



# THE LUNAR OBSERVER

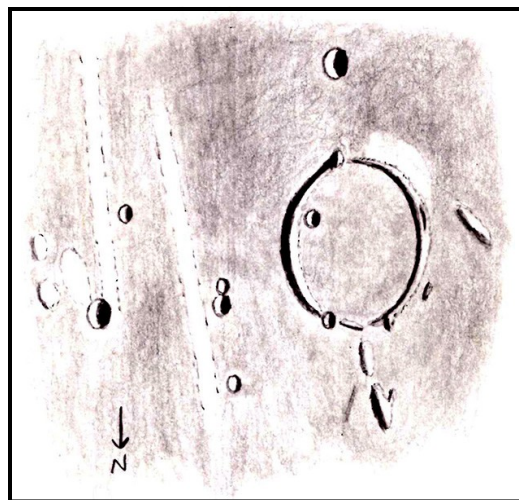
A PUBLICATION OF THE LUNAR SECTION OF THE A.L.P.O.

EDITED BY: Wayne Bailey [wayne.bailey@alpo-astronomy.org](mailto:wayne.bailey@alpo-astronomy.org)

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RECENT BACK ISSUES: [http://moon.scopesandscapes.com/tlo\\_back.html](http://moon.scopesandscapes.com/tlo_back.html)

## FEATURE OF THE MONTH – SEPTEMBER 2018 COOK



**Sketch and text by Robert H. Hays, Jr. - Worth, Illinois, USA  
March 4, 2018 04:55-05:27, 05:40-05:56 UT, 15 cm refl, 170x,  
seeing 8/10, transparency 6/6.**

I drew this crater and vicinity on the night of March 3/4, 2018. This crater is near the southern tip of Mare Fecunditatis, and has obviously been flooded by that mare. Cook has a dark interior that appears smooth and featureless except for the pit Cook A inside the southeast rim. An apparent pit on the north rim is near two small gaps. The short ridge between those gaps does not quite line up with the rest of Cook's rim. Two ridges and a dusky strip of shadow are north of Cook. The more northerly ridge has dark shadowing and a short prong. A peak is on the north rim of Cook just west of the gaps, and a small peak is just outside the rim nearby. A narrow bit of shadow is on the outside of Cook's west rim indicating possible terracing, and another ridge is west of Cook. Overall, the east rim of Cook is wider than the west rim. A light dusky area adjoins the southwest rim. This area is intermediate in tone between the mare and sunlit rims. Cook G is south of Cook, and has a bright interior. Cook B is the largest of several craters east of Cook, and is very much like Cook G in size and brightness. Cook C is south of B, and is similar to the larger of a tight pair of craters just east of Cook. The other crater of this pair is smaller and shallower, and a fairly shallow pit is north of the pair. The tight pair is shown but not labeled on the Lunar Quadrant map, and the crater to their north is not even shown there. Two faint ray segments are in this area, and they converge slightly to the south. A vague bright patch is just southeast of Cook B, and two low mounds are nearby.

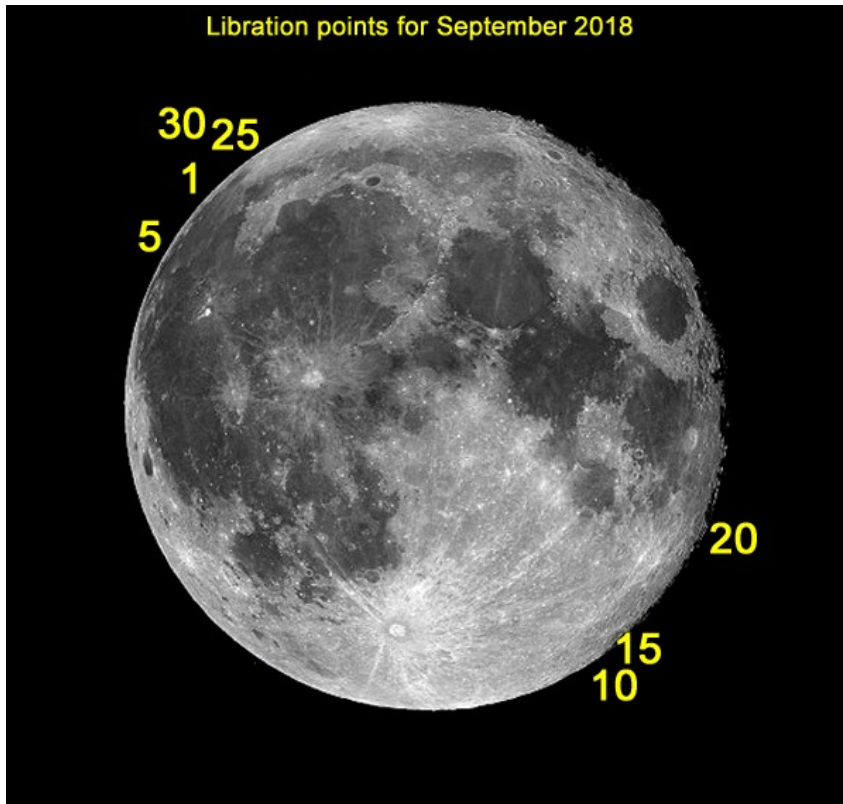
# LUNAR CALENDAR

2018	U.T.	EVENT
Sep 03	01:37	Last Quarter
05	06:56	Moon North Dec.: 20.8° N
06	22:42	Moon Ascending Node
08	01:21	Moon Perigee: 361400 km
09	18:01	New Moon
14	02:21	Moon-Jupiter: 4.6° S
16	23:15	First Quarter
17	16:46	Moon-Saturn: 2.3° S
18	09:35	Moon Extreme South Dec.: 20.9° S
20	00:54	Moon Apogee: 404900 km
20	09:30	Moon Descending Node
25	02:53	Full Moon

2018	U.T.	EVENT
Oct 02	09:45	Last Quarter
02	13:03	Moon Extreme North Dec.: 21° N
04	03:10	Moon Ascending Node
05	22:29	Moon Perigee: 366400 km
09	03:47	New Moon
11	21:21	Moon-Jupiter: 4.3° S
15	03:01	Moon-Saturn: 2° S
15	17:26	Moon Extreme South Dec.: 21.2° S
16	18:02	First Quarter
17	12:03	Moon Descending Node
17	19:16	Moon Apogee: 404200 km
18	13:01	Moon-Mars: 2.2° S
24	16:45	Full Moon
29	18:34	Moon North Dec.: 21.3° N
31	03:46	Moon Ascending Node
31	16:40	Last Quarter
31	20:05	Moon Perigee: 370200 km

# LUNAR LIBRATION

## SEPTEMBER-OCTOBER 2018

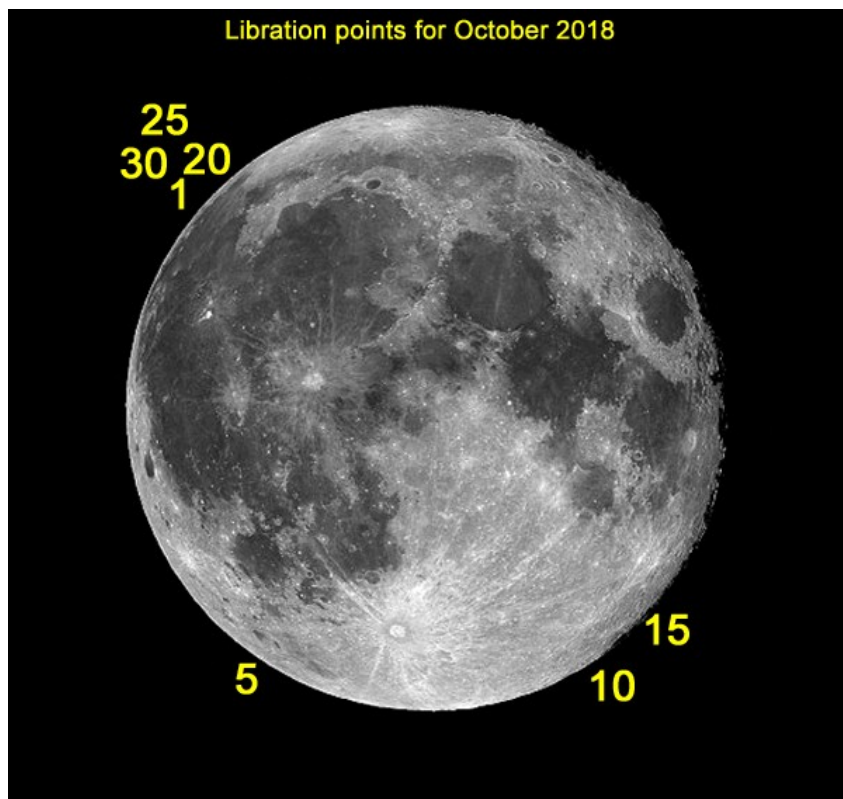


### Size of Libration

09/01	Lat +06°42'	Long -06°26'
09/05	Lat +03°10'	Long -04°13'
09/10	Lat -04°48'	Long +03°20'
09/15	Lat -06°04'	Long +06°32'
09/20	Lat -00°31'	Long +01°04'
09/25	Lat +05°31'	Long -04°29'
09/30	Lat +05°35'	Long -04°45'

**NOTE:**

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



### Size of Libration

10/01	Lat +04°35'	Long -04°15'
10/05	Lat -01°27'	Long -00°43'
10/10	Lat -06°33'	Long +05°03'
10/15	Lat -03°17'	Long +04°02'
10/20	Lat +03°16'	Long -02°33'
10/25	Lat +06°32'	Long -04°56'
10/30	Lat +01°52'	Long -01°41'

**NOTE:**

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

## **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](mailto: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](mailto:wayne.bailey@alpo-astronomy.org)

and Jerry Hubbell – [jerry.hubbell@alpo-astronomy.org](mailto: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 16 Region – Descartes and Cayley Plains

*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 2018** edition will be the **Apollo 16 Region – Descartes and Cayley Plains**. 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](mailto:jerry.hubbell@alpo-astronomy.org)

**Wayne Bailey** - [wayne.bailey@alpo-astronomy.org](mailto:wayne.bailey@alpo-astronomy.org)

**Deadline for inclusion in the Apollo 16 Region – Descartes and Cayley Plains article is Oct. 20, 2018**

## FUTURE FOCUS ON ARTICLES:

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

<u>Subject</u>	<u>TLO Issue</u>	<u>Deadline</u>
Apollo 15 Region – Mare Imbrium and Hadley Rille	January 2019	December 20, 2018
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

# Focus On: Apollo 17 Region Sea of Serenity

**Jerry Hubbell**

Assistant Coordinator, Lunar Topographical Studies

The 50<sup>th</sup> anniversary of the first NASA manned lunar landing mission that occurred in July 1969 is approaching fast. I fondly remember following with great interest the Apollo program, I couldn't get enough of it. I was a bit too young to follow and understand the Mercury and Gemini programs, but by the time the Apollo 7 mission occurred in October 1968 I had just started 3<sup>rd</sup> grade and was reading everything I could get my hands on about the program.

A few months ago, I figured out that the TLO Focus On series of articles should commemorate this achievement by focusing on the Apollo 11 Mission for the July 2019 issue. I then thought that we should be commemorating all the manned lunar landings here in the TLO, so I decided that the Focus On Apollo mission articles should be on the regions explored by the NASA astronauts. Since there were 6 successful lunar landing missions, that gave me 6 articles that would start this month. Since I wanted to have the Apollo 11 50<sup>th</sup> anniversary article in July 2019, the only way to accommodate that was to start with Apollo 17 and count backwards through Apollo missions 17, 16, 15, 14, 12, and finally 11. Kind of like a launch countdown. I talked with ALPO Lunar Section Coordinator Wayne Bailey and he agreed and supported this plan, so that is how these articles came about.



*Figure 1.* Apollo 17 Mission Patch, NASA image.

I am going to follow a specific outline for each of these articles to include a mission summary. The main topic of each of these articles will be on the region around the landing sites, the interesting topographical features that can be observed and imaged, and the purpose and reasoning behind the selection of these locations by NASA for each of the missions. I think this will give us further context when we observe these regions. I plan on including three NASA images in each of these articles for historical purposes and to compare to our own images and observation notes that Wayne and I receive.

*Figure 2.* Apollo 17 Astronauts. (from left to right) Harrison Schmidt, Eugene Cernan, and Ronald Evans. NASA image.

A related Focus On article that includes additional information about this area appeared in the January 2017 issue of The Lunar Observer..

The Apollo 17 mission was launched at 12:33 am EST on December 7, 1972. The crew consisted of Commander Eugene Cernan, Command



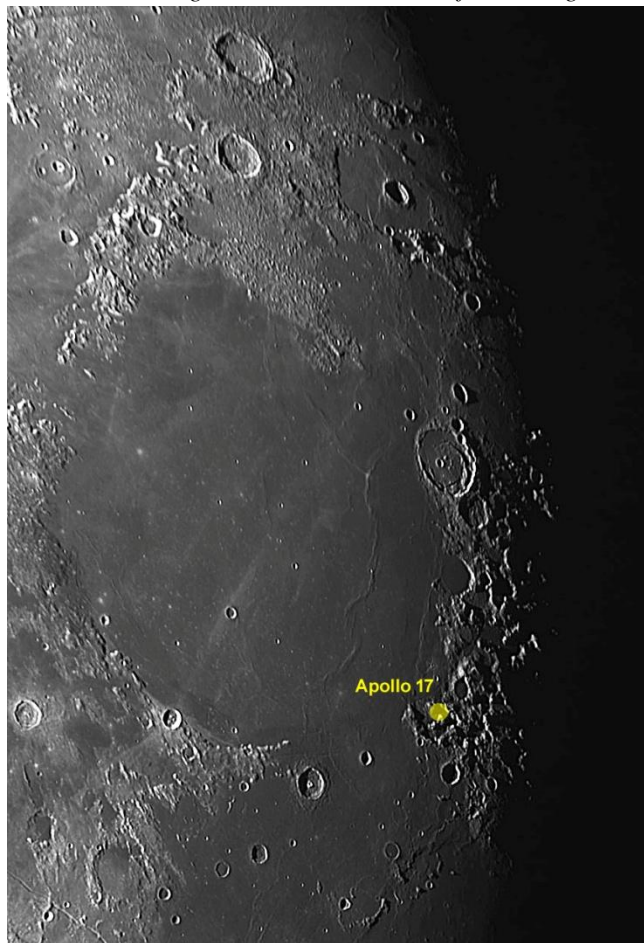
Module Pilot Ronald Evans, and Lunar Module Pilot Harrison Schmidt. One of the main features of this mission crew was that Harrison Schmidt was the first Scientist to be included on a lunar mission. He is a professional geologist (Figure 2.)

The landing site for Apollo 17 was just east of where Mare Serenitatis, the Sea of Serenity and Mare Tranquilitatis, the Sea of Tranquility come together in the mountainous terrain of the Taurus Littrow Valley. Landing occurred on Dec. 11 at 07:55 pm EST. The landing site is located at Selenographic coordinates 20°10' north, 30°46' east. Figure 3.

One reason the Taurus Littrow Valley was chosen by NASA was because the region provided an excellent opportunity to sample a wide range of material; those from the maria and also material from the mountainous region to the immediate east of Mare Serenitatis.

ALPO member and TLO contributor David Teske provides further comments about the exploration of the Taurus – Littrow Valley:

*“...As the Taurus-Littrow Valley has both highland material in the massifs and dark mare material on the valley floor, this site was chosen with anticipation of sampling ancient highland material and young volcanic materials in the same landing site. The massifs surrounding the Serenitatis basin seemed likely to contain ancient, pre-Imbrium rocks. During Apollo 15, Al Worden in orbit had seen dark-halo craters in this region that looked like cones that looked like cones scattered all over the region’s brighter surfaces. This dark mantle also showed up clearly as streaks on the massifs, supporting its interpretation as a pyroclastic deposit that had been forcefully fountained from volcanic vents. Perhaps interest in these dark coatings would have been satisfied during the same Apollo 15 mission if the drill core had not been*



*stuck and prevented astronauts Scott and Irvin from visiting the North Complex which was believed to have a thin coating of pyroclastic coating. In the end, this dark mantle area which was thought to be relatively young turned out to be ancient, 3.64 billion years old, which was much older than predicted. There were few craters in this dark mantled region because the craters that were formed occurred in a thick-glass-rich regolith and the original pyroclastic layer had softened the initial shapes and then soften more quickly than they would have in hard rock...”*

*Figure 3. Apollo 17 Landing Site – Mare Serenitatis, David Teske, Louisville, Mississippi, USA. 13 July 2017 at 0939 UT. Colongitude 141.9 degrees, seeing 6/10, 4-inch APO refractor, 2 x Barlow, Mallicam GMTm camera, 518 frames. (ed. highlight label added)*

There are several popular targets for observing and imaging in the lower east quadrant of the Sea of Serenity including the craters Posidonius (58.0 mi, 96.0 km), Plinius, and Dawes in the Sea of Serenity, and further east in the higher terrain craters Cleomedes, and Macrobius and Romer. Crater Jansen is south of the landing site in

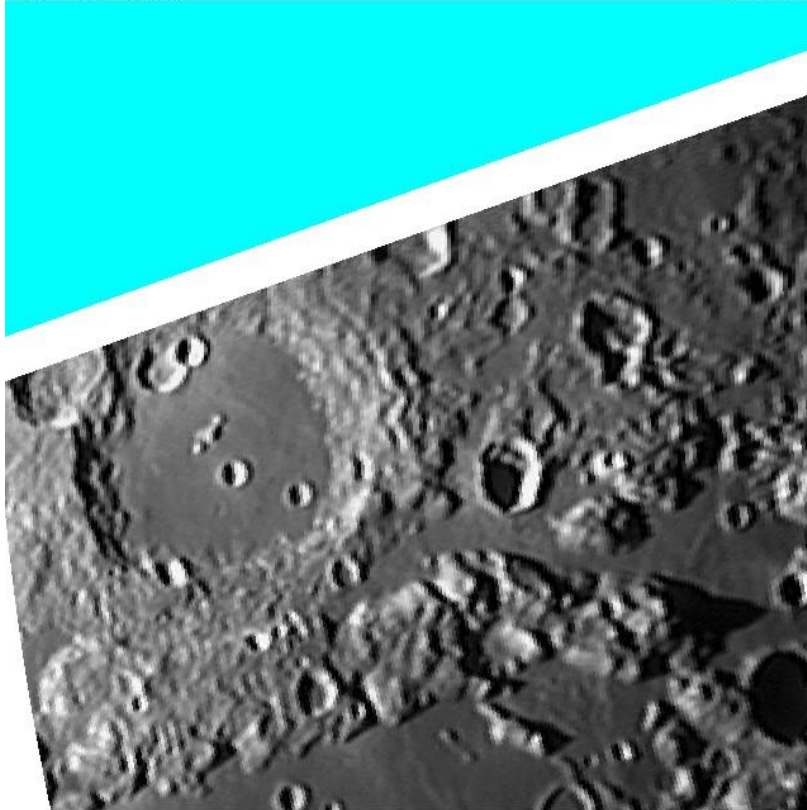


the Sea of Tranquility. The interesting features Dorsa Smirnov and Lister are also to the northwest and west of the Apollo 17 landing site. (Figures 3, 4, and 5).

**Figure 4.** Dawes – Mare Serenitatis, Luis Francisco Alsina Cardinali, Oro Verde, Argentina, 01 July 2017 2334 UT, Colongitude 5.4 degrees, 0.2-m Refractor, QHY5-II CCD camera.



Sub-solar Pt = 19.675°W/1.479°S Sub-Earth Pt = 58.487°E/15.951°N Center = 58.834°E/28.214°N Zoom = 10.000  
Vertical axis : central meridian LTVT v0.21.4



Texture file: MareCrisium4\_Panorama.jpg

**Figure 5.** Aerial View of Cleomedes, Jerry Hubbell, Locust Grove, VA, USA, 04 August 2012 0054 UT, 0.13-m APO Refractor (Explore Scientific 5-inch ED APO), Imaging Source DMK21AU04 CCD, 4x Powermate. Seeing 8/10, Transparency 5/6, north/up, east/right.

## **REFERENCES:**

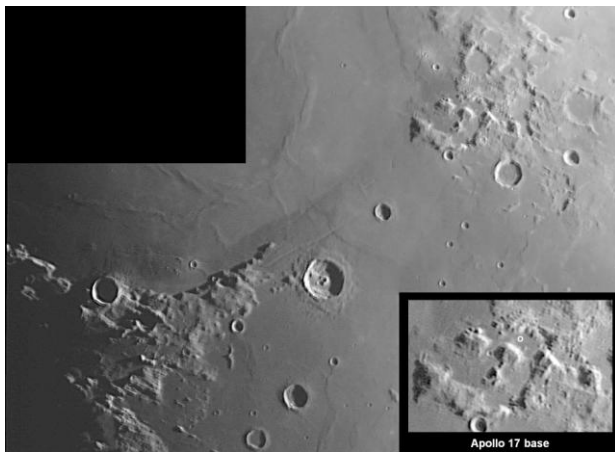
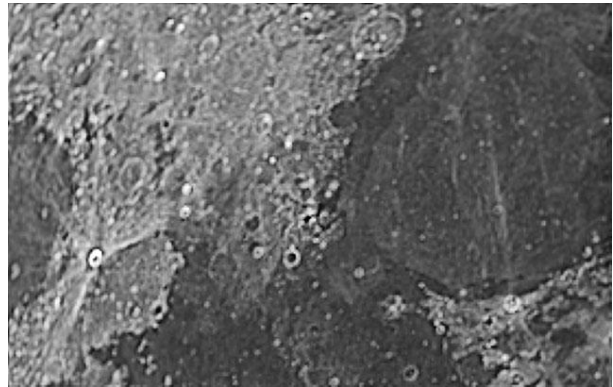
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## **ADDITIONAL READING:**

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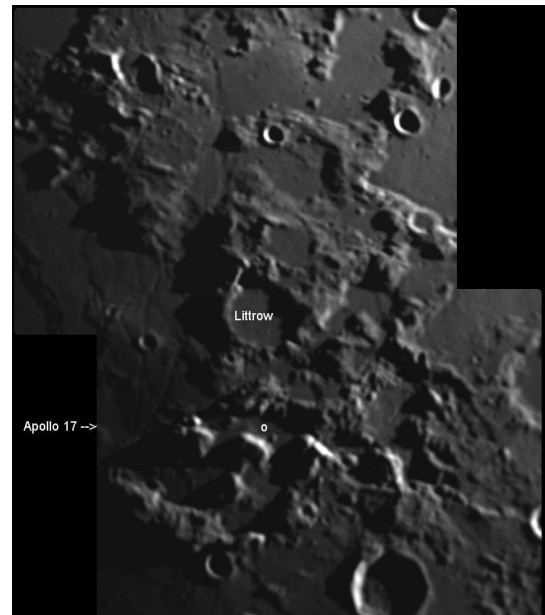
## ADDITIONAL APOLLO 17 IMAGES

**Apollo 17.** Sergio Babino, Montevideo Uruguay. December 11, 2016 00:03 UT. Seeing 6/10, transparency 5/6. Williams Optics Gt81, f/6.6, ZWO 174mm.



**Apollo 17.** Richard Hill, Tucson, Arizona USA. March 15, 2016 01:48 UT. Seeing 8/10. TEC 8" f/20 Mak-Cas. Skyris 445M, 656.3nm filter.

**Apollo 17-Littrow.** Richard Hill, Tucson, Arizona USA. June 9, 2008 03:07 UT. Seeing 8/10. C-14 SCT, 2x barlow. SPC900NC, UV-IR block filter.



# Mons Undest

**Alberto Anunziato**

Taking advantage of a moment of excellent seeing at 32.4° colongitude, I was able to make a tour around Lambert's vicinity and stop at one of the isolated peaks of the western part of the Mare Imbrium, that was formerly known as "Lambert Gamma" and now unofficially known as "Mons Undest" (fig. 1). Most likely it is an outcrop of the mountainous ring formed by the impact that formed the Mare Imbrium basin. In this phase of the lunation Mons Undest shines strongly, it is strange that such a prominent moon feature does not even have a name. At the time of observation it was almost as bright as Mons La Hire. To the east of our



**FIGURE 1.** *Mons Undest* – Alberto Anunziato Paraná, Argentina. January 26, 2018 23:40 – 00:10 UT. Seeing 8/10, Meade EX-105 Mak-Cass, 154x.

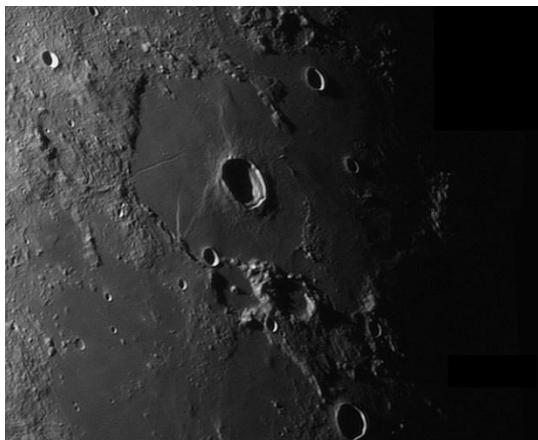
peak we can observe the dim shadows of the elevations that form the Hizagy Dorsum. There is a clear contrast with the other system of wrinkle ridges that appears in the image, known as Dorsa Stille, north of Undest. There are no shadows just a bright area that I could only identify as the sunlight illuminated heights of Dorsa Stille using the Lunar Chart 40 of NASA (Timocharis). Obviously Dorsa Stille is lower than Dorsa Hizagy. East of Dorsa Hizagy (right of the image) there is a small hill not as bright as Undest but projecting a similar triangular shadow. This peak has no name, not even unofficial. The most spectacular images of this area were obtained in orbit by the Apollo 15 mission, identified as AS15-M-1152 and AS15-M-1010, included in the book "Apollo over the Moon: a view from orbit". To complete a contrasting landscape, the shadow that covers the western area belongs to the foothills of the ejection field of the neighbouring Lambert.

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# A Lakeside Sunset

**Rik Hill**

Waning phases of the Moon are generally less observed by amateur astronomers. I have to admit I'm one of those amateurs but with good reason. My eastern sky has a lot of restrictions and my late night seeing is usually poor. But this night things were all working well. I was treated to a lakeside sunset on Lacus Mortis! It was one of those sights that caught my breath (fig. 1). The polygonal walls of the lacus were very obvious and the three larger rimae stood out nicely, each of a different geologic origin. The central crater Burg (41km diameter) was still deep in shadow at this colongitude (145°) but to the south the two splendid craters Plana (46km) on the left with a tiny central peak sporting a nice shadow and Mason (44km) to the right half in shadow. I like the weathered look of these two both of Nectarian age, about 3.9 billion years old, a lot older than Burg which is Copernican, formed in the last billion years. The crater at the very bottom of the image is Grove (29km). The flat area off to the lower left of the image is Lacus Somnorum.



Lastly, notice halfway between Grove and Plana what appears to be a small dome about 8-10km in diameter. I find no reference to it in the online Lunar Domes Atlas but I can't see how it would not be known!

**FIGURE 1.** *Lacus Mortis* – Rik Hill, Tucson, AZ USA August 1, 2018 07:26 UT. Colongitude 145.1°, seeing 8-9/10, TEC 8" f/20 Mak-Cass, 610nm filter, Skyris 445M,

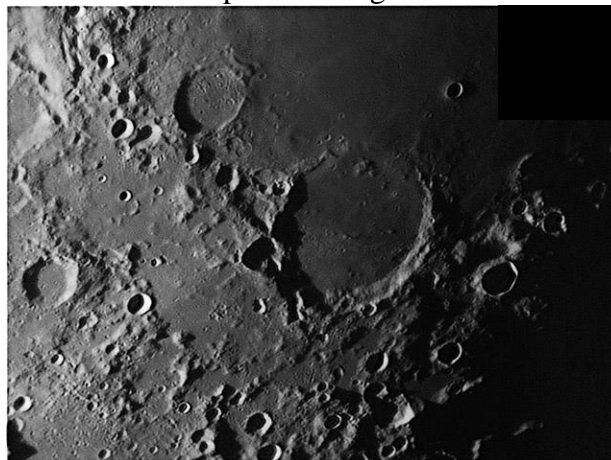
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## **Fracastorius Redux!**

### **Rik Hill**

In Oct., 2015, I posted this image (fig. 1) of Beaumont (upper left) and Fracastorius (center). It was good but I wasn't completely happy with it. Three years and several software versions later I took the original stacked images and reprocessed them. Which brings up a cautionary note, ALWAYS keep your intermediate steps (images) when processing so you can go back if need be, to reprocess generally or bring out a particular feature. In this day and age of terebyte disks for only \$60-70, it really pays to have and use the space. Saving AVIs is a bit much, and very space intensive, but if you can, so much the better. I have never done that as my AVIs are between 1-2Gb.

**FIGURE 1.** *Fracastorius* – Richard Hill – Tucson, Arizona, USA October 3, 2015 09:03 UT. Seeing 9/10. TEC 8" f/20 Mak-Cass, SKYRIS 445M, 656.3 nm filter.



In this case the resolution improved by a factor of two. The rima in Fracastorius was only fragmentary and partially visible in the original posting. However, here you can see the delicate cat's smile on the floor. There are secondary craters and dome-like features (to the left of Fracastorius) that were simply lost in the earlier processing. Moral of the story? Keep the intermediate stages of your work so you can take advantage of improvements in software in the future. There may be gold in those old pixels!

# Ukert.....Mykert....Whatever!

## Rik Hill

In the center of the Moon's visible disk you get this splendid sight (fig. 1) for a few days after first quarter. The crater below center is Triesnecker (27km dia.) with much internal detail and rilles or rimae down to about 1km width. Notice the interior detail in this crater and the dome-like feature just north of it. North of this rille system is the wide "V" shaped Rima Huyginus with the crater Hyginus (10km) in the center. This rima is of a very different origin than the previous ones. This one is of volcanic origin and you can see on the left branch a row of 2-4 km diameter vents. Between Triesnecker and Hyginus and to the left is an almost triangular crater, Ukert (24km) diameter. Under higher lighting it looks even more triangular! There are interesting interior markings and it looks like there was a central peak that has been covered over by ejecta.

**FIGURE 1. Ukert** – Richard Hill – Tucson, Arizona, USA May 24, 2018 02:50 UT. Colongitude 19.6°, Seeing 8/10. TEC 8" f/20 Mak-Cass, SKYRIS 445M, 656.3 nm filter.

To the left (west) of Triesnecker are two ancient craters that I find very interesting. The bigger one is Murchison (60km) with a flat bottom and broken wall on the east side, dating from the earliest cratering period on the moon as long as 4.5 billion years ago (up to 18 rotations of our galaxy ago!) and overlapping it is the younger Pallas (51km) west, with a low central peak. There are craters on either side of these last two. On the east side near the broken wall of Murchison is Chladni (14km) and on the other side is Bode (19km). Both of these craters are comparatively recent but Chladni is the most recent (1 billion years to present) and it becomes very obvious when you look at it with the LROC Quick Map at: [quickmap.lroc.asu.edu](http://quickmap.lroc.asu.edu). I highly recommend this site to all lunar observer but plan on spending one or two evenings there, it's addictive!



# **A Call For Science Minded Amateur Astronomers**

**Alberto Martos**

On July 27<sup>th</sup>, a total lunar eclipse took place and its visibility favored Near East countries in Europe, Africa and Indian Ocean islands. From Spain, we were deprived of half of the celestial show, being the Moon completely dark reddened at rise time.

For the profane, the show was rather disappointing. The Moon rose so pallid that many people did not realized it was above the horizon, until they were pointed at, by some other one finger. But what a poor sight! They saw no blood-Moon, but rather a dull Moon, faintly glowing dark red and grey in the dusk. Hundred thousands of pictures were probably taken during this phase, for people who frowned their eyebrows by insatisfaction.

For people in the Lunar Group of the Madrid Amateur Astronomy Society (AAM), this aftermath was expected. We were aware of at least, six powerful eruptions of volcanoes all around the world, had permeated the Earth's atmosphere, dumping thousand millions of tons of magma grains, dust particles, water vapor and poisonous bubble gases, mainly of carbon and sulfur dioxides. All this exotic material trapped Sun rays that would have been otherwise refracted towards our satellite, pouring a misty red coat over its surface. But the darkening of the Earth atmosphere provoked the darkening of the Moon and the loss of its charming aspect.

For geophysicists, the grading of illumination of the Moon, in the Danjon scale from 0 to 4, and the hue of its reddish or yellowish face, reveals the status of contamination that exists in our high atmosphere and the ozone concentration at that height. This happening converts the observation of a lunar eclipse in a geophysical task, rather than an astronomical one.

This is as far as high altitude atmosphere is concerned. But the eclipsed Moon still offers some more valuable information to astrophysicists, about the health of the low altitude Earth atmosphere. When dusty particles concentrate in the bottom layers of the atmosphere, close to the surface of the planet, they form a thick stratum that becomes opaque because it absorbs most of solar light. In these cases, best timing calculation of eclipse contacts, falls short at the first contact with the umbra point and falls long at the last contact with the umbra point. For early eighteen century astronomers who observed these facts, as Pierre La Hire in 1702, the most obvious explanation was that the true size of the Earth had not been determined with sufficient accuracy by geographers, since out of these facts, it seemed to be a bit bulkier than what they had thought.

Nowadays, even though a comprehensive explanation of this event has not been achieved, it is assumed that the thick bottom layer of the atmosphere behaves as an extra extension of the solid body of Earth. At the end, a result of atmospheric contamination at low level. According to the XIX century American mathematician William Chauvenet, this apparent extension of Earth size can be modellized by adding a 2% (50 arcsecs) increment to Earth's radius for the umbra contact time calculations, and another increment of greater magnitude (88 arcsecs) for the penumbra contact time calculations. Later on, XX century French astronomer André Danjon, developed a second algorithm based on a 1% (41 arcsecs) increment for both umbra and penumbra contact time calculations.

The big problem for these two receipts, is that the first and last contacts of the Earth umbra with the Moon globe, occur in such places that are not visible for Earth based observers. They are located in points at 90 and 270 deg. of colongitude, that is in the Moon limb and so, located in the very line of sight of terrestrial observers. Because of that, from Earth we can only see the lunar surface darkening, when Earth shadow spreads around an

enough extent and for then, there can be an elapsed time of up to 30 seconds. That's is why this measurement rules cannot be carried out with sufficient accuracy.

Then, astronomers cooked up the crater timing method. Relevant craters can be selected all across the near side of the Moon, so they can be free of observer's line of sight obliquity effects. And because the shadow enlargement of the Earth seems to vary from one eclipse to the next, amateur astronomers of the whole world are encouraged to take crater going in and out of shadow timings and forward their measurements to scientific institutions, as Sky & Telescope, for analysis. These reports have lately found a collateral application for scientists interested in the Earth atmosphere evolution as a key symptom of climate change.

In accordance with the above criteria, the Lunar Group of AAM planned to observe the part of the eclipse visible from Spain and make the corresponding set of crater timings, to be forwarded to the scientific institutions. The following table list our measurements versus NASA expected timings, as published by Fred Espenak in his Mr. Eclipse web page.

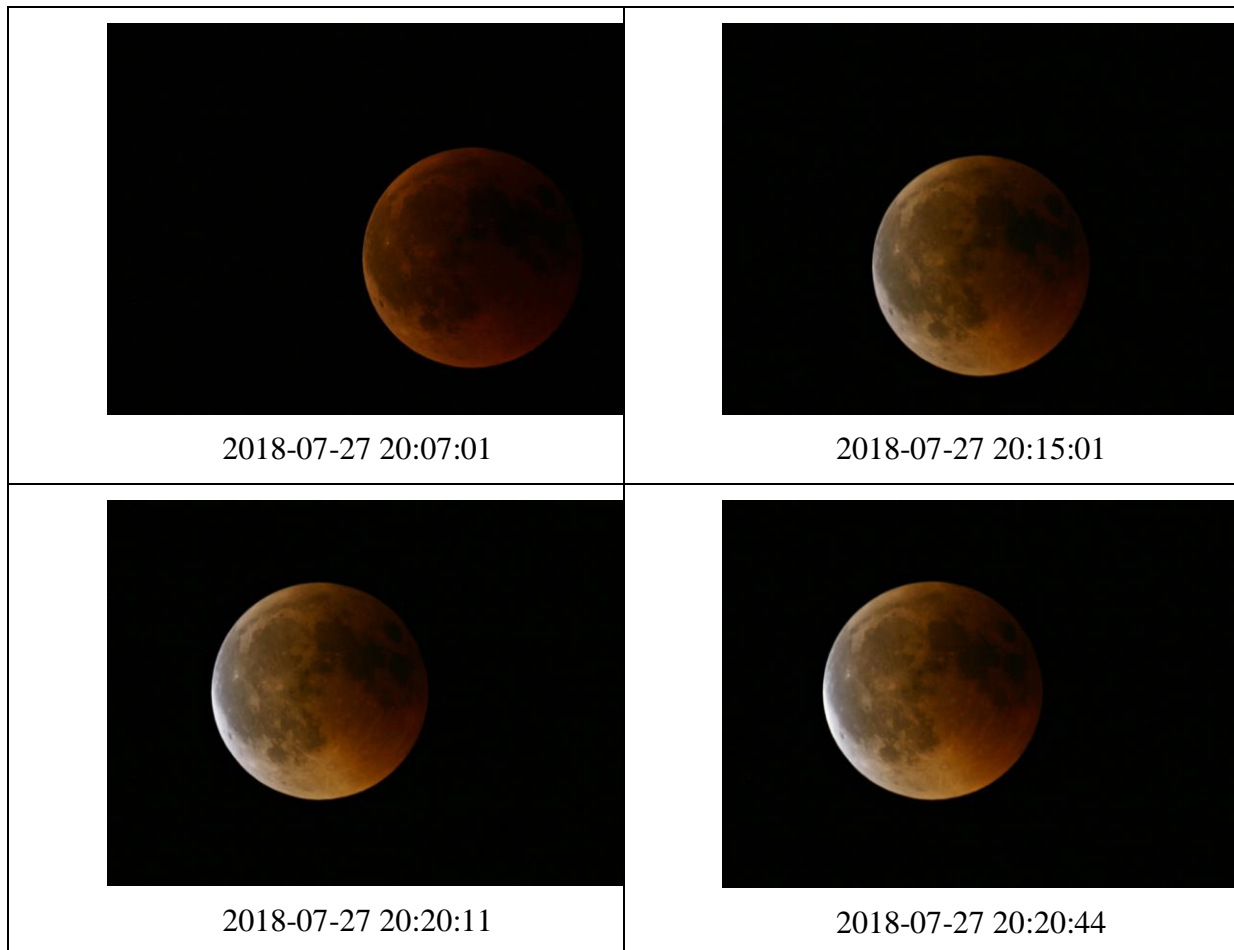
<b>UT of Emersion</b>	<b>Crater Name</b>	<b>Our measurements</b>
21:15	Riccioli	21:15:04
21:16	Grimaldi	21:16:34
21:23	Billy	21:22:27
21:23	Aristarchus	21:22:40
21:26	Kepler	21:26:24
21:33	Campanus	21:33:06
21:35	Pytheas	21:35:15
21:36	Copernicus	21:36:00
21:38	Plato	21:39:07
21:38	Timocharis	21:38:56
21:40	Tycho	21:40:58
21:45	Autolycus	21:46:25
21:48	Aristoteles	21:48:50
21: 50	Eudoxus	21:49:56
21:51	Manilius	21:51:53
21:55	Menelaus	21:55:20
21:57	Dionysius	21:56:55
21:58	Endymion	21:58:06
21:59	Plinius	21:59:51
22:05	Censorinus	22:05:04
22:09	Proclus	22:09:40
22:10	Goclenius	22:10:13
22:10	Taruntius	22:11:03
22:11	Messier	22:12:54
22:15	Langrenus	22:15:40

Besides the above crater timings, we determined the following two events.

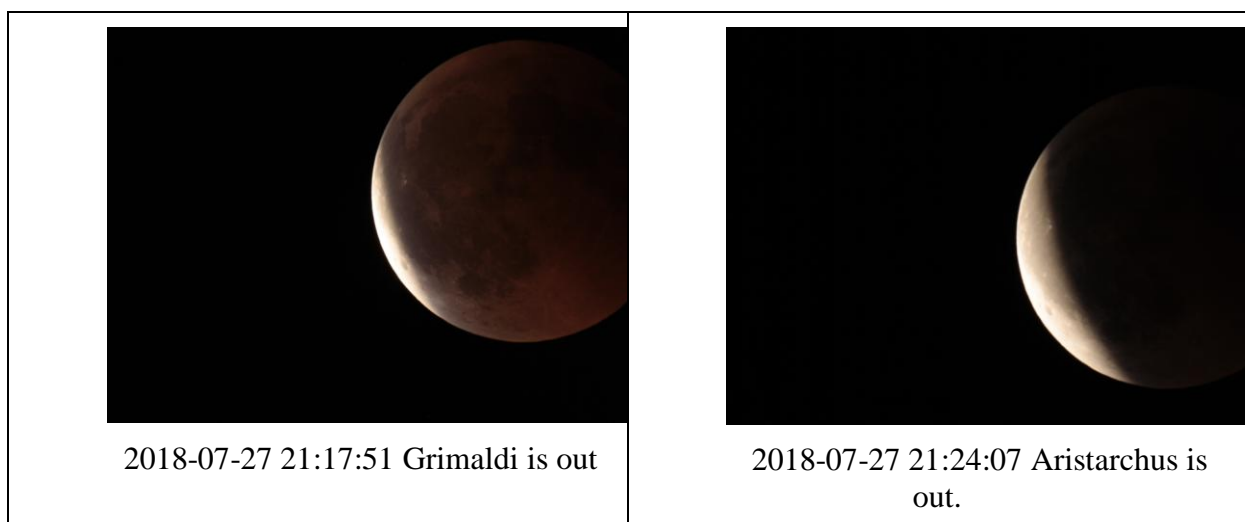
<b>NASA (F. Espenak)</b>	<b>Event</b>	<b>Our measurement</b>
21:13:12	End of totality	21:12:10
22:19:00	Last contact with umbra	22:19:10

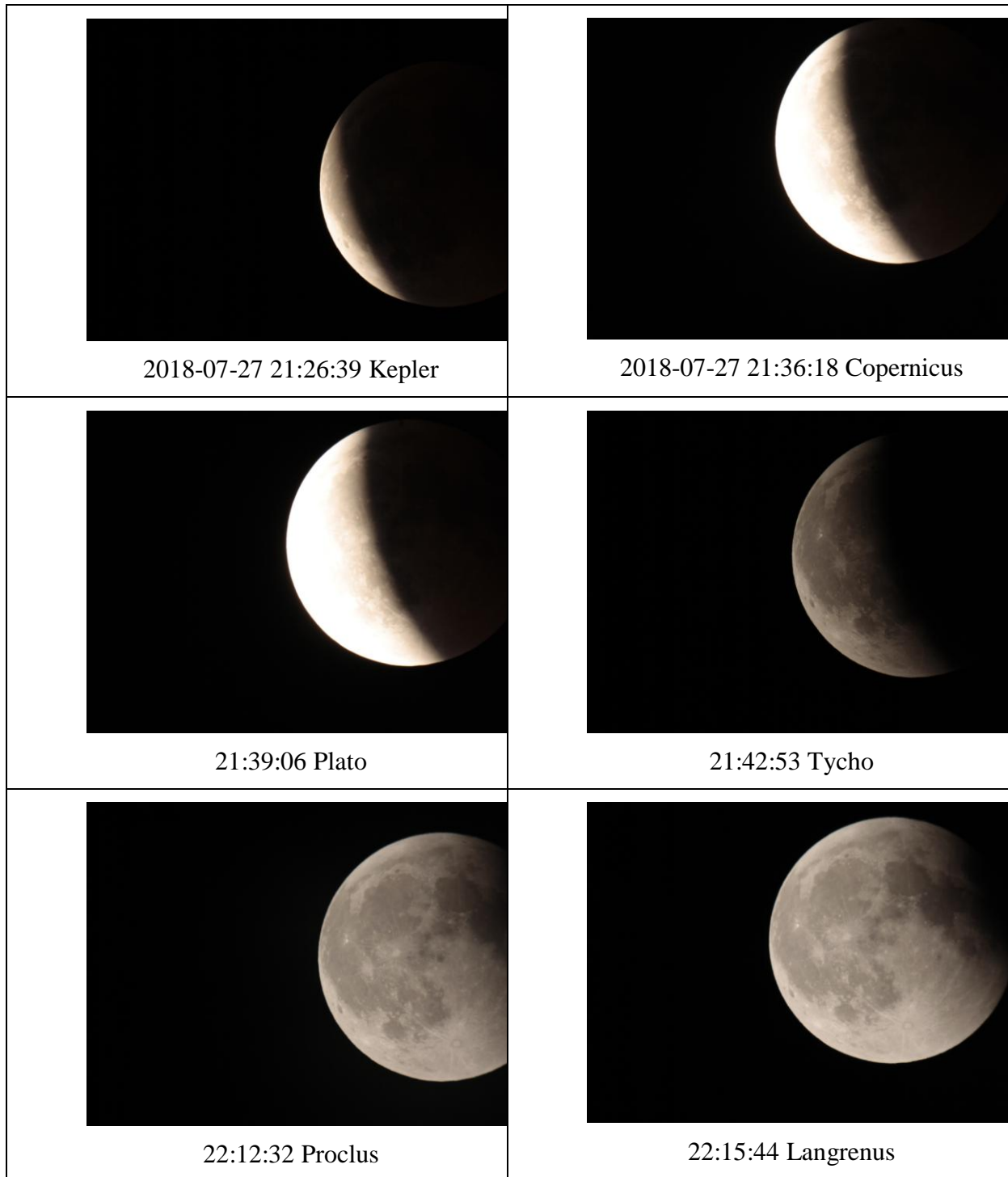


We, of course, took some pictures during our observation. Pictures 1 to 4 were taken by an 8 inc Schmidt-Cassegrain telescope and a Canon Eos 400D camera, attached as a prime focus. Exposure times are shown at the picture legend.



In addition to the above pictures, we took a few more ones with an 80 mm APO refractor (Megrez) provided with a 2x ED Barlow lens, in an f/12 configuration and a Canon 1000D camera. Legends show timings and emerging from shadow crater name.





As in some other occasions, we forwarded our crater timings to Roger Sinnott<sup>1</sup>, ancient editor of *Sky and Telescope* magazine and author of relevant works about crater timings during lunar eclipses, as “Measuring Earth’s Shadow: 170 Years of Crater Timings”<sup>2</sup>. Mr. Sinnott acknowledged receipt of our data, thanked us for them, and to our disappointment, informed us of the importance that our data have acquired, as it was the third set of crater timings that he had received so far. And even worse, in the case of the previous eclipse, he had received no measures at all from anyone. In his own words, *a lot of people*

<sup>1</sup> <https://www.skyandtelescope.com/astronomy-news/useful-projects-for-a-lunar-eclipse/>

<sup>2</sup> *Sky and Telescope*, April 2015.

*nowadays are content to take pretty pictures of the eclipse and ignore the chance to make useful observations.*

There is no doubt that the photographs keep a beautiful memory of the event. But they contain less scientific information than crater timings. Mainly, lunar hue at maximum phase, for very a sophisticated analysis made by some scientists<sup>3</sup> to determine the contents of ozone at high altitude. As a prove of truth, anyone can check some of our pictures and try to notice the event it portraits. Only in well overexposed pictures and large craters, as Copernicus and Plato, or in some cases of high contrast as in Grimaldi and Tycho, pictures can time the event. But for the case of regular sized craters as Kepler, Manilius or even Proclus (no matter how bright is this one) is dubious and for the small ones, as Dionysius or Censorinus, don't even try!

The message enclose in this work clarifies the intention of our call for amateur astronomers, to enjoy the pleasure of collaborating with scientists from other specialties, because the substance of the matter has not been fully understood yet, and because presently the threat of climate change worries all people interested in science. The road to the expertise presents certain difficulties that require patience and some degree of skill, ... exactly what attracts us, as amateurs!

The Lunar Group of the Madrid Amateur Astronomy Society.

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<sup>3</sup> As Giovanni di Giovanni, at Osservatorio Colle Leone, Mosciano Sant'Angelo.  
[https://britastro.org/journal\\_item/12171](https://britastro.org/journal_item/12171)

# LUNAR TOPOGRAPHICAL STUDIES

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

## OBSERVATIONS RECEIVED

ALBERTO ANUNZIATO - ORO VERDE, ARGENTINA. Drawing of Mons Undest.

SERGIO BAMBINO - MONTEVIDEO, URUGUAY. Digital images of Apollo 17 region, Copernicus & waxing gibbous Moon.

JUAN MANUEL BIAGI - ORO VERDE, ARGENTINA. Digital image of Posidonius.

FRANCISCO CARDINALLI - ORO VERDE, ARGENTINA. Digital images of Agrippa, Archimedes (2), Curtis, Dawes, Mare Serenitatis, Pickering & Theophilus.

JAIRO CHEVEZ - POPAYÁN, COLUMBIA. Digital image of waxing gibbous Moon.

MAURICE COLLINS - PALMERSTON NORTH, NEW ZEALAND. Digital images of 7(2), 8, 10, 11, 13(2) & 17 day Moon, Archimedes, Aristarchus, Atlas-Hercules, Clavius, Copernicus, Copernicus-Kepler, East limb, Janssen, Mare Crisium(2), Mare Frigoris, Mare Humororum, Plato, Ptolemaeus-Alphonsus, Theophilus, Tycho & western Limb.

JOHN DUCHEK – St. LOUIS, MISSOURI, USA. Digital image of J. Herschel.

WALTER ELIAS - ORO VERDE, ARGENTINA. Digital images of Daniell(2), Plato & Proclus.

LAWRENCE GARRETT - FAIRFAX, VERMONT, USA. Digital image of Lamb A mountain.

MARCELO GUNDLACH – COCHABAMBA, BOLIVIA. Digital images of Bullialdus, Copernicus, Eratosthenes, Maurolycus & Plato(2).

RICHARD HILL – TUCSON, ARIZONA, USA. Digital images of Aristillus, Deslandres, Fracastorius, Lacus Mortis, Piccolomini-Fracastorius, Theophilus & Ukert.

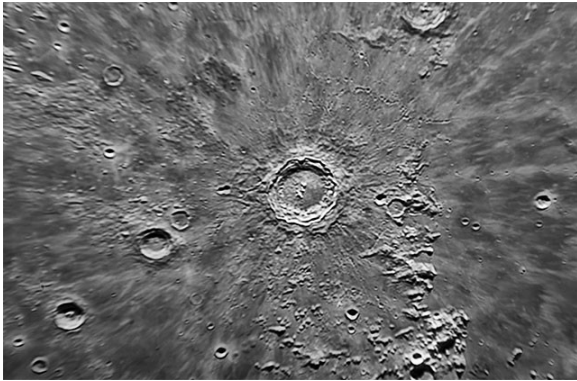
ALBERTO MARTOS – MADRID, SPAIN. Digital images of lunar eclipse(13).

PEDRO ROMANO – SAN JUAN, ARGENTINA. Digital images of 1st Qtr Moon.

MICHAEL SWEETMAN – TUCSON, ARIZONA USA. Digital image of Deslandres.

DAVID TESKE - LOUISVILLE, MISSISSIPPI, USA. Digital images of Apollo 17 site(3).

## RECENT TOPOGRAPHICAL OBSERVATIONS



**COPERNICUS** - Sergio Babino,- Montevideo, Uruguay. February 25, 2018 00:01 UT. 81 mm refractor. ZWO 174 mm. Baader Moon & Skyglow filter.

**POSIDONIUS** - Juan Manuel Biagi-Oro Verde, Argentina. March 27, 2016 04:20 UT. C-11 HD edge SCT, Canon EOS Digital Rebel XS.



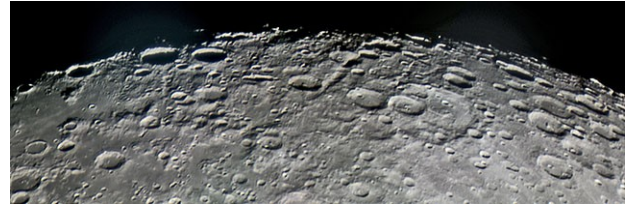
**ARCHIMEDES** - Luis Francisco Alsina Cardinalli, Oro Verde, Argentina, July 1, 2017, 00:05 UT, 200mm refractor, QHY5-II, Astronomik ProPlanet 742 IR-pass filter.

**WAXING GIBBOUS MOON** - Jairo Chavez,- Popayán Columbia. July 28, 2018 03:44 UT. 10" Dobsonian, Huawei Y360 camera, ISO200.

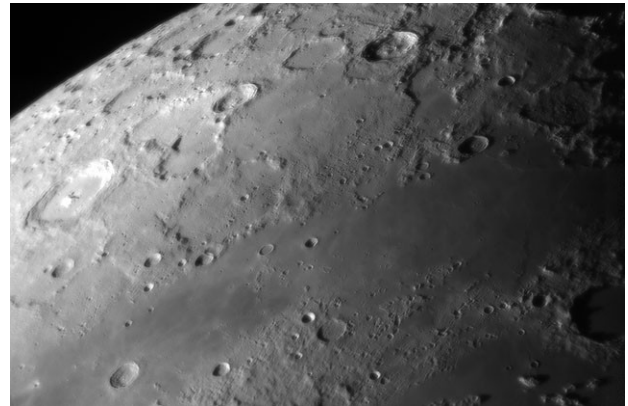


# RECENT TOPOGRAPHICAL OBSERVATIONS

**JANSSEN** - Maurice Collins,- Palmerston North, New Zealand. July 30, 2018 00:39 UT. FLT-110 f/21. ASI120M.C .

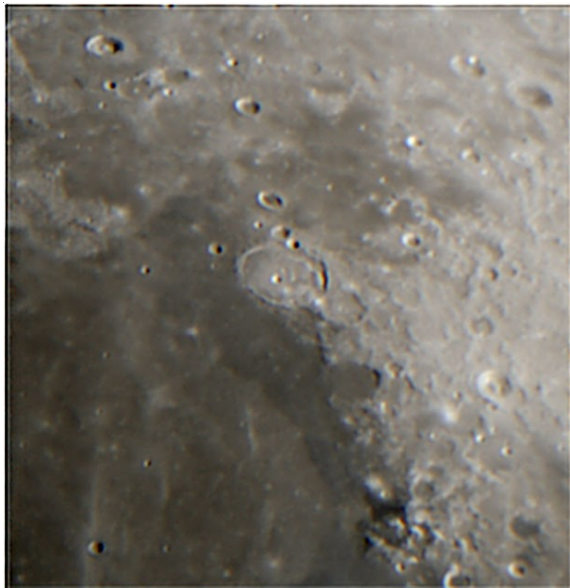


**PTOLEMAEUS-ALPHONSUS** - Maurice Collins,- Palmerston North, New Zealand. August 19, 2018 07:19 UT. FLT-110 f/14. ASI120M.C North down.



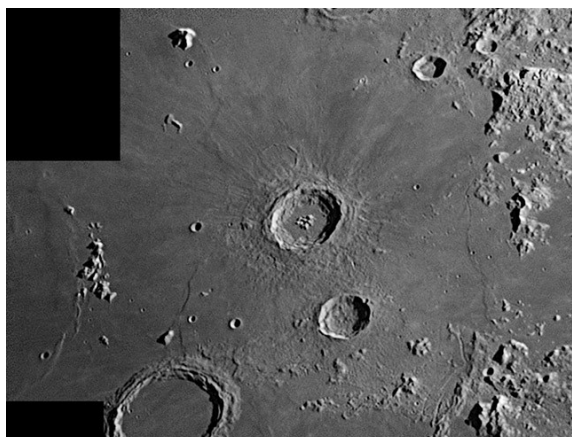
**J. HERSCHEL** – John Duchek - Carrizozo, New Mexico USA. August 4, 2018 13:57 UT. Seeing 6/10, Transparency 5/6. 7" SkyWatcher Mak-Cas F/15. ZWO-ASI-120-MM , IR pass filter.

This image was taken after sun up at about 7:57 am. Reflective insulation was used on the OTA to eliminate uneven sun heating of the tube. It is an infrared image; all visible was blocked with the IR pass filter.



**DANIELL** - Walter Elias, Oro Verde, Argentina. July 21,, 2018 03:43 UT. Celestron CPC-1100, Canon Rebel. XS.

# RECENT TOPOGRAPHICAL OBSERVATIONS



**ARISTILLUS**– Rik Hill, Tucson, AZ USA May 24, 2018 02:39 UT. Colongitude 19.6°, seeing 8/10, TEC 8” f/20 Mak-Cass, 610nm filter, Skyris 445M.

*What a beautiful sight is the 56km diameter Aristillus in the morning light. Notice the great radial splash pattern of the ejecta. You can even see a secondary ring to the west (left) and north. Also to the north and unnamed ghost crater some 40km diameter. Aristillus is one of a triumvirate of craters the largest of which is Archimedes (85km) peeking in at the bottom, and Autolycus (41km) roughly forming a right triangle with the other two. Luna 2, the Soviet lunar lander touched down just to the west of Autolycus. The mountains in the upper right corner are the Montes Caucasus with the crater Thaetetus (26km) on the*

*western flanks. Further down you can see Rima Thaetetus also on the western side of these mountains. in the lower left corner we see northernmost point of the Montes Apennines and Promontorium Fresnel and Rima Fresnel. The small crater there is Santos-Dumont (9km).*

*At the top of the image is the spectacular Mon Piton (2250m high) poised like some gigantic rocket ready to blast off, with two small craters below. Another small crater to the left (west) can be seen, this is Piazzzi Smyth U only 3km in diameter and nowhere near the limit for this image. Lastly near the western edge are the Montes Spitzbergen just above Archimedes. Though only 1400m high, they just sparkle in the morning light and always are a treat. Note the two small craters off the lower right point of these mountains. The larger one is Archimedes V at 3km diameter with the other being around 2.5km diameter as measured on the LROC Quick Map. There is an isolated peak between these mountains and Archimedes. Off its southern tip is a little pit. This crater is just below 2km diameter!*

**DESLANDRES**– Rik Hill, Tucson, AZ USA April 24, 2018 02:17 UT. Colongitude 12.9°, seeing 8/10, TEC 8” f/20 Mak-Cass, 610nm filter, Skyris 445M.

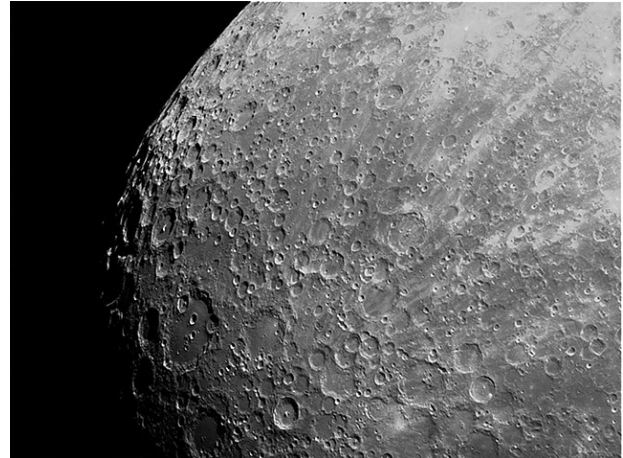
*When the Moon is 8 days old, (8 days after new Moon) the terminator is dominated by Plato, Vallis Alpes, the trio of Archimedes-Aristillus-Autolycus, the trio of Ptolemaeus-Alphonsus-Arzachel, Rupes Recta, Tycho and Maginus that some other gems are overlooked! Among these is the giant ancient crater Deslandres (241km diameter), from 3.9-4.5 billion years old. This badly ruined monster is just south of Purbach and Rupes Recta in an area heavily overlain by impacts of the last 3 billion years and peppered by secondary cratering. Seen here it dominates the center of this two frame image. On its southern edge is the crater Lexell (65km) with its northern wall missing and only a tiny remnant of a central peak while on the western side of Deslandres is the shadow filled Hell (34km). The floor of Deslandres has many interesting tiny rimae and crater chains many of which, like the one north of hell and the one north of this chain just outside the crater wall, that point back towards the Ptolemaeus-Alphonsus-Arzachel trio. Another large crater borders on Delandres to the east (right). This is Walther (145km) with the odd easterly displaced central peak surrounded by smaller craters of 12 km diaeter and below.*



*At the top of this image is the southern half of Werner (71km) with the misshapen Regiomontanus (129 km) to its left (west) however, Regiomontanus looks to be only about 80 km in the north-south dimension. Note the peak on the floor of Regiomontanus that appears to have a caldera in the top! This is Regiomontanus A (6 km) which appears to be the fortuitous juxtaposition of an impact crater on a low mountain with a nice crater-chain leading off to the southern wall. There are many such wonderful things in this overlooked region that will keep you looking it over until it's over-looked!*

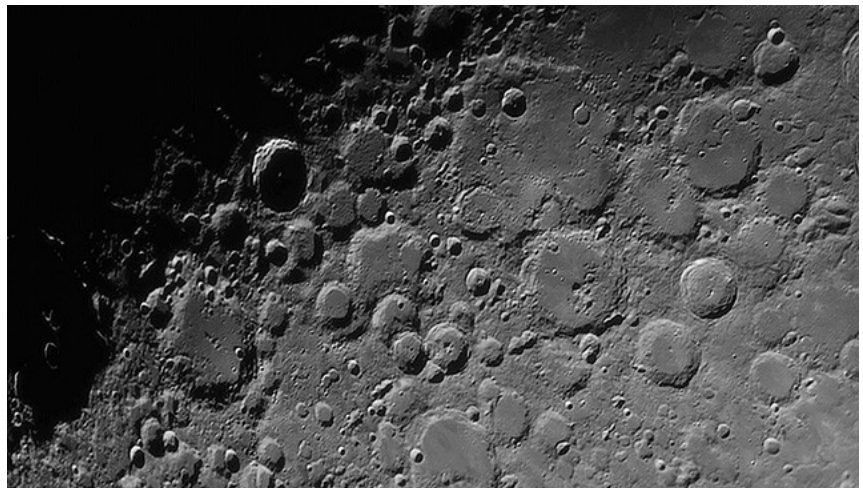
# RECENT TOPOGRAPHICAL OBSERVATIONS

**MAUROLYCUS**– Marcelo Gundlach,  
Cochabamba, Bolivia. July 22, 2017 23:42 UT.  
150mm f/8 refractor, Orion V-block filter. SWO  
CMOS.



**1st QUARTER MOON** - Pedro Romano,  
San Juan, Argentina. August 17, 2018  
23:30 UT. 500mm reflector, ASI 120.

**DESLANDRES** Michael  
Sweetman - Tucson, Arizona,  
USA, August 20, 2017 04:44 UT.  
Seeing 7/10, haze. 4" achromatic  
refractor, f/20. Skyris 132M,  
Baader fringe killer filter.





# LUNAR GEOLOGICAL CHANGE

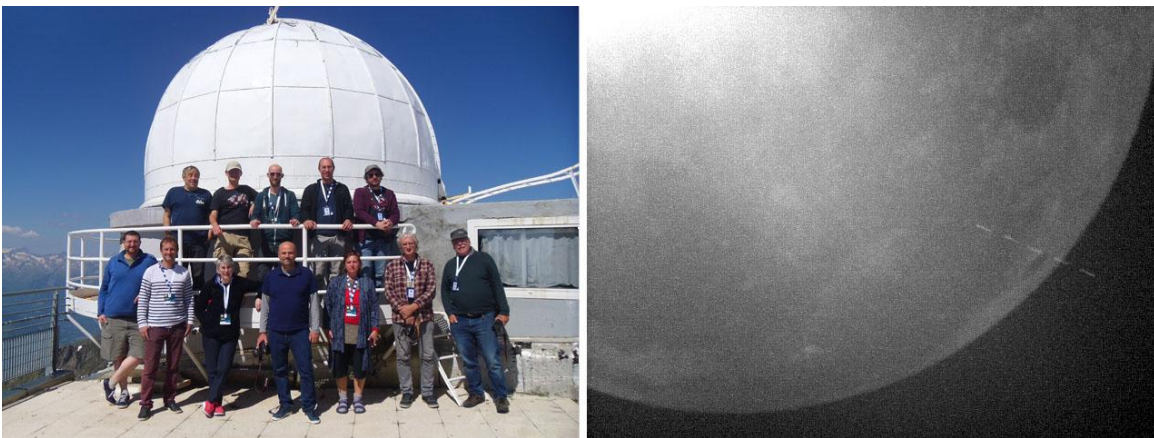
## DETECTION PROGRAM

Coordinator – Dr. Anthony Cook – [atc@aber.ac.uk](mailto:atc@aber.ac.uk)

Assistant Coordinator – David O. Darling - [DOD121252@aol.com](mailto:DOD121252@aol.com)

Reports have been received from the following observers for July: Jay Albert (Lake Worth, FL, USA - ALPO) observed: Aristarchus, Herodotus, Hyginus, Littrow, Mare Imbrium, Proclus, Ross D, Sinus Iridum and several features. Jerzy Bohusz (Poland – PTMA) observed and imaged the lunar eclipse. Maurice Collins (New Zealand – ALPO/BAA/RASNZ) imaged: Aristarchus, Atlas, the eastern limb, earthshine, Gassendi, Janssen, Kepler, the lunar Eclipse, Mare Crisium, Mare Humorum, Plato, Schiller, and several other features. Alexandra Cook (Spain - NAS) imaged the lunar eclipse. Collin Ebdon (Colchester, UK - BAA) observed Herodotus. Walter Elias (Argentina – AEA) imaged Daniell, Plato and Proclus. Valerio Fontani (Italy – UAI) imaged the lunar eclipse. Raffello Giunchedi and Thomas Bianchi (Italy, UAI) imaged the lunar eclipse. Maercello Gundlach (Bolivia – IACCB) imaged several features. Leonardo Mazzei (Italy – GAMP/UAI) imaged the lunar eclipse. Julien Quirin (France – SAFGA) imaged the lunar eclipse and the Moon. Franco Taccogna (Italy – UAI) imaged Herodotus, Plato, Tycho, and several features, Franco Taccogna and Matteo Diana (UAI) imaged the lunar eclipse. Helen Usher (Pic-du-Midi - Open University) videoed earthshine.

**News:** Since the last newsletter, we have lost a couple of leading experts in planetary astronomy. ALPO's [John Westfall](#), as many of you know was a former editor of the ALPO journal, and a former Executive ALPO director, to name two of the many roles he played. He is also well known for his Atlas of the Lunar Terminator and work on classifying lunar domes, as far back as 1964. I believe that I have met him and his wife, Beth on a couple of occasions at LPSC meetings in Houston and came across as a very modest person. He also helped me eliminate the bright spot on the NW rim of Mare Crisium from our LTP list. I was also sad to learn of passing of [Dr Paul Spudis](#) of the Lunar and Planetary Institute, Houston – you may or may not be aware that Paul Spudis helped kick start modern lunar exploration after its doldrums of the late 1970's to early 1990s's. He was a major participant in the Clementine mission in 1994, and on many subsequent missions, and was a keen supporter of private enterprise sending missions to the Moon. I collaborated on a paper with him about an early [Clementine derived topographic map](#) of the lunar polar regions and a conference abstract on previously [unknown lunar impact basins](#), though alas the Sylvester-Nansen basin later turned out to be an artifact caused by spacecraft systematic pointing errors. Paul kept a definitive list of all known lunar impact basins, and was author and co-author on several well known books such as: [The Once and Future Moon](#), [The Clementine Atlas of the Moon](#), and [The Geology of Multi-Ring Impact Basins](#). Again another scientist who was very modest in his personality.



**Figure 1.** Pic-du-Midi Europlanet Observing Workshop. **(Left)** The participants. **(Right)** Helen Usher's (Open University) recording of five frames of a candidate(?) satellite passage across the Moon on 2018 Jul 17 UT 21:31:00.

In the middle of July I gave a talk on lunar impact flash observing at an observing Pic-du-Midi observatory (Fig 1 – Left), in the French Pyrenees. This was a Europlanet funded conference, with the aim bringing together professional and amateur astronomers, sharing techniques and showing how they could help each other. Readers may be interested to know that a new lunar impact flash program called: ALFI (Automated Lunar Flash Investigation) has been developed, made possible by the Horizon 2020, Europlanet 2020 Research Infrastructure (EPN2020-RI, <http://www.europlanet-2020-ri.eu> ). This is not intended to compete with the existing [LunarScan](#) software, written by Pete Gural, but to complement it, by extending impact flash detection onto the Moon's dayside. If anybody would like to Beta test this then please email me and I will let you have a trial version. At the workshop a couple of observing sessions were held, with some large amateur sized scopes being given to the participants to use. Helen Usher (Open University) used an 11" C11 Celestron scope, and a ZWO ASI1600MM-Cooled camera, and obtained some quite respectable video of earthshine on 2018 Jul 17, for a beginner. Some 19 minutes of video was captured, and although the Moon was at a lower altitude above the horizon than we would normally recommend, only 13° to 7°, at a height of 9,432 feet the atmosphere was sufficiently clear to make observations possible without too much absorption or scattering. Lots of cosmic ray flashes were captured, which are not surprising at that altitude. Also captured were two occultations, and one possible passing satellite (See Fig 1 – Right). Alas no impact flashes were found, though just by chance a significant flash was just missed, in between recording sessions, but successfully captured from [Spain](#). The thing I had not appreciated about working at this kind of altitude was not so much shortness of breath (I did not suffer from this!), but getting headaches in the first day up there, significant short term variability in weather, and suffering poor short term memory. All returned to normal once I reached ground level after 2.5 days up on the Pic.

During the Summer holidays I accidentally came across a Sky Satellite TV program on the Discovery Channel called "NASA's Unexplained Files", I have no idea which series, or episode, I chanced upon, but it covered the flash photographed on the Moon by Dr Leon Stuart in 1953. Unfortunately they depicted Dr Stuart looking through a refractor, when he actually used a reflector, and then went onto say that a team at JPL identified the location of the flash using spacecraft images, but only briefly mentioned at the end, that ALPO's John Westfall had shown that their claimed new crater, existed on photographic plates, taken decades earlier - so probably was not the one that corresponded to the flash in 1953. To be honest, the number of times they mentioned "*could it be aliens?*" on the Discovery Channel, made my stomach churn, and make me wonder whether their main purpose is not to educate, but to entertain at any cost?

On 2018 Jul 27 there was a total lunar eclipse. Of course from the British Isles, especially after I was interviewed by BBC Radio Wales on their Good Morning Wales show, guaranteed that the clouds would fill up the sky, and nobody would see anything! In fact the cloud-cover were so thick that even after the eclipse was over there was no sign of the Full Moon! However my wife was out in Spain and at least managed to capture a naked eye type view (See Fig 2) with her camera phone, though it is interesting that the Moon does not look especially red in this – possibly due to the color balance in the camera/seeing it against a blue twilight? But more about the eclipse later.

**LTP Reports:** No LTP reports were received for July though on 2018 Jul 15 Julien Quirin (Southern France – SAFGA) videoed, on 2018 Jul 21 UT 21:04, a moving white point and a brief red flash off the SW limb of the Moon. As this was not on the lunar disk, this does not constitute a LTP. As to what it might have been: either a remote sensing satellite equipped with a laser altimeter (hence the red flash), or an aircraft strobe light, or perhaps even the LEDs on a drone? One has to be open minded these days with all this man-made equipment up in our atmosphere, or beyond.

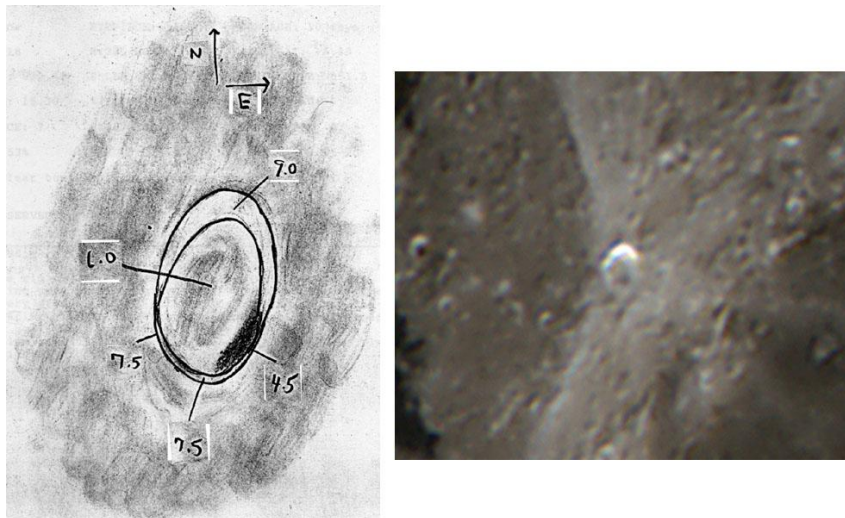
**Routine Reports:** Below is a selection of reports received for July that can help us to re-assess unusual past lunar observations – if not eliminate some, then at least establish the normal appearance of the surface features in question.



**Figure 2.** Naked eye type resolution view of the lunar eclipse on 2018 Jul 27 UT 19:52 taken from Alexandra Cook (NAS) from Torrevieja, Spain, with a hand held smart phone. An enlargement shows the eclipse already in shadow under the evening twilight.

**Proclus:** On 2018 Jul 21 UT 03:38 Walter Elias (AEA) imaged this crater under similar illumination, and topocentric libration to within  $\pm 1^\circ$  to one of David Darling's reports from 1989:

*On 1989 Feb 14 at UT03:45-04:38 D. Darling (Sun Praire, WI, USA, 12.5" reflector, 3" refractor, x90, seeing=3/10 and transparency=5) noted that there was a dark patch of brightness 4.5 on the south east of Proclus - it was not as dark as it was on 1988 Jul 22. Cameron comments that the dark patch is normal. The north rim of Proclus was 9.0 in brightness, the floor had a brightness of 6.0, the west rim and south wall were both 7.5. The Cameron 2006 catalog ID=352 and the weight=0. The ALPO/BAA weight=1.*



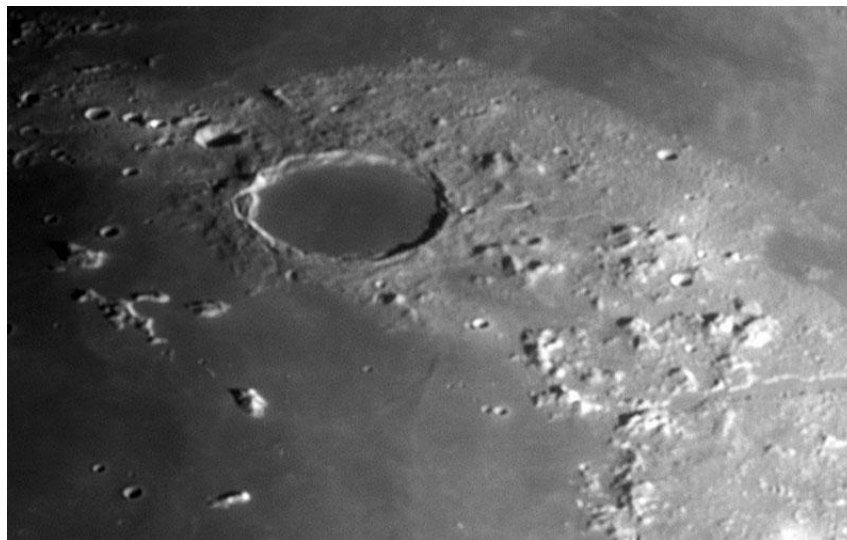
**Figure 3.** Proclus orientated with north towards the top. **(Left)** A sketch by David Darling (ALS/ALPO) made on 1989 Feb 14 UT 03:35, 12.5" reflector, x159, seeing 3/10 and transparency 5. The visual intensity values have been rotated so that the sketch can be viewed with north towards the top. **(Right)** A color image, from 2018 Jul 21 UT 03:38, by Walter Elias (AEA).

Winnie Cameron never regarded this to be a LTP as she gave it a weight of 0, and the only reason why we gave it a weight of 1 in the ALPO/BAA database, was just to double check this conclusion. I am happy to say that with Walter's image (Fig 3 Right), we can verify that the dark area discussed in David's report (Fig 3 Left) is perfectly normal. Indeed David just reports what he saw in the American Lunar Society's LTP Network Newsletter of Lunation 818, where Fig 3 (Left) comes from, and makes no claim that it was a LTP - just that he was surprised to still see a dark mark here at this stage in the illumination. We shall return the weight to 0 again – permanently.

**Plato:** On 2018 Jul 22 UT 23:37 Marcello Gundlach (IACCB), imaged this region in monochrome under similar illumination (to within  $\pm 0.5^\circ$ ) to this report from 1996:

*Plato 1982 Jun 02 UT 22:00. Mobberley could not see the central craterlet on the floor of Plato tonight. Foley notes that he could only just see the central craterlet on nights of 2-5th Jun and it was of reduced in brightness from normal. North reported that the floor seemed nearly black, but brighter in a green filter (x144 magnification used). All three observers compared the Plato area to other areas for reference. All the above seems normal, apart from the floor being brighter in the green filter. Cameron 2006 extension catalog ID 170 and weight=5. BAA/ALPO weight=3.*

Indeed the floor is pretty featureless, in Fig 4, and the central craterlet is definitely not visible. We have examined this before in the 2015 Oct, 2016 Jan, and 2016 Oct newsletters. Because there is a slight difference in opinion between two observers as to whether the central floor craterlet was visible, and only one observer reported the floor being very dark, but slightly brighter in a green filter (we cannot test this as Marcello's image in monochrome), we shall lower the weight from 3 to 2 for now.

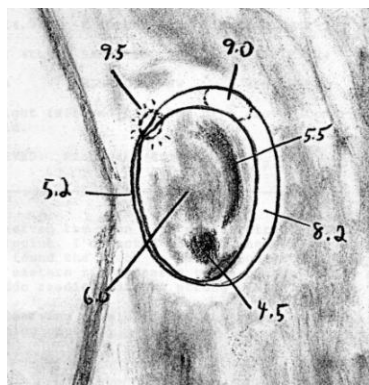


**Figure 4.** Plato from 2018 Jul 22 UT 23:37, as imaged by Marcello Gundlach (IACCB), and orientated with north towards the top.

**Proclus:** On 2018 Jul 24 UT 01:27-01:40 Jay Albert (ALPO) observed visually this crater under similar illumination, to within  $\pm 0.5^\circ$ , to another David Darling report, made three days later after the one mentioned above:

*On 1989 Feb 17 at UT00:55 D. Darling (Sun Prairie, WI, USA, 12.5" reflector, x248) found that the brightness of the rim of Proclus was 9.0, the north west wall to be 9.5, the west wall to be 5.2, and the east wall 8.2 (normal?). The Cameron 2006 catalog ID=355 and the weight=1. The ALPO/BAA weight=2.*

Jay comments, that Proclus was a brilliant ring with the NW wall the brightest part, but unlike the LTP report, the west wall was almost equal in brightness to the east wall – the opposite of what David Darling observed (Fig 5). Jay found that the south wall was bright, but very slightly narrower and less bright than the other walls. He used a Celestron NexStar Evolution 8" SCT, with a magnification of x226, under 5-6/10 seeing, but poor transparency. It is possible that a difference in viewing angle (topocentric libration) may explain the effect seen – we should keep on observing to make sure? But for now I believe that we are justified in keeping the weight at 2 in the ALPO/BAA database as opposed to Cameron's lower weight of 1.



**Figure 5.** A sketch of Proclus, by David Darling (ALS/ALPO) orientated with north towards the top, made on 1989 Feb 19 UT 00:55, from an American Lunar Society Newsletter.

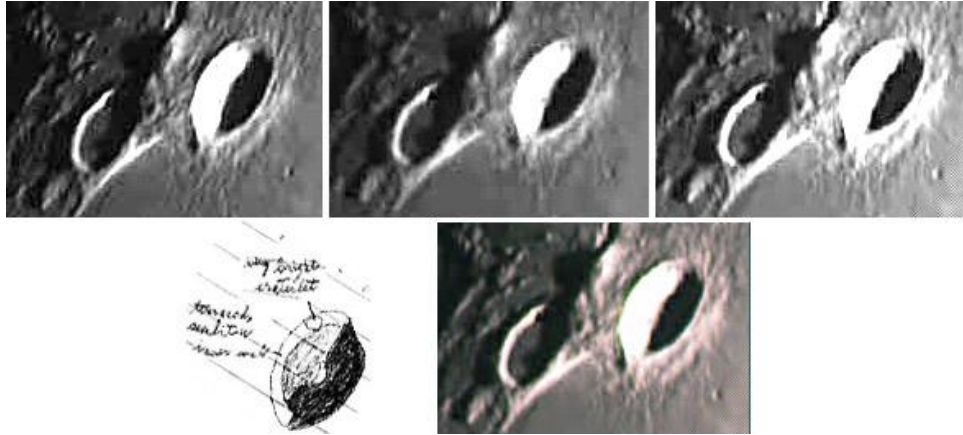
**Herodotus:** On 2018 Jul 24 UT 18:35-22:09 Franco Taccogna (UAI) and at 21:32-22:40 UT Collin Ebdon (BAA) imaged and visually observed (respectively) this crater under repeat illumination events, to the nearest  $\pm 0.5^\circ$  to the following – N.B. I have listed the corresponding repeat illumination windows on 24<sup>th</sup> July in square brackets at the start of each description:

[19:34-21:29] On 2003 May 13 at UT06:40-07:26 W. Haas (Las Cruces, NM, USA, 12.5" reflector, x321 and x202, S=2, T=3.5) suspected (06:40-06:55UT) that he saw an oval bright feature (intensity 5.5) near the centre of the floor of

*Herodotus crater indenting into the shadow - however the seeing was none too good, so it is more of a suspicion than a definite sighting. At 07:14-07:26UT he re-examined the region (x202 and x321, S=1-2 and T=3.5) and had better glimpses that conformed his initial suspicions of there being an oval indentation bright spot (now intensity 6) into the shadow in the centre of the floor. Of course Herodotus does not have a central peak! There was also a very bright spot on the NW> sunlit rim of Herodotus crater. The ALPO/BAA weight=2.*

[21:28-23:19] *Herodotus 1950 Mar 30 UT 19:00? Observed by Wilkins (Kent, UK, 15" reflector) "Transient c.p. (similar phen. to Bartlett's in later yrs.? see #532). NASA catalog weight=4. NASA catalog ID #523. ALPO/BAA weight=3.*

[21:55-23:51] *Herodotus 1956 Nov 15 UT 01:05-01:30 Observed by Bartlett (Baltimore, MD, USA, 3.5" reflector x100) "Pseudo c.p. clearly seen est. I=5.5, wratten filters showed it neutral to green, red, & yellow, but duller in blue. Floor est. 2deg, distinctly olive-green. Precise time at 0117 at col. 55.27deg" NASA catalog weight=4. NASA catalog ID #655. ALPO/BAA weight=3.*

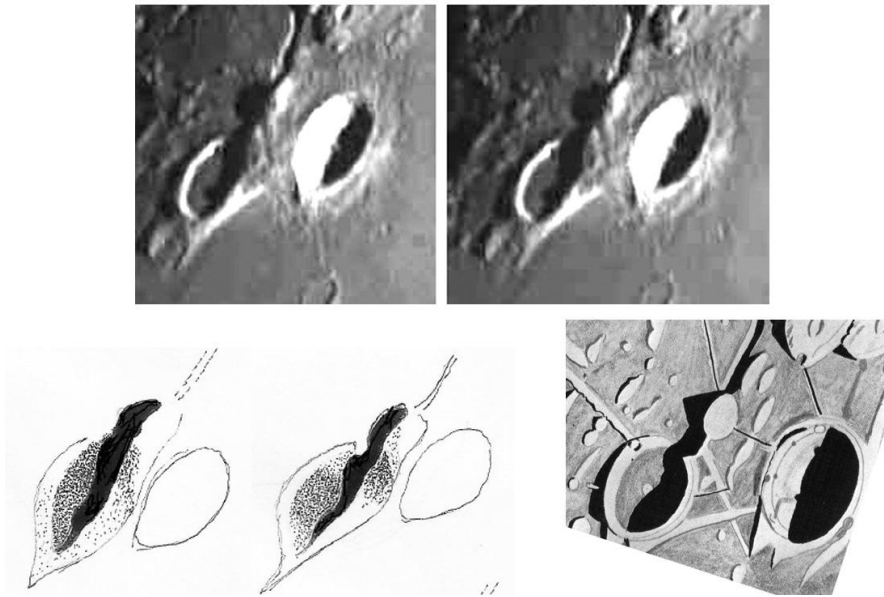


**Figure 6.** The walled flat floored crater, Herodotus crater, just to the right of the bright ray crater Aristarchus. Images have been orientated with north towards the top. **(Top Left)** Taken by Franco Taccogna on 2018 Jul 24 UT20:41. **(Top Centre)** Taken by Franco Taccogna (UAI) on 2018 Jul 24 UT 21:13. **(Top Right)** Taken by Franco Taccogna (UAI) on 2018 Jul 24 UT 21:21. **(Bottom Left)** A sketch by Walter Haas made on 2003 May UT 06:40-07:26 – the sketch has been rotated to match the orientation of the other images – the top caption reads: “very bright craterlet”, the lower caption reads: “Towards(?) sunlit W inner wall”. **(Bottom Right)** A composite of the three top rows of images taken by Franco Taccogna (UAI).

This is not the first time we have tried to do repeat illumination observations, to see if we can detect a central pseudo peak. However there are several accounts, not just these three historic observations, which makes it interesting to attempt to re-observe this, though nothing very convincing has turned up yet.

Franco Taccogna obtained three images which matched the selenographic colongitude and solar altitude ranges of the Walter Haas report, to within:  $\pm 0.1^\circ$ , and are shown in Fig 6. It is not at all apparent from the three images that there is a white diffuse spot where Walter suspected one back in 2003, despite the images being contrast stretched. However when you combine them, as has been done in Fig 6 (Bottom Right), there is perhaps a hint of a central white diffused spot, when you blur your eyes? But by the same token there is a hint of one in the shadow dimple to the south too? Is this what Walter saw back in 2003? Could this central pseudo spot/peak business all be due to resolution effects and the dimple in the shadow? Note for the Walter Haas observation he does mention that the seeing was poor and that he only glimpsed the central spot.

With regard to the Wilkins pseudo peak effect, the closest image in terms of selenographic colongitude and solar altitude (to within  $\pm 0.2^\circ$ ) were taken by Franco Taccogna (UAI) at 22:09, and a couple of sketches by Collin Ebdon, made at 22:13 and 22:40, and these can be seen in Fig 7, along with the sketch that Wilkins made. As mentioned in the paper: “The Pseudo Peak of Herodotus”, by Cook and Dobbins (The Moon – Occasional Papers of the Lunar Section of the British Astronomical Association), concerning historical accounts of a pseudo peak in this crater, the Wilkins sketch has some ambiguities involving the amount of shadow in Herodotus and Aristarchus, and the UT of 19:00 given is only an estimate. It is possible that the sketch was made using a background chart of clefts and faults, and possibly the observing session might have lasted a long time, so shadows may have changed in appearance. But anyway, no striking sign of a clearly defined central light spot, on the edge of the shadow can be seen in Franco’s images or Colin Ebdon’s sketches.



**Figure 7.** Herodotus images and sketches orientated with north towards the top. **(Top Left)** Image by Franco Taccogna (UAI) taken on 2018 Jul 24 UT 22:07. **(Top Right)** Image by Franco Taccogna (UAI) taken on 2018 Jul 24 UT 22:09. **(Bottom Left)** A sketch by Colin Ebdon (BAA) made on 2018 Jul 24 UT 22:13. **(Bottom Centre)** A sketch made by Colin Ebdon (BAA) on 2018 Jul 24 UT 22:40. **(Bottom Right)** 1950 Mar 30 UT 19:00? – a sketch by H.P. Wilkins (BAA) showing a central pseudo peak in Herodotus.

Lastly for the Bartlett report, we have no original drawing, but the 22:32 sketch by Collin is only  $0.2^\circ$  in colongitude and  $0.1^\circ$  in solar altitude, before Bartlett's, in terms of illumination. Again no obvious sign of a central pseudo peak, though from the UK shores, the Moon is fairly low above the horizon in July, so observing conditions are not very optimal, though his seeing was Antoniadi III, but deteriorating as time went on. Collin did note for his 22:40 and 22:44 sketches that lighter patches were visible on the crater floor, but were probably due to differing floor height levels. In the BAA's Lunar Section Circular from 1970, p104, Bartlett says:

*"Nov. 15, 1956 (UT date here and hereafter) at 1h 17m, col.  $55^\circ 27'$ ; September 6, 1957 at 3h 10m, col.  $58^\circ 58'$ ; and on June 30, 1966 at 3h 23m, col.  $53^\circ 56'$ . I have not seen it since, though considerable gaps in the record may have a bearing. However, it is of interest to note, as testifying to the rare and irregular appearances of the pseudo-peak, that it was seen once in 1956 and once in 1957 and then not again for nine years when it made two appearances in two consecutive lunations".*

So perhaps we should not expect to see the pseudo peak/central spot every time we look, but at least know from the historical records that if, and when it has been seen, then it lies between selenographic colongitudes of  $52.6^\circ$  and  $60.5^\circ$ , at sunrise, and between  $214.0^\circ$  and  $223.8^\circ$  at sunset. The weights of all three reports shall stay the same for now. Let us keep on looking to learn more about the effects of resolution and observing conditions on the appearance of the floor.

**Figure 8.** A sketch of Herodotus by Collin Ebdon (BAA) made on 2018 Jul 24 UT 22:44, and orientated with north towards the top.



**Lunar Eclipse:** On 2018 Jul 27 the eclipse was observed by many of you, and I have tried to put together a sequence in Figure 9. There are many tens of accounts of LTP seen during, past lunar eclipses, way too many to list them individually, but in general these have included: red streaks being seen on the floor of Plato, Sir William Herschel seeing roughly two hundred round red spots across the face of the eclipsed Moon, a luminous point being seen inside Stofler, apparent changes in the appearance of Eratosthenes after the umbra exited this crater, Aristarchus brightening several times during an eclipse, a white streak seen from Grimaldi to the SW limb, a weak green-grey ray from Tycho towards Longomontanus, various craters being described as abnormally bright (though they never say how this determined), a brief, pin-point light being seen inside Janssen, various accounts of spectral enhancement and tumescence, blue brightening/flashes seen in Aristarchus, blueness seen in Romer, the two dark

spots in Atlas (during the penumbral phase) seemed to darken quickly but become sharp in detail, and star-like points being seen inside craters, etc, etc.

The images that some of you captured, are exhibited in Fig 9 in sequence – though please bear in mind that many different sized telescopes or telephoto lenses were used, with different cameras and exposures. Totality lasted from 19:30 -21:13 UT with the maximum at 21:22 UT, covering Figs 8c-h. Exposures varied, but Figs 8d-f show the blood red color well. Due to the combined length of the umbral stage, the event was visible from more than an entire hemisphere here on Earth as was testified by Maurice Collin's image (Fig 8a) taken in the early morning twilight of New Zealand, before the Moon set locally.

Of particular interest this time was whether any of you could detect red streaks on the floor of Plato as witnessed in 1685:

*1685 Dec 10 UT 22:00-23:00 Bianchini(Italy?) Red streak seen on floor of Plato during an eclipse. The Cameron 1978 catalog assigns a LTP ID of 14 and a weight of 1. The ALPO/BAA catalog assigns a weight of 1 too.*

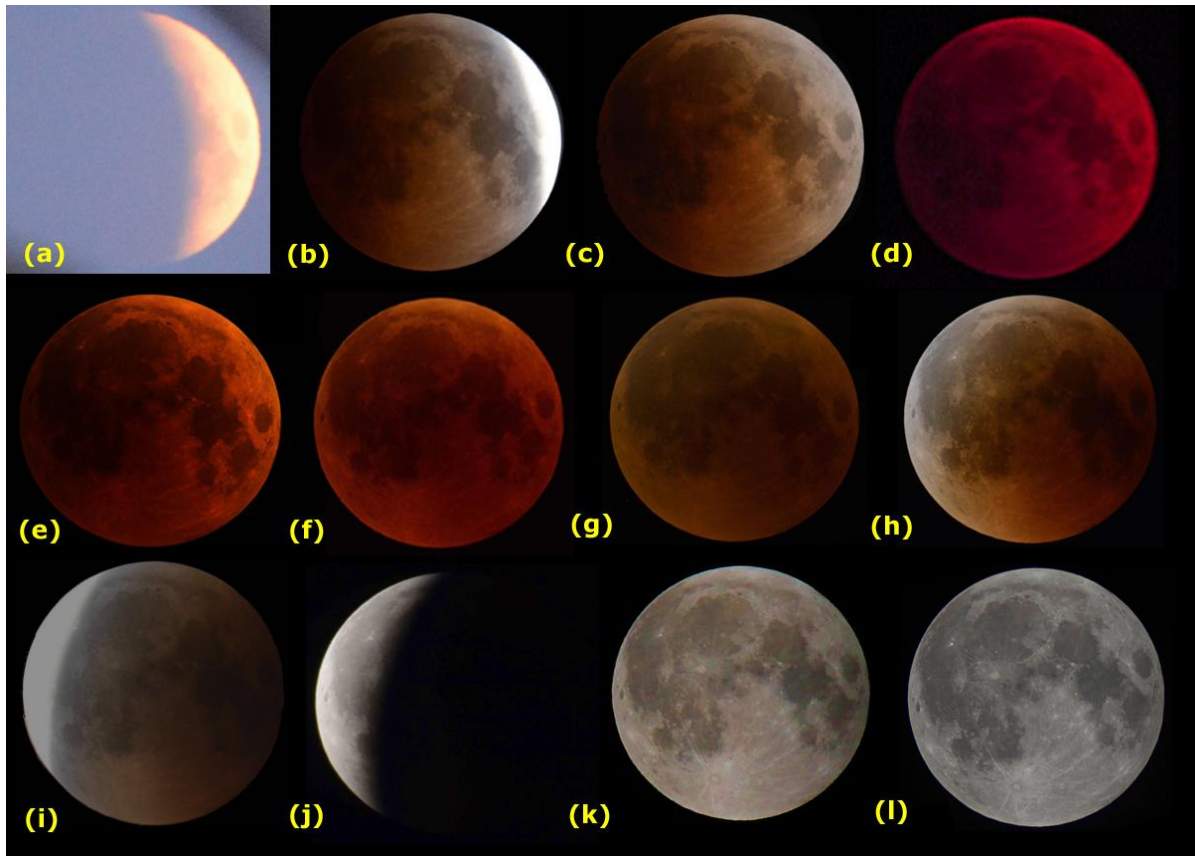
Franco Taccogna/Matteo Diana and Valerio Fontani (UAI) attempted to take some images at higher resolution (See Fig 10), but as you can see, there are obvious signs of colored streaks on the floor of Plato, so we shall leave the weight at 1 – though we must remember at that back in 1685, telescopes were nowhere near the quality of modern day scopes.

Now why should LTP occur during a total lunar eclipse? I do not know the answer, though the Moon is very close to the centre of the Earth's magnetotail, so will be bombarded by ions and electrons present in the plasma sheet - though at a much lower density than in the solar wind. There may be magnetic reconnection events and other changes in the magnetic field direction, which could interact with charged dust particles on the lunar surface. Secondly the UV radiation from the Sun, which would normally de-ionize any charged dust particles, will be at a minimum, as the Moon is bathed in lower energy red and near IR light. Dust particles might potentially flow from the dark shadow areas into sunlit areas – though the umbral:penumbra boundary is somewhat more diffuse than normal shadow edges. Lastly the lunar surface is undergoing a very rapid temperature drop and rise, so the surface will be under a lot of thermal stress, rocks can crack more easily, and potentially lead to mass wasting on steep slopes?

**Cleomedes:** On 2018 Jul 30 UT Maurice Collins (ALPO/BAA/RASNZ) captured an image of Mare Crisium and the area to the north, that just happened to coincide with a report from Bob Mizon:

*Cleomedes 1991 Dec 23 UT 22:50 Observed by Bob Mizon (Colehill, Dorset, UK, 8" f/6 reflector x216) "Oval or pear-shaped ashy glow visible for 2 min, then vanished quite suddenly" - Ref. personal communication received by BAA Lunar Section.*

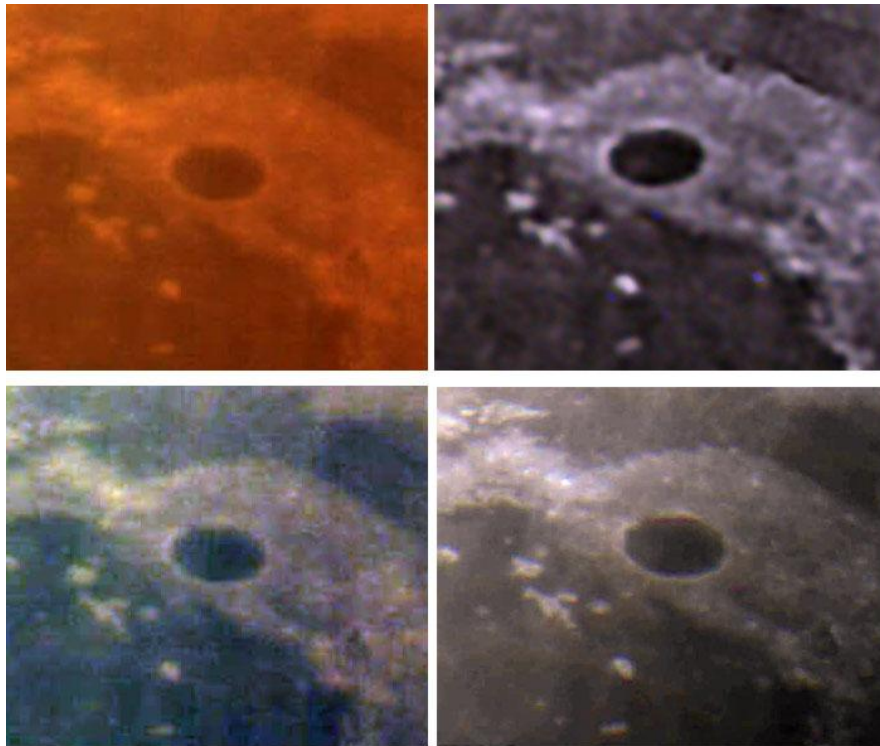
The images captured by Maurice do indeed show a pear-shaped area – on the remained]r of the sunlit floor, however they were taken when the Sun was  $2.1^\circ$  above the horizon, where as Bob Mizon's sketch was made when the Sun was at an altitude of  $1.6^\circ$ . A quick scan through the ALPO/BAA archives revealed that there was not a lot of repeat illumination material, because after Full Moon, the number of people observing falls off exponentially as the Moon enters unsociable times of the night for the average observer. I did find two other relevant observations within a sub-solar longitude range of  $\pm 0.2^\circ$  of Bob's observation. One was another image, albeit lower resolution, by Maurice Collins, at a solar altitude of  $2.0^\circ$ , taken in 2007, again still showing that oval sunlit floor path. The other was a sketch by Craig Wandke, published on p15 of the [Summer 2006 Edition of Selenology](#), by the American Lunar Society. Craig's sketch was made when the Sun was at an altitude of  $0.9^\circ$  over Cleomedes, and shows the entire floor to be in shadow. So to sum up, at some point, between selenographic co-longitudes of around  $122.5-122.7^\circ$ , the oval shaped illuminated area on the floor of Cleomedes goes from sunlit, to invisibility in around 2 minutes – if Bob Mizen's observation is correct? I will add this to the [Lunar Schedule](#) web site and see if we can get some confirmation of this rapid effect? I will lower the weight from 2 to 1 in the ALPO/BAA database as we know that the oval shaped description is correct – it's just the rapid fade which seems curious?



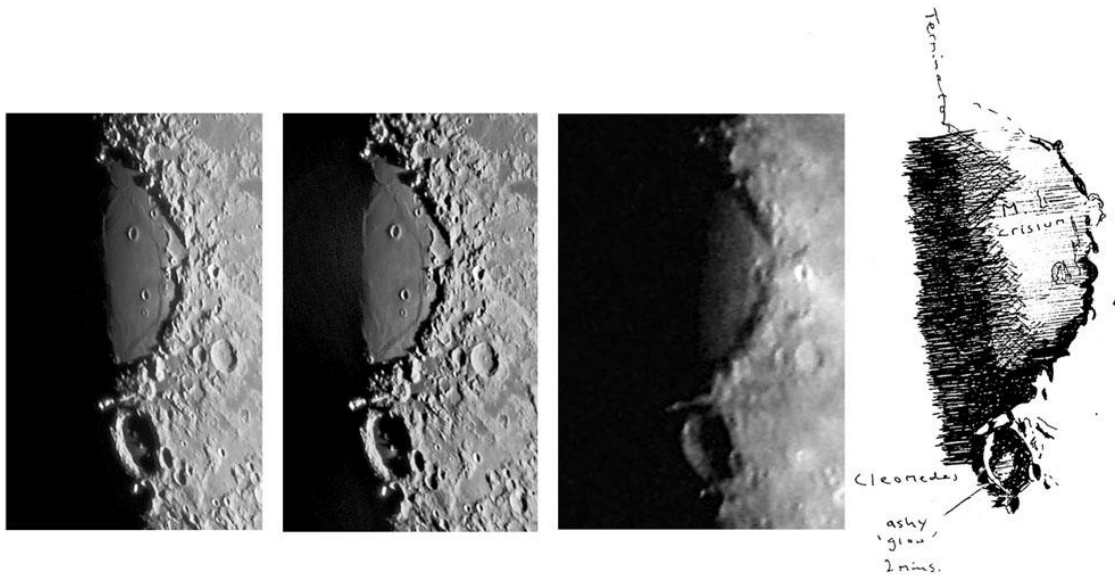
**Figure 9.** The Lunar Eclipse from 2018 Jul 27, with all images reorientated with north towards the top. **(a)** 19:03 Maurice Collins (ALPO/BAA/RAS NZ) 19:09UT. **(b)** 19:23 UT by Franco Taccogna and Matteo Diana (UAI). **(c)** 19:46 UT by Franco Taccogna and Matteo Diana (UAI). **(d)** 20:02 UT by Julien Quirin (SAFGA). **(e)** 20:12 UT by Leonardo Mazzei (GAMP/UAI). **(f)** 20:31 UT by Franco Taccogna and Matteo Diana (UAI). **(g)** 20:41 UT by Raffello Giunchedi - Thomas Bianchi (UAI – Oss. Astronomico Monte San Lorenzo). **(h)** 20:57 UT by Franco Taccogna and Matteo Diana (UAI). **(i)** 21:22 UT by Franco Taccogna and Matteo Diana (UAI). **(j)** 21:30 UT by Franco Taccogna and Matteo Diana (UAI). **(k)** 22:23 UT by Jerzy Bouchez (PTMA). **(l)** 23:04 UT by Leonardo Mazzei (GAMP/UAI).

**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](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](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>





**Figure 10.** Plato during the lunar eclipse on 2018 Jul 27, orientated with north towards the top. **(Top Left)** A raw color image of Plato within the umbral shadow, taken by Franco Taccogna (UAI) at 21:00 UT. **(Top Right)** A color normalized image taken by Valerio Fontani at 20:56 UT. **(Bottom Left)** The 21:00 UT image by Franco Taccogna (UAI) but color normalized to remove the effect of the red umbral shadow. **(Bottom Right)** A color normalized view of Plato in the penumbral shadow, taken by Franco Taccogna at 21:52 UT.

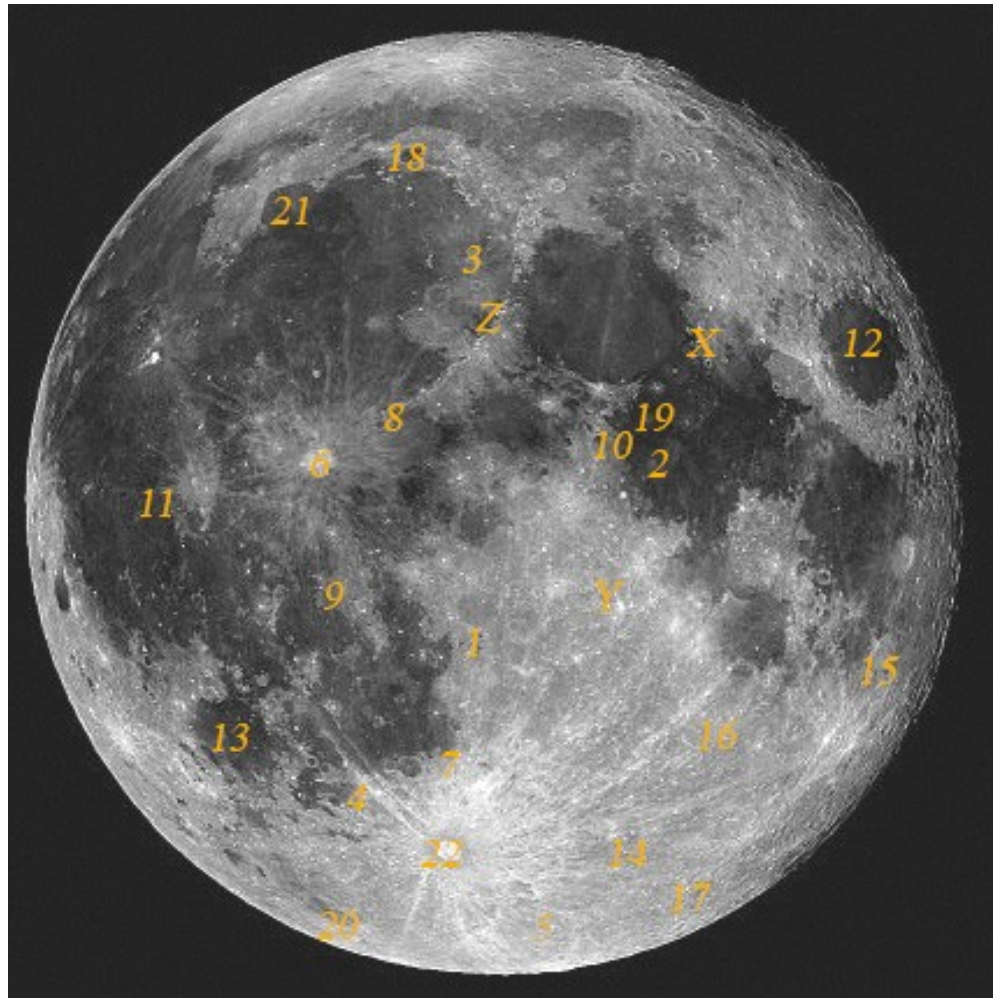


**Figure 11.** The Mare Crisium with Cleomedes just underneath. North is towards the bottom so as to preserve the writing direction on the sketch. **(Far Left)** An image by Maurice Collins on 2018 Jul 30 UT 10:32 (Selenographic Colongitude 122.1°, solar altitude 2.1°). **(Left)** An image by Maurice Collins on 2018 Jul 30 UT 10:42 (Selenographic Colongitude 122.2°, solar altitude 2.1°). **(Right)** An image by Maurice Collins taken on 2007 Apr 5 UT 10:13 (Selenographic Colongitude 122.7°, solar altitude 2.0°). **(Far Right)** A sketch by Bob Mizon on 1991 Dec 23 UT 22:50 (Selenographic Colongitude 122.5°, solar altitude 1.6°).

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## KEY TO IMAGES IN THIS ISSUE

1. Archimedes
2. Aristillus
3. Cook
4. Copernicus
5. Daniell
6. Deslandres
7. Fracastorius
8. Herodotus
9. J. Herschel
10. Janssen
11. Lacus Mortis
12. Maurolycus
13. Mons Undest
14. Plato
15. Posidonius
16. Proclus
17. Ptolemaeus
18. Ukert



### **FOCUS ON targets**

**X = Apollo 17 Mare Serenitatis**

**Y = Apollo 16 Descartes-Cayley Plains**

**Z = Apollo 15 Mare Imbrium-Hadley Rille**