



THE LUNAR OBSERVER

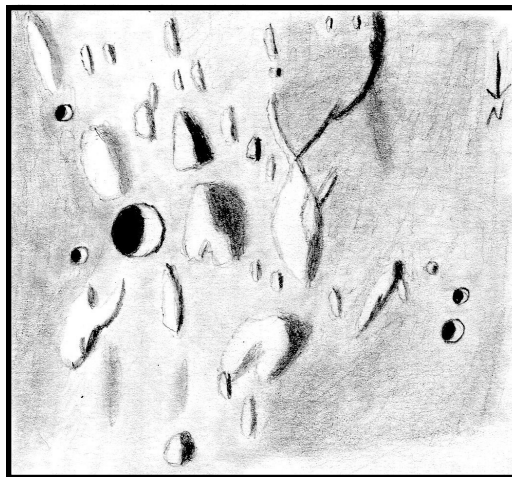
A PUBLICATION OF THE LUNAR SECTION OF THE A.L.P.O.

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RECENT BACK ISSUES: http://moon.scopesandscapes.com/tlo_back.html

FEATURE OF THE MONTH – DECEMBER 2018 MÖSTING A



Sketch and text by Robert H. Hays, Jr. - Worth, Illinois, USA
May24, 2018 02:45-03:45 UT, 15 cm refl, 170x,
seeing 8-10, transparency 5/6.

I observed this crater and vicinity on the evening of May 23/24, 2018. This area is near the center of the visible side close to Sinus Medii. Mosting A is a crisp round crater with a bright interior. The small pit just east of Mosting A is Flammarion D, and Flammarion B is the similar crater to its south. Several nearby mounds are part of the broken ring of grayish Flammarion. There is a great variety of elevations in this area which I have tried to draw as well as possible. A large low mound notched in its north side is just west of Mosting A, and a similar mound is to its northwest. A large triangular hill with dark shadowing is southwest of Mosting A. This hill is surrounded by smaller peaks with mostly lighter shadowing except for one to its west. Another peak with dark shadowing is the roundish one well north of Mosting A. A large, roughly Y-shaped complex is farther to the west. The southeast end is a narrow broken ridge. The southwest arm is a strip of dark shadow generally widening to the south. This arm did not show a sunlit side. The area south of the Y junction is gray and smooth except for two tiny peaks. North of the Y junction is a low mound with some interior shadowing. Mosting B is the larger of a close pair of craters to the west; its smaller neighbor is Mosting BA. All of the intact craters in this drawing are crisp and round. An elongated hill with fairly dark shadowing is between the B-BA pair and the north end of the Y complex. Several small low peaks are also in this area.

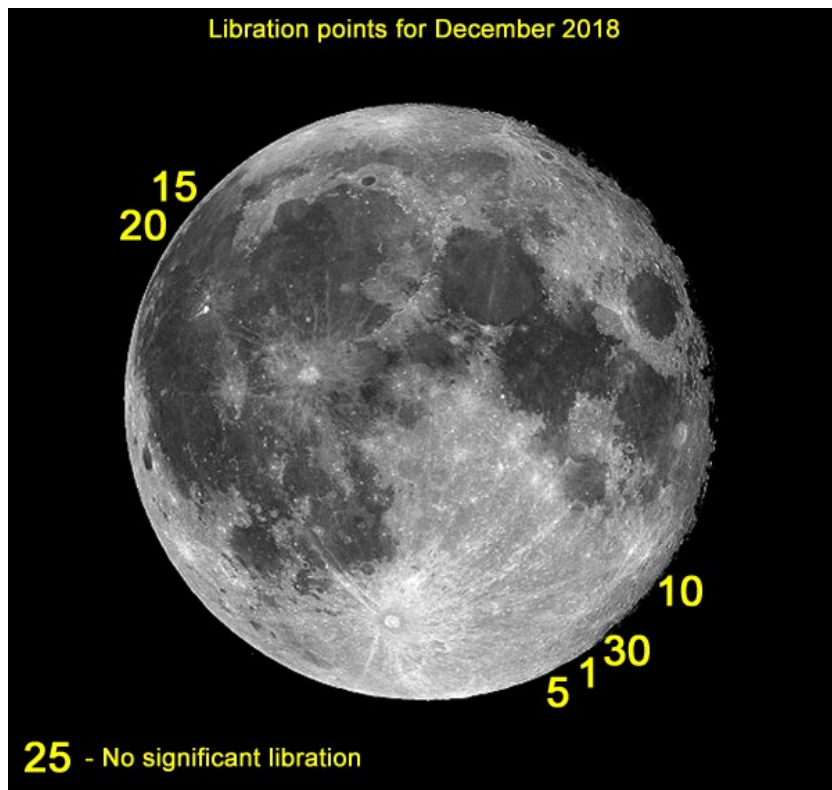
LUNAR CALENDAR

2018	U.T.	EVENT
Dec 03	18:42	Moon-Venus: 3.8° S
07	07:20	New Moon
09	05:30	Moon-Saturn: 1.2° S
09	11:12	Moon Extreme South Dec.: 21.5° S
10	17:57	Moon Descending Node
12	12:25	Moon Apogee: 405200 km
14	23:21	Moon-Mars: 3.9° N
15	11:49	First Quarter
22	17:49	Full Moon
23	11:48	Moon Extreme North Dec.: 21.6° N
24	09:52	Moon Perigee: 361100 km
24	11:54	Moon Ascending Node
29	09:34	Last Quarter

Jan	01	16:50	Moon-Venus: 1.4° S
	03	02:37	Moon-Jupiter: 3.4° S
	05	13:46	Moon South Dec.: 21.6° S
	05	20:28	New Moon
	05	20:41	Partial Solar Eclipse
	06	19:08	Moon Descending Node
	08	23:29	Moon Apogee: 406100 km
	14	01:46	First Quarter
	19	18:20	Moon North Dec.: 21.5° N
	20	17:48	Moon Ascending Node
	21	00:12	Total Lunar Eclipse
	21	00:16	Full Moon
	21	14:58	Moon Perigee: 357300 km
	27	16:11	Last Quarter
	30	18:54	Moon-Jupiter: 3° S
	31	12:36	Moon-Venus: 0.1° S

LUNAR LIBRATION

DECEMBER 2018—JANUARY 2019

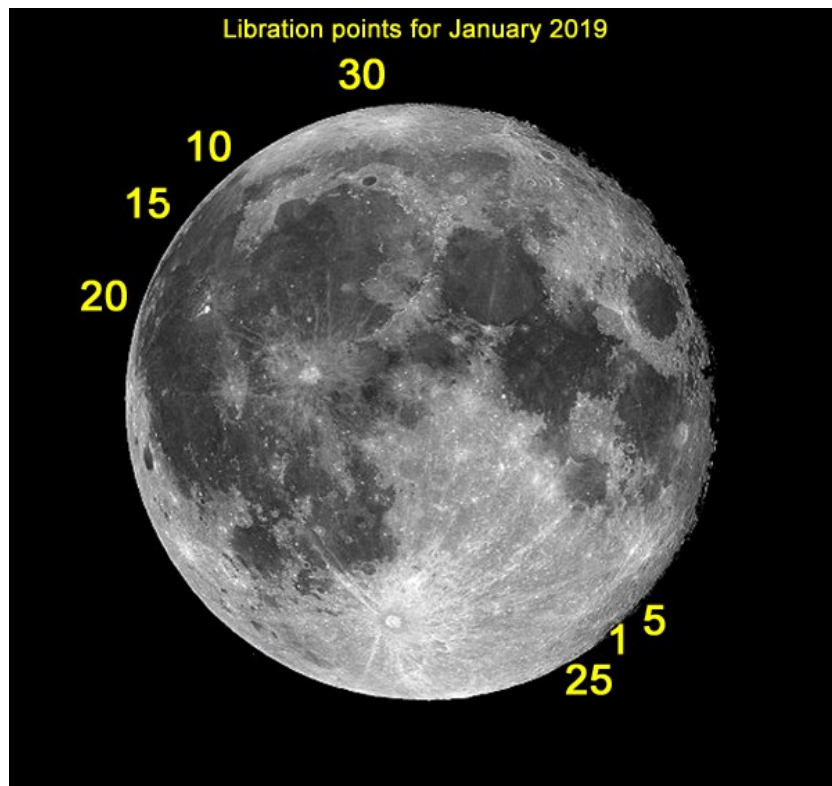


Size of Libration

12/01	Lat -05°21'	Long +03°41'
12/05	Lat -06°23'	Long +05°07'
12/10	Lat -01°06'	Long +01°57'
12/15	Lat +05°11'	Long -04°46'
12/20	Lat +06°11'	Long -06°29'
12/25	Lat -00°51'	Long +00°22'
12/30	Lat -06°41'	Long +05°57'

NOTE:

Librations are based on a geocentric position at 0 hr. Universal Time.



Size of Libration

01/01	Lat -06°07'	Long +06°56'
01/05	Lat -02°24'	Long +03°53'
01/10	Lat +04°18'	Long -03°20'
01/15	Lat +07°15'	Long -08°33'
01/20	Lat +02°12'	Long -04°10'
01/25	Lat -05°32'	Long +05°51'
01/30	Lat -04°52'	Long +07°24'

NOTE:

Librations are based on a geocentric position at 0 hr. Universal Time.

2019 ALPO MEETING

The 2019 Annual Meeting of the Association of Lunar and Planetary Observers will be held, combined with the South East Region Astronomical League, at Gordon College in Barnesville, GA the weekend of July 12-14.

Additional information will be available in the JALPO and included here as it becomes available.

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 nonmember 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 which, for the lunar gallery is:

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 “-”)

As an example the following file name would be a valid filename:

Copernicus_2018-04-25-0916.jpg

(Feature Copernicus, Year 2018, Month April, Day 25, UT Time 0916)

Additional information requested for lunar images (next page) should 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 correction prior to uploading the image(s). However, if they come in the recommended format, it would reduce the effort to post the images a lot.

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.

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 both

Wayne Bailey – wayne.bailey@alpo-astronomy.org

and Jerry Hubbell – jerry.hubbell@alpo-astronomy.org

Hard copy submissions should be mailed to Wayne Bailey at the address on page one.

CALL FOR OBSERVATIONS:

FOCUS ON: Apollo 15 Region – Mare Imbrium & Hadley Rille

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 **January 2019** edition will be the **Apollo 15 Region – Mare Imbrium & Hadley Rille**. 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):

Jerry Hubbell – jerry.hubbell@alpo-astronomy.org

Wayne Bailey - wayne.bailey@alpo-astronomy.org

Deadline for inclusion in the Apollo 15 Region – Mare Imbrium & Hadley Rille article is Dec. 20, 2018

FUTURE FOCUS ON ARTICLES:

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

<u>Subject</u>	<u>TLO Issue</u>	<u>Deadline</u>
Apollo 14 Region – Fra Mauro	March 2019	February 20, 2019
Apollo 12 Region – Ocean of Storms	May 2019	April 20, 2019
Apollo 11 Region – 50th Anniversary – Sea of Tranquility	July 2019	June 20, 2019

DESCARTES HIGHLANDS: RIGHT PLACE, WRONG REASON

Howard Eskildsen

What a mess! This part of the Southern Highlands of the moon (fig. 1) shows an ancient, crater-saturated surface with rubble and scars from a violent past. The only smooth areas seem to be from dusty fill as seen in the Cayley Plains. But a chaotic moonscape is a geologist's dream, and it was here that Apollo 16 made the only lunar highlands landing. They thought they knew what to expect, but boy were they wrong!

FIGURE 1. DESCARTES HIGHLANDS - Howard Eskildsen, Ocala, Florida, USA. February 24, 2018 00:59, UT. Seeing 10/10, transparency 5/6. 6" Refractor, f/8, 2x barlow, W-8 Yellow filter, DMK41AU02.AS.

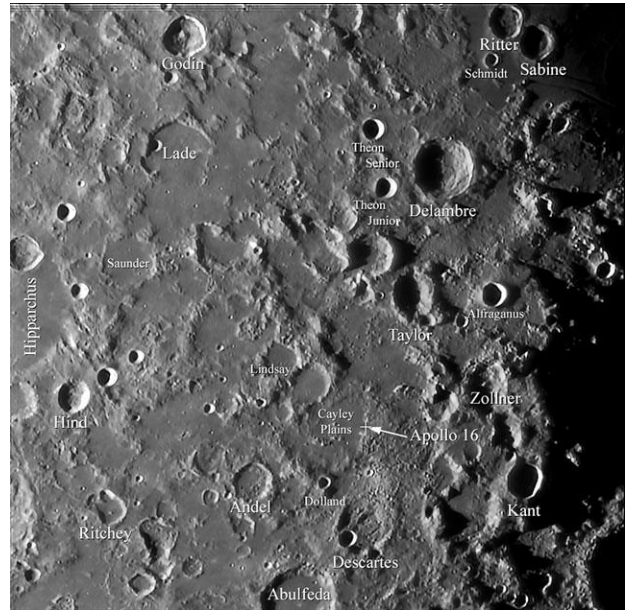
The origin of lunar craters was still being debated at that time. While more and more scientists believed that most craters were created by impacts, many still believed that at least some of them had to be of volcanic origin. Look at the rubble extending northward of Descartes to the Apollo 16 landing site. Known as the Descartes Highlands, it resembles earthly volcanoes with lava pouring out of a caldera. Likewise, many thought that the Cayley Plains were volcanic in origin. The landing site was carefully chosen after scrutiny of high-resolution images to be sure it was safe despite the treacherous terrain.

Apollo 16 landed between two small bright craters known as North Ray and South Ray craters and used the lunar rover to go cover as much ground as possible. No evidence of volcanic flows was found. Instead breccia, a conglomerate of fragmented, sharp shards of rock, was found in abundance. Further evaluation of the fragments within the rocks show most of them to be pieces of more ancient breccia. While it was not directly sampled, the Descartes Highlands is now thought to be ejecta from several lunar impacts.

The rest of the landscape consists mostly of ancient craters that predate the Imbrium impact event. Lindsey, Lade, Saunder, and others show severe erosion consistent with their great age. Delambre and Kant are younger, but still weathered. Theon Senior and Theon Junior are younger still, but Alfraganus is the only named crater on this image likely to a billion years or less in age.

The whole region probably represents original lunar crustal material that has been pulverized by countless impacts over the early eons of the Moon's existence. This is likely what the maria looked like before the basin lowlands were excavated by gigantic impacts and then filled with basaltic lava. The Apollo discoveries put another nail in the coffin of the volcanic crater hypothesis and drew attention to neglected, seminal works that had been published more than two decades earlier.

Dr. Ralph Baldwin (fig. 2) from Grand Rapids, Michigan, studied craters produced by explosives during World War II, and became interested in lunar craters while lecturing at Adler



Planetarium. His discovery that the depth to diameter ratios of the craters fit well on a logarithmic curve generated from his explosives studies led him to publish a paper on the impact origin of lunar craters in *Popular Astronomy* in 1942. He theorized that impacts of objects traveling at speeds measured in tens of kilometers per second would vaporize as violently and quickly on

impact as TNT, causing explosive excavation of a craters. Later he published *The Face of the Moon* in 1949, further detailing his theory for crater formation. The scientific journals of the day were not interested in lunar astronomy, and his work was ignored academically at the time.

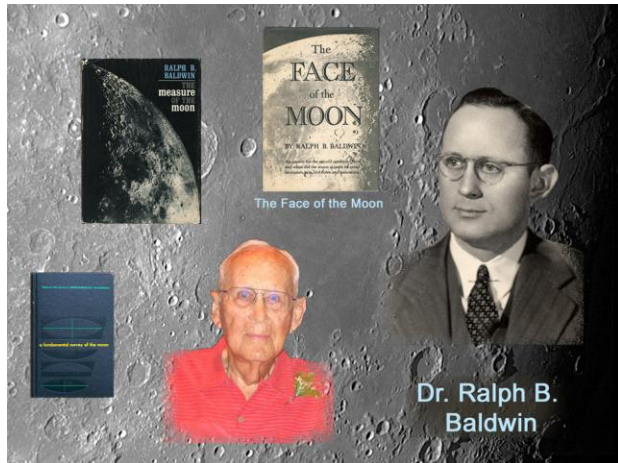


FIGURE 2. DR. RALPH BALDWIN

He published *The Measure of the Moon* in 1963 and *A Fundamental Survey of the Moon* in 1965, expanding on his previous works. Apollo explorations and rock samples supported his conclusions as did other lunar studies, and eventually his views were accepted by the rest of

the scientific community. He finally received well-deserved recognition in 2000 when he was presented with the Barringer Medal for his studies in impact cratering. It was succinctly noted: “Seldom has one man been so right about so many things so early.”

I had the privilege of meeting Dr. Baldwin in 2009. Fellow lunar enthusiast Bob O’Connell and I traveled to his home in Naples, Florida. Though he was 97 years old and hard of hearing, he was alert and insightful. He was working on an article about Mare Nectaris for the journal *Icarus* at the time. We left feeling thrilled and inspired by the visit.

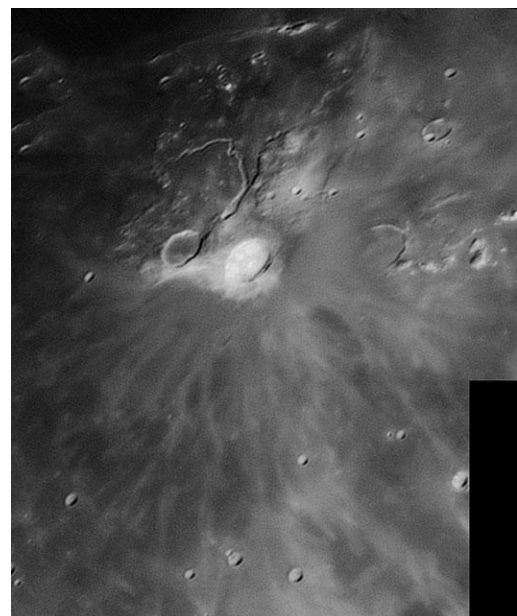
RAYS AROUND THE PLATEAU

Rik Hill

As we head for Full Moon after Copernicus is in full Sun we get the treat of the dazzling 41km diameter Aristarchus and it’s associated plateau to enjoy (fig. 1). While not at all a big crater it nevertheless has the highest albedo of any crater on the moon as old lunar eclipse photometrists know. Many times I measured the brightness of this easily identifiable spot as it passed through the Earth’s shadow.

FIGURE 1. ARISTARCHUS PLATEAU – Richard Hill – Tucson, Arizona, USA September 23, 2018 52:01 UT. Colongitude 71.4°. Seeing 7/10. TEC 8” f/20 Mak-Cass, SKYRIS 445M, 610 nm filter.

The Aristarchus Plateau is a squarish region of the moon a little over 100km on a side with Aristarchus itself in the southeast corner and the Montes Agricola making a



rough northern boundary. The western edge is lost in the terminator here. The eastern edge is well delineated here by what appears to be a shadow filled portion of Rupes Toscanelli.

The seeing was mediocre this evening and the resolution is somewhat less so I processed this to show the beautiful ray system south the plateau and some of the prominent features on the plateau. To the left of Aristarchus is the similar sized Herodotus (36km) with the "Cobra Head" and Vallis Schroter arcing over the latter crater. To the right of Aristarchus is a partial crater, just the arc of one wall, that is Prinz (29km) and further east (right) are the Montes Harbinger. Above Prinz are the Rimae Prinz, hard to see here, The crater north of Prinz with another smaller crater on its southern wall is Krieger (22km) and the smaller one is Van Bisbroeck (10km).

The wonderful ray pattern about the plateau is well seen here and mingles at the bottom of the image with the rays of Kepler to the south. To the west of this image is Reiner Gamma but its meandering rays are not visible here.

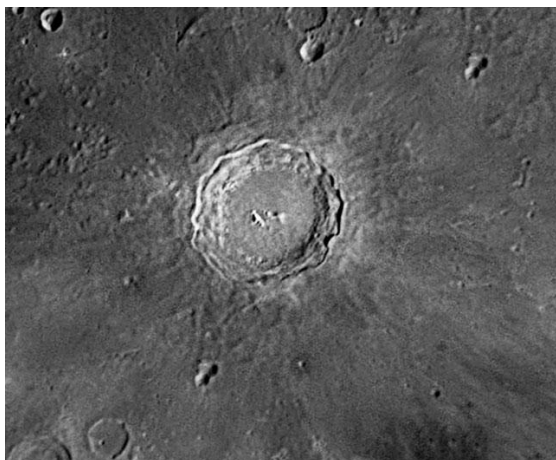
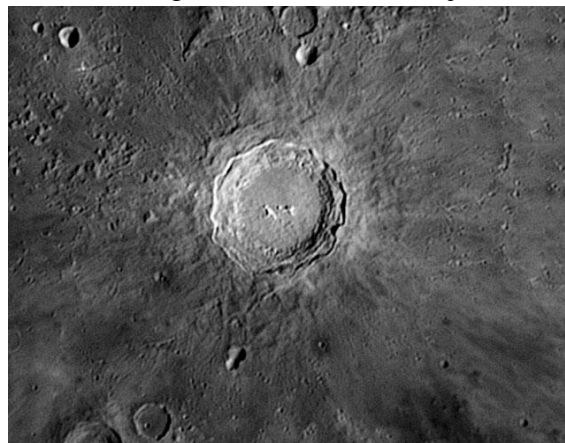
A CRATER OF ANOTHER COLOR

Rik Hill

I had finished my IR (850nm) observation of Mars last night and there was the fat gibbous Moon not far away with Kepler on the terminator. Rather than change filters I decided to just have some fun and see what I would get in the near-IR. The first thing I saw on the monitor when I got there was Copernicus (fig. 1). This was a perfect target as I would have many other images of it from over the years to compare to it.

FIGURE 1. COPERNICUS-infrared – Richard Hill – Tucson, Arizona, USA November 19, 2018 03:05 UT. Colongitude 36.3°. Seeing 7/10. TEC 8" f/20 Mak-Cass, SKYRIS 445M, 850 nm filter.

The results were interesting. For the comparison I found an image from October, 2015 with a 656nm filter (fig. 2) where the colongitude



was very close (36.3° in this image versus 38.0° in the 2015 image). The differences were subtle but clear. In the 850nm image the dark haloed craters were more evident as were the rays around the crater

FIGURE 2. COPERNICUS-red – Richard Hill – Tucson, Arizona, USA October 24, 2015 02:21 UT. Colongitude 38.0°. Seeing 7/10. TEC 8" f/20 Mak-Cass, SKYRIS 445M, 656 nm filter.

with the clear maria regions between the rays being darker. Though detail in the central peaks and the terraced walls of Copernicus were sharper in the older image, secondary cratering was more clear in

the recent image. I am now eager to try some more of this on the same night.

The 2018 image was made of 900 frames from an AVI of 1800 frames stacked with AVIStack2 and further processed with GIMP and IrfanView. The 2015 image was made from 500/3000 frames stacked and processed the same way.

NORTH BY NORTHWEST

Rik Hill

A day or two short of the full moon, depending on the libration, on the northwest terminator of the moon you will find a remarkable crater that catches the eye. This is Pythagoras (133km dia.) with beautifully terraced walls and a central peak that casts great shadows across the western side of the crater and the west wall (fig. 1). The extreme near limb presentation of this magnificent crater gives us the opportunity to see just how shallow craters are. When on the terminator near the center of the moon, they look like deep wells but in this case the depth is only 4.8 km or 3.75% of

the diameter! Shallow indeed! You can see this for yourself by making a 100mm diameter crater that is only 4mm deep.

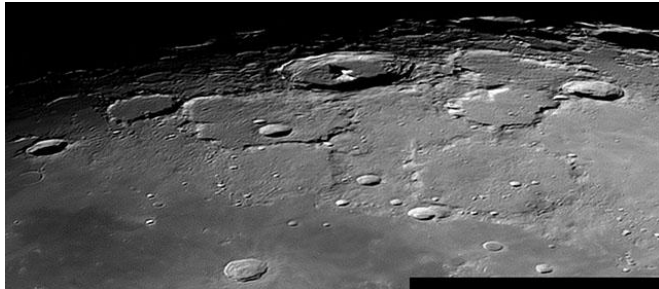


FIGURE 1. PYTHAGORAS – Richard Hill – Tucson, Arizona, USA September 23, 2018 05:14 UT. Colongitude 71.4°. Seeing 7/10. TEC 8" f/20 Mak-Cass, SKYRIS 445M, 610 nm filter.

The large non-circular crater in front of Pythagoras is Babbage (148km) and to it's left is Oenophiles (70km) and further on is the smaller Markov (43km). To the lower right of Pythagoras is Anaximander (also 70km) and further right is Carpenter (61km). Above Carpenter is the shadow filled Pascal (109km) seen well at this libration.

Below Anaximander is a large shallow circular depression that is the remnant of a once tremendous crater, J. Herschel (160km). On its southern border is Horrebow (26km) and to the left of the the great crater is Robinson (also 26km). Lastly, at the very bottom of this image is the crater Harpalus (41km). Between this crater and Babbage is a squarish area that is named South (111km). Babbage, South, Herschel and Anaximander are the oldest craters in this image being of Pre-Nectarian age, possibly as old as 4.55 billion years. while Harpalus and Carpenter are the youngest being Copernican as old as 1.1 b.y. This is a region worthy of your study on those bright moonlit nights!

On the Southern Shores of Mare Humorum

David Teske

In this observation (fig. 1) I had a nice look to the south of Gassendi and the southern part of Mare Humorum. Near the southern shores, I saw interesting ghosts of craters. Maybe most eye-catching was the crater Doppelmayer looking like a splendid lunar bay. Named after Johann

Doppelmayr, a German mathematician and astronomer who lived from 1671 to 1750, this heavily eroded crater with a diameter of 64 km is almost open to Mare Humorum to its northeast. The tilt towards the center of the Humorum Basin is evident as Doppelmayr is a classic example of crater subsidence. The encroaching lavas from Mare Humorum have affected various amounts of destruction to Doppelmayr. With low lighting, the nearly destroyed rim of Doppelmayr can be traced nearly around its full circumference as a wrinkle ridge. The central mountain peak is still visible, pyramid-like and rising 760 m above the floor of Doppelmayr. This central peak is linked to a ridge that runs around the western part of the crater floor. The central peak is surrounded by several low hills that form portions of a ring, possibly due to uplift of the floor. This peak may be higher than some portions of its remaining rim. North of the central peak is a crater with low walls.

FIGURE 1. MARE HUMORUM – David Teske, Louisville, Mississippi, USA, October 21, 2018 09:27 UT. Colongitude 48.9°, seeing 5/10, 102 mm APO refractor, 2.5 x Power Mate, zwoASI120mms

Just “offshore” of Doppelmayr is the more dilapidated 25 km diameter crater Puiseux which has almost become a ghost of its former self. The rim of Puiseux is tilted towards the center of Mare Humorum. The ghost ring that remains is up to 400 m tall. This ring was probably filled through fractures with Puiseux itself. Inside the ring are some tiny central hills.

Moving back to the south shore of Mare Humorum and just east of Doppelmayr, the crater Lee is visible, though less impressive than Doppelmayr. Named after the English selenographer John Lee who lived from 1783 to 1866, this crater with a diameter of 41 km also has its northeastern wall sunk and covered with mare lava. There are a few peaks of rim still visible on the open side. The interior of Lee has a few hills which have escaped destruction. The floor is darker to the northeast than the southwest which is lighter. The rim of Lee on the southeast side has two signatures. There is a ridge that connects Lee with Doppelmayr. Lee appears to have formed on another larger crater, Lee M, on its northeastern side. Lee M has been completely covered with mare lava and is now just seen as a bay in the mare.

At the southernmost reaches of Mare Humorum is the 42 km diameter crater Vitello. This shallow crater, 1.7 km deep, was named after Erasmus C. Witelo, a Polish mathematician and physicist who lived from 1225 to 1290. Vitello is a smaller version of the beautiful crater Gassendi to its north. Both craters are located on Humorum’s main ring/rim and both have a wonderful series of fractures and peaks on their floors, though Vitello seems a bit younger and sharper than Gassendi. In researching Vitello, I find many different descriptions of its interior and central peak. The central peak is surrounded by a bright ring with a C-shaped gap. This has been described as a spiral-like structure. Vitello then may be a concentric crater, even though the inner ring is not concentric with the main wall. This central mountain is surrounded almost entirely by a small sinuous rille, though beyond the grasp of this image. Shadows indicate that there is a depression in its north wall. Vitello appears to have formed after the craters Doppelmayr and Lee as shown by its complex rim and the lack of lava flooding on its floor.

Scanning the southeast coast of Mare Humorum brings to view the crater Hippalus with its great rilles. Named after the Greek navigator of 120 AD, the crater Hippalus has a diameter of 54



km. Like Doppelmayer and Lee, Hippalus has a breached rim, but in this case, the floor has been completely covered by mare lavas. Its seaward wall is now barely traceable. Most notably, the area around Hippalus contains the finest example of arcuate rilles on the Moon. Each of the three arcuate rilles that are concentric with the shore of Mare Humorum is around 3 km wide and 200 km long. The origin of these arcuate rilles goes back to the formation of the Humorum Basin. Long ago, when basaltic flows filled the lunar basins, the weight of the lava caused the crust to fracture and subside towards the center of the basin. This subsidence caused the craters discussed above to have their seaward walls breached or destroyed. This subsidence caused tectonic fracturing is preserved in the form of concentric rille systems found on the perimeters of the lunar seas, especially the eastern shores of Mare Hippalus near Hippalus.

Coming full circle, the Rimae Doppelmayer follows the curvature of southwestern Mare Humorum, much as the Rimae Hippalus. These fine rilles have an overall length of 160 km and need 150 mm plus glass to resolve.

References

- Chu, A., Paech, W., Weigand, M., and Dunlop, S. 2012. The Cambridge Photographic Moon Atlas. Cambridge University Press, New York.
- Grego, Peter. 2005. The Moon and How to Observe it: Springer, London.
- Kitt, Michael T. 1992. The Moon: An Observing Guide for Backyard Telescopes, Kalmbach Books, Waukesha.
- Moore, John. 2014. Craters of the Near Side Moon.
- Moore, Patrick: On the Moon, Cassell & Co., 2001.
- Planck, Andrew: What's Hot on the Moon Tonight? 2015. Moonscape Publishing LLC.
- Rükl, Antonin: Atlas of the Moon, Kalmbach Books, 1990.
- Wilkinson, John. 2010. The Moon in Close-up, Springer, Berlin .
- Wood, Charles A. 2003. The Modern Moon, Sky Publishing Corp., Cambridge.

LUNAR TOPOGRAPHICAL STUDIES

Coordinator – Wayne Bailey - wayne.bailey@alpo-astronomy.org

Assistant Coordinator – William Dembowski - dembowski@zone-vx.com

Assistant Coordinator – Jerry Hubbell – jerry.hubbell@alpo-astronomy.org

Website: <http://moon.scopesandscapes.com/>

OBSERVATIONS RECEIVED

FRANCISCO CARDINALLI - ORO VERDE, ARGENTINA. Digital images of Alphonsus, Arisstillus, Carlini D, Cichus, Copernicus, Curtis, Lambert, Menelaus, Messier(2), Mons Pico, Plato(3) & Proclus.

JAIRO CHEVEZ - POPAYÁN, COLUMBIA. Digital images of 1st Qtr. Moon, Aristoteles, Mare Serenitatis, Maurolycus, Menelaus & Vallis Alpes.

JUAN MARTIN COINTRY - ORO VERDE, ENTRE RIOS, ARGENTINA. Digital images of Messier A & Posidonius.

MAURICE COLLINS - PALMERSTON NORTH, NEW ZEALAND. Digital images of 6(2), & 10(2) day Moon, Copernicus, Milichius, Sinus Iridum & Tycho-Bullialdus.

WALTER ELIAS - ORO VERDE, ARGENTINA. Digital images of Alpetragius, Alphonsus, Censorinus, Eratosthenes, Jensen, Langrenus, Maurolycus, Plato, Proclus(2), Theophilus & Tycho.

HOWARD ESKILDSEN - OCALA, FLORIDA, USA. Digital image of Descartes highlands.

ROBERT HAYS - WORTH, ILLINOIS, USA. Drawings of Cardanus-Krafft & Mösting A.

RICHARD HILL – TUCSON, ARIZONA, USA. Digital images of Aristarchus, Cleomedes, Copernicus(2) & Pythagoras.

JERRY HUBBELL – LOCUST GROVE, VIRGINIA, USA. Digital image of 3rd Qtr. Moon.

DAVID TESKE - LOUISVILLE, MISSISSIPPI, USA. Digital image of Mare Humorum.

RECENT TOPOGRAPHICAL OBSERVATIONS



CICHUS - Luis Francisco Alsina Cardinalli, Oro Verde, Argentina, February 25, 2018, 00:42 UT. 200mm refractor, QHY5 II.

PLATO - Luis Francisco Alsina Cardinalli, Oro Verde, Argentina, August 20, 2018, 23:34 UT. 200mm refractor, QHY5 II.



MAUROLYCUS – Jairo Chavez,- Popayán Columbia. October 17, 2018 02:39 UT. 10” Dobsonian, Sony DSC-WX50.

POSIDONIUS - Juan Martin Cointry Oro Verde, Entr Rios, Argentina, October 15, 2018, 22:22 UT. CPC-1100, 2x barlow. ZWO ASI 120 MM/S.



RECENT TOPOGRAPHICAL OBSERVATIONS

6 day MOON - Maurice Collins,- Palmeron North, w Zealand. November 14, 2018 08:23-08:40 UT. FLT-110, f/14. ASI120M.C North down.



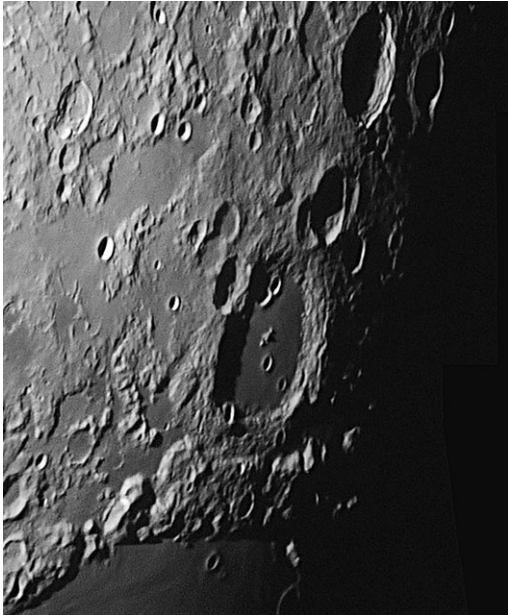
terminator near MILICHIUS - Maurice Collins,- Palmerston North, New Zealand. November 18, 2018 09:31 UT. FLT-110, f/14. ASI120M.C North down.

Editor's Note: Click on the image to view the original image, which shows much more detail than is visible here.

JANSEN - Walter Elias, Oro Verde, Argentina. October 16, 2018 01:09 UT. Celestron CPC-1100, 2x barlow, ZWO ASI 120 MM/S.



RECENT TOPOGRAPHICAL OBSERVATIONS



CLEOMEDES – Richard Hill – Tucson, Arizona, USA September 27 2018 05:21 UT. Colongitude 119.9°. Seeing 7-8/10. TEC 8" f/20 Mak-Cass, SKYRIS 445M, 610 nm filter.

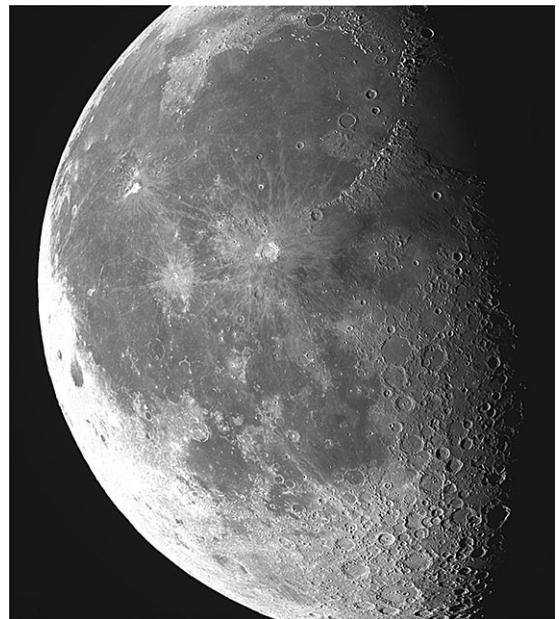
Age is relative

I like to point out features on the Moon that are impressive in their own right but overshadowed by larger or more spectacular formations nearby. Such is the case with 129km diameter Cleomedes, in the center of this image, just north of Mare Crisium (the north wall of which can be seen at bottom). There is so much that is interesting about the mare that this crater and Geminus (88km) deep in shadow further north, are often missed. The former is of Nectarian age (3.85-3.92 billion years old) and the latter is substantially younger at Eratosthean age (1.1-3.2 b.y.o) on the relative "selenological timescale" (explained on Wikipedia or in William Leatherbarrow's recently published book "The Moon"). These differences in ages can be seen in the condition of the walls. The walls of Cleomedes are worn and eroded, the floor is flooded, with a curious off center central peak, while Geminus has well

terraced walls with a sharp rim. Between these two is the crater Burckhardt (60km), just a little younger than Geminus at Lower Imbrian age (3.8-3.85 b.y.o).

In the upper left corner of this image is the crater Newcomb (41km) also Eratosthean age but pretty beat up. There is evidence of slumping of the walls and infilling from ejecta from more recent impacts. The LROC Quick Map has very good images of this crater. Don't pass up an opportunity to to the north of Mare Crisium just after new or full moon.

3rd Quarter MOON - Jerry Hubbell · Wilderness, Virginia USA.. October 30, 2018 07:30 UT. 0.165m APO refractor, f/5, 0.7x FRFF. Seeing 7/10, transparency 3/6. QHY174M-GPS.



BRIGHT LUNAR RAYS PROJECT

Coordinator – Wayne Bailey – _wayne.bailey@alpo-astronomy.org

Assistant Coordinator – Jerry Hubbell – jerry.hubbell@alpo-astronomy.org

Assistant Coordinator – William Dembowski – dembowski@zone-vx.com

Bright Lunar Rays Website: <http://moon.scopesandscapes.com/alpo-rays.html>

RECENT RAY OBSERVATIONS

COPERNICUS - Maurice Collins,-
Palmerston North, New Zealand.
November 11, 2018 09:14 UT. FLT-110
f/14. ASI120M.C North down.



PROCLUS - Walter Elias, Oro Verde,
Argentina. October 16, 2018 01:012 UT.
Celestron CPC-1100 SCT, 2x barlow. ZWO
ASI 120 MM/S.

LUNAR GEOLOGICAL CHANGE

DETECTION PROGRAM

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

Assistant Coordinator – David O. Darling - DOD121252@aol.com

Reports have been received from the following observers for October: Jay Albert (Lake Worth, FL, USA - ALPO) observed: Agrippa, Aristarchus, Plato, Poisson, Proclus, Ptolemaeus, Ross D and Theophilus. Francisco Alsina Cardinali (Argentina - AEA) imaged Eudoxus, Mare Crisium, Maskelyne, Maurolycus, and Proclus. Maurice Collins (New Zealand – ALPO/BAA/RASNZ) imaged: Alphonsus, Clavius, Copernicus, earthshine, Gassendi, Mare Nectaris, Proclus, Schiller, Tycho and took some whole Moon images. Marie Cook (Mundesley, UK – BAA) observed: Aristarchus, Kepler and Plato, Proclus. Walter Ricardo Elias (Argentina – AEA) imaged Promontorium Agarum, and the south pole. Valerio Fontani (Italy – UAI) imaged Cichus. Desiree Godoy (Argentina – AEA) imaged Biela and Manzinus. Leo Mazzei (Italy - Gruppo Astrofili Montagna Pistoiese/AEA) imaged Cichus and generated some LTVT views. Robert Stuart (Rhayader, UK – BAA) imaged: several features. Franco Taccogna (Italy – UAI) imaged Cichus. Ivor Walton (UK – CADSAS) imaged Theophilus, Tycho and several features.

News: This month I find myself “up to my eyes” in coursework marking and so have to curtail drastically what I can write. Don’t worry, if your observation from October is not shown here, I will see if I can find room for it in the next newsletter. But would like to show some work our UAI colleagues have sent in on the Cichus-Weiss area.



Figure 1. A fault scarp produced in the 1968 Mekinging quake. See: <https://aees.org.au/gallery/1968/?meckering> for further images/information. Could such scarps form in a similar sudden manner on the lunar surface during extremely rare violent shallow quakes?

I also wanted to mention a paper published by Russian planetary geologist, Sasha Basilevsky, concerning the strength of shallow moon quakes. As readers will probably be aware, the Apollo seismic experiments showed that there were thousands of quakes from the deep interior, but these were very weak and only seismometers would ever notice. However, there were some stronger shallow quakes that could get up to magnitude 4.2, which might potentially be felt by astronauts on the surface, but there were only 25-28 of these observed between 1969-1977. The paper by Sasha Basilevsky, published in ПИРОДА • № 11 • 2017 (PRIRODA • № 11 • 2017) discusses the similarity between low lying scarps (10-15 km long and up to tens of metres high) discovered in NASA LRO images and a fault scarp (3m high and 40 km long) formed suddenly during a catastrophic earthquake in Meckering, Western Australia on 1968 Nov 14, which attained magnitude 6.9. The paper highlights the need to consider the possibility, based upon similarities to the Meckering scarp, that the strongest observed 4.2 moonquake should not be regarded as an upper limit for moonquakes, as the Apollo seismometer network only functioned for 8 years. Hence future lunar exploration and bases need to be designed structurally to cope with more violent (albeit highly rare) shallow quakes. Sasha Basilevsky's paper also raised the possibility that at the polar areas, where we have permanently shadowed areas and ice on/beneath the surface, such strong quakes could release volatiles. Though personally I would have thought the chances of seeing some quake related activity in a telescope would require continuous observing of the polar areas for at least ten years – something which is not very practical for earth-based observers. Though it does make you wonder if moon quake lights (if they exist?) could contribute to some LTP reports (this is not discussed in the paper). Alas the physics behind [quake lights](#) seen here on Earth, let alone on the Moon, is poorly understood and probably needs some sort of atmosphere or gas to be present!

LTP reports: No LTP were observed in October. However, I have received news of an unconfirmed impact flash seen visually through a telescope by Nicolas Bonini (Montevideo, Uruguay) on 2018 Nov 14 UT 01:23. It was seen to last < 1 second, was white and was approximately magnitude 5.5-6 on the night side, in the vicinity of Mare Nubium/Humorum (normally we expect impact flashes to be red). A 127 mm f/8 telescope was used with a 10mm eyepiece. Thanks to Tim Haymes (BAA), Brian Cudnik (ALPO) for alerting me to this and to Alberto Anunziatio (LIADA) for contacting the observer to find out more details. Also, I learnt from my [Twitter page](#) that Carlos Henrique de Oliveira Barreto videoed a candidate impact flash on 2018 Aug 14 UT 21:31:14 from the ROCG observatory in Brazil the event lasted four frames of video at 30fps.

Cichus-Weiss Area Observations:



Figure 2. Cichus-Weiss area as imaged by UAI observers on 2018 Oct 18 and orientated with north towards the top. **(Left)** An image by Franco Taccogna taken at 18:54 UT. **(Centre)** an image by Leo Mazzei taken at 21:24 UT. **(Right)** image by Valerio Fontani taken at 22:21 UT under worsening observing conditions.

We have been requesting repeat illumination images of this region to support Nigel Longshaw's study of this area, trying to detect the needle/thread like ray of sunlight in the shadowed area beyond the terminator. According to the [Lunar Schedule web site](#), this should have been visible sometime in the region of 19:58-22:05 to UAI observers on 2018 Oct 18. However, as you can see from Fig 2 it was not seen for selenographic colongitude that cover this time period. The reason for this is illustrated in the plot in Fig 3 which shows a strong sub-solar latitude dependence, or to put it in simpler terms during the southern lunar Winter, you have to wait longer for this sunray effect to be seen. This is why the UAI observers, represented by the purple line in Fig 3, did not image the effect. I will narrow down the search window so that we get more data points between a selenographic colongitude on 24°-25° and a sub-solar latitude of -0.1 to +0.9°.

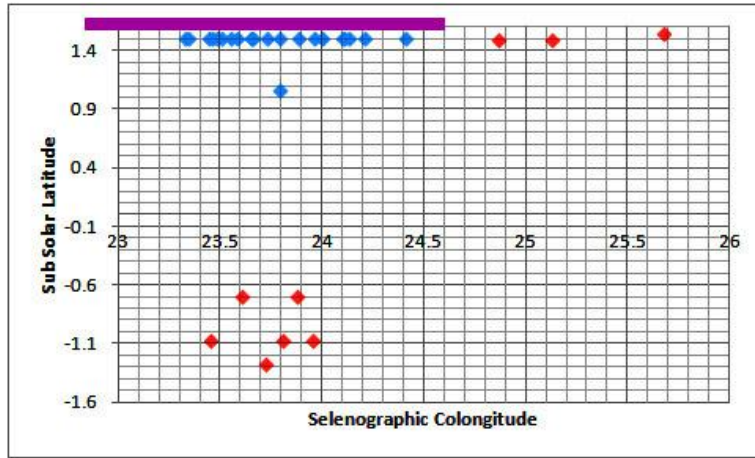


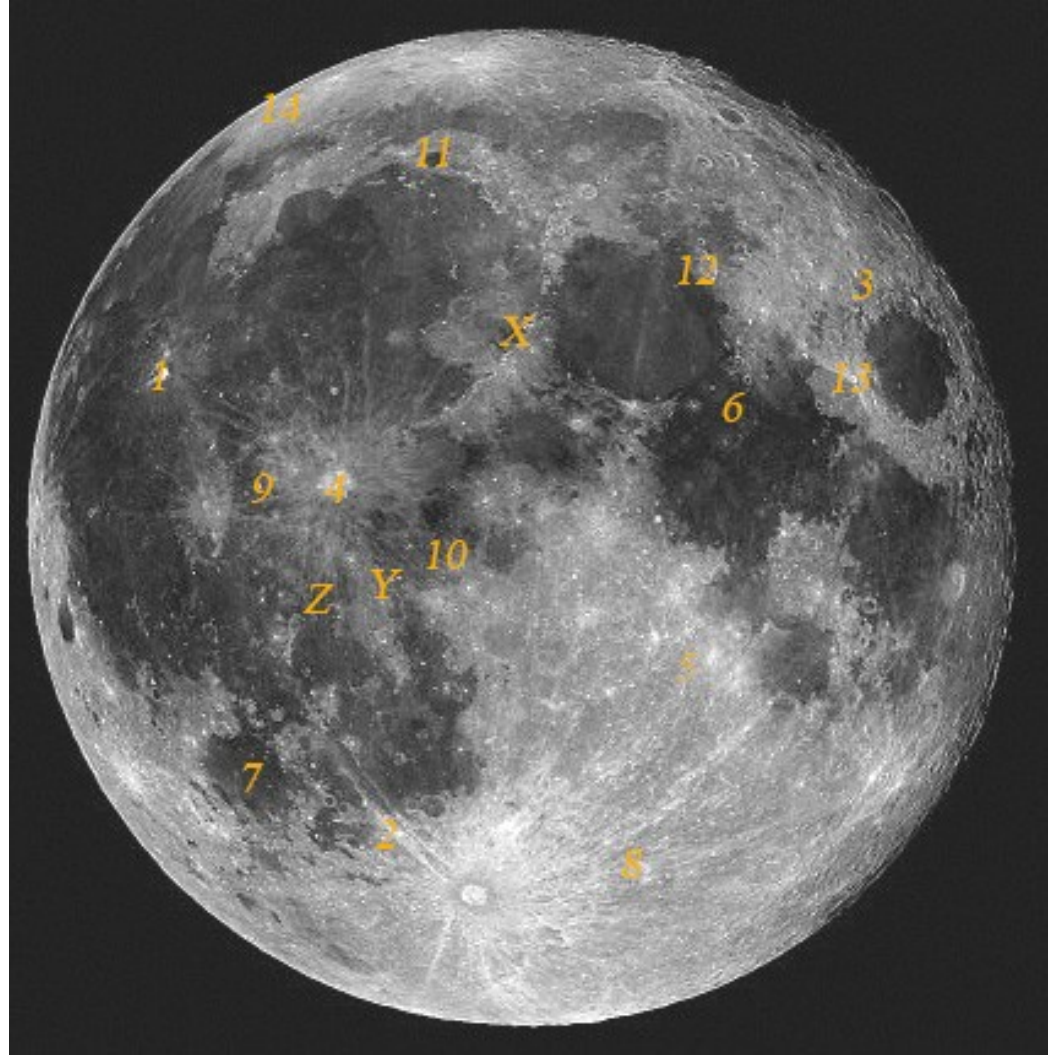
Figure 3. The visibility of the needle/thread-like ray of light beyond the terminator in the Cichus-Weiss area. The points represent past observation Red=visible. Blue=invisible. Purple = 2018 Oct 18 observations which also did not show this effect.

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. To keep yourself busy on cloudy nights, why not try “Spot the Difference” between spacecraft imagery taken on different dates? This can be found on: http://users.aber.ac.uk/atc/tlp/spot_the_difference.htm . 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> .

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KEY TO IMAGES IN THIS ISSUE

1. Aristarchus
2. Cichus
3. Cleomedes
4. Copernicus
5. Descartes
6. Jansen
7. Mare Humorum
8. Maurolycus
9. Milichius
10. Mösting
11. Plato
12. Posidonius
13. Proclus
14. Pythagoras



FOCUS ON targets

X = Apollo 15 Mare Imbrium-Hadley Rille

Y = Apollo 14 Fra Mauro

Z = Apollo 12 Ocean of Storms