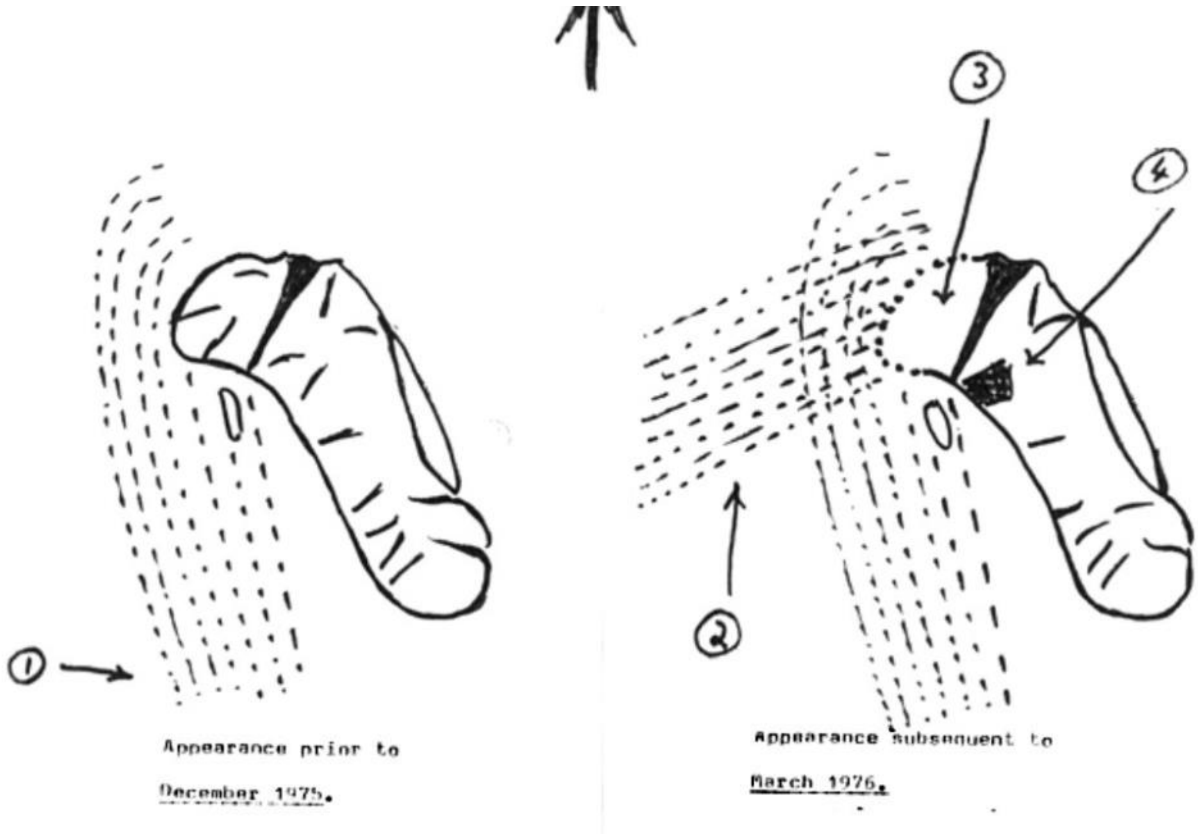


Figure 4 *Illustrative sketches of Mons Pico from an unpublished paper by Peter Foley and Patrick Moore, showing: (1) N-S ray to the west of Mons Pico, (2) a SW ray coming off the NW corner of the mountain, (3) suggested change of detail on the N part of the mountain, (4) suggested appearance of a dark feature. North is towards the top.* ***(Left)*** *appearance prior to December 1975,* ***(Right)*** *appearance for March 1976 onwards.*

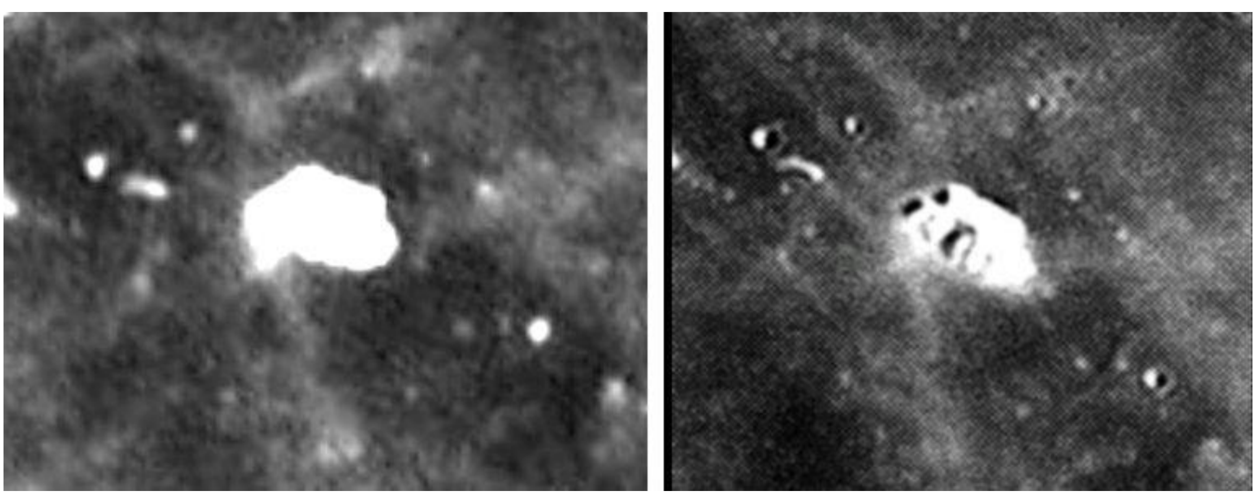


Figure 5 *Mons Pico with north towards the top.* ***(Left)*** *An enlarged and highly contrast stretched Consolidated Lunar Atlas photograph taken on 1965 Oct 09 UT 06:29 using a 61-inch scope at the US Naval Observatory.* ***(Right)*** *An image taken by Francisco Alsina Cardinalli (SLA) on 2024 Jul 17 at 23:09 UT using a much smaller 8 inch Newtonian telescope.*

Aristarchus and Herodotus: On 2024 Jul 18 UT 06:54 Maurice Collins (ALPO/BAA/RASNZ) imaged this area under similar illumination to the following two LTP reports:

Aristarchus 1975 Mar 24 at UT19:08-19:45 P.W. Foley (Kent, UK) observed blueness in the North East (Classical?) corner of Aristarchus. Moon blink seen - pale in red. Most other observers clouded out. The ALPO/BAA weight=3.

Herodotus 2002 Sep 18 UT 22:00 Observed by Raffaello Lena (GLR, Italy). Event described was of two pseudo-peak/hill-like features, one on the southern floor of the crater, and another just slightly to the NW of the center. on the southern floor of the crater. Lena suspects a combination of seeing effects and albedo markings on the floor. However this effect of two spots on the floor has not been repeated again. For further information, theory, and a sketch please see Fig 5 in this web link: http://utenti.lycos.it/gibbidomine/analisi123.htm ALPO/BAA weight=2.

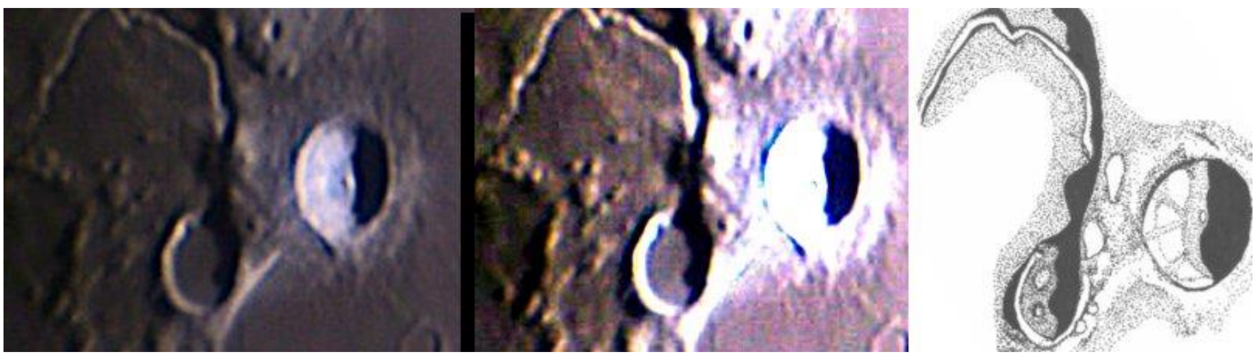


***Figure 6.** Aristarchus and Herodotus, orientated with north towards the top. **(Left)** Image by Maurice Collins taken on 2024 Jul 18 UT 06:54 with color saturation increased. **(Center)** Same image but contrast stretched to bring out detail on the floor of Herodotus. **(Right)** A sketch by Raffaello Lena (BAA/GLR) captured from the GLR web site.*

Maurice's image (Fig 6 – Left) has a dark slate grey appearance to the floor of Aristarchus, but no sign of any blueness on the NE (classical) or indeed NW of the crater rim. We shall therefore leave the weight at 2 for now.

Raffaello's sketch (Fig 6 right) from 2002 is remarkably detailed and accurate compared to Maurice's image (Fig 6 Left and Center). Generally speaking, the spots that Raffaello draws, have areas in Maurice's image, that resemble them, all except for the two light spots on the floor of Herodotus, which we cannot see in the contrast stretched similar illumination image in Fig 6 (center). I will therefore increase the ALPO/BAA weight from 2 to 3 as the effect differs from what we would expect and the observer is a skilled sketcher.

Alphonsus: On 2024 Jul 27 UT 03:13 Bob Bowen (NAS) imaged the whole Moon under similar illumination to the following report:

On 1958 Dec 02 at UT 06:00 an unknown observer detected a LTP on the Moon. The reference for this is from Palm, 1967 Icarus. The Cameron 1978 catalog ID=709 and weight=0. The ALPO/BAA weight=1.

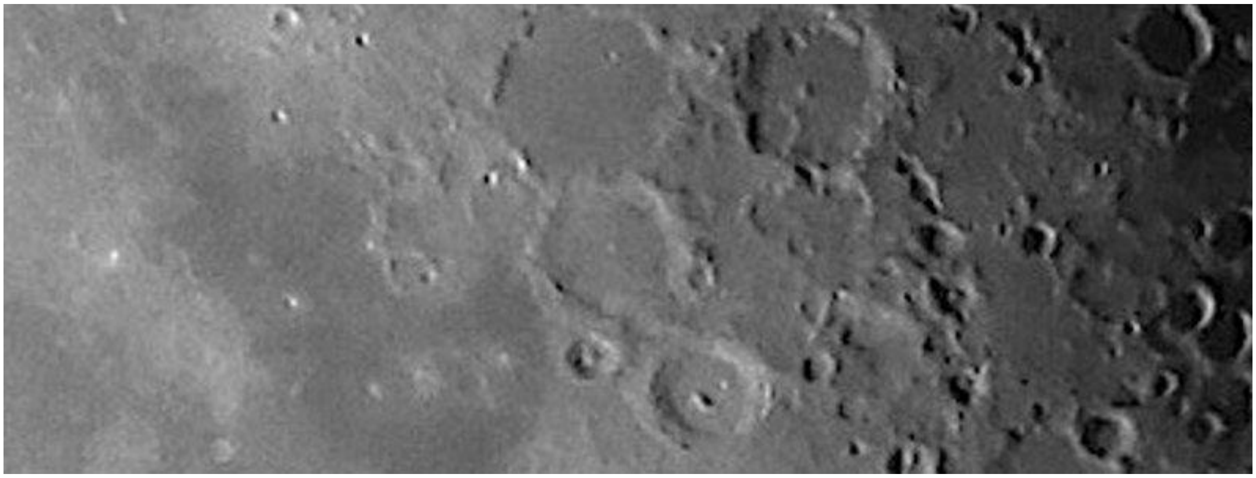


Figure 7. Alphonsus as imaged by Bob Bowen (NAS) on 2024 Jul 27 UT 03:13 and orientated with north towards the top.

Everything looks normal in Fig 7. We have covered a similar repeat illumination for the LTP before in the 2019 Nov newsletter. An examination of the Cameron cards for this event mentions that it was covered at an AGU meeting on Apr 20th, 1967. Alas I don't have access to this, nor an article by A. Palm "Enhanced Luminance of the Moon" published in Icarus, Vol 7, issue 1-3, p188-192. We shall leave the weight at 1 for now.

Alphonsus: On 2024 Jul 27 UT 10:58 Walter Elias (AEA) imaged this crater under similar illumination and similar topocentric libration (viewing angle) to within ±1˚ of the following report:

Alphonsus 1964 Oct 27 UT 05:18-06:10 Observed by Hall, Johnson, Weresulk (Pt. Tobacco, MD, USA, 16" reflector x400, S=5-7). "Red spot. Pink glow detected with Trident MB & seen visually too." NASA catalog weight=5. NASA catalog ID #863. ALPO/BAA weight=5.

Figure 8. Alphonsus as imaged by Walter Elias (AEA) on 2024 Jul 27 UT 10:58 and orientated with north towards the top. Image has been contrast normalized, slightly sharpened, and had its color saturation increased.

There is no sign of a red spot in Alphonsus, in Fig 8, though there is some natural surface orange color near Lassell K to the SW of Alphonsus. This begs the question why Hall did not detect that? Maybe the red spot was a lot more vivid than the orange coloration at Lassell K. You probably would not notice the orange color visually looking through a telescope. We shall leave the weight at 5 for now as the LTP was detected back in 1964 with an electronic Moon Blink device.

Plato: On 2024 Jul 29 both Luigi Zanatta and Franco Taccogna had goes at trying to record the ashen light effect on the floor of the crater, sometimes seen around this colongitude at lunar sunset, for example a sketch made by Phil Morgan (BAA) from 2009:

BAA Request: Itis around this Co-Longitude that some observers have reported seeing an Ashen Light effect on the shadowed floor of Plato, caused by scattered light off of an illuminated peak on the rim. Please have a go either visually, or with long exposure time lapse imagery to see if you can pick up the development of this weak illumination effect on the floor. Please send any sketches or images to: a t c @ a b e r . a c. u k .

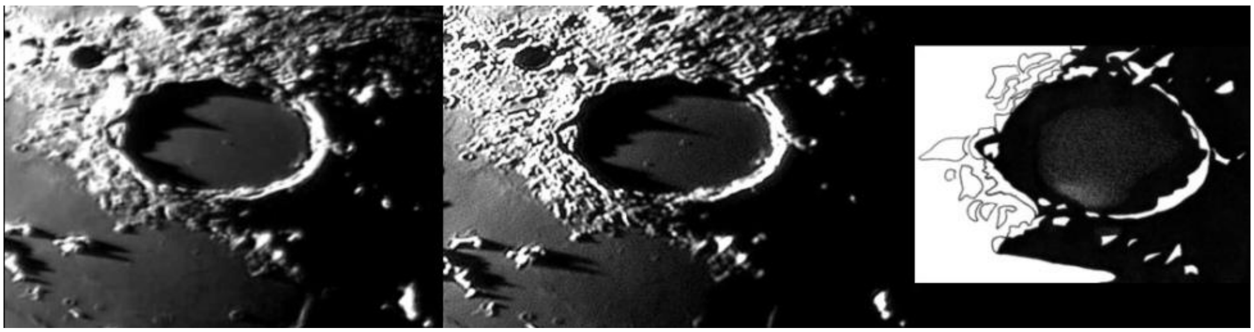


Figure 9. *Plato orientated with north towards the top.* ***(Left)*** *An image by Franco Taccogna taken on 2024 Jul 29 UT 01:06 ($\lambda_{\odot}$=262.91˚, $\varphi_{\odot}$=+1.35˚, Col=187.09˚).* ***(Center)*** *An image by Luigi Zanatta (UAI) taken on 2024 Jul 29 UT 02:37 ($\lambda_{\odot}$=261.13˚, $\varphi_{\odot}$=+1.35˚, Col=187.87˚).* ***(Right)*** *A sketch by Phil Morgan (BAA) made on 2009 Jun 16 UT 03:20-03:40 ($\lambda_{\odot}$=260.25˚-260.42˚, $\varphi_{\odot}$=+0.93˚, Col=189.58˚-189.75˚).*

In the original sketch (Fig 9 – right) by Phil Morgan, he quotes a selenographical colongitude of 189.0˚-189.2˚. This was used to define a search parameter in the Lunar schedule program which ran from 188.0˚-190.0˚ in terms of selenographic colongitude. Allowing for the precision of the lunar schedule program, this throw up some observing times for our UAI observers in Italy. Franco Taccogna took the earliest image (Fig 9 – Left) in this observing window, and Luigi Zanatta a later image (Fig 9 – center). Although both show approximately the correct amount of shadow on the western floor as shown in Phil Morgan's Ashen light sketch (Fig 9 – Right), the central shadow spire in Phil's image does not show and the terminator below Plato is further west.

This suggests that something maybe in #correct with the 2009 observation. I checked the sub-solar colongitude from the NASA JPL Horizons web site (https://ssd.jpl.nasa.gov/horizons/app.html#/) and from that derived the selenographic colongitude for the 2009 Jun 16 report and it came out to be : Col=189.58-189.75˚ , off by 0.6˚ from Phil's calculations. In fact, it makes the crater completely shadow filled apart from this ashen light effect. I will adjust the selenogtraphic colongitude range in the lunar schedule database to compensate for this. Although Franco and Luigi did not capture the completely shadow filled floor, and hence any ashen light effect, their observations have located an error in the calculations by Phil Morgan.

General Information: For repeat illumination (and a few repeat libration) observations for the coming month - these can be found on the following web site: http://users.aber.ac.uk/atc/lunar_schedule.htm . By re-observing and submitting your observations, only this way can we fully resolve past observational puzzles. If in the unlikely event you do ever see a LTP, firstly read the LTP checklist on http://users.aber.ac.uk/atc/alpo/ltp.htm , and if this does not explain what you are seeing, please give me a call on my cell phone: +44 (0)798 505 5681 and I will alert other observers. Note when telephoning from outside the UK you must not use the (0). When phoning from within the UK please do not use the +44! Twitter LTP alerts can be accessed on https://twitter.com/lunarnaut .

Dr Anthony Cook, Department of Physics, Aberystwyth University, Penglais, Aberystwyth, Ceredigion, SY23 3BZ, WALES, UNITED KINGDOM. Email: atc @ aber.ac.uk

Basin and Buried Crater Project

Coordinator Dr. Anthony Cook- atc@aber.ac.uk

Skylar Rees and Tony Cook

Sinus Asperitatis (Bay of Roughness)

This month, we look at another basin, or perhaps buried crater, or both? "*Asperitatis"* appears in the basin catalog at 27°E, 8°S with a proposed diameter of 730 km. The mare material from *Sinus Asperitatis* lies in the corridor between *Mare Tranquillitatis* and *Mare Nectaris*, south and southeast of it respectively. It's center is found at around 27°E, 4°S on the lunar nearside, and the eponymous mare is about 206km long. There are many nearby large craters such as *Theophilus* and *Cyrillus.* Then you have a buried crater by the same name of *"Sinus Asperitatis"* that lies at 28.2°E, 5.4°S and is 87 km in diameter and has a more recent crater, Torricelli at its center.

As before, we infer from morphometric, gravitational and even geological filters on the NASA QuickMap web site. Remember if it is a basin it is of the order of 300km or so in diameter, where as if it is a buried crater then it is under this size and upto approximately 100km across complex craters have central peaks, but for larger sized craters the central peaks can become ring peaks. Of course with buried craters peaks, ring peaks or indeed the rim may be partly obscured and buried.

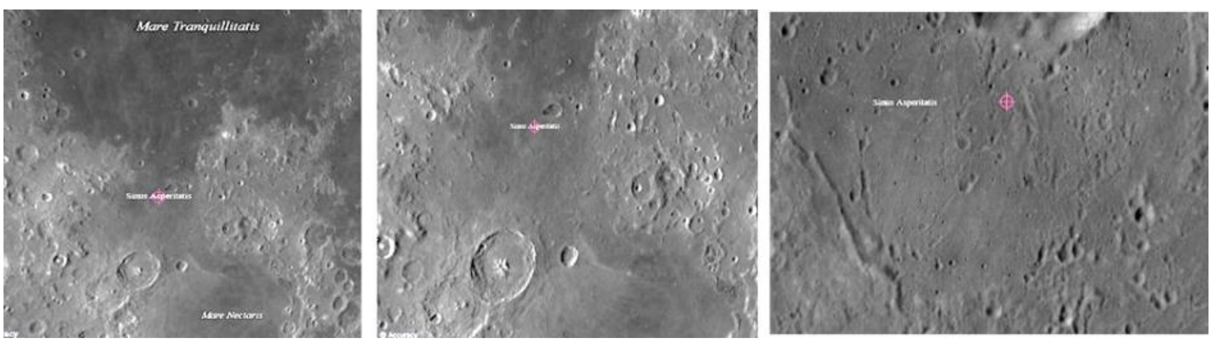


Figure 1. Views of *Asperitatis basin* using NASA's QuickMap mosaic tool. **(left)** *Asperitatis basin* is nestled between *Tranquillitatis* and *Nectaris*. **(center)** Closer view of *Asperitatis basin* itself. **(right)** close-up of the suggested buried crater region.

Fig.1 (right) shows a vaguely diamond-like trace with a raised south-to-west edge. Many small craters seem to dot around this area as if constrained by its rim. The surviving rim seems to have a smooth and higher-albedo 'pile' next to it, which could indicate the ejecta from a now-buried impact. Moving anti-clockwise from the *Sinus Asperitatis* label there is another vaguely concentric distribution of small impact craters.

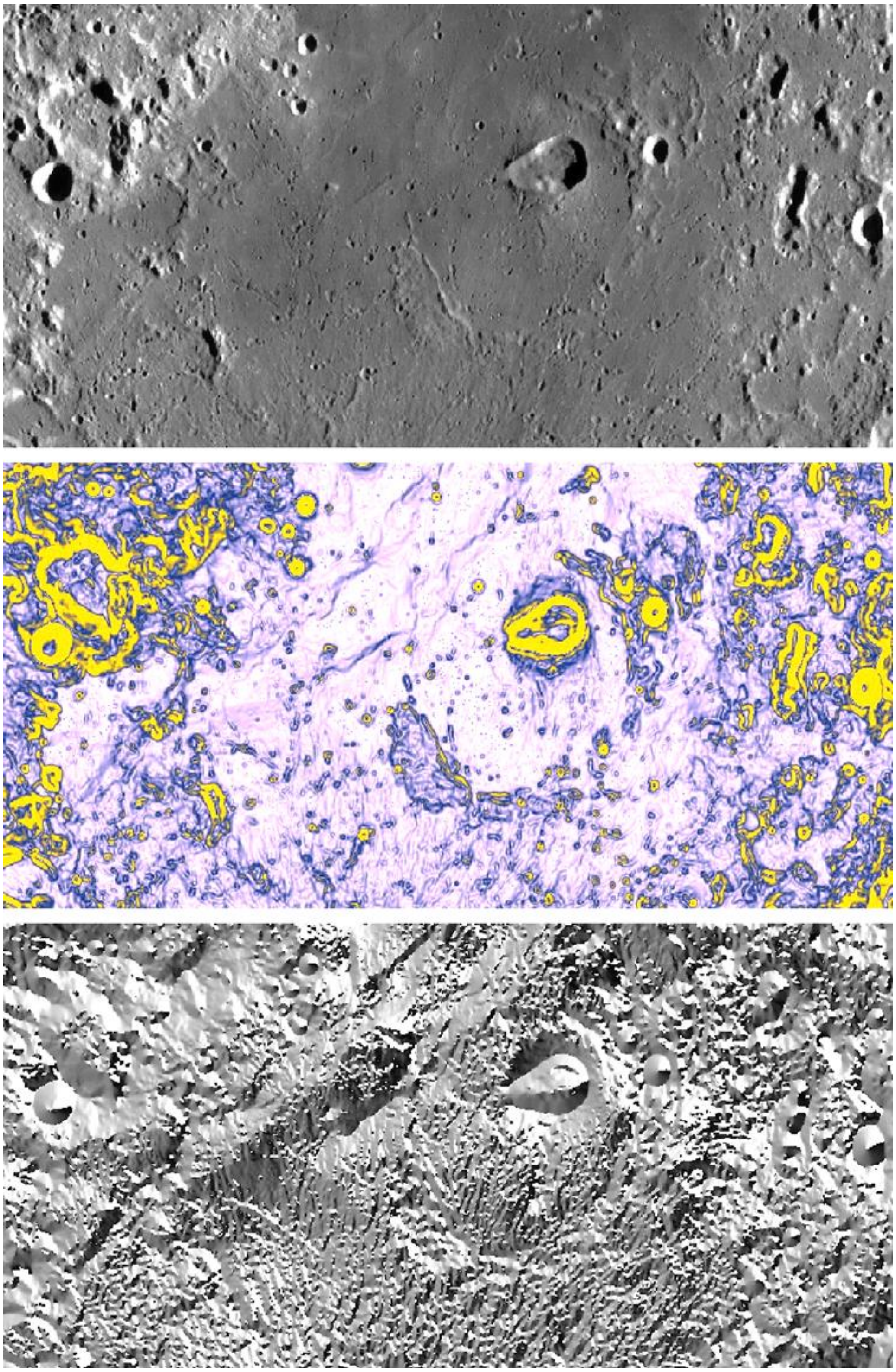


Figure 2. (Top) NASA LROC WAC image mosaic with shadows. **(Center)** *TerrainSlope* filtered view, showing height variation. **(Bottom)** *TerrainAzimuth* view, highlighting impacts as 'aberrations' to the direction of azimuthal light. Scale for all three images is 350 km wide horizontally.

TerrainSlope shows the partial rim of the buried crater though in general we see a flat surface surrounded by grooved, negatively sloping walls. TerrainAzimuth shows the buried crater less well, but there appears to be some concentric arcs beyond the rim, further to the east? In both plots the buried crater is elongated in the N-S direction slightly. Just north of the center of the buried crater is Torricelli – it is interesting to see that this sits upon a circular domed structure.

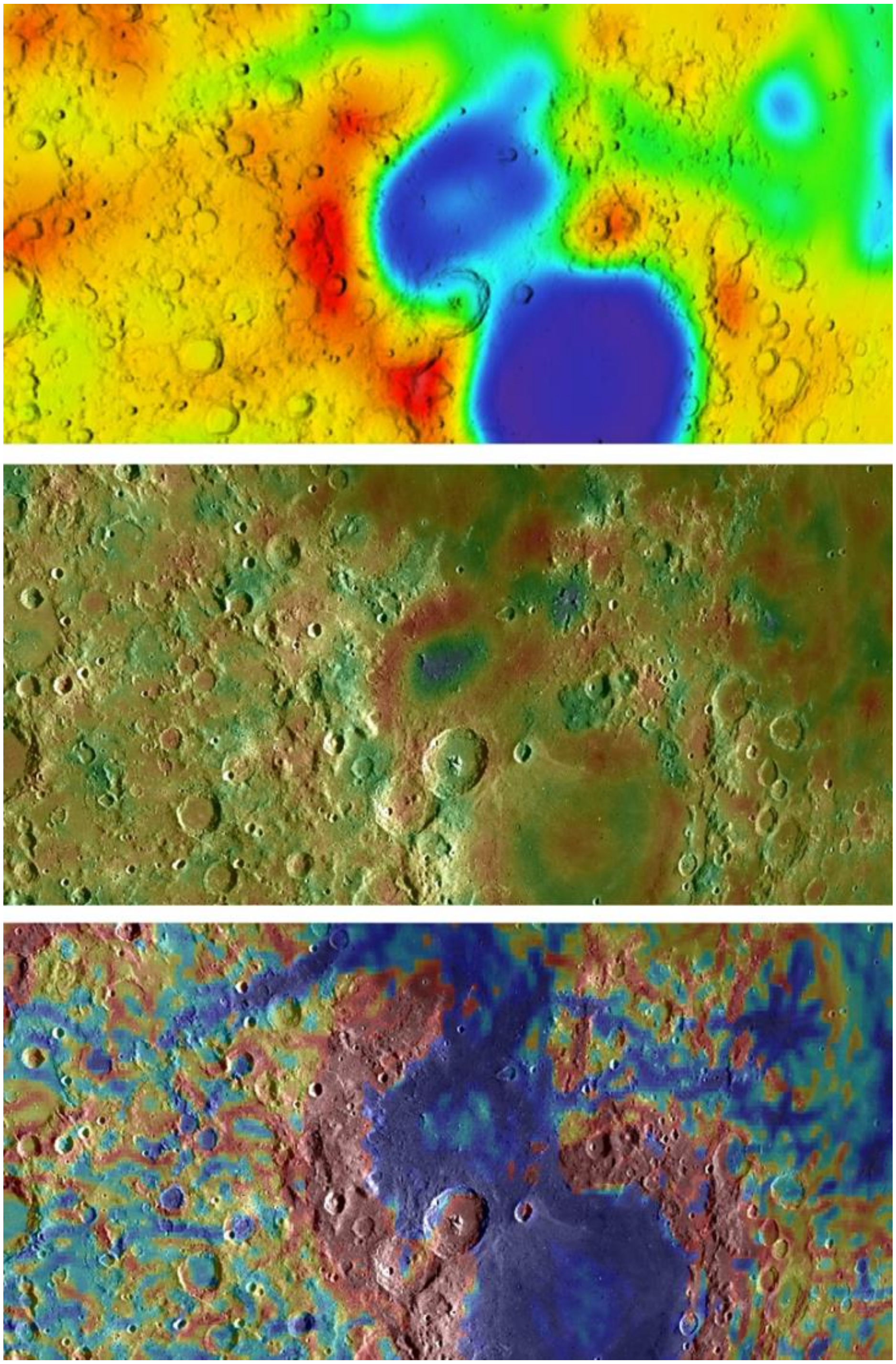


Figure 3. (Top) GRAIL Crustal Thickness map. **(Center)** Bouguer Gravity (degree 6 to 660) with shading. **(Bottom)** Bouguer gravity gradients.

The crustal thickness map (Fig 3 Top) shows a thin crust, where the Asperitatis basin center is supposed to be, and three reddish thick crust areas where a possible rim may be. The Bouguer gravity map (Fig 3 Center) shows a non-mascon basin, but not all basins have mascon's at their centers. Finally, the gravity gradient map (Fig 3 – Right) has a nice broad gradient arc on the western side of the basin.

Is *Asperitatis* a buried crater or basin or both? The buried crater in Fig 1 may be related to the basin, perhaps an inner ring, or alternatively it may just be a buried crater by coincidence? Further telescopic evidence of the remains of the basin or buried crater would be appreciated. If you are interested in reading further about Sinus Asperitatis, then see the article by Barry Fitz-Gerald published in the Jan 2024 BAA Lunar Section Circular, p34-40.

Lunar Calendar September 2024

Date	UT	Event
1	0900	Mercury 5° south of Moon
3	0156	New Moon (lunation 1258)
5	0543	Moon at descending node
5	1000	Venus 1.2° north of Moon, occultation Antarctica
5	1500	Moon at apogee 406,211 km
6	1700	Spica 0.5° south of Moon, occultation NE North America, Africa
10	1300	Antares 0.1° north of Moon, occultation Africa to Indonesia
11	0606	First Quarter Moon
12		West limb most exposed -7.4°
12		Greatest southern declination -28.7°
13		North limb most exposed +6.8°
17	1000	Saturn 0.3° south of Moon, occultation Australia to western North America
18	0234	**Full Moon, Partial lunar eclipse**
18	0800	Neptune 0.7° south of Moon, occultation Polynesia to North America
18	1300	Moon at perigee 357,286 km, Large tides
18	1951	Moon at ascending node
22	1100	Moon 0.2° north of Pleiades
23	2300	Jupiter 6° south of Moon
24	1850	Last Quarter Moon
25		Greatest northern declination +28.6°
25	1200	Mars 5° south of Moon
25		East limb most exposed +7.8°
25		South limb most exposed -6.8°
26	1100	Pollux 1.7° north of Moon

AN INVITATION TO JOIN THE A.L.P.O.

The Lunar Observer is a publication of the Association of Lunar and Planetary Observers that is available for access and participation by non- members free of charge, but there is more to the A.L.P.O. than a monthly lunar newsletter. If you are a non-member you are invited to join our organization for its many other advantages.

We have sections devoted to the observation of all types of bodies found in our solar system. Section coordinators collect and study members' observations, correspond with observers, encourage beginners, and contribute reports to our Journal at appropriate intervals.

Our quarterly journal, *The Journal of the Association of Lunar and Planetary Observers-The Strolling Astronomer*, contains the results of the many observing programs which we sponsor including the drawings and images produced by individual amateurs. Additional information about the A.L.P.O. and its Journal is on-line at: **http://www.alpo-astronomy.org.** I invite you to spend a few minutes browsing the Section Pages to learn more about the fine work being done by your fellow amateur astronomers.
To learn more about membership in the A.L.P.O. go to: **http://www.alpo- astronomy.org/main/member.html** which now also provides links so that you can enroll and pay your membership dues online.

SUBMISSION THROUGH THE ALPO IMAGE ARCHIVE

ALPO's archives go back many years and preserve the many observations and reports made by amateur astronomers. ALPO's galleries allow you to see on-line the thumbnail images of the submitted pictures/observations, as well as full size versions. It now is as simple as sending an email to include your images in the archives. Simply attach the image to an email addressed to

lunar@alpo-astronomy.org (lunar images).

It is helpful if the filenames follow the naming convention :

FEATURE-NAME_YYYY-MM-DD-HHMM.ext

YYYY {0..9} Year

MM {0..9} Month

DD {0..9} Day

HH {0..9} Hour (UT)

MM {0..9} Minute (UT)

.ext (file type extension)

(NO spaces or special characters other than "_" or "-". Spaces within a feature name should be replaced by "-".)
As an example the following file name would be a valid filename:

Sinus-Iridum_2018-04-25-0916.jpg
(Feature Sinus Iridum, Year 2018, Month April, Day 25, UT Time 09 hr16 min)

Additional information requested for lunar images (next page) should, if possible, be included on the image. Alternatively, include the information in the submittal e-mail, and/or in the file name (in which case, the coordinator will superimpose it on the image before archiving). As always, additional commentary is always welcome and should be included in the submittal email, or attached as a separate file.

If the filename does not conform to the standard, the staff member who uploads the image into the data base will make the changes prior to uploading the image(s). However, use of the recommended format, reduces the effort to post the images significantly. Observers who submit digital versions of drawings should scan their images at a resolution of 72 dpi and save the file as a 8 1/2"“x 11" or A4 sized picture.

Finally a word to the type and size of the submitted images. It is recommended that the image type of the file submitted be jpg. Other file types (such as png, bmp or tif) may be submitted, but may be converted to jpg at the discretion of the coordinator. Use the minimum file size that retains image detail (use jpg quality settings. Most single frame images are adequately represented at 200-300 kB). However, images intended for photometric analysis should be submitted as tif or bmp files to avoid lossy compression.

Images may still be submitted directly to the coordinators (as described on the next page). However, since all images submitted through the on-line gallery will be automatically forwarded to the coordinators, it has the advantage of not changing if coordinators change.

ATTENTION ALL CONTRIBUTORS
Effective Immediately (March 1, 2024)

While it is a great honor to put together The Lunar Observer, we are now overwhelmed by our success with some issues in excess of 200 pages.

The increased time it requires for me to perform this job (as a volunteer) pulls me away from my own family and other obligations. Thus, the following rules are being implemented to improve content flow on my end and provide you with the criteria needed to make the "TLO" even more professional in appearance and subject matter.

1. **Review your image(s) at your location before submitting it/them, then brighten or darken it/them as needed and if required, using whatever tools you have at hand. Images deemed unsuitable (including blurry, out-of-focus or "clouded-out" images) will either be returned for your attention or simply not used.**
2. **Images in jpeg format are preferred but others are also acceptable.**
3. **Crop your images to avoid jagged edges.**
4. **Orient the image so it makes the most sense. North at the top (with Mare Crisium at the upper right) is preferred but not required. To our many wonderful southern hemisphere contributors, please orient as you wish (probably south at top).**
5. **Be very limited on end-of-the-month submissions.**
6. **CHOOSE ONLY YOUR BEST IMAGES and limit the number to no more than eight (8) per each issue of the TLO. (obviously, if there is an article you are writing or contributing to this does not apply).**
7. **The image filename should be submitted with the object name spelled correctly, then the year-month-day-hour-minutes-Your Name or initials So, my image of Copernicus should have a file name of:**

Copernicus_2023-08-31-2134-DTe
means
Copernicus, 2023 August 31, 21:34 UT by David Teske

If we all do this going forward, it should make putting this all together faster and easier. Many of you already do this. Thank you for your contributions and your help. We have a premier lunar resource for the planet.

Please send images/drawings/text to drteske@yahoo.com

ATTENTION ALL CONTRIBUTORS
Effective Immediately (March 1, 2024)

In his efforts to make our organization as professional as possible, the late Walter Haas, the founder of the ALPO, urged that all image and sketch CAPTIONS be as complete as possible. This could enable others to perform their own observations using as much of the original caption data as possible to obtain the same or at least similar results. And while not everyone can provide every detail, we request the following in your captions:

1. Name of feature or object followed by name of imager and their specific location (including geographical coordinates if readily available).
2. Date and Universal Time when image was captured (or sketch was completed) using either the three-letter abbreviation or full spelling of the month to avoid possible month-and-date or date-and-month confusion.
3. Sky seeing (steadiness) conditions (0 = Worst and 10 = Perfect).
4. Sky transparency (opacity of the atmosphere) conditions (poor to good)
5. Intensity conditions (Standard ALPO Scale of Intensity: 0.0 = Completely black and 10.0 = Very brightest features, Intermediate values are assigned along the scale to account for observed intensity of features).
6. Equipment details (including instrument type, brand is optional) and aperture size (inches or mm/cm); telescope mount data (if applicable), camera brand and type, filter data (if applicable), as much exposure data as available (sketchers should provide other pertinent data).
7. Capturing, exposure and processing software data.
8. Personal comments about specific features including north (or south) in the image (sketch), markings and all other items pertinent to the subject being presented.
9. Any other pertinent comments.
10. Email or other contact information.

Below are two sample captions. Both at least attempt to follow the above-stated guidelines

Meton Region as imaged by Massimo Dionisi of Sassari, Italy (10°43’26” N, 8° 33’9” E), on 2024 January 30, at 00:03 UT. Equipment details: Sky Watcher 250 mm, f/4.8 reflector telescope, Tecnosky ADC, Celestron X-cel LX 3x Barlow lens, effective focal length = 4,750 mm, 685 nm IR pass filter, Neptune-M camera, Skywatcher EQ6-R Pro mount. Seeing conditions = III-to-IV (Antoniadi scale). Software details: SharpCap 4.0 acquisition (mono), AutoStakkert! 3.1.4 ELAB, Registax Wavelets.

Lunar craters Hausen and Bailly D as imaged by István Zoltán Földvári of Budapest, Hungary on 2020 April 07, at 21:03-21:17 UT. Colongitude 86.5°. Equipment details: 70 mm refractor telescope, f/l = 500 mm, Vixen Lanthanum LV 4mm eyepiece, 125x, Baader Contrast Booster Filter. Sky seeing = 7 out of 10, sky transparency = 6 out of 6.

When submitting observations to the A.L.P.O. Lunar Section

In addition to information specifically related to the observing program being addressed, the following data should be included:

Name and location of observer
Name of feature
Date and time (UT) of observation (use month name or specify mm-dd-yyyy-hhmm or yyyy-mm-dd-hhmm)
Filter (if used)
Size and type of telescope used Magnification (for sketches)
Medium employed (for photos and electronic images)
Orientation of image: (North/South - East/West)
Seeing: 0 to 10 (0-Worst 10-Best)
Transparency: 1 to 6

Resolution appropriate to the image detail is preferred-it is not necessary to reduce the size of images. *Additional commentary accompanying images is always welcome.* **Items in bold are required. Submissions lacking this basic information will be discarded.**

Digitally submitted images should be sent to:
David Teske – david.teske@alpo-astronomy.org
Alberto Anunziato–albertoanunziato@yahoo.com.ar
Wayne Bailey—wayne.bailey@alpo-astronomy.org

Hard copy submissions should be mailed to David Teske at the address on page one.

CALL FOR OBSERVATIONS:
FOCUS ON: Archimedes region

Focus on is a bi-monthly series of articles, which includes observations received for a specific feature or class of features. The subject for the November 2024, will be Archimedes. Observations at all phases and of all kinds (electronic or film based images, drawings, etc.) are welcomed and invited. Keep in mind that observations do not have to be recent ones, so search your files and/or add these features to your observing list and send your favorites to (both):

Alberto Anunziato – albertoanziato@yahoo.com-ar
David Teske – david.teske@alpo-astronomy.org

Deadline for inclusion in the Archimedes Focus-On article is October 20, 2024

FUTURE FOCUS ON ARTICLES:

In order to provide more lead time for contributors the following future targets have been selected:

Subject	TLO Issue	Deadline
Archimedes Region	**November 2024**	**October 20, 2024**
Anaxagoras	**January 2025**	**December 20, 2024**
Clavius	**March 2025**	**February 2025**
Volcanic Features	**May 2025**	**April 20, 2025**

Focus On Announcement:
Archimedes, Autolycus and Aristillus: The Magnificent Three

These beautiful features in the western part of the Mare Imbrium are well known but always deserves another look. Archimedes, Autolycus and Aristillus are very different from each other. Archimedes is a large crater (83 km.) with a floor completely flooded by the lava that formed Mare Imbrium, which also flooded partially it's ejecta blanket. Autolycus (39 km.) is the smaller one, its main characteristic is a rough and disintegrated floor. Aristillus (55 km.) is a typical and splendid impact crater with terraced inner walls, wide and bright ejecta blanket and a constellation of central peaks. Let's enjoy these 3 magnificent craters along with other nearby wonders such as Montes Spitzbergen, Montes Mountains or Palus Putredinis.

SEPTEMBER 2024 ISSUE-Due August 20 2024: ARISTOTELES AND EUDOXUS

NOVEMBER 2024 ISSUE-Due October 20 2024: ARCHIMEDES, AUTOLYCUS AND ARISTILLUS

JANUARY 2025 ISSUE-Due December 20 2024: ANAXAGORAS

MARCH 2025 ISSUE-Due February 20 2025: CLAVIUS

MAY 2025 ISSUE-Due April 20 2024: VOLCANIC FEATURES

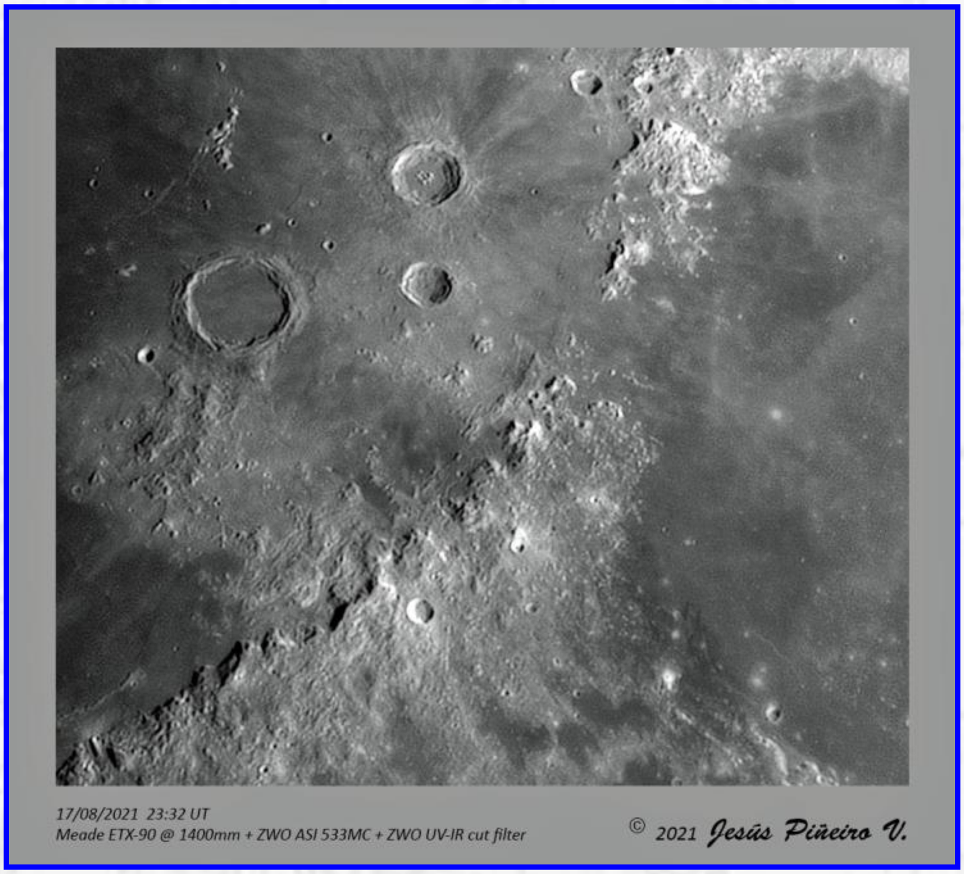


IMAGE CREDIT: JESÚS PIÑEIRO

Focus-On Announcement
Anaxagoras, the "Tycho" of the North

Anaxagoras, with a diameter of 50 km, is a relatively small and relatively recent crater (it belongs to the Copernican period) and that is why we can appreciate the deadly magnificence of the ejected materials, which cover surfaces that reach more than 600 kilometers from the crater and with the Sun's rays striking frontally near the full moon it has an undeniable similarity to Tycho. With a more oblique illumination it is a real challenge to locate it, since it is quite close to the northern limb, a location that has taken away its prominence among those who observe and photograph the Moon. It is an interesting crater, with features such as a central peak of anorthosite and bright rays that cross its walls.

FOCUS ON NOVEMBER 2024: Due: October 20, 2024: ARCHIMEDES, AUTOLYCUS AND ARISTILLUS

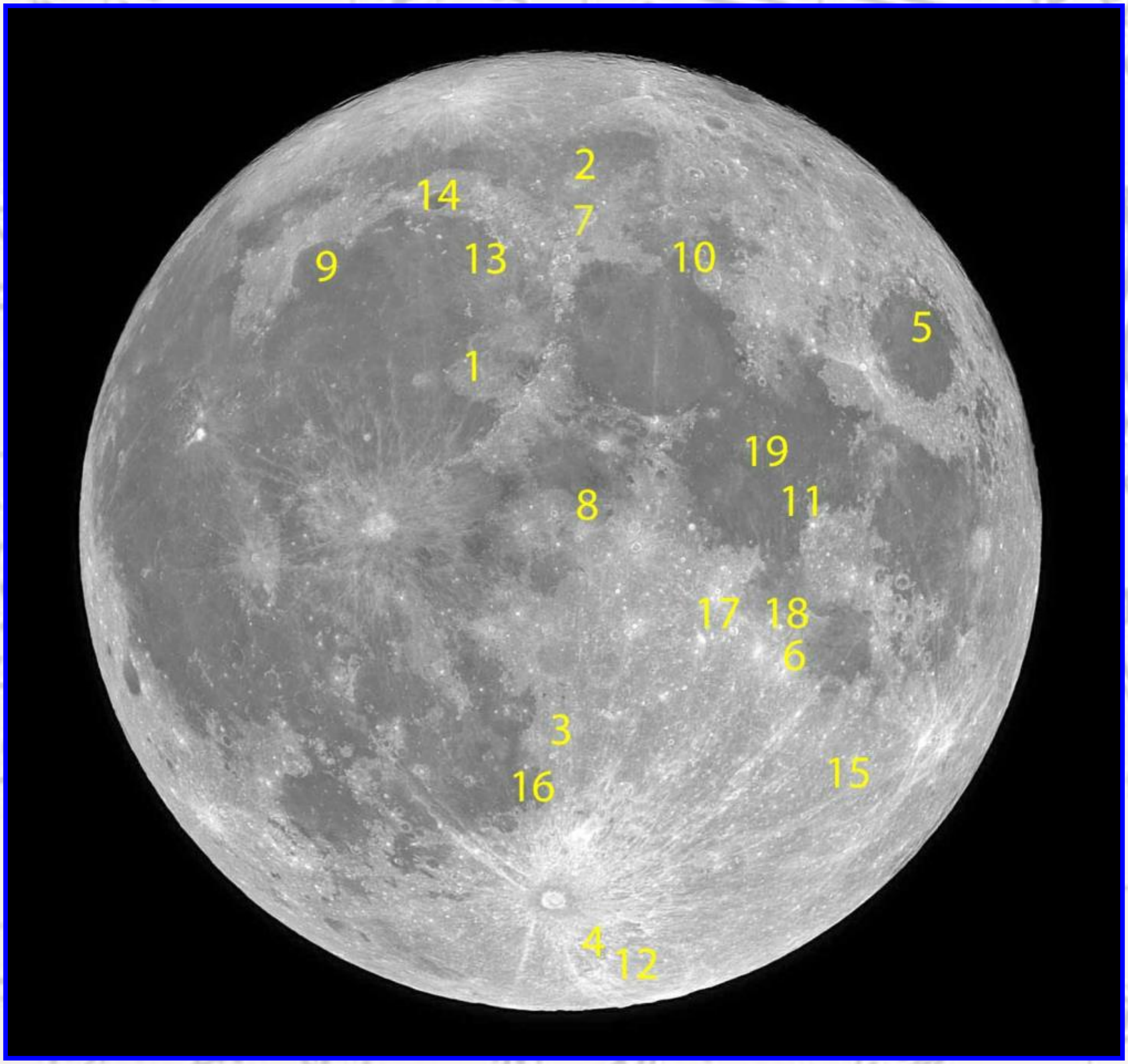
FOCUS ON JANUARY 2025: Due December 20, 2024: ANAXAGORAS

FOCUS ON MARCH 2025: Due February 20, 2025: CLAVIUS

FOCUS ON: MAY 2025: Due April 20, 2025: VOLCANIC FEATURES

Image Alberto Anunziato

Key to Lunar Images In This Issue



1. Archimedes
2. Aristoteles
3. Arzachel
4. Clavius
5. Crisium, Mare
6. Cyrillus
7. Eudoxus
8. Hyginus
9. Iridum, Sinus
10. Luther
11. Maskelyne
12. Moretus
13. Piton, Mons
14. Plato
15. Rothmann
16. Recta, Rupes
17. Taylor
18. Theophilus
19. Tranquillitatis, Mare