THE LUNAR OBSERVER

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

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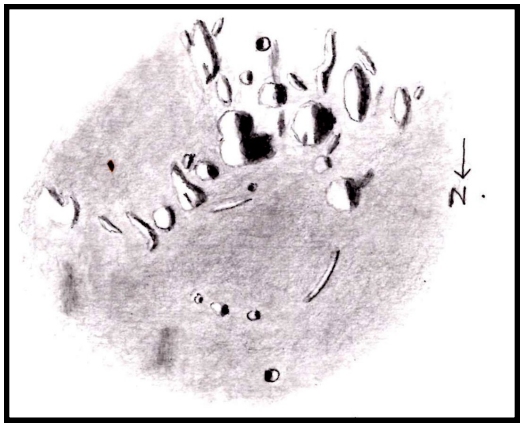
RECENT BACK ISSUES: http://moon.scopesandscapes.com/tlo_back.html

FEATURE OF THE MONTH – NOVEMBER 2018

OPPOLZER



Sketch and text by Robert H. Hays, Jr. - Worth, Illinois, USA
May23, 2018 02:00-02:56 UT, 15 cm refl, 170x,
seeing 8-6/10, transparence 6/6.

I sketched this crater on the evening of May 22/23, 2018. Oppolzer is on the southern edge of Sinus Medii, and has obviously been flooded by its material. Three peaks, one very small, are remnants of a northern rim. A curved ridge west of these peaks may be another remnant. Oppolzer A is the small crisp pit to the north. The nominal south rim of Oppolzer is a hodgepodge of disconnected mountains. The largest of them is a conspicuous double-peaked feature. The northern end of this feature is bigger and cast a two-pointed shadow at this time. A large round mountain is to its west, and a jumble of hills is in this area. More hills extend southward from the large double peak. These, together with hills east of Oppolzer, make up part of the rim of Reaumur. I have tried sketching this detail as well as possible. Reaumur X is the pit tucked among the hills south of Oppolzer. This pit is very similar to Oppolzer A in size and appearance despite very different surroundings. The crater interiors appear very smooth despite the surrounding chaos. Oppolzer K is the tiny craterlet within Oppolzer north of the large double peak, and a short rille segment is nearby. Oppolzer K is much smaller than A, and was seen only when the view was steadiest. The rille segment may be part of the Rima Oppolzer I feature shown on the Lunar Quadrant map, but the rest of it could not be seen. The visible rille segment was best seen as a narrow bright feature seen against the gray backdrop of Oppolzer. The terrain was a rather dark gray inside Oppolzer, Reaumur and northward, but much lighter among the hills to the south.

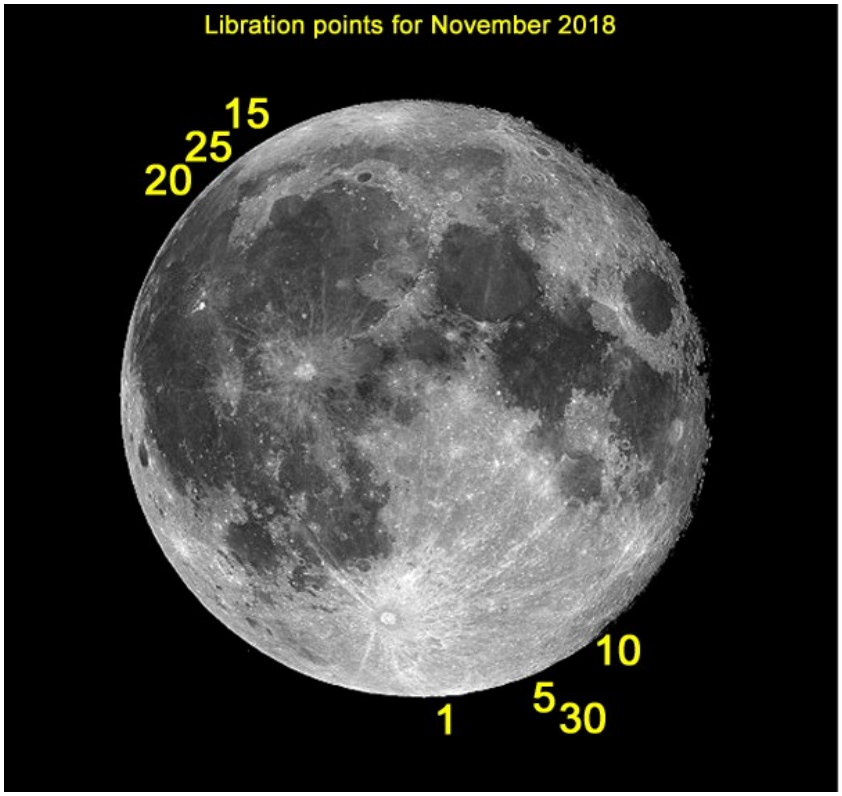
LUNAR CALENDAR

2018	U.T.	EVENT
Nov 07	16:02	New Moon
11	15:46	Moon-Saturn: 1.6° S
12	02:21	Moon Extreme South Dec.: 21.4° S
13	14:04	Moon Descending Node
14	15:57	Moon Apogee: 404300 km
15	14:54	First Quarter
16	04:16	Moon-Mars: 1.1° N
23	05:39	Full Moon
26	01:48	Moon North Dec.: 21.5° N
26	12:10	Moon Perigee: 366600 km
27	00:18	Moon Ascending Node
30	00:19	Last Quarter

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

LUNAR LIBRATION

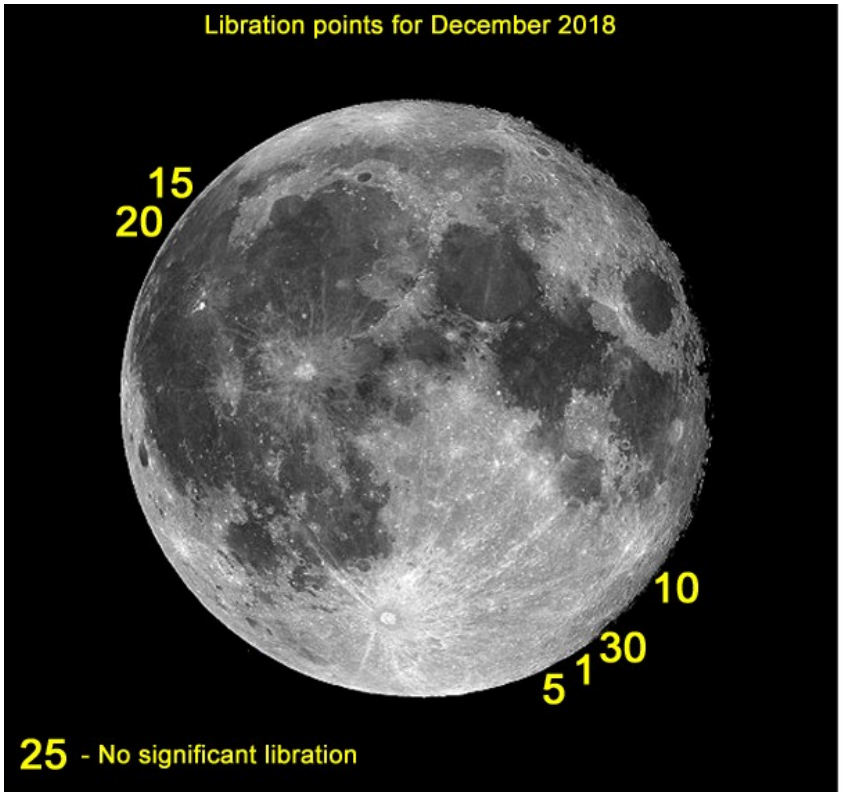
NOVEMBER-DECEMBER 2018



Size of Libration

11/01	Lat -01°21'	Long +00°03'
11/05	Lat -06°06'	Long +03°32'
11/10	Lat -04°36'	Long +04°34'
11/15	Lat +01°53'	Long -01°05'
11/20	Lat +06°28'	Long -05°49'
11/25	Lat +03°35'	Long -02°34'
11/30	Lat -04°13'	Long +02°55'

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



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.

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 potential contributors the following targets have been selected:

Subject	TLO Issue	Deadline
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 16 Region – Descartes and the Cayley Plains

Jerry Hubbell
Assistant Coordinator, Lunar Topographical Studies

This is the second in a series of TLO Focus On articles on the Apollo lunar landing missions that will end on the 50th anniversary of the Apollo 11 mission in the July 2019 issue of TLO. To learn about the background and thinking behind this series of articles to commemorate the Apollo program see the September 2018 TLO Focus On article.

Figure 1. Apollo 16 Mission Patch,
NASA image.

The Apollo 16 mission was launched at 12:54 pm EST on April 16, 1972. The crew consisted of Commander John Young, Command Module Pilot Ken Mattingly, and Lunar Module Pilot Charles Duke. (Figure 2.)

Figure 2. Apollo 16 Astronauts. *(from left to right) Ken Mattingly, John Young, and Charles Duke. NASA image.*

At Descartes, the Cayley and Descartes formations were the primary areas of interest in that scientists suspected, based on telescopic and orbital imagery, that the terrain found there was formed by magma more viscous than that which formed the lunar maria. The Cayley Formation's age was approximated to be about the same as Mare Imbrium based on the local frequency of impact craters.

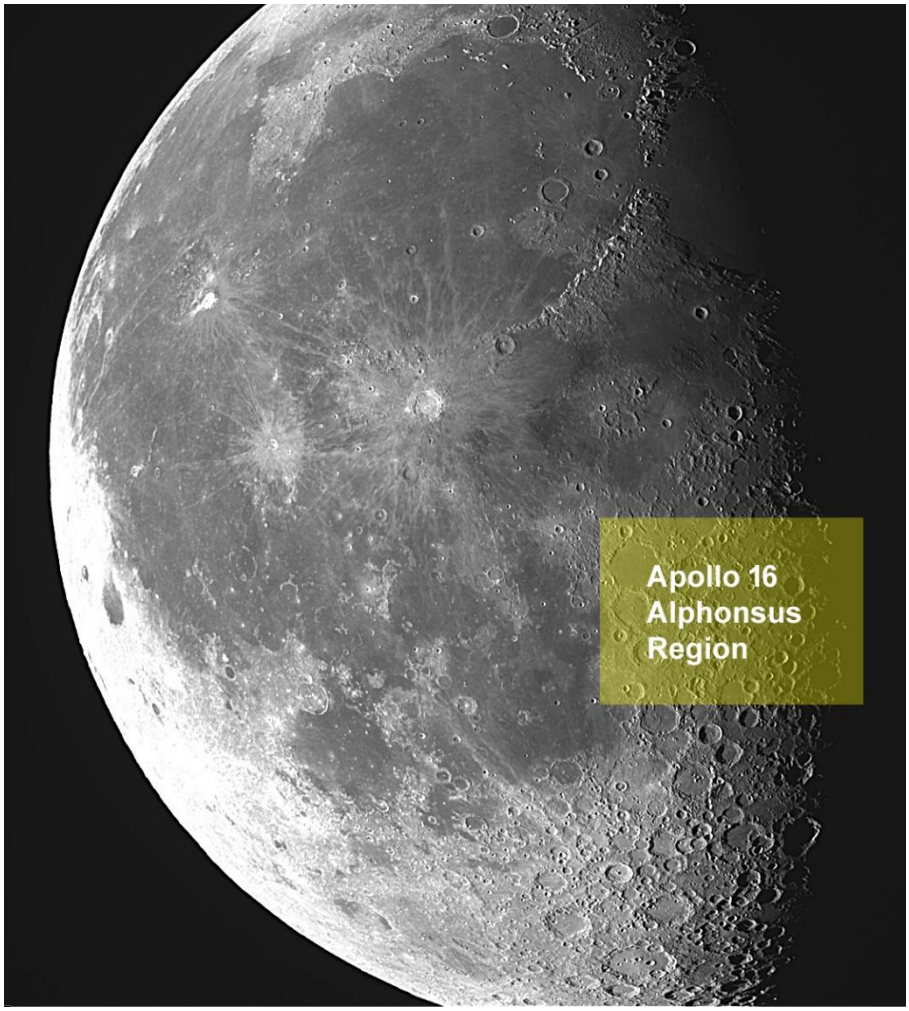


Figure 3. Apollo 16 Alphonsus Region – Third Quarter Moon, *Jerry Hubbell, Wilderness, Virginia, USA. 30 October 2018 at 0730 UT. Colongitude 163.1°, seeing 7/10, transparency 3/6, 0.165-m APO refractor, 0.7x Focal Reducer, QHY174M-GPS TEC (deep-sky) Camera (ed. highlight label added)*

The landing site for Apollo 16 was in the Descartes Highlands region west of Mare Nectaris and the crater Alphonsus. Figures 3, 4. The Cayley and Descartes formations (Figure 5) were suspected to be formed by magma more viscous than that of the lunar maria and were of primary interest by mission scientists. Landing occurred on April 20, 1972 at 22:23:35 EST. The landing site is located at Selenographic coordinates 8°58’ south, 50°30’ east, in between craters Andel and Andel F. Figure 4.

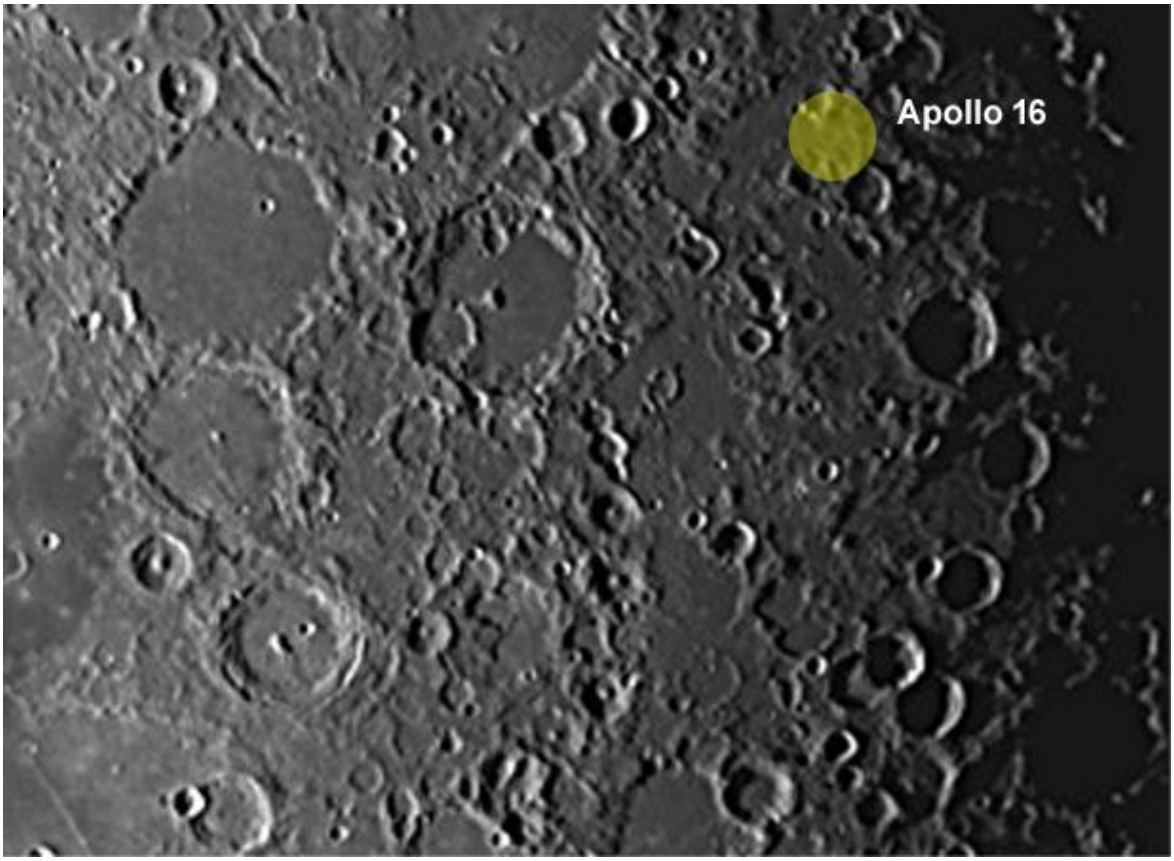


Figure 4. Apollo 16 Landing Site – Third Quarter Moon *(ed. crop), Jerry Hubbell, Wilderness, Virginia, USA. 30 October 2018 at 0730 UT. Colongitude 163.1°, seeing 7/10, transparency 3/6, 0.165-m APO refractor, 0.7x Focal Reducer, QHY174M-GPS TEC (deep-sky) Camera (ed. highlight label added)*

The Apollo Field Geology Investigation Team provides the following summary:

> *"The Cayley Plains at the Apollo 16 landing site (Figure 5) consist of crudely stratified breccias to a depth of at least 200 meters, overlain by a regolith 10 to 15 meters thick. Samples, photographs, and observations by the astronauts indicate that most of the rocks are impact breccias derived from an anorthosite gabbro complex. The least brecciated members of the suite include coarse-grained anorthosite and finer-grained, more mafic rocks, some with igneous and some with metamorphic textures. Much of the traverse area is covered by ejecta from North Ray and South Ray craters, but the abundance of rock fragments increases to the south toward the younger South Ray crater. The Descartes highlands, a distinct morphologic entity, differ from the adjacent Cayley formation more in physiographic expression than in lithologic character."*

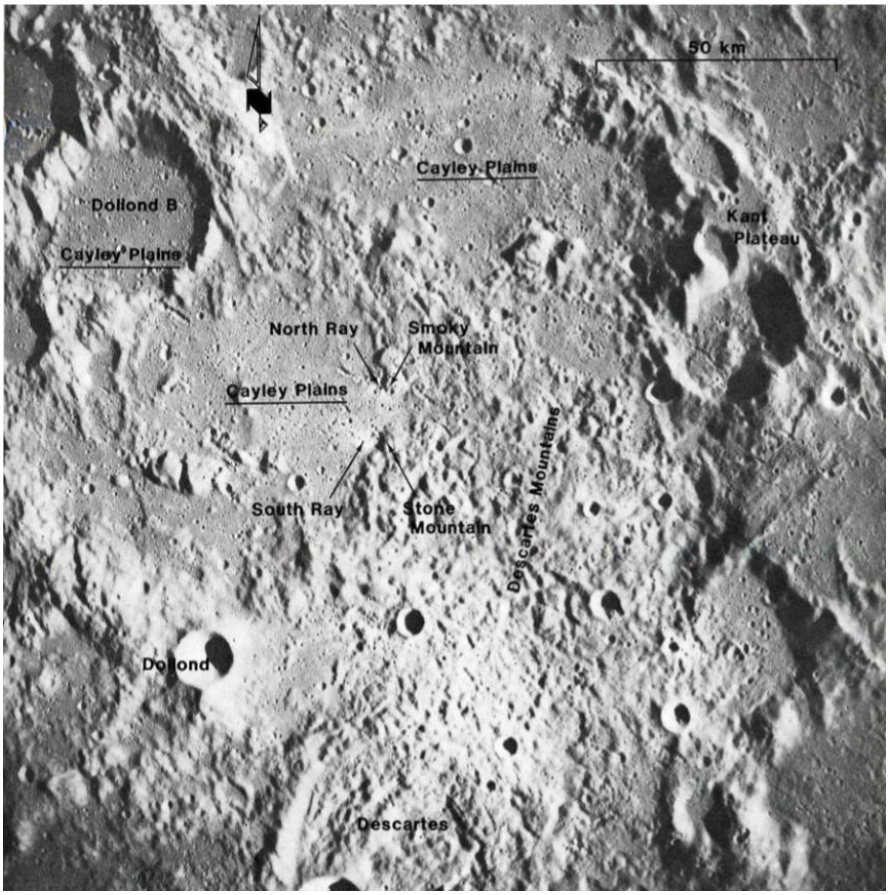


Figure 5. Apollo 16 Landing Site – Descartes and Cayley Plains*, NASA Apollo Mission metric camera frame 439.*

There are several popular targets for observing and imaging in the Ptolemaeus, Alphonsus, Arzachel region of the moon. For beginners, this is often one of the most recognizable areas of the moon since it is right on the terminator at first quarter, probably the most popular time to observe the moon. Rupes Recta, the "Straight Wall" is very easy to see and a favorite. Other large and small craters such as Albategnius, Klein, Hipparchus, Herschel, Abulfeda, and Delambre, just to name a few, are clearly visible in a small telescope and can be explored at your leisure when imaged.

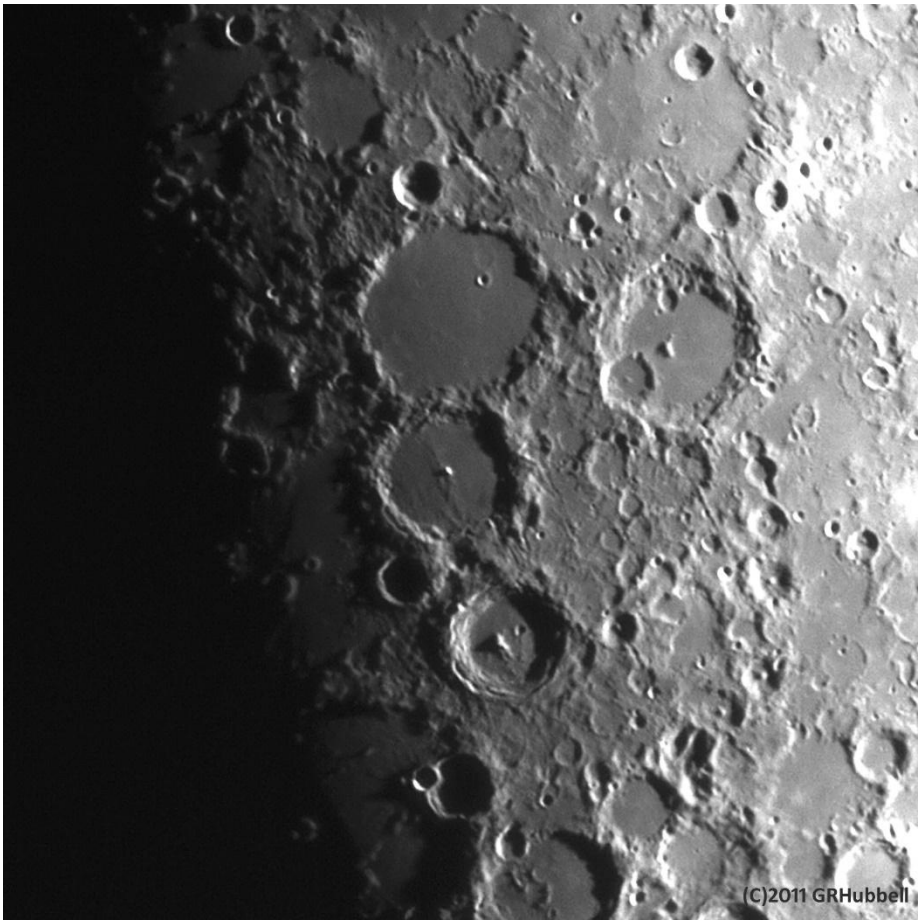


Figure 6. Ptolemaeus, Alphonsus, and Arzachel*, Jerry Hubbell, Locust Grove, VA, USA, 03 March 2011 0217 UT, 0.13-m APO Refractor (Explore Scientific 5-inch ED APO), Imaging Source DMK21AU04 CCD, 4x Powermate. Seeing 8/10, Transparency 5/6, north/up, east/right.*

Rik Hill contributed the following:

"Often, we look too much at the terminator. A day or so after the terminator passed over this area there is still a lot to see. The first thing that stands out are the great terraced walls of Arzachel. Look carefully at the floor of this crater and you'll see the Rimae Arzachel. Just above this is the larger crater Alphonsus with the obvious dark haloed volcanic features, some of the best such features visible to the amateur. Just to the lower left of Alphonsus is the interesting crater Alpetragius, with its round-mound central peak. Compare this peak to the one in Arzachel. The huge crater Ptolemaeus is the topmost of the three great craters here. At low sun angles its floor is filled with soft depressions and small craters. Then to the lower left of this is the heavily eroded crater Davy and the arc of little craters crossing the floor. This crater chain is thought to be formed from the impact of a fragmented asteroid or comet broken up by earth-moon gravitational forces. This is like the S-L/9 impact on Jupiter but with the much slower rotation of the moon leaving them in a much shorter chain.

At the bottom of this image is clearly seen "The Straight Wall" or Rupes Recta. On the south end is what used to be called "The Stag Horn Mountains". They seem to have lost that name over the years.

Lastly, back away and look at the whole glorious field and note the numerous diagonal gashes from the upper left to the lower right. These were carved out by mountain-sized and city-

sized chunks of the lunar surface, blown out during the huge impacts that carved out the large mare to the north.

The 4 images of this montage were each made by stacking 300 frames of 1500 frame AVIs taken with the equipment noted on the image. Assembly of the montage was done with AutoStitch and final processing was accomplished with IrfanView and GIMP."

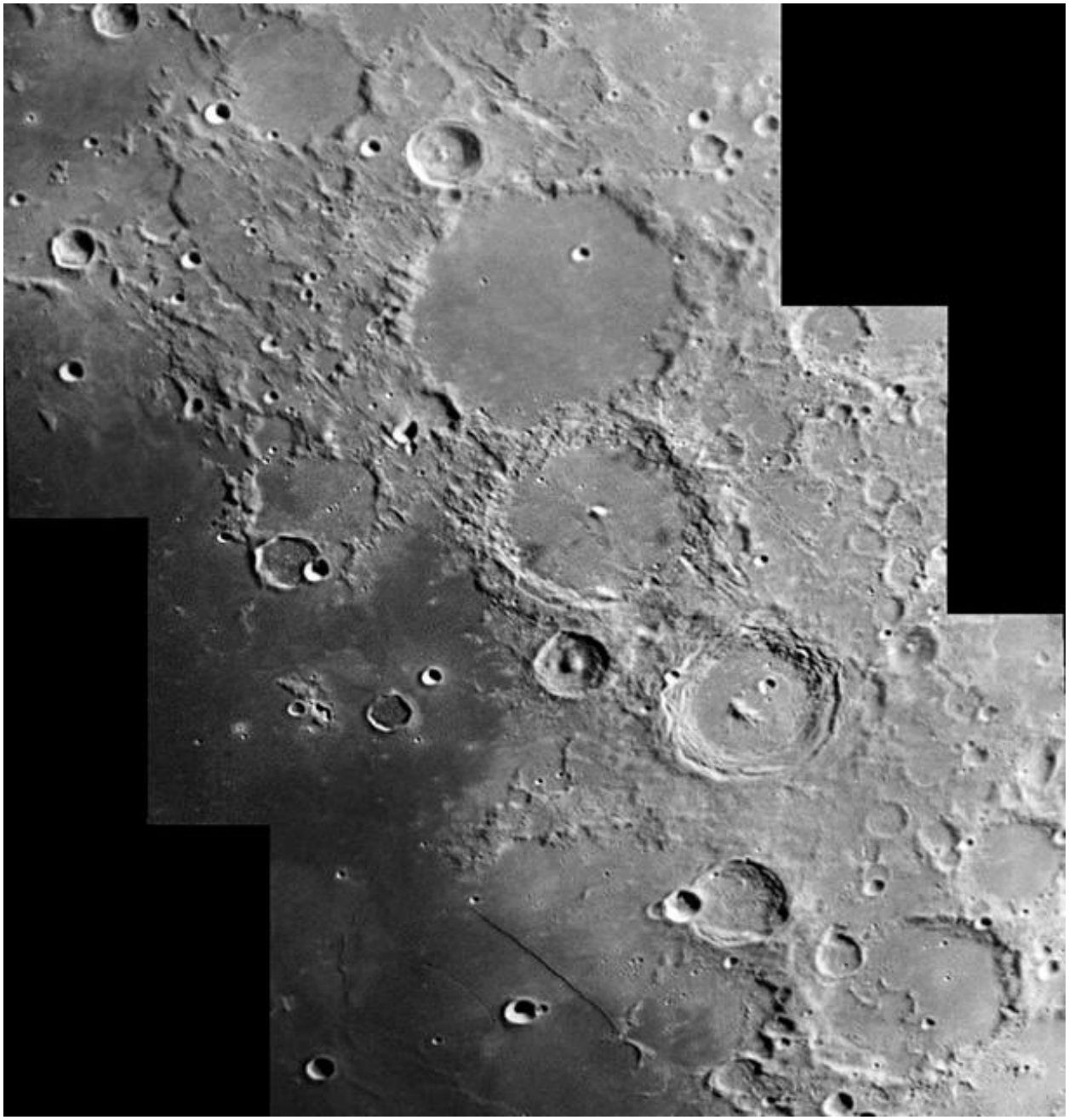


***Figure 7. Rupes Recta to Ptolemaeus**, Rik Hill, Tucson, AZ, USA, 09 May 2014 0350 UT, TEC 8-inch Mak-Cas Reflector, Skyris 445M CCD, 656.3nm Filter, seeing 8/10, north/up, east/right.*

Michael Boschat contributed the following:

"I was just looking at the Moon's terminator using 140x and noticed that Alphonsus central peak was catching the sunlight, and just near it's base was a "halo" of sunlight just ever

illuminating the crater floor. It was just an interesting observation, so I decided to try and get a image of the area. I used my Canon xsi with a 2x Barlow and took a series of exposures trying to get a decent image. I used the live view on camera to focus the craters as sharp as possible. This was about the best image I could get. Also, I was shooting though my open apartment window, and visually looking though the eyepiece everything was sharp and clear, very, slight turbulence."

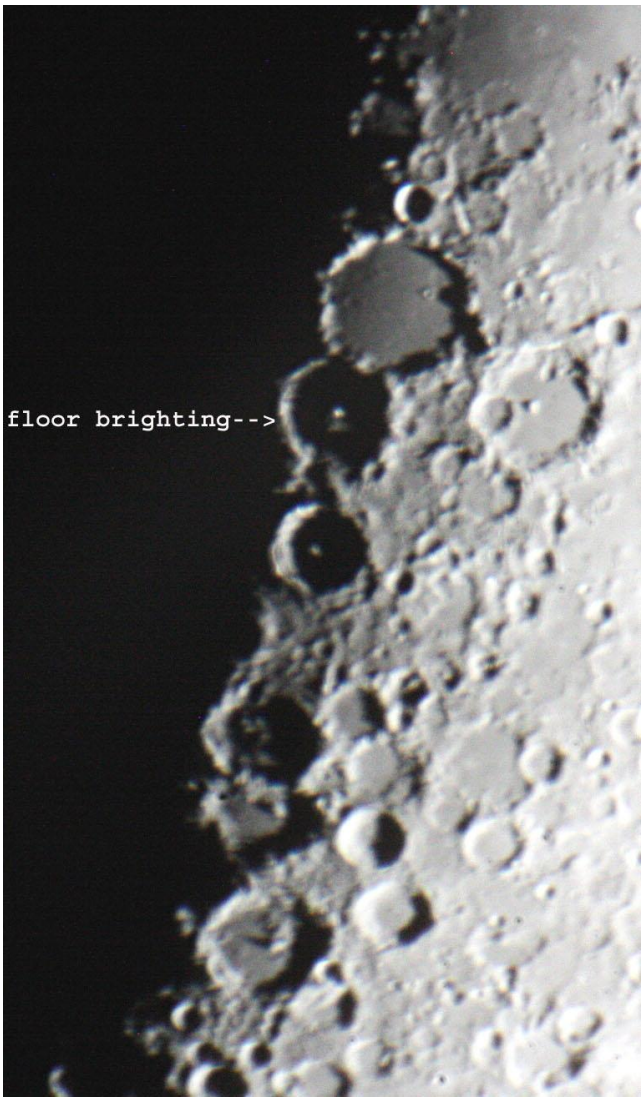


Figure 8. Alphonsus, *Michael Boschat, Halifax, Nova Scotia, Canada, 27 October 2017 2158 UT, ETX 90mm Maksutov Reflector + 2x Barlow, Canon xsi DSLR. seeing 8/10, transparency 4/6, north/up, east/right.*

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BOHNENBERGER F IN THE TERMINATOR

Alberto Anunziato

In the first hour of October 14th the terminator passed near the eastern edge of Mare Nectaris, which allowed (with good seeing) to observe details of little-known (for me) craters, such as Bohnenberger F. In fact, what I observed (fig. 1) is the show of shadows and bright areas in this crater. The brightest area is the high north and west walls of Bohnenberg F, so bright that they concealed the details of the ridge of the Pyrenaeus Mountains on which it sits. The shadow of the craterlet is added to the shadow cast by the westernmost ridge of the Pyranaeus Mountains, so we can check the extra

Figure 1. ***BOHNENBERGER F.*** *Alberto Anunziato. Paraná, Argentina. October 14, 2018 00:45-01:15. Meade EX 105Mak-Cass, 154x.*

height provided by the high walls of our small crater by comparing its shadow with the shadow cast by the section of this mountain range located to the north of Bohnenberger F. We can also compare the regular shape of the shadow of the northern section of Pyrenaeus Mountains with the shadow shaped like a peak of Bohnenberger F, which decreases towards the south. The peak of the shadow coincides with a small bright spot, probably a high area of one of the wrinkle ridges concentric with the impact basin of Mare Nectaris. We also observed two smaller craters between Bohnenberger F and the main ridge of the Pyrenaeus Mountains, which extends a slightly less dark shadow to the east. These craterlets are Bohnenberger J (to the north) and a smaller one in the vicinity of the strait by which the lava that formed Mare Nectaris found a path on the lower part of the mountain range formed by the lifting of the lunar crust at the moment of the impact that created the basin.

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NORTH OF CRISES

Rik Hill

. It's a crescent moon in the evening twilight sky sitting there like a Cheshire Cat smile. It's low in the west, and the seeing will probably not be good but you go for it anyway. There, on the north end are the dramatic mountains on the north shore of Mare Crisium. Just north of these mountains is a large crater (fig. 1), Cleomedes (128 km diameter) just a little younger than Crisium. Notice the beautiful terracing on the west interior wall as it catches the morning sunlight and the convex appearance of the floor, caused from the curvature of the Moon itself. North of this are two more craters, deep in shadow. The first one is Burckhardt (60 km) and above it is Geminis (88 km) on the top edge of the image with Bernoulli (49 km) to the east (right) of it. There are some interesting unnamed rimae just below these last two craters.

FIGURE 1. CLEOMEDES-GAUSS *– Richard Hill – Tucson, Arizona, USA September 13, 2018 02:07 UT. Colongitude 306.1°. Seeing 8/10. TEC 8" f/20 Mak-Cass, SKYRIS 445M, 610 nm filter.*

Due east of Cleomedes are two craters arranged north-south. The lower one with the central peak is Hahn (87 km) and the one to the north with the flat floor is Berosus (77 km). But beyond these, towards the limb, is a true giant of a crater that is only occasionally well seen, Gauss (182 km). This libration was not the best, but close. It can be seen a bit better. . Watch for it!

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LANGUISHING LANGRENUS

Rik Hill

Having to share a terminator with a fabulous crater like Petavius is hard. Such is the lot of Langrenus (fig. 1) a magnificent 136km diameter heavily terraced crater about 500km north of its big brother. When the libration is such that both are exactly on the terminator along with Vendelinus (151km) between them, the large flat bottomed ringed plain at the bottom of this image, and Furnerius further to the south it makes a striking sight. Such was what I saw on the morning of Mar. 06 of 2007 after coming home from my work at the observatory on the mountain, as all these were on the sunset terminator. They were even visible in 10x50 binoculars! In this image there is a crater on the north rim of Vendelinus with a central peak in a rough "X" shape. This is Lame (87km) and to its left (west) still half in shadow with a nice central peak is Lohse (43km). From Langrenus

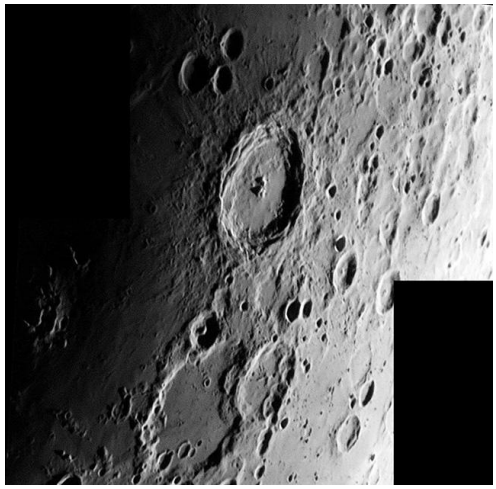

Figure 1. LANGRENUS *– Richard Hill – Tucson, Arizona, USA September 13, 2018 02:02 UT. Colongitude 306.1°. Seeing 8/10. TEC 8" f/20 Mak-Cass, SKYRIS 445M, 610 nm filter.*

to the right (east) are a pair of similar sized craters each with small central peaks. The closer one is Barkla (44km) and the farther with a bit nipped out by the image edge, is Kapteyn (51km). Above Langrenus is a prominent trio of craters still much in shadow. The larger one furthest to the west is Bilharz (44km) with Atwood (31km) to its right and above is Naonobu (36km).

Vendelinus is an ancient formation, perhaps as old as 4.5 billion years, while Langrenus is between 3.2-1.1 billion years old. Both are older than complex life on our planet! In 1992 the astronomer Dollfus reported glows that changes shape over time on the floor of Langrenus. These he attributed to gaseous emissions from the fissures in the floor of that crater.

So when you're done with Petavius, head north and spend a few minutes with his little brother!

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W. BOND AND ANAXAGORAS

David Teske

These two craters are some of the many majestic craters on the northern plains of the Moon. W. Bond, named after the American astronomer William Bond (1789-1859) is a vast enclosure that is ancient and in dilapidated condition. With a diameter of 170 km, it looks square tipped on its northern corner. Its pre-Nectarian true rim is hard to define, especially in the southeast and northwest sectors. In these regions, there seems to be two separate sections with about 20 km wide valleys in between the walls. The southwestern crater wall has been broken by the crater Timaeus (32 km). The crater floor is covered with ejecta from the Imbrium Basin to the southeast and material from Anaxagoras to the north. Because W. Bond is in the northern plains, it shows a foreshortened view, and it is a challenge to see the striations and secondary crater chains that are radial to Imbrium. The easiest to spot is an ill-defined set of linear ridges and depressions lying between the craters Archytas and W. Bond to the southeast of W. Bond.

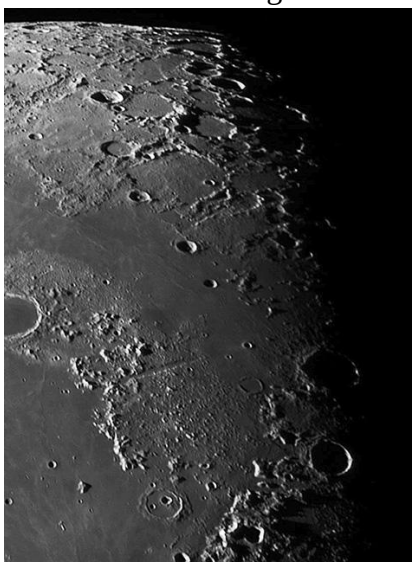

Figure 1. ***Vallis Rheita*** - David Teske, Louisville, Mississippi USA, October 11, 2017 11:23 UT. Colongitude 161.3°, Seeing 5/10, 4 inch APO refractor, 2.5 x Powermate, ZWO ASI 120mms.

North of W. Bond is the very conspicuous crater Anaxagoras. With a diameter of 52 km and Tycho-like crater rays, this crater was named after the Greek philosopher who lived from 500 to 428 BC. Ejecta from this Copernican age crater covers portions of the crater Goldschmidt to its east and this ejecta even smoothed out nearly its own entire outer rim sector lying to the south. The rays of Anaxagoras radiate away like meridians on longitude on a globe, though there are few rays to the west, suggesting an oblique impact. One of these rays may be followed as far as the crater Plato. Since Anaxagoras is so far north, it can be challenging to see its central peak and high walls. When libration is good near full moon, the inner walls of Anaxagoras can be seen crossed by two or more bright stripes of ray material.

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LUNAR TOPOGRAPHICAL STUDIES

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

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OBSERVATIONS RECEIVED

JAY ALBERT - LAKE WORTH, FLORIDA, USA. Digital images of Mare Imbium & Sinus Iridum.

ALBERTO ANUNZIATO - ORO VERDE, ARGENTINA. Digital images of Aristarchus & Lavosier A, Menelaus. Drawing of Rima Hyginus.

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

FRANCISCO CARDINALLI - ORO VERDE, ARGENTINA. Digital images of Copenicus, MonsPico & Schickard.

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

MAURICE COLLINS - PALMERSTON NORTH, NEW ZEALAND. Digital images of 6, 9 & 10 day Moon, Alphonsus, Apennine Mountains, Copernicus(2), Mare Nubium, Plato(2), Sinus Iridum, Theophilus & Tycho.

JOHN DUCHEK – St. LOUIS, MISSOURI, USA. Digital image of 3rd quarter Moon.

WALTER ELIAS - ORO VERDE, ARGENTINA. Digital images of Aristarchus, Brenner(2), Fapricius, Gassendi, Grimaldi, Langrenus, Mare Crisium & Petavius.

HOWARD ESKILDSEN - OCALA, FLORIDA, USA. Digital images of Archimededs, Montes Apennines & Sinus Aestuum-MareVaporum.

JUAN CRUZ FRONTÁN - ORO VERDE, ARGENTINA. Digital image of Aristarchus.

DESIREÈ GODOY - ORO VERDE, ARGENTINA. Digital image of Mare Humorum.

DAVID JACKSON - REYNOLDSBURG, OHIO, USA. Drawing of mountains near Plato.

RICHARD HILL – TUCSON, ARIZONA, USA. Digital images of Furnerius, Petavius & Theophilus.

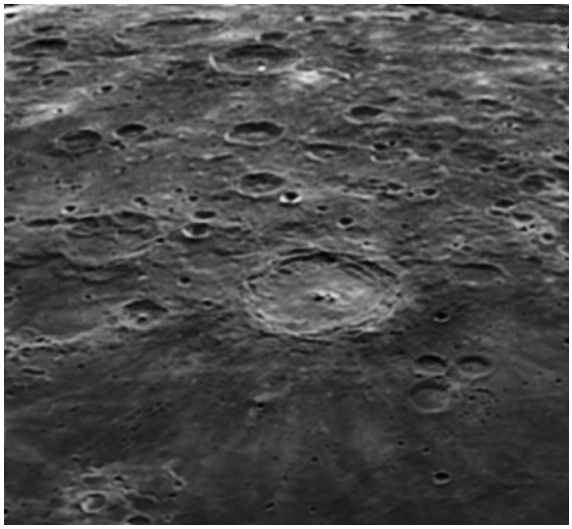
JERRY HUBBELL – LOCUST GROVE, VIRGINIA, USA. Digital image of 25 day Moon.

DAVID TESKE - LOUISVILLE, MISSISSIPPI, USA. Digital image of Vallis Rheita.

RECENT TOPOGRAPHICAL OBSERVATIONS

MONTES APPENNINES - Jay Albert, Lake Worth, Florida USA. October 18, 2018 02:15UT. Seeing 6/10, transparency 2/6. 8" NexStar Evolution SCT, 11mm orthoscopic eyepiece. iPhone .

FABRICIUS - Sergio Babino,- Montevideo, Uruguay. October 14, 2018 23:24 UT. 81 mm refractor. ZWO 174 MM.



LANGRENUS - Sergio Babino,- Montevideo, Uruguay. October 14, 2018 23:24 UT. 81 mm refractor. ZWO 174 MM.

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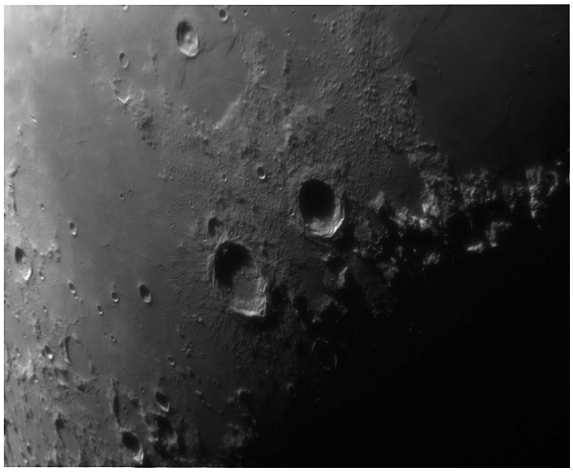


EUDOXUS - Luis Francisco Alsina Cardinalli, Oro Verde, Argentina, October 15, 2018, 23:47 UT. 200mm refractor, QHY5 II.

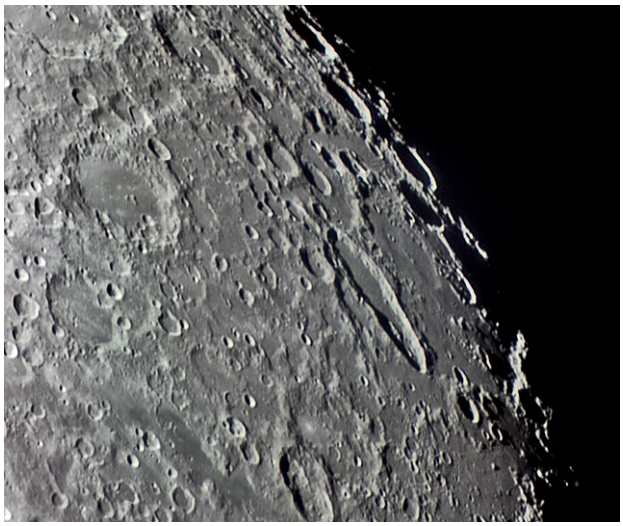
RECENT TOPOGRAPHICAL OBSERVATIONS

PLATO – Jairo Chavez,- Popayán Columbia. September 20, 2018 01:50 UT. 10" Dobsonian, Huawei Y360 camera, ISO200.

12 day MOON - Maurice Collins,- Palmerston North, New Zealand. October 21, 2018 08:06 UT. FLT-110. ASI120M.C North down.

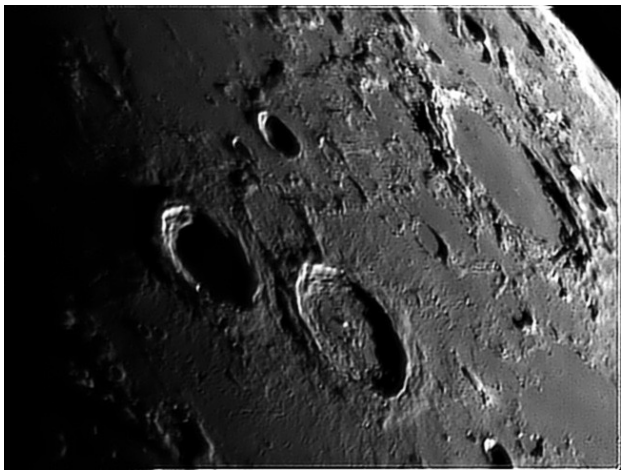
MARE NECTARIS - Maurice Collins,- Palmerston North, New Zealand. October 14, 2018 07:58 UT. FLT-110, f/14. ASI120M.C North down.

The terminator was right through Mare Nectaris and the dimple depression in the mare there was clearly visible to the eye again. Has been a little while since I last saw it as the illumination conditions have to be just right.

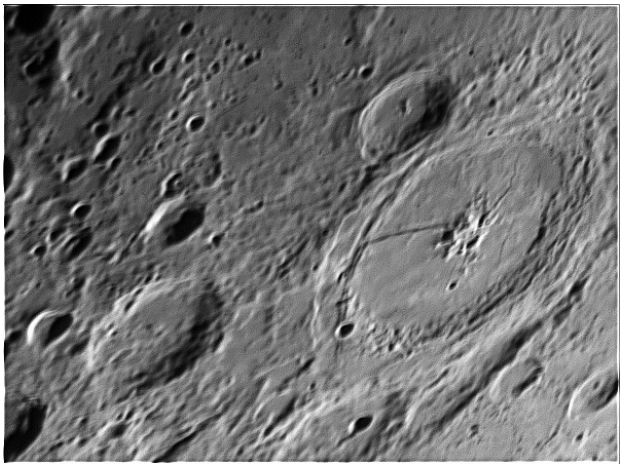


SCHILLER- Maurice Collins,- Palmerston North, New Zealand. October 21, 2018 08:15 UT. FLT-110, f/21. ASI120M.C North down.

RECENT TOPOGRAPHICAL OBSERVATIONS

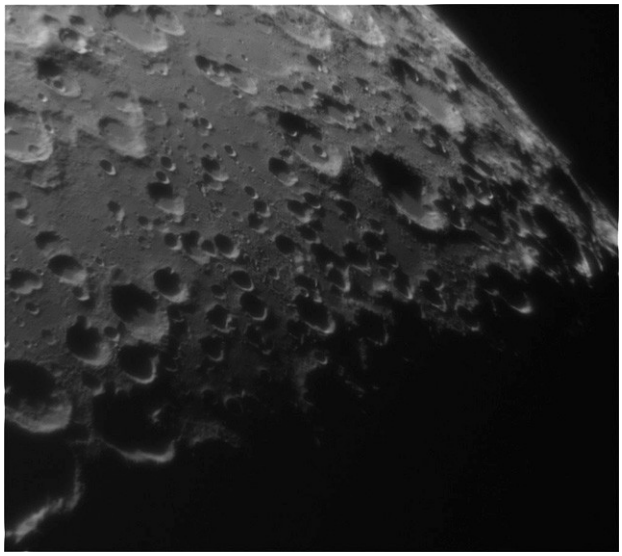


ATLAS-HERCULES - Walter Elias, Oro Verde, Argentina. October 13, 2018 22:59 UT. Celestron CPC-1100, f/10, ZWO ASI 120 MM/S.



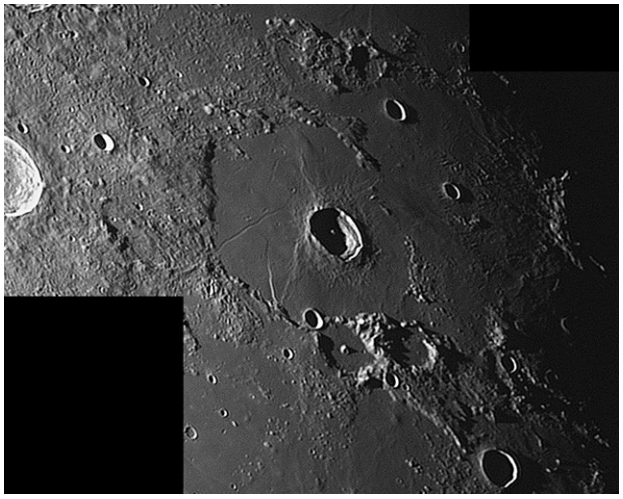
PETAVIUS - Walter Elias, Oro Verde, Argentina. October 13, 2018 23:04 UT. Celestron CPC-1100, f/10, ZWO ASI 120 MM/S.

PROMONTORIUM AGARUM - Walter Elias, Oro Verde, Argentina. October 13, 2018 22:52 UT. Celestron CPC-1100, f/10, ZWO ASI 120 MM/S.



MANZINUS - Desireé Godoy -Oro Verde, Argentina. October 16, 2018 01:01 UT. 200mm refractor, QHY5-II.

RECENT TOPOGRAPHICAL OBSERVATIONS



LACUS MORTIS – Richard Hill – Tucson, Arizona, USA September 29 2018 07:01 UT. Colongitude 144.6°. Seeing 8/10. TEC 8" f/20 Mak-Cass, SKYRIS 445M, 610 nm filter.

Fall is the time when we get the best views of the aining gibbous moon. The waxing moon in this season is in Libra to apricornus only 20-30 deg. up at best but after full phase the moon gets into Aquarius to Taurus, almost overhead. This was such a night when we got this beautiful view of sunset on Lacus Mortis and its central crater Burg (41km dia.), Rimae Burg and dorsum. The rima on the left or west side of the lacus is a graben while the one that is bright (illuminated cliff face) below it the result of vertical faulting. To the east of that is a dorsum that continues north on the other side of Burg. It's interesting how Burg is so central in Lacus Mortis when its age is estimated to be no more than 1.1 billion years old while Lacus Mortis may be as old as 4.5 billion years.

There are two fascinating flooded craters on the southern wall of the lacus. The one with a central peak is Plana (46km) and next to it is Mason (44km) and further on at the bottom of the image is Grove (29 km) which may be as old as the lake itself! On the right edge of this image is the last light on the west wall of Hercules (71km). Betweem Burg and Hercules is a small crater Burg A (12km) and above that is another small crater Baily A (16km). A between these two, extended north takes you to the ruined crater Baily (27km) barely identifiable as a circular formation!

Enjoy this sunset on these cool clear autumnal nights when the waining moon rides high on the ecliptic!

FULL MOON - David Jackson, Reynoldsburg, Ohio USA. October 25, 2018 02:24 UT. Meade ETX-125, 30mm eyepiece, Moto Z smartphone.

LUNAR GEOLOGICAL CHANGE DETECTION PROGRAM

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Reports have been received from the following observers for September: Jay Albert (Lake Worth, FL, USA - ALPO) observed: Aristarchus, Atlas, Plato and Proclus. Alberto Anunziato (Argentina - AEA) observed: Aristarchus, Langrenus and Proclus. Jairo Andres Chevez (Columbia – AEA/LIADA) imaged Copernicus, Plato and Tycho. Maurice Collins (New Zealand – ALPO/BAA/RASNZ) imaged: Alphonsus, Copernicus, Mare Imbrium, Mare Nubium, Montes Appennines, Plato, Sinus Iridum, Theophilus, Tycho and captured some whole Moon images. Marie Cook (Mundesley, UK – BAA) observed: Aristarchus, Plato, Proclus and Promontorium Agarum. Collin Ebdon (Colchester, UK – BAA) observed Montes Spitzbergen. Walter Elias (Argentina – AEA) imaged Dawes, Plato, Proclus and several features. Valerio Fontani (Italy – UAI) imaged Alphonsus, Censorinus, and captured a whole Moon image. Les Fry (West Wales - NAS) imaged several features. Rik Hill (Tucson, AZ, USA – ALPO/BAA) imaged: Cleomedes, Lacus Mortis, Langrenus, and Petavius. Dean Jones (Newtown, UK – NAS) imaged several features. Jean Marc Lechopier (France – UAI) imaged Archimedes, Descartes, and took some whole Moon images. Robert Stuart (Rhayader, UK – BAA) imaged: Atlas. Baillaud, Burg, Cyrillus, de la Rue, Endymion, Fracastorius, Hercules, Meton, Piccolomini, Posidonius, Rimae Burg, Strabo, Theophilus and took some whole Moon images. Gary Varney (Pembroke Pines, FL, USA, ALPO) imaged Gassendi, and Moretus.

News: As mentioned last month, the teaching work load at the Physics Department at Aberystwyth University is very high. Therefore I will just show images or written reports sent in, and the associated repeat illumination prediction, and let the readers form their own opinion. Sometime in January perhaps, when I have time to catch my breath I will re-assign weights to the original LTP reports, based upon the reports received – this can be done in a short table.

I have heard from four Lunar Section members: Pierre Temmerman (Belgium) has promised to take part in our repeat illumination program, but has been thwarted by the weather. Jill Scambler (BAA - UK) is helping to look up some old LTP reports in journals and books in the hope that these will fill some gaps in the knowledge of what Cameron summaries in her catalogs. At the moment she is trying to find the source material behind a LTP shown as a star on the Moon in a wood cutting from Worms, Germany from 1540 Nov 26 with the star-like effect being seen somewhere between Mare Serenitatis and Mare Imbrium areas. I have seen a picture of this wood cutting many years ago, but have not been able to track it down recently. Jason Wentworth (USA, ALPO) has sent me the following web link: http://www.spacedaily.com/reports/Earths_Dust_Cloud_Satellites_Confirmed_999.html which shows imagery proving that there are dust clouds in some of the Lagrangian points in the Earth-Moon system. These are referred to as Kordylewski clouds – something astronomers have been trying to image for a very long time. Finally Nigel Longshaw has sent me some details of W.H. Pickering's descriptions of "Vapors" in the vicinity of Vallis Schroteri/Cobra's head area of Aristarchus. I would like to show you some of these but time prevents me on this occasion, suffice to say that it's all just light albedo material which I can even see in LROC WAC images of the area. We shall keep some of the repeat illumination requests for these in there but assign them a very low weight, and gradually remove these from the database as we receive observations. The Pickering sketches seem to show variation in shapes of this lighter material, so would like to replicate this effect, out of curiosity – but they are clearly not LTP.

I have been in correspondence with one of Winnie Cameron's daughters, Selene Green, and was very kindly sent an interesting newspaper cutting about the early days of Winnie Sawtell-Cameron, from 1942 Jun 14, entitled: "Elevator Girl Hitches Wagon to the Stars" . Winnie Cameron produced a NASA

catalog of LTP in 1978 and was heavily involved with LTP study from a professional perspective during the 1960's-1980's. Selene notes that she knew her mother was probably involved with astronomical societies from early age, indeed Winnie headed an astronomy club at undergraduate school at Northern Illinois University. In fact she believes that her mother was also president of the Chicago Burnham Astronomical Society at some point. During a visit from Frank Edmondson (Indiana University Astronomy Department) to present a lecture at Burnham, Frank introduced himself to Winnie and they had a long conversation about astronomy. He was so impressed, and sympathetic with her lack of funds, that he offered her a graduate teaching position at IU where she eventually gained her Masters in Astronomy, and later met her husband Robert Cameron. I would like to thank Selene for these interesting biographical details about her mother.

Lastly I wish to apologize to Francisco Alsina Cardinali and Camilio Salto in last month's newsletter whom I affiliated to UAI, where as in fact they work for the AEA.

LTP Reports: No LTP reports were received for September.

Routine Reports: Below is a selection of reports received for September 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. Due to pressure of work no analysis will be done here, but if weights are updated, these will be given in a table of REF numbers, associated with each prediction description, in a future newsletter.

Montes Spitzbergen: On 2018 Sep 03 UT 02:30-03:30 Colin Ebdon (BAA) sketched (Fig 1 – Right) this region to see if he could detect a subdued valley-like feature, first noted in an image by Ken Warren (Fig 1 – Left). This is not a geological change type observation, but Ken Warren's image peaked my interest, so the illumination constraints were put into the Lunar Schedule website. Colin's observation was used in a talk I gave at the EPSC conference in Berlin in September, showing how useful repeat illumination observations could be. – in fact it is clearer in Ken's image and Collin's sketch than it is in the LRO LOLA digital elevation model (Fig 1 Top and Bottom). The original repeat illumination request was as follows:

> *ALPO Request: please image or sketch the area to the east and north west of this group of mountains. We are attempting to study some wrinkle ridges here, and in particular trying to see if there is a very low lying (previously unknown) valley in the mare here. Any visual descriptions, sketches or images of Earthshine should be emailed to: a t c @ a b e r . a c . u k ....from: http://users.aber.ac.uk/atc/lunar_schedule.htm* ***[REF #1]***

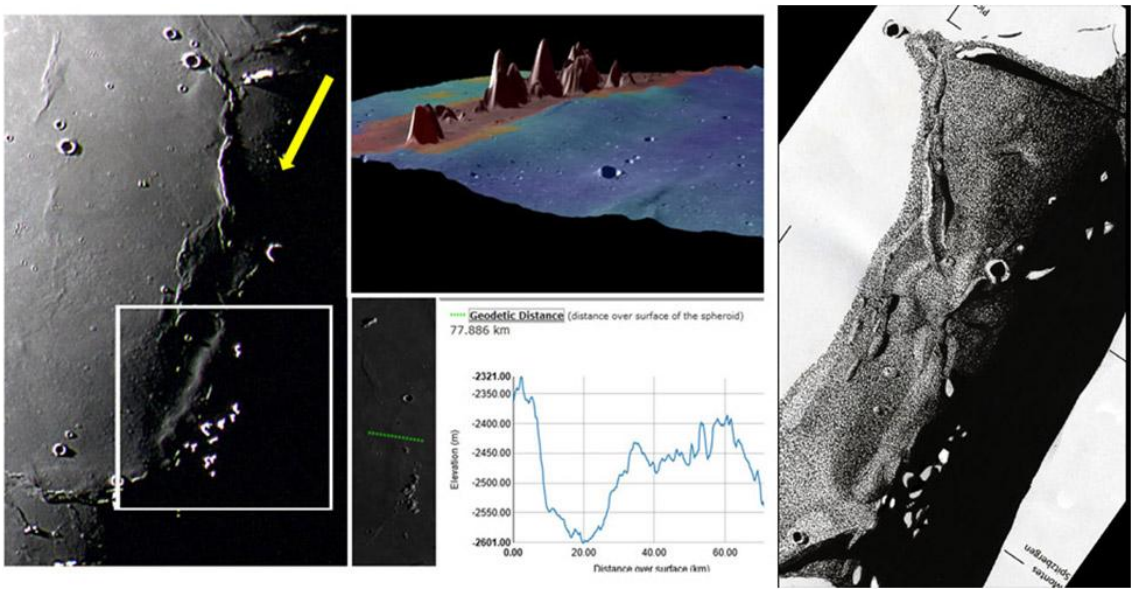

Figure 1. *The Montes Spitzbergen area of the Moon with north towards the top, unless specified otherwise.* ***(Left)*** *Image by Ken Warren (ALPO) taken on 2016 Jul 27 UT 10:23.* ***(Top)*** *A NASA LRO Quickmap view of vertically exaggerated terrain as seen from the NW.* ***(Bottom)*** *A cross-section through LRO's LOLA laser altimeter digital elevation model, through the subdued valley floor.* ***(Right)*** *A sketch by Collin Ebdon (BAA) made on 2018 Sep 03 UT 02:30-03:30.*

Descartes: On 2018 Sep 16 UT 18:08-18:11 Jean Marc Lechopier (UAI) imaged this region in color with similar illumination (to within ±0.5°) to:

> *On 2010 Apr 20 sometime between UT 22:00 and 23:00 I.Bryukhanov (Minsk, Zeiss Refractor at the Minsk planetarium) observed an orange-brown tint a little to the west of Zollner and Kant craters. Apparently images were obtained. ALPO/BAA Weight=1.* **[REF #2]**

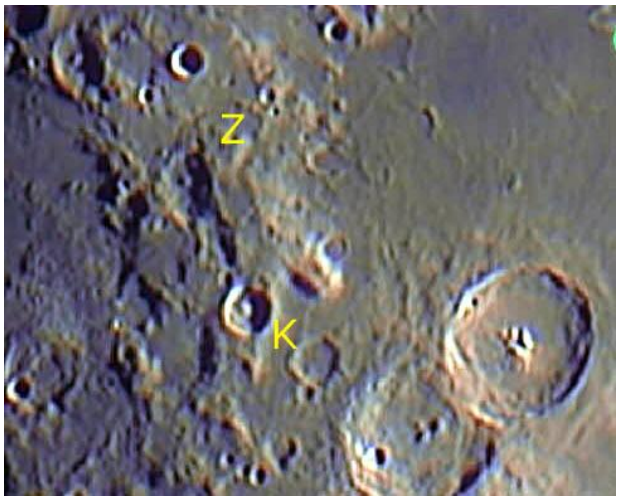

Figure 2. *The Descartes area imaged by Jean Marc Lechopier (UAI) on 2018 Sep 16 UT 22:10 and orientated with north towards the top. The image has been color normalised but shows some atmospheric spectral dispersion. Zollner (Z) and Kant (K) are indicated by letters.*

Copernicus: 2018 Sep 19 UT Maurice Collins imaged the crater under similar illumination, to within ±0.5° to the following report:

> *2006 Jun 05 G. Burt made a drawing over a period of 30 minutes. Upon examining drawing, and comparing with photos made under similar illumination was struck by the abnormality of a small white blob in the north east corner of the shadowed floor. There should be no raised topography between the wall and the central peaks that could give rise to this. The making of the sketch overlapped with an earlier drawing made by Rony de Laet (Belgium) which did not show this blob. Subsequent attempts to find sketches/images at very similar illumination angles have failed to show the blob in the north east corner of the shadowed floor. ALPO/BAA weight=3.* ***[REF #3].***

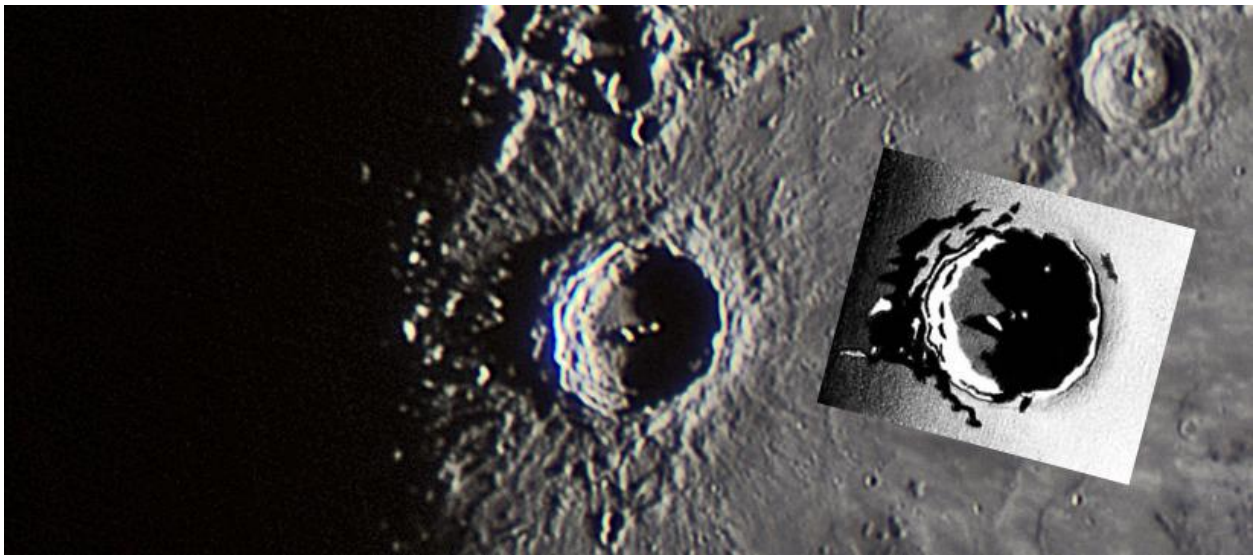

Figure 3. *Copernicus orientated with north towards the top by Maurice Collins (ALPO/BAA) on 2018 Sep 19 UT 19 UT 07:27.* ***(Insert)*** *Sketch by Geoff Burt (BAA) from 2006 Jun 05 UT 21:00-22:00.*

Promontorium Laplace: 2018 Sep 19 UT 22:09 Walter Elias (AEA) took a low resolution image of Promontorium Laplace under similar illumination to the following report:

On 1980 Oct 19 at UT0054 Hobdell (St. Petersburg, FL, USA, 2.4" refractor) observed that Cape Laplace cast a very long (~66km) shadow. This suggested a height of ~6.6km). The Cameron 2006 catalog ID=116 and the weight=1. The ALPO/BAA weight=1. **[Ref #4]**

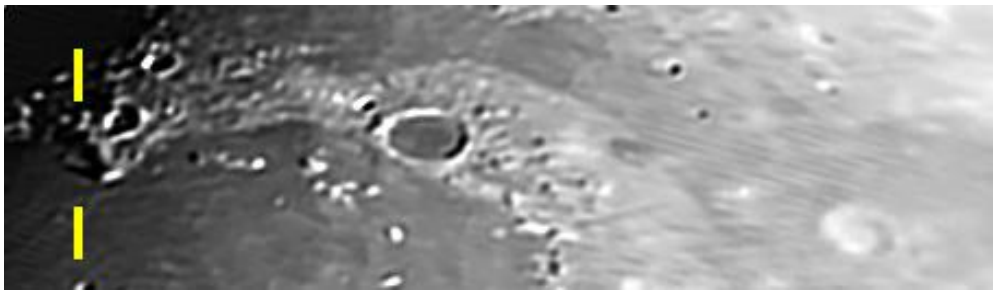

Figure 4*. Promontorium Laplace with the "normal" elongated shadow, highlighted by the yellow markers, and imaged by Walter Elias on 2018 Sep 19 UT 22:09. Orientated with north towards the top.*

Although I said that I would do no analysis – the shadow indicated in Fig 4 is so obvious, we shall set the weight to 0 as this is entirely the normal appearance! Actually the height of Promontorium Laplace is about 3 km.

Plato: 2018 Sep 20 UT 01:21 Jairo Andres Chevez (AEA/LIADA) imaged this crater under similar illumination, to within ±0.5°, to the following 1973 report:

On 1975 Mar 22 at UT22:10-22:25 T.Flynn (Edinburgh, UK, 30cm Newtownian, x75) observed 3 large areas on the floor of Plato to be delicately darker in the blue filter. They were of different darkness. He did not regard these as LTP, but permanent blinks. This is a BAA report. The ALPO/BAA weight=1. ***[REF #5]***

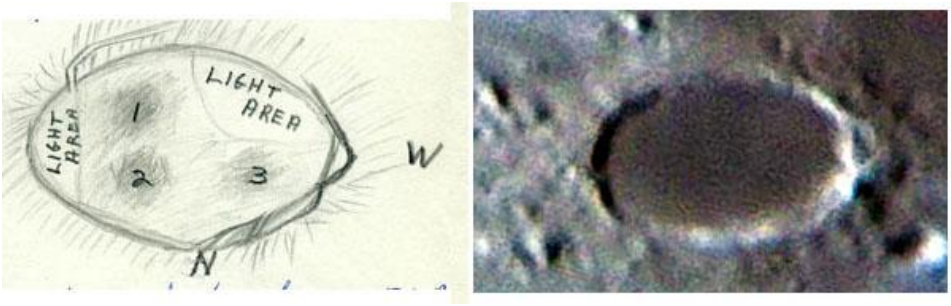

Figure 5. *Plato orientated with north towards the bottom,* ***(Left)*** *A sketch by Tom Flynn (BAA) made on 1975 Mar 22 UT 22:10-22:25.* ***(Right)*** *A color image by Jairo Andres Chevez (AEA/LIADA) on 2018 Sep 20 UT22:10-22:25 with the color normalized and saturation increased to 50%.*

Alphonsus: On 2018 Sep 21 UT 18:51-19:51 Valerio Fontani (UAI) imaged Alphonsus under similar illumination (±0.5°) to the following report:

*On 2001 Aug 30 at UT20:35-21:15 C. Brook (Plymouth, UK) found a dimming in the central peak of Alphonsus, however it had returned to normal by Aug 31 UT 00:29-00:50UT when A.C. Cook (Alexandria, VA, USA, 8" reflector) examined the area, though there were some slight brightness variations that were attributed to seeing conditions. The ALPO/BAA weight=2.****[REF #6]***

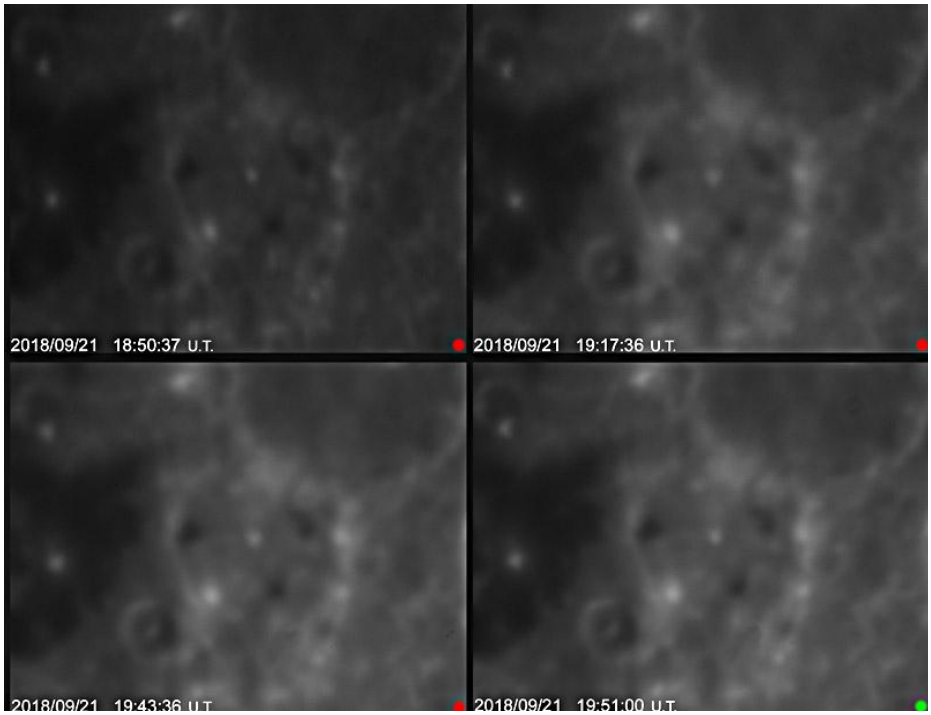

Figure 6. *Alphonsus by Valerio Fontani (UAI) orientated with north towards the top – dates and UTs are given in the bottom left of each image. The dots in the bottom right corner of each image are* ***red****=”inside the requested similar illumination observation window” and* ***green****=”outside the requested similar illumination window”.*

Langrenus: On 2018 Sep 22 UT 05:37-05:57 and 06:50-07:00 Alberto Anunziato (AEA) observed visually, under similar illumination, to within ±0.5°, these two respective reports:

> *SE of Langrenus 1947 Aug 28 UT 21:00? Observed by Baum (Chester, England) A long mountain mass, on limb to the SE of Langrenus crater, had a decidedly bluish cast. To the north, on the limb, were several ordinary peaks appearing in profile and some were sharp and pointed. NASA catalog ID=498. NASA catalog weight=3. ALPO/BAA weight=2.****[REF #7]***
>
> *On 1992 Feb 16 at UT 01:05-01:35 P. Moore (Selsey, UK, 12.5" reflector, seeing=III) found the north rim area to be both very bright and misty - though he did not think it to be a LTP but wanted it to be recorded, just in case. The Cameron 2006 catalog ID=440 and the weight=1. The ALPO/BAA weight=1.****[REF #8]***

Alberto was using a Meade EX105 at x154. For the first report he comments: *“I could not see any peak at all in Langrenus (beyond the reach of my scope?, bad seeing 4.5/10 ?)”* and for the second: *“”The north rim was not bright, nor misty”*. We have certainly had repeat illumination observations of the Richard Baum report before, and it really depends upon the libration, being associated with mountain on the limb.

Aristarchus: On 2018 Sep 24 UT 21:06 Robert Stuart captured (see Fig 7) a repeat illumination, repeat topocentric libration image (to within ±1°) to the following LTP report:

> *Aristarchus 1976 Jan 16 UT 22:00-23:15 Observed by P.W. Foley (Wilmington, Kent, UK, seeing II) - Aristarchus was tremendously bright. No color seen. ALPO/BAA weight=1.****[REF #9]***

Figure 7. *2018 Sep 24 UT 21:06 The Full Moon imaged by Robert Stuart on 2018 Sep 24 UT 21:06.* ***(Left)*** *Raw image.* ***(Right)*** *Contrast stretched - so as just to show the brightest features on the Moon.*

Atlas: 2018 Sep 28 UT 03:00-03:25 Jay Albert (ALPO) observed visually and imaged this crater under similar illumination, to within ±0.5° to the following French report:

> *Atlas 1954 Mar 23 UT 00:00? Observed by Delmotte (France?) "Violet tint in crater" NASA catalog weight=3. NASA catalog ID #562. ALPO/BAA weight=3.* ***[REF #10]***

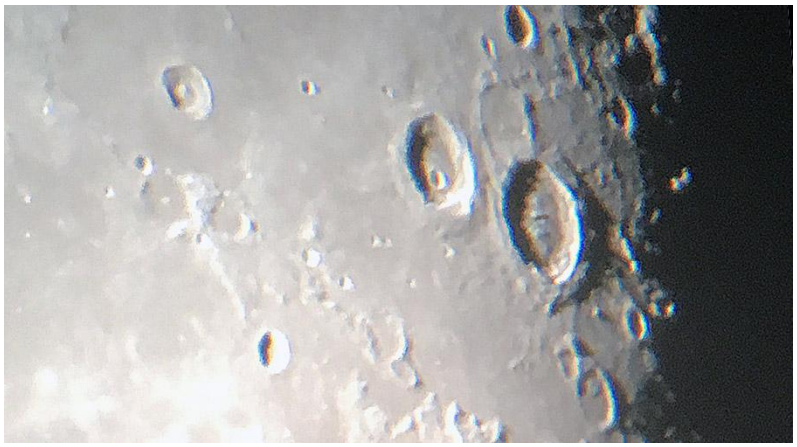

Figure 8. *Atlas and Hercules orientated with north towards the top, taken by Jay Albert (ALPO) on 2018 Sep 28 UT 03:22*

Jay comments that: *"I did not see the "violet tint" or other color in Atlas. The upper E wall was very brightly lit and detailed. The crater floor was darker with the central peaks very bright and casting black shadows on the floor. The W wall was in shadow and cast a shadow on about 40% of the W part of the crater floor. This shadow showed the high peaks on the W rim. I observed Atlas from 03:00 to 03:25 at 226x and 290x with an attempted iPhone image at 226x".* You can see his image in Fig 8.

Plato: On 2018 Sep 28 UT 22:07 and 22:30 Les Fry (NAS) and Dean Jones (NAS) respectively, imaged this crater (Fig 9), and from 22:30-22:40 Marie Cook (BAA) visually observed, under the similar illumination and topocentric libration (similar to within ±1°) to the following report:

> *On 1975 Mar 02 at UT05:00-06:18 P.W.Foley (Wilmington, Dartford, Kent, UK, 12" reflector) observed blueness along the southern wall of Plato. This is a BAA observation. Note that it is assumed that this is the same as Cameron's catalog 1975 Mar 02 UT 01:00 or 23:00 report by an Unknown English Observer who apparently observed color in Plato (Red or violet). The Cameron 1978 catalog ID=1402 and weight=1. The ALPO/BAA weight=1.****[REF 11]***

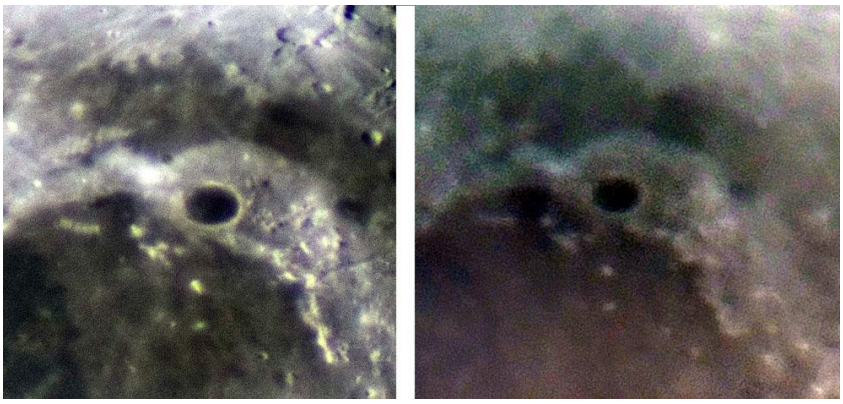

Figure 9. *The Plato area orientated with north towards the top – extracted from larger area images.* ***(Left)*** *Image by |Les Fry taken on 2018 Sep 28 UT 22:07.* ***(Right)*** *image taken by Les Dean at 22:30 UT using a Camera Phone attached to his telescope - and one of his first photographs of the Moon.*

Marie Cook, using a Questar telescope under Antoniadi III seeing and good transparency, reported: "*Crater sharp and clear, No blueness seen along the southern wall of Plato. No color seen anywhere in the crater. Normal.*"

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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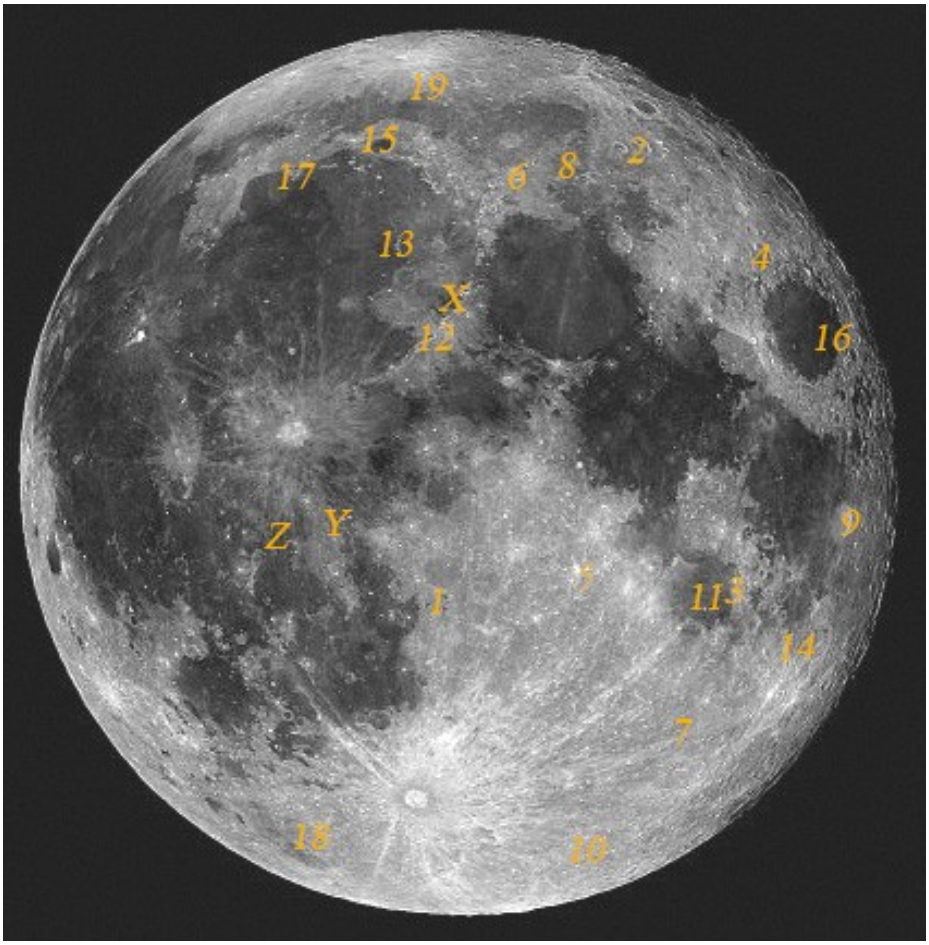
KEY TO IMAGES IN THIS ISSUE

1. **Alphonsus**
2. **Atlas**
3. **Bohnenberger**
4. **Cleomedes**
5. **Descartes**
6. **Eudoxus**
7. **Fabricius**
8. **Lacus Mortis**
9. **Langrenus**
10. **Manzinus**
11. **Mare Nectaris**
12. **Montes Apennines**
13. **Montes Spitzbergen**
14. **Petavius**
15. **Plato**
16. **Promontorium Agarum**
17. **Promontorium Laplace**
18. **Schiller**
19. **W. Bond**



FOCUS ON targets

X = Apollo 15 Mare Imbrium-Hadley Rille
Y = Apollo 14 Fra Mauro
Z = Apollo 12 Ocean of Storms