Lunar Section

BAA

British Astronomical Association

Director: Bill Leatherbarrow

LUNAR SECTION CIRCULAR

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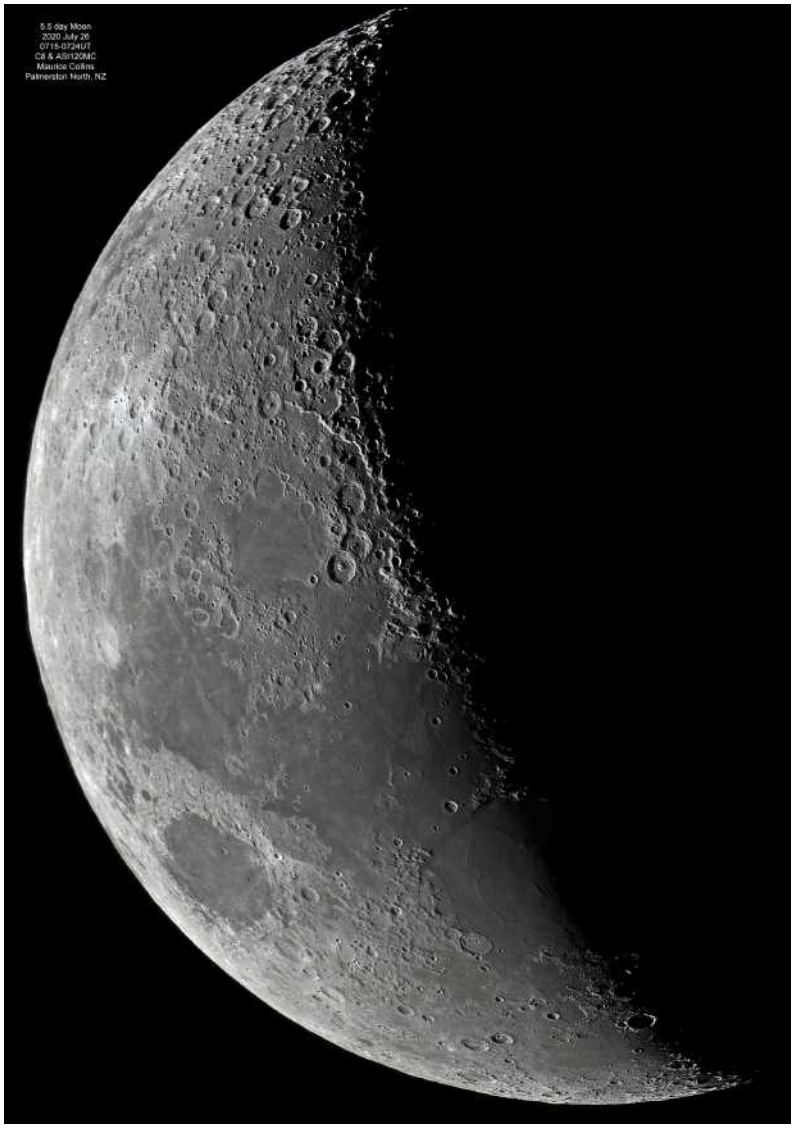


FROM THE DIRECTOR

This time of year is usually a quiet one in terms of Section activity and this year is no exception. The usual problems of short nights, the low elevation of the Moon from northern latitudes and changeable weather have been exacerbated this year by changes to life's normal patterns occasioned by the Covid pandemic.

Nevertheless, some fine observations have been submitted by Section members, for which I am very grateful. A particularly interesting contribution came from KC Pau in Hong Kong. Some time back KC imaged an elusive linear feature on the Mare Serenitatis. It was at the very limits of resolution for his telescope and observing conditions, with the result that its true nature was unclear. He has recently captured the feature again and his observations have been subjected to careful examination by Raffaello Lena. The results go some way towards resolving the uncertainties surrounding the feature and they appear later in this issue.

Meanwhile, the hours of darkness are increasing and the Moon is rising higher in our skies, so I look forward to seeing more excellent work by our members in future months.

Bill Leatherbarrow

OBSERVATIONS RECEIVED

This month images have been submitted by the following observers: Maurice Collins (New Zealand), John Dunthorne, Dave Finnigan, Rik Hill (USA), Rod Lyon, KC Pau, George Whiston, and the Director.

Rik Hill offers the following thoughts on libration:

'Something a little different this time to demonstrate what libration is and how it can be used to advantage. Here we have two images of the region from the crater Janssen looking east. Janssen is the largely ruined 196km diameter polygonal crater near the terminator in the center top of each of the two images in the montage below. To the right of the center of this crater is a smaller crater, Fabricius (80km) with an odd mountain range on its floor. To the right of this is the slightly larger Metius (90km) and farther on the trench that is Vallis Rheita some 515km long. Below Janssen are two overlapping craters, the top one being Steinheil (70km) lying on top of Watt (68km).

Notice that in the image on the right you see a lot more terrain between Watt and the limb. This is what a "favorable libration" can do for you and why you need to pay attention to that. A favorable libration on one side of the Moon means an unfavorable

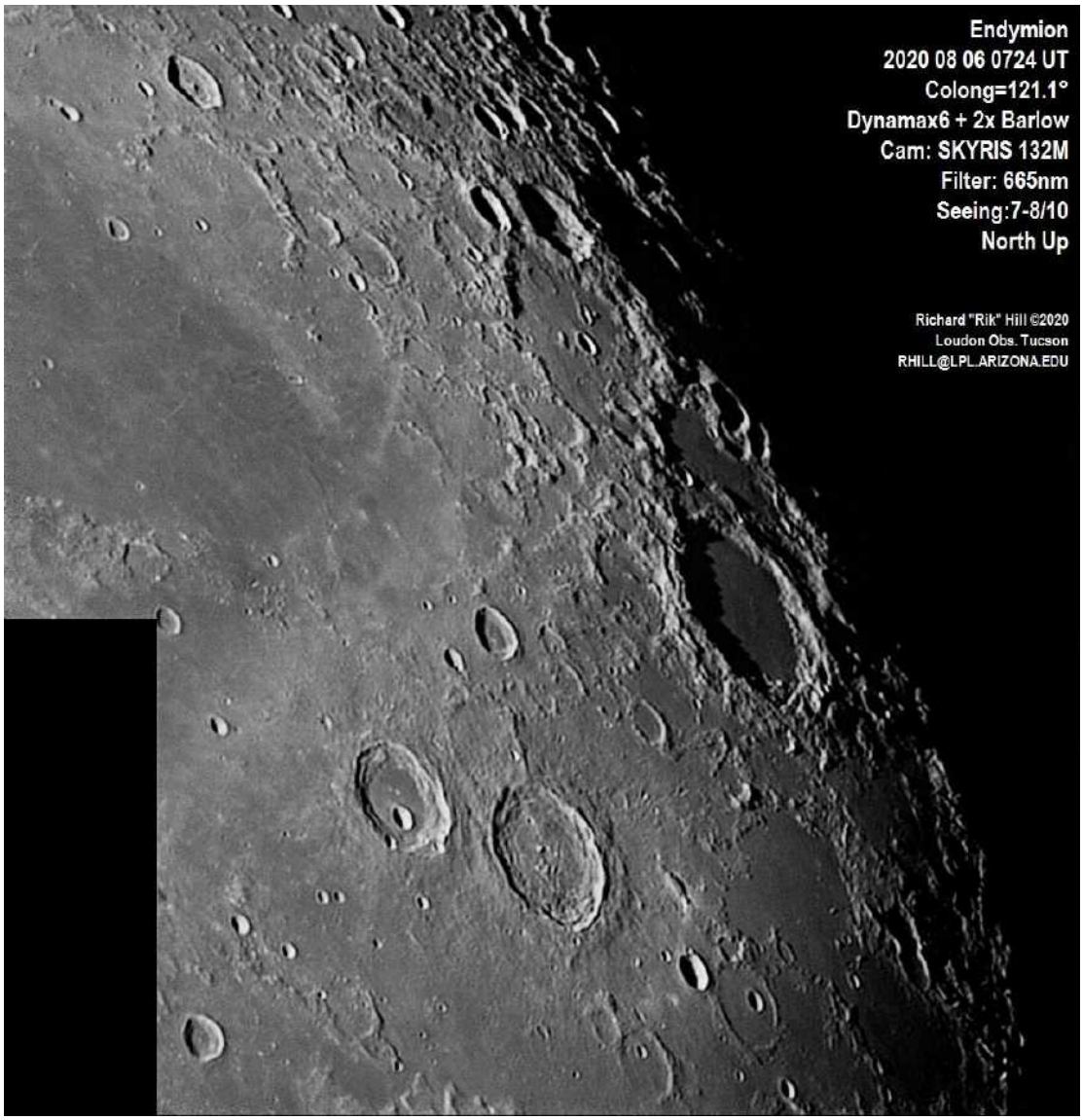
on the opposite side. On the limb in the image on the right is a portion of Mare Australis which is completely invisible on the left. On the left in the middle of the limb is the highly foreshortened crater Hanno B (36km) but in the July image the crater can be seen plain and clear on the nearside (west) of Mare Australis. These two images clearly show how by picking the right night you can see around the corner, or limb as it were.'

Rik also sends the following image, along with associated notes on Endymion:

'Normally a more foreshortened feature, at this libration we get a good look into Endymion, the large 125km diameter crater just right of center. As lunar night approaches we see the wonderful shadows crawling across its floor. The two large craters below and to the left (west) are Atlas (90km) and the smaller, younger Hercules (71km) with the satellite crater Hercules G (13km) on its floor. Many observers think these two are much alike but actually they are remarkably different with a smooth flat floor in Hercules and rimae, and roughness on the floor of Atlas. Even the ejecta is very different in the two with Atlas having a thick ejecta blanket that covers over a much older crater to the north. Above these two is the teardrop-shaped crater Keldysh (34km). Below and to the right of Atlas is a ghost crater seen best at this sun angle, Chevallier (54km), with small satellite crater Chevallier B (13km) contained within its walls. To the right of Chevallier is a flat figure-8 shaped area that is Lacus Temporis some 257km long.

Another smaller mare-like region that lies just north of Endymion is unnamed. North of this region is a hard to trace, ruined crater De La Rue with a 14km crater in the

middle, De La Rue J. On its north wall are a couple more craters Strabo (56km) and to its left Thales (32km). At the top of this image is a rather polygonal crater Democritis (41km) and below it another large ghost crater Gartner (105km) opening onto easternmost Mare Frigoris similar to Fracastorius but a much weaker copy. So one way you can remember the layout is that at one END of Mare Frigoris you will find ENDymion!'



John Dunthorne has submitted the following note on sunrise over the great crater Clavius:

'While exploring the Moon south of Tycho on 30th May 2020, I was very surprised to see two brightly lit circles against a black background. I wondered what they were, then realised that I was looking at Clavius C and D catching the sun and contrasted against the still shadowed floor of Clavius. The image below shows that my eyes/brain were to some extent deceiving me and they weren't perfect circles.

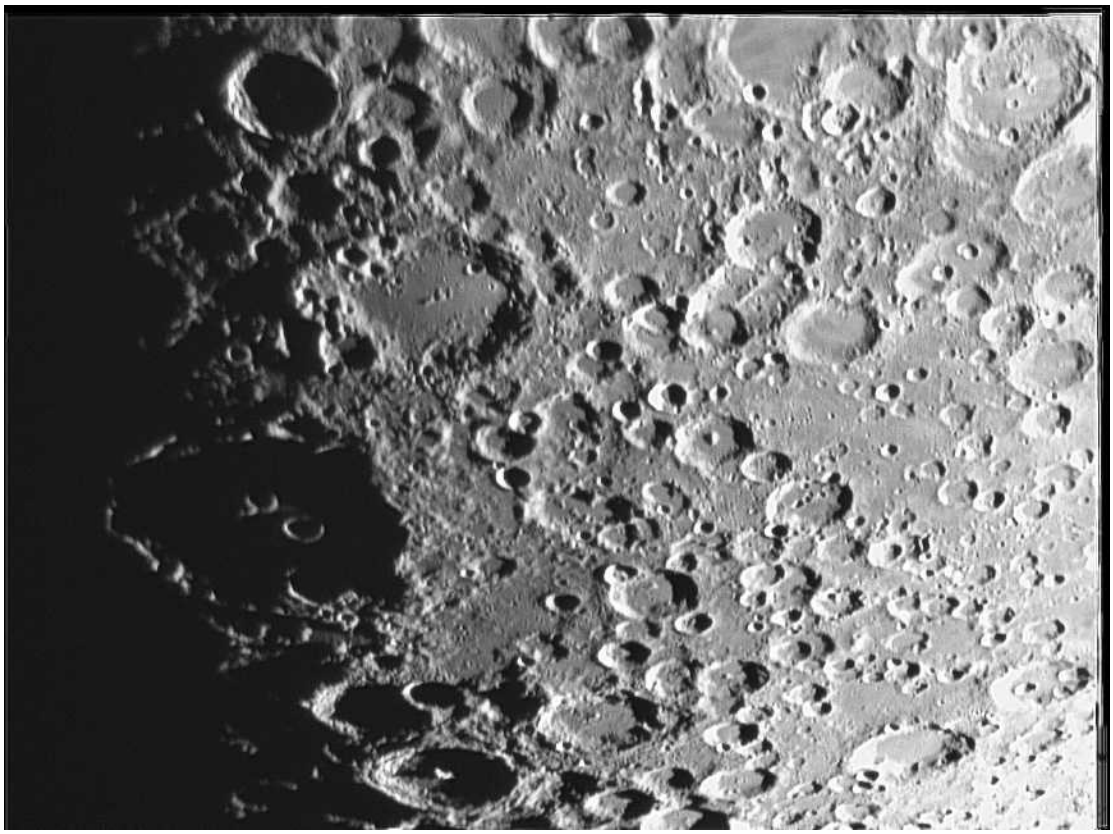
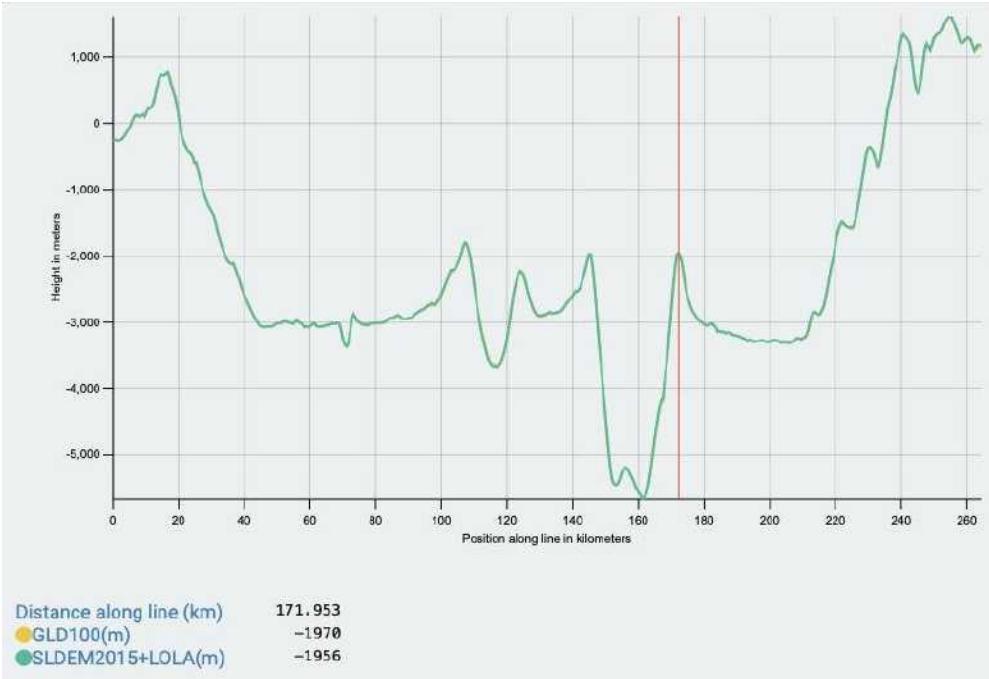


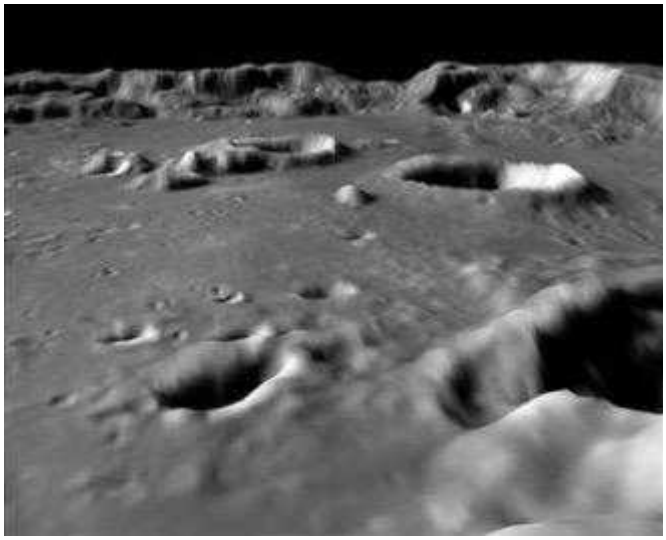
Image taken at 22:22 with a Celestron 8SE and ZWO ASI120MC camera. It was processed in PIPP, AutoStakkert, Registax and Photoshop elements.

I was intrigued by how this effect had been created. It clearly required the local Sun angle to be very low.

QuickMap provided a profile to give me heights and distances. I determined the height difference between the eastern rim mountains and the edge of Clavius D nearest to the mountains, and the horizontal distance between them. Tan^{-1} (height difference/distance apart) gave me an estimate of the angle of the sunlight as it grazed the top of D. It came to 2.5°. I repeated this for the rim of Clavius C furthest from the mountains and got an angle estimate of 1.3°. These very low angles (albeit very rough estimates) show how the sunlight could just touch the tops of the eastern rim of Clavius and still skim over the tops of Clavius C and D. It is also clearly inevitable that some parts of the western rim will be illuminated. Even without calculations, the graph itself hints at this if one remembers that the vertical scale is much exaggerated compared with the horizontal scale. I estimate about 50X in this case.



Measurements across the craters with QuickMap confirmed, to some degree, that areas of C and D rims still in shadow were lower than the rest of the rims, especially the NE part of D. The SW part of C showed up as relatively high. 3D modelling in QuickMap (vertically exaggerated) roughly shows that the parts of the rim which are unlit are the lower parts of the rims as one would expect.



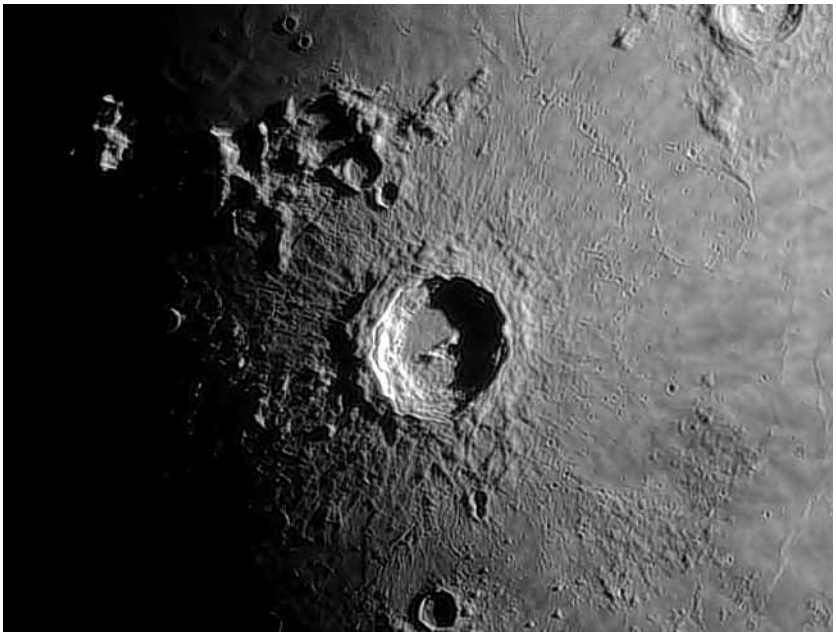
3D modelling of the whole of Clavius shows that you can just peer over the eastern rim and see the tops of C and D and the western rim which was also illuminated. It is interesting to contemplate how this would all appear from the vantage point of a future astronaut, standing on the shadowed floor of Clavius, as the sun rose over its eastern rim.'

By coincidence, the Director imaged Clavius just an hour or so earlier the same evening (see below).

Clavius, 30 May 2020, 21-19 UT, OMC300 Mak-Cass (Bill Leatherbarrow)

IMAGES GALLERY

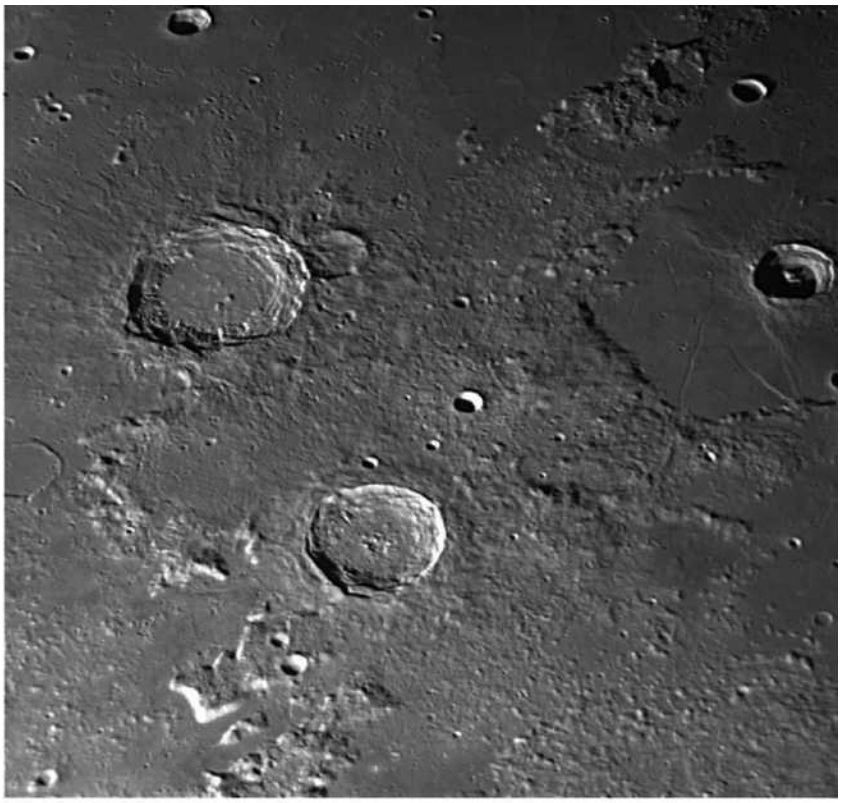
George Whiston imaged Copernicus on 31 May 2020 at 19.50 UT, using a C11.



Jansen, rimae Jansen, dorsa Barlow 2020.05.28 20:52 UT, S Col. 349.5°,
seeing 5/10, transparency good. Libration: latitude -4°35', longitude -05°59'
305mm Meade LX200 ACF, f 25, ZWO ASI 120MMS camera, Baader IR pass filter: 685nm.
640 frames processed in Registax 6 and Paintshop Pro 8.
Dave Finnigan

Maskelyne and rima 2020.05.28 20:59 UT, S Col. 349.5°, seeing 5/10, transparency good.
Libration: latitude -04°35', longitude -05°59'
305mm Meade LX200 ACF, f 25, ZWO ASI 120MMS camera, Baader IR pass filter: 685nm.
640 frames processed in Registax 6 and Paintshop Pro 8.
Dave Finnigan, Halesowen

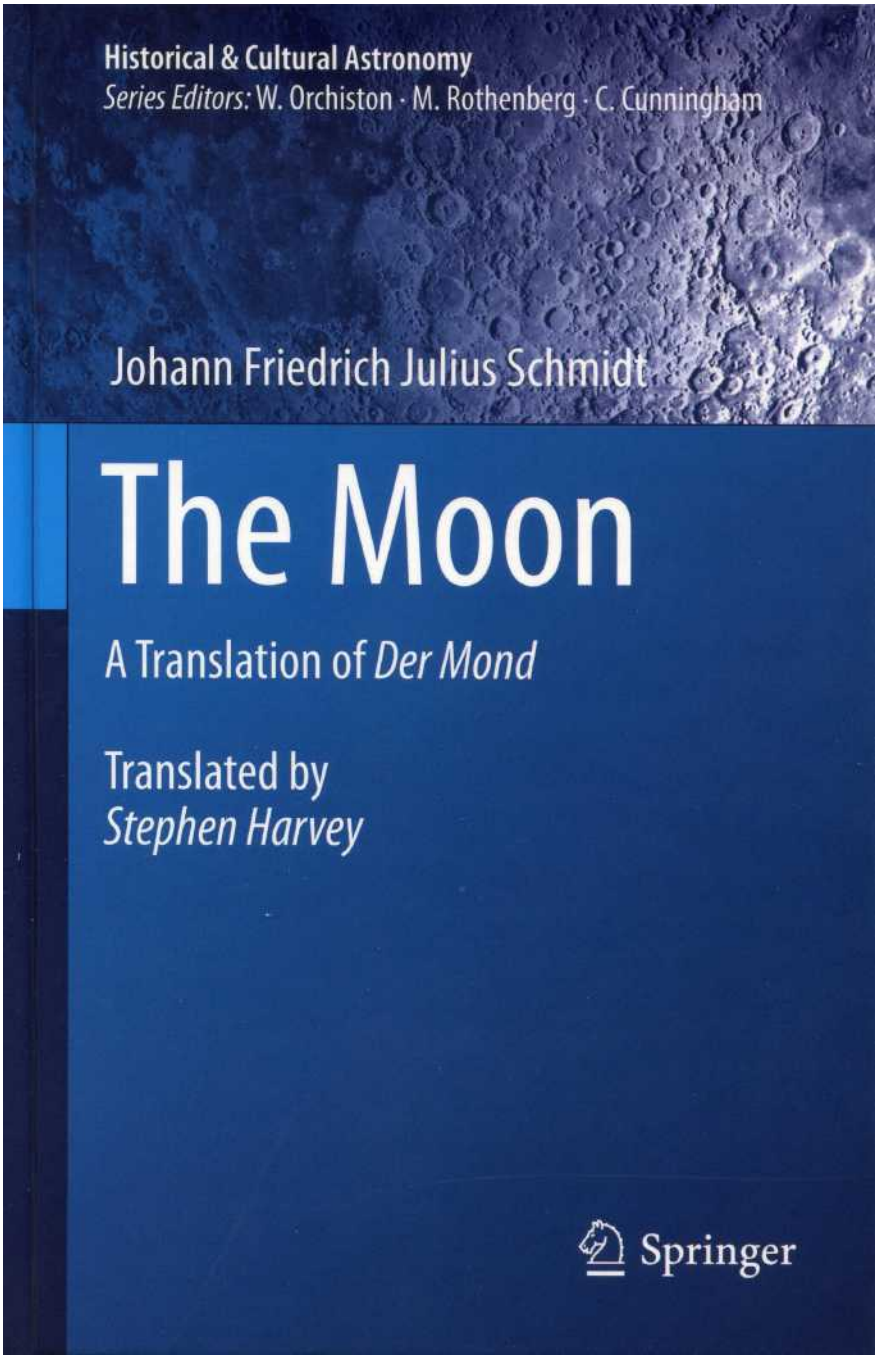
Proclus and surrounding area under high sun 2020.07.27 - 19.10 UT
300mm Meade LX90, ASI 224MC Camera with Pro Planet 742nm I-R
Pass Filter. 400/4,000 Frames. Seeing: 6/10. Rod Lyon



Aristoteles & Eudoxus 2020.08.08 - 06.08 UT
300mm Meade LX90, ASI 224MC Camera with Pro Planet 742nm
I-R Pass Filter. 400/4,000 Frames. Seeing; 7/10 Rod Lyon

NEW TRANSLATION OF A SELENOGRAPHICAL CLASSIC

J.F.J. Schmidt's classic study *Der Mond* (1856) is now available in an English translation by Steve Harvey, Director of the BAA's Computing Section. Published by Springer at £99.99 (hardback), the edition is expensive, but nevertheless Steve is to be congratulated in reviving interest in a long-neglected classic.



DETECTION AND IDENTIFICATION OF TWO RILLE-LIKE FEATURES SOUTH OF CRATER LINNÉ G

Raffaello Lena and KC Pau

Introduction and observations

When Pau processed an image of Montes Caucasus, taken on 1 March 2020 at 11h33m UT, Colong 350º with his 250mm f/6 Newtonian reflector, like every other lunar amateur, his focus was on the mountains and the nearby Valentine dome. All of a sudden, a faint dark streak, south of crater Linné G, flashed into his eyes. Scanning this area carefully, Pau could confirm the streak was not an artifact. It was really there. Later, he compared the image with the LROC QuickMap (http://target.lroc.asu.edu/da/qmap.html). The same location shows faintly a delicate dark line (Fig. 1).

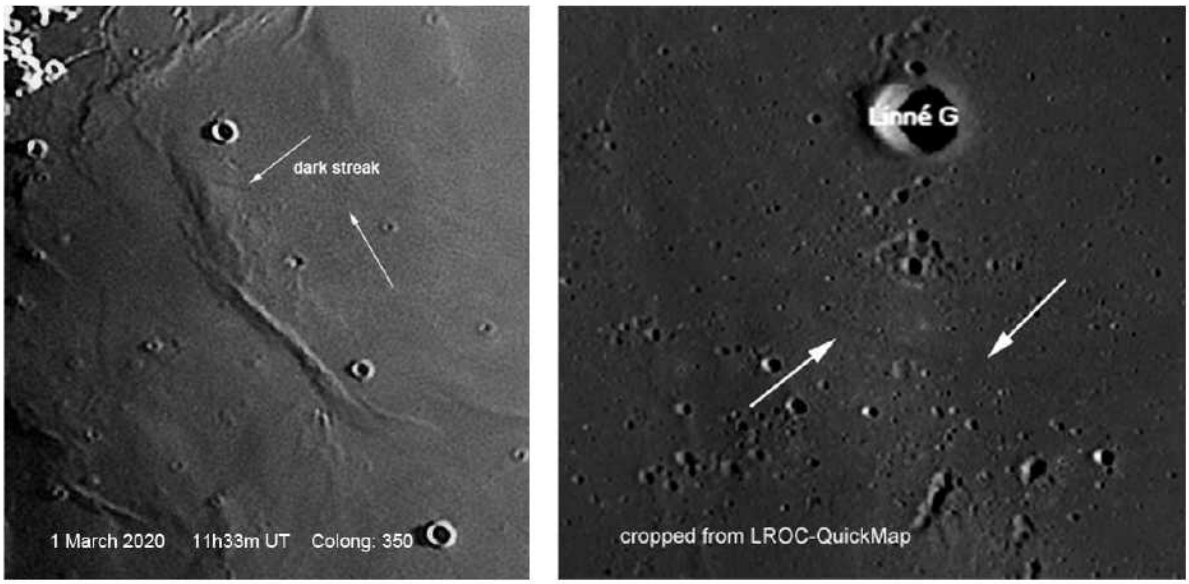


Fig. 1: Image by Pau (left). The dark streak is marked with white lines. Cropped image from LROC QuickMap (right).

Pau sent both his own image and that derived from QuickMap to the Director for his advice. His response was it looked like a tiny rille. The resolution of the image is not good enough to confirm that the streak is a real rille. Recently, Pau worked through his archive of lunar images and he found one image that had better resolution of the dark streak. In this image the streak looks really like two rilles that run parallel to each other (Fig. 2). The image was taken on 11 September 2017 at 21h05m UT, Colong 162º. Equipment used is same as the previous image, with a 2.5X Barlow and a QHYCCD290M planetary camera.

Pau sent the latest image to the Director for his advice. He advised Pau to contact Raffaello Lena for further analysis and interpretation. In fact the examined features do not really show up as such on QuickMap elevation profiles and 3D modelling.

Many rilles existing on the surface of the near-side Moon have been created by volcanism and tectonism. Some lunar rilles need an appropriate illumination condition to identify them, such as the *Rima Sheepshanks*. In this preliminary note we examine these two rille-like features using the LOLA DEM data set and the LTVT software

package. Finally the Chandrayaan-1 M^3 data set was used to derive spectra that highlight mineralogical characteristics of lunar volcanic materials.

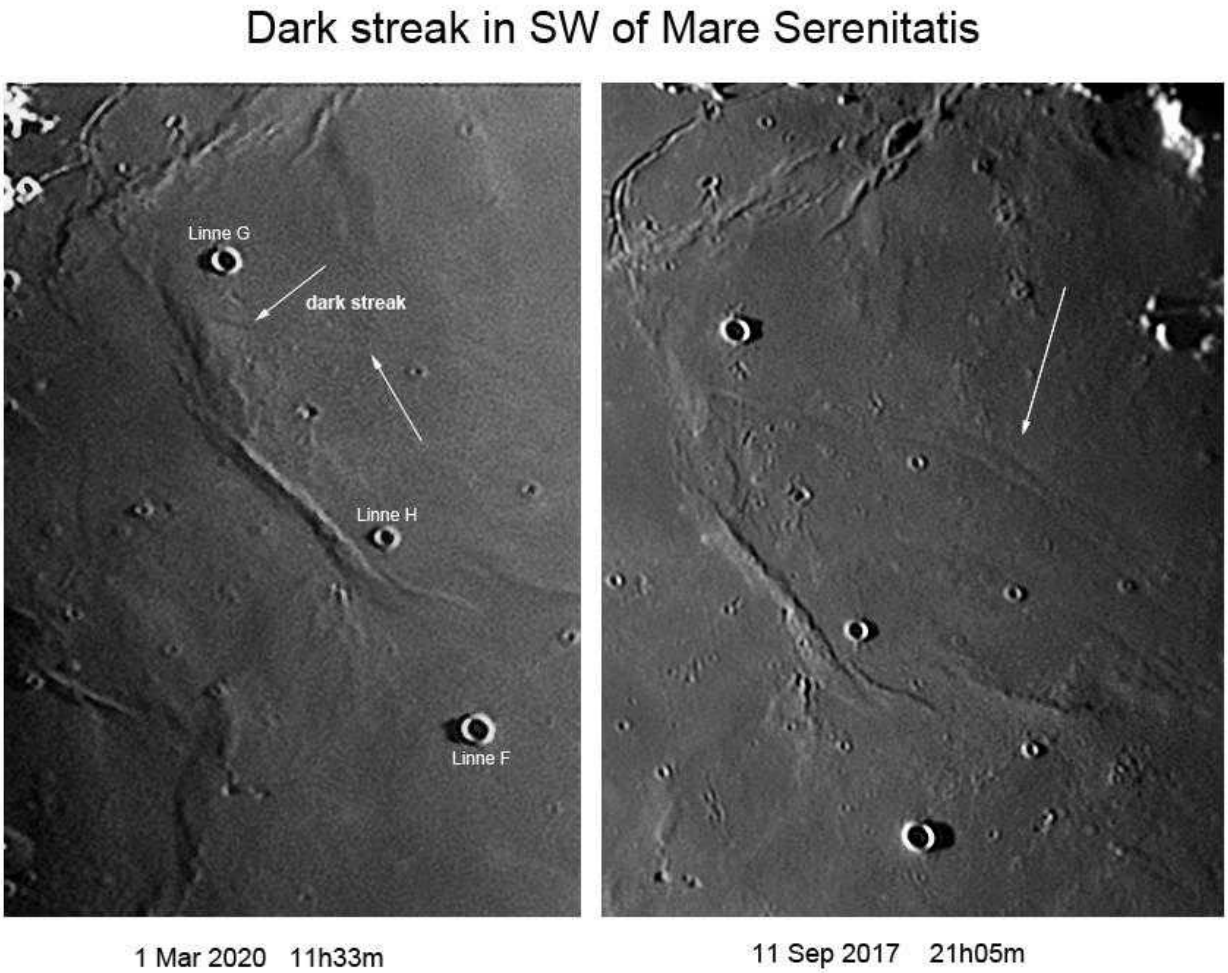


Fig. 2: Images by Pau as described in the text. In the image taken on 11 September 2017 two rille-like features run parallel to each other.

Rendered Images of the examined rille-like features based on LOLA DEM

Generating an elevation map of a part of the lunar surface requires its three-dimensional (3D) reconstruction. Recently, a global lunar digital elevation map (DEM) obtained with the Lunar Orbiter Laser Altimeter (LOLA) instrument on the Lunar Reconnaissance Orbiter (LRO) spacecraft has been released. A synthetic image of the lunar surface can be generated based on an available DEM as seen from a given direction for lighting from some other specified direction. The LTVT software by Mosher and Bondo was used to generate a synthetic view of selected parts of the LOLA DEM.

A rendered image displays the shadow length cast by a dome and or a crater and is useful for simulating particular situations, showing how rapidly the appearance of these features changes with increasing solar elevation. LOLA DEM was thus used for rendered images with different solar illumination angle, which show the examined structures at times of 3h00m UT, 5h00m UT, 8h00m UT and 11h30m UT respectively

of the same day as Pau's first image (cf. Figs 3-6). The simulation effectively displays two rilles that run parallel to each other (termed R1 and R2 and marked with white lines).

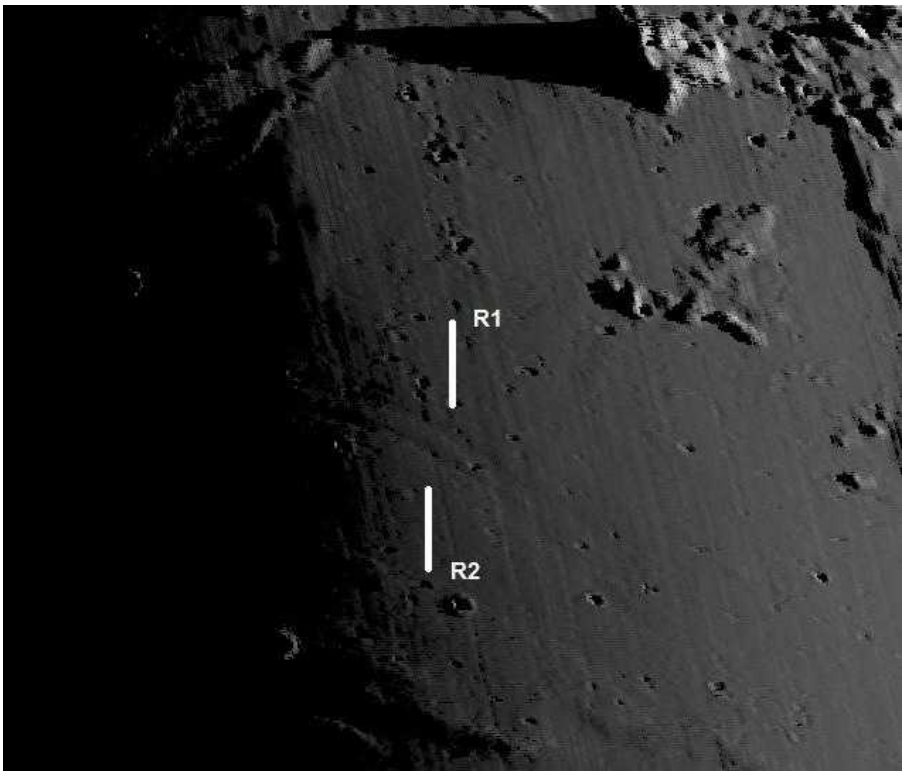


Fig. 3: Rendered image based on the LOLA DEM using LTVT for 1 March 2020 at 03h00m UT.

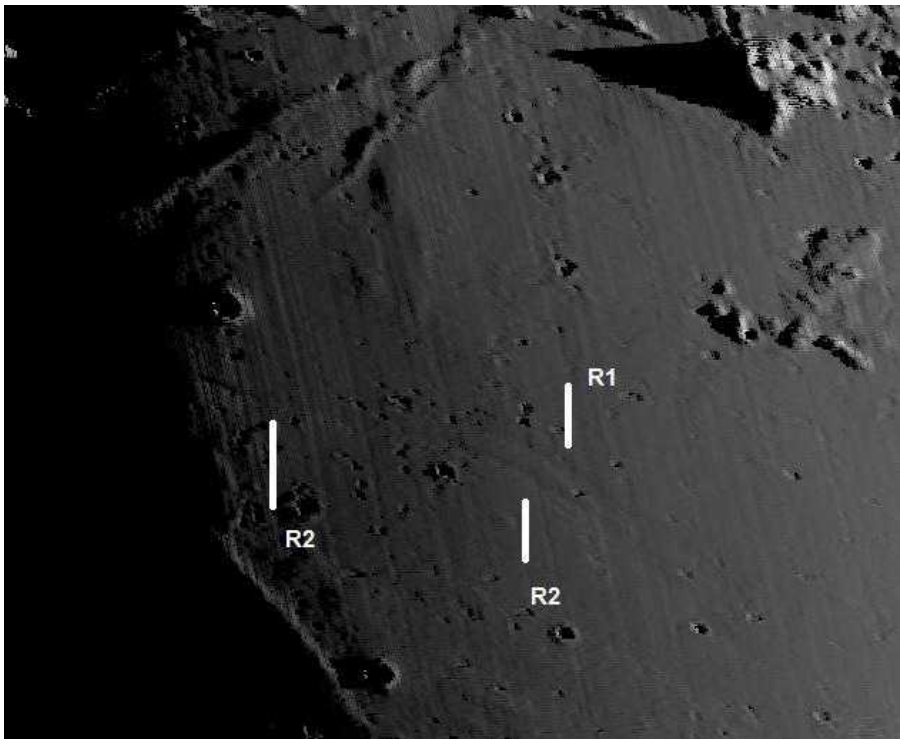


Fig. 4: Rendered image based on the LOLA DEM using LTVT for 1 March 2020 at 05h00m UT.

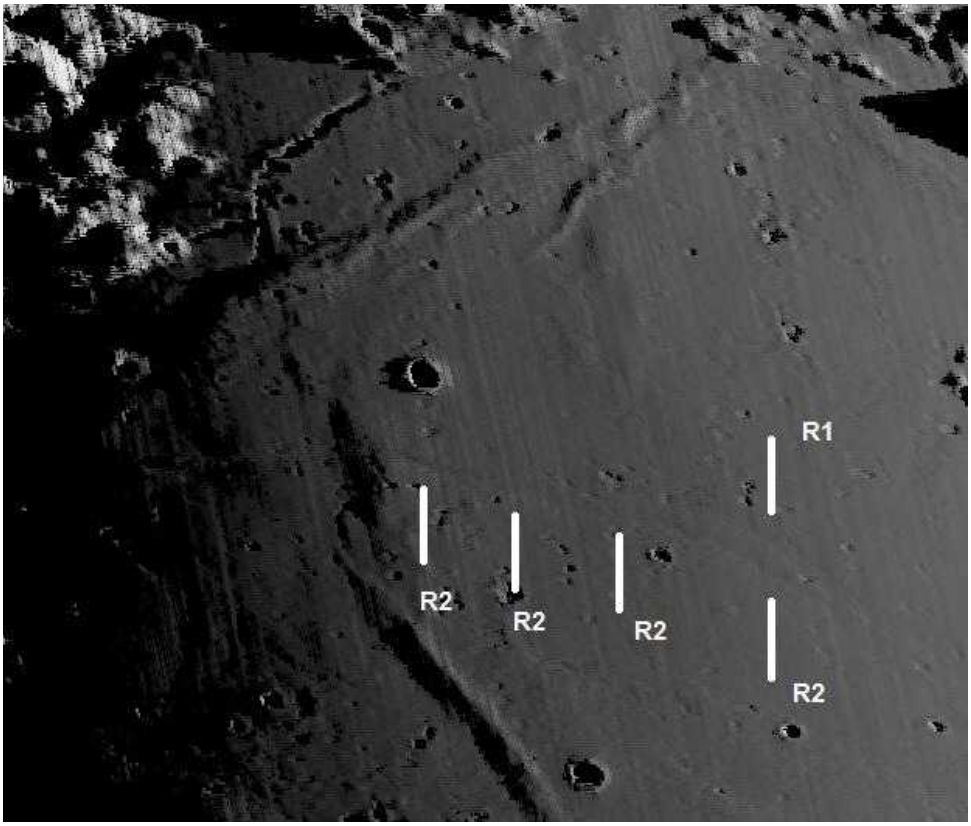


Fig. 5: Rendered image based on the LOLA DEM using LTVT for 1 March 2020 at 05h00m UT.

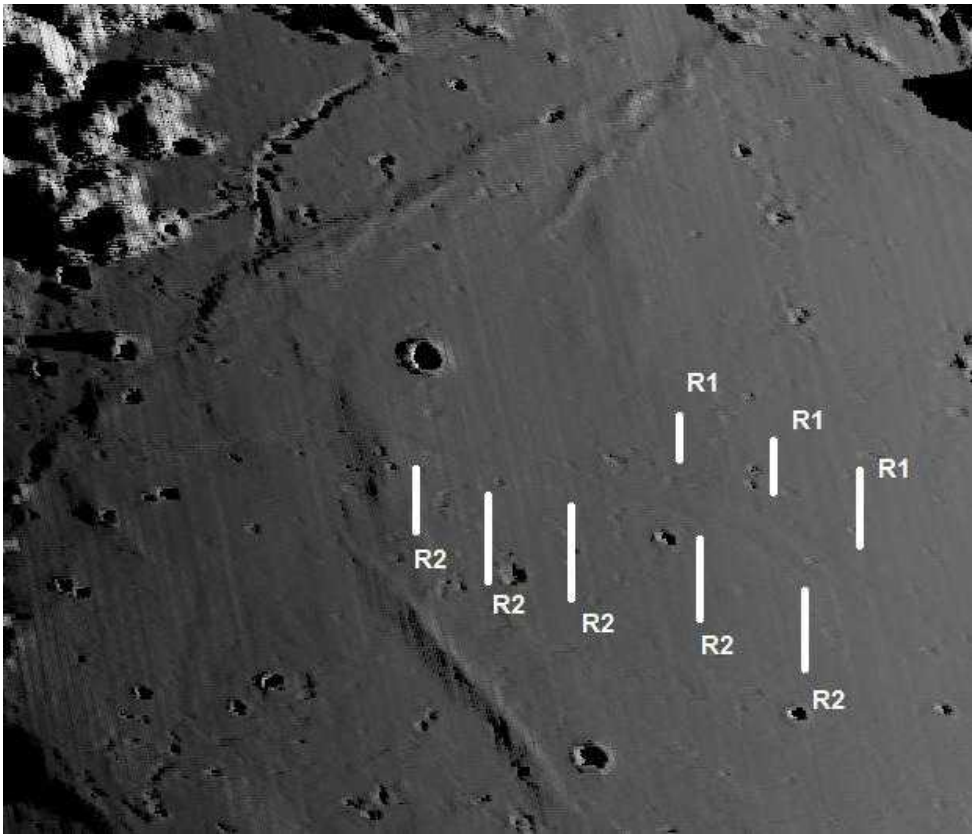


Fig. 6: Rendered image based on the LOLA DEM using LTVT for 1 March 2020 at 011h30m UT.

Thus the rendered images based on LOLA DEM indicate the real presence of these elusive features: they are clearly detectable under a strongly oblique solar illumination angle (about 1°, see Fig. 4).

Spectral Analysis

M^3 is an imaging reflectance spectrometer that can detect 85 channels between 460 to 3000 nm, and has a spatial resolution of 140 or 280 meters per pixel. Data have been obtained through the M^3 calibration pipeline to produce reflectance with photometric and geometric corrections using image set taken during the optical period OP1B. A continuum removal method that enhances the features in the 1000 nm absorption band and more accurately shows the position of the band centre has been used fitting a straight line between 750 and 1500nm to remove the continuum (Fig. 7).

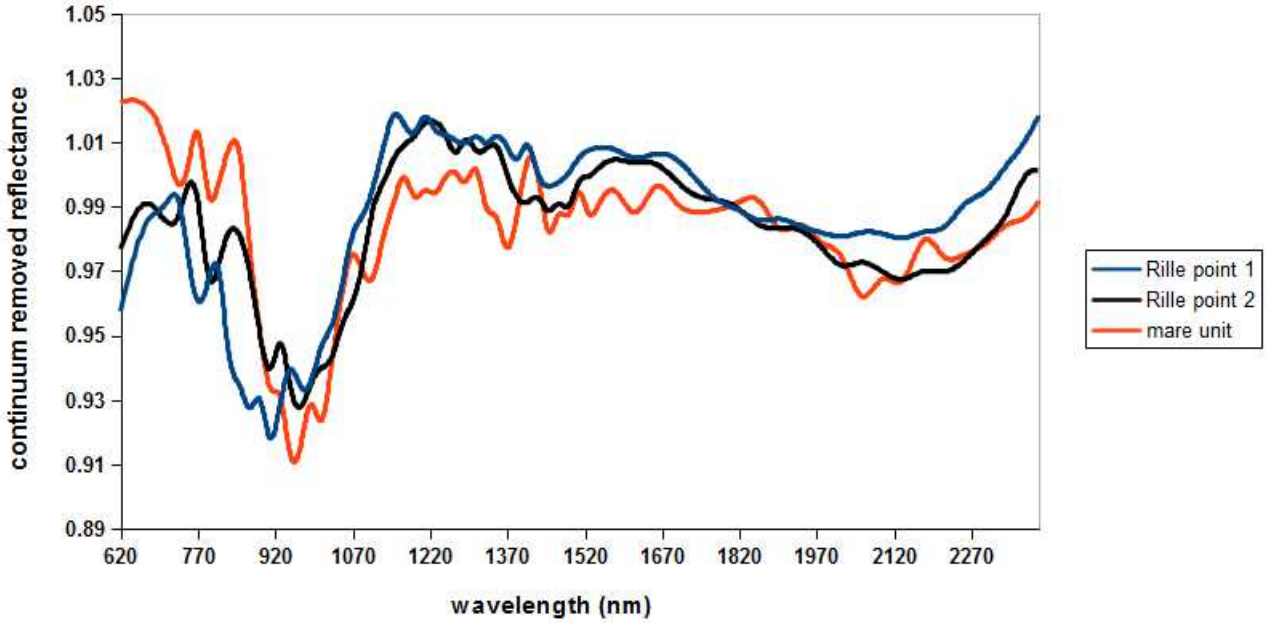


Fig. 7: Moon Mineralogy Mapper (M^3) spectra of the examined features (rille point 1 and point 2 at 35.49° N 13.06° E and 35.44° N 13.15° E) and the mare unit (35.50° N 13.72° E).

The spectra of the two points of the rille R2 (Fig. 7) display a narrow trough around 1000nm with a minimum wavelength at 960nm and an absorption band at around 2000nm, corresponding to a typical pyroxene signature, indicating a basaltic composition. Fig. 7 also display the spectrum of the mare unit (35.50° N 13.72° E) with similar absorption bands, demonstrating the basaltic composition of the examined features described in the current article.

Summary and Conclusion

Our data show very clearly there are two long and elusive rille-like features oriented roughly radially with respect to Mare Imbrium. There are small craters present on the floors of both rilles (from LROC WAC imagery), which suggests that the rilles are older than those superimposed craters. R1 and R2 look like degraded old structures,

rille-like features or valleys, which deserve further investigation and imagery. We encourage more high-resolution imagery of this area so we can have more data to identify their shape and size. Please check your past imagery and send any likely results to us for the ongoing study.

It once again shows that with today's imaging technology, there is still a chance for amateurs to study elusive features on the Moon. In combination with high-resolution images, such investigations might greatly extend our present knowledge of the processes that occurred on the Moon.

References

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LUNAR OCCULTATIONS September 2020 Tim Haymes

Time capsule: 50 year ago (LSC Vol. 5, No.9)

[With thanks to Stuart Morris for the LSC archives]

Novosti (USSR) – 'Breath of the Moon' – account of the Kozyrev TLP. J. Hedley-Robinson suggest there is actually no 'bridge' on the Moon and cautions observers on their interpretations.

G.J. Kirby (Weymouth) reports his last 10 occultation observations and includes his residuals (O-C) from the RGO reduction. For DD events the range was: +0.65 to +0.06 arcsec.

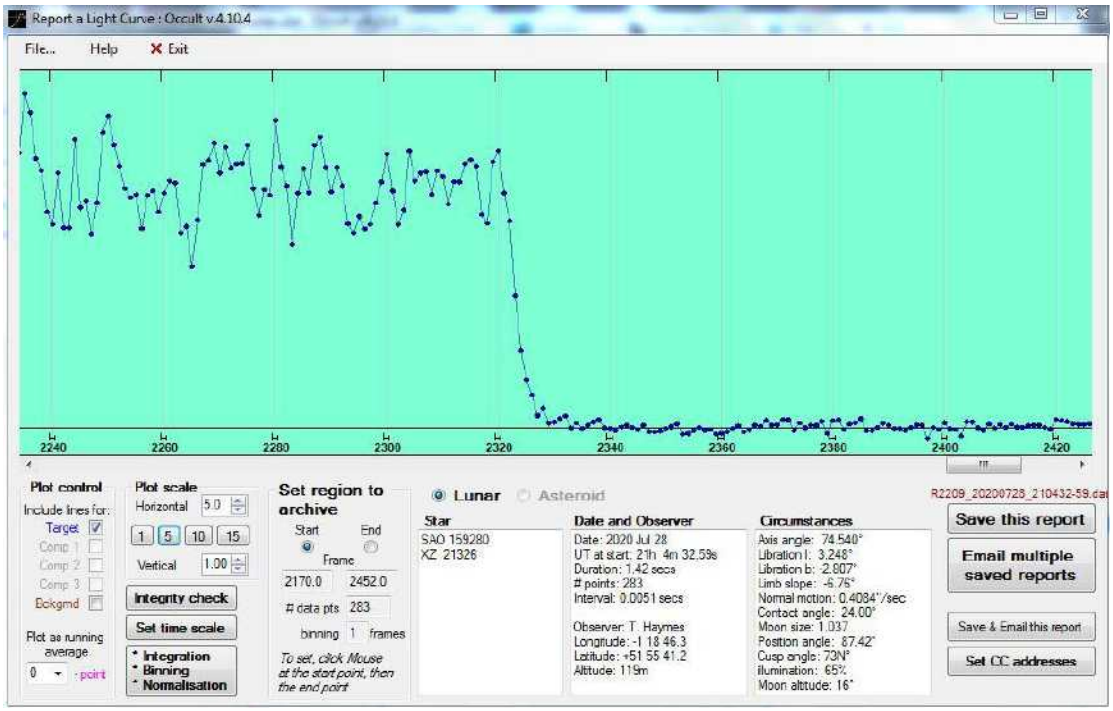
2020 August

Cloud and heavy rains for the mornings of 14th and 15th curtailed observation of the crescent passing through Taurus and Gemini. However the coordinator had better luck with 32 Libra at the end of July.

32 Lib at high frame rate

On the evening of July 28 at 2104UT the coordinator set up his QHY174m_GPS camera at 200 fps (5ms) with reduced area of interest (AOI) to allow the faster data collection. An AVI was obtained of the dark limb disappearance. The star was bright enough with C11 and focal reducer and a light curve was obtained with TANGRA software. The duration occurred over 5 frames, that is 25ms. At a normal video frame rate (25fps, 40ms) the event would have appeared instantaneous. The time in Occult 4 was reported with higher precision.

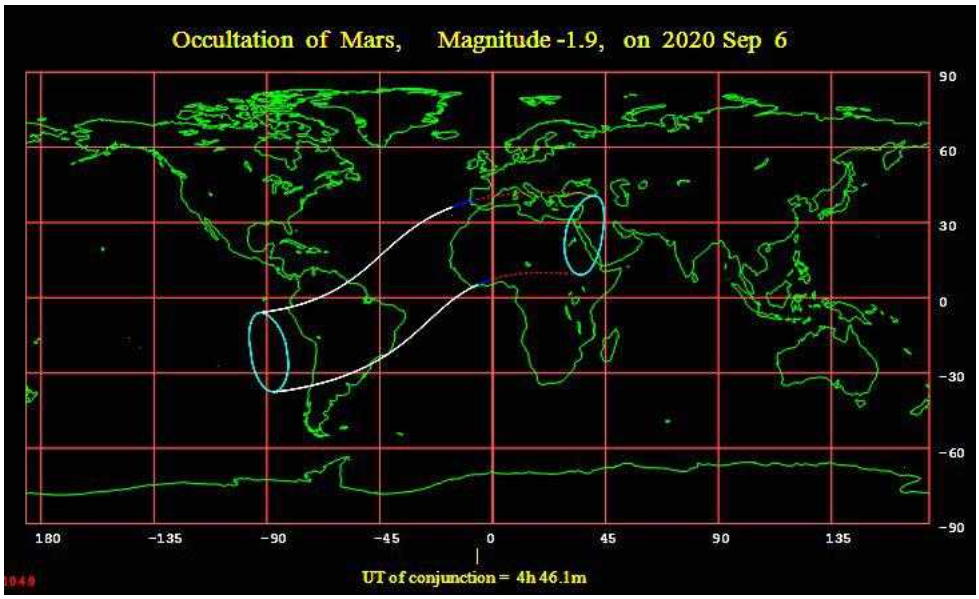
Fig 1: Small section of the 32 Libra light curve around the point of emersion at the lunar dark limb. The figure indicates frame numbers counted from the time of the first point selected by Occult4 during light-curve submission process.
Each point is 5ms



Conjunction with Mars

The Moon will be about 0.3 deg South of Mars (from the UK) on Sep 6th at 0500 UT, just before sunrise.

Fig. 2 An occultation during darkness can be seen from South America.



2020 September predictions for Manchester (Occult4 by D.Herald).
W. Long. 002d 15', N Lat. +53 25', Alt. 50m

y	m	day d	Time h	m	s	Ph	Star No	Sp	Mag v	Mag r	% ill	Elon	Sun Alt	Moon Alt	Moon Az	CA o	Notes
20	Sep	3	21	45	28.6	R	18	K1	5.8	5.3	97-	160		16	122	77S	Dbl*
20	Sep	5	4	54	53.2	R	150	F1	6.1	5.9	92-	147	-5	29	227	43N	26 Ceti
20	Sep	6	23	29	40.2	R	110516	K0	6.9*	6.4	80-	127		26	109	58N	
20	Sep	7	1	6	17	Gr	362	F5	6.5	6.2	80-	127		39	** GRAZE:		Near Birmingham
20	Sep	7	1	8	1	M	362	F5	6.5*	6.2	80-	127		38	133	15N	25 ceti
20	Sep	8	2	40	26.4	R	93362	F8	8.0	7.7	71-	115		47	145	47S	
20	Sep	11	0	25	56.7	R	861	K2	6.4	5.7	43-	82		17	75	74S	
20	Sep	11	3	1	7.3	R	77559	K0	7.6	7.0	42-	81		40	105	67S	
20	Sep	11	5	24	27.9	R	887	K5	7.0	6.1	42-	80	-3	57	147	55N	Dbl*
20	Sep	11	12	11	11.0	R	916	G7	4.3		39-	78	41	24	277	62S	1 Gem Dbl*
20	Sep	12	0	38	18.7	R	1017	K0	6.8		33-	71		12	67	83S	Dbl*
20	Sep	12	1	33	33.8	R	1024	F5	7.4	7.2	33-	70		20	77	85S	
20	Sep	12	3	52	47.1	R	78707	K2	7.2	6.5	32-	69		40	104	44S	
20	Sep	12	4	37	31.2	R	78733	F5	7.8	7.5	32-	69	-10	46	115	43S	Dbl*
20	Sep	13	0	36	58.6	R	79527	G5	7.3	6.8	24-	58		5	57	52S	
20	Sep	13	2	52	8.8	R	1161	K5	5.9	5.1	23-	57		23	82	40S	
20	Sep	13	2	52	16.5	R	79603	A2	8.4		23-	57		23	82	87N	
20	Sep	13	3	13	29.8	R	79616	A0	8.2	8.1	23-	57		26	86	58S	
20	Sep	13	3	51	50.0	R	79634	K0	8.5	7.9	23-	57		32	93	81N	
20	Sep	13	4	29	12.7	R	79657	K5	7.4	6.6	22-	56	-11	37	100	64N	
20	Sep	13	4	43	10.1	R	79663	K0	7.5*	6.9	22-	56	-9	39	104	40S	
20	Sep	14	4	54	24.1	R	80388	K0	8.1	7.5	14-	44	-8	31	96	24S	
20	Sep	15	4	21	9.4	R	98711	F2	8.9	8.7	7-	31		15	81	61N	Dbl*
20	Sep	27	21	10	15.9	D	3164	B3	4.5*	4.6	85+	135		17	178	80N	epsilon Cap
20	Sep	28	0	44	52.3	D	3175	G8	4.7*	4.3	86+	136		6	227	78N	kappa Cap
20	Sep	30	23	37	39.9	D	3536	M3	4.4	3.5	99+	168		31	182	56S	30 Psc Dbl*
20	Oct	2	22	54	25.1	R	210	B9	6.6	6.7	99-	167		35	144	51S	
20	Oct	3	23	23	30.9	R	322	G0	5.6	5.3	96-	157		39	139	82N	64 ceti
20	Oct	3	23	36	17.7	D	327	G8	4.4	3.9	96-	157		40	142	-30N	xi Ceti Dbl*
20	Oct	4	0	38	8.9	R	327	G8	4.4	3.9	96-	156		44	162	75N	xi Ceti Dbl*
20	Oct	5	5	6	9.9	R	93261	G8	7.4*	6.9	91-	144	-12	38	236	47S	
20	Oct	5	21	12	0.0	R	527	K0	6.2	5.7	86-	136		17	84	76N	

Predictions up to October 5th

Notes on the Double Star selection.

Doubles are selected from Occult 4, where the fainter companion is brighter than mag 9.0, and the time difference(dT) is between 0.1 and 10 seconds. **Please report double star phenomena.**

Key:

P = Phase (R or D), **R** = reappearance **D** = disappearance
M = Miss at this station, Gr = graze nearby (possible miss)
CA = Cusp angle measured from the North or South Cusp.
Dbl* = A double star worth monitoring. Details are given for selected stars.
Mag(v)* = asterisk indicates a light curve is available in Occult-4
Star No:
1/2/3/4 digits = Zodiacal catalogue (ZC) referred to as the Robertson catalogue (R)
5/6 digits = Smithsonian Astrophysical Observatory catalogue (SAO)
X denotes a star in the eXtended ZC/XC catalogue.
The ZC/XC/SAO nomenclature is used for Lunar work. The positions and proper motions of the stars in these catalogues are updated by Gaia.

Detailed predictions at your location for 1 year are available upon request.
Occultation Subsection Coordinator: Tim Haymes

LUNAR GEOLOGICAL CHANGE DETECTION PROGRAMME

Tony Cook

Introduction: For the set of observations received in the past month, these have been divided into three sections: Level 1 is a confirmation of observations received for the month in question. Every observer will have all the features observed listed here in one paragraph. Level 2 will be the display of the most relevant image/sketch, or a quote from a report, from each observer, but only if the date/UT corresponds to similar illumination (±0.5º) and topocentric libration (±1.0º) for a past TLP report, or a Lunar Schedule website request. A brief description will be given of why the observation was made, but no assessment done – that will be up to the reader. Level 3 will highlight reports, using in-depth analysis, which specifically help to explain a past TLP, and may (when time permits) utilize archive repeat illumination material.

TLP reports: No TLP were reported in July.

Level 1 – All Reports received for June

Jay Albert (Lake Worth, FL, USA - ALPO) observed: Agrippa, Aristarchus, Grimaldi, Plato, Pytheas and Sharp. Alberto Anunziato (Argentina - SLA) observed: Bürg, Curtis, Proclus, Rabbi Levi, Walther and several features. Aylen Borgatello Alaniz (Argentina – AEA) imaged: Aristarchus. Maurice Collins (New Zealand – ALPO/BAA/RASNZ) imaged: several features. Vincenzo della Vecchia (Italy – UAI) imaged Aristarchus. Walter Elias (Argentina – AEA) imaged: Censorinus, Dionysius, Helicon, Messier, the whole Moon, Moretus, Plato and Sharp. Valerio Fontani (Italy – UAI) imaged Ptolemaeus. Marina Lorena Grandolio (Argentina – AEA) imaged:

Aristarchus, Censorinus, Dionysius and Messier. Rik Hill (Tucson, AZ, USA - ALPO/BAA) imaged: Janssen. Gabriel Re (Argentina – AEA) imaged: Aristarchus. Leandro Sid (Argentina – AEA) imaged: Agrippa, Alphonsus, Aristarchus, Bullialdus, Censorinus, Dionysius, Gassendi, Godin, Mare Crisium, Marius, the whole Moon, Sharp and Vieta. Trevor Smith (Codnor, UK – BAA) observed Adams D. Bob Stuart (Rhayader, UK – BAA/NAS) imaged: several features. Franco Taccogna (Italy – UAI) imaged Mare Frigoris. Aldo Tonon (Italy – UAI) imaged: Mare Frigoris. Fabio Verza (Italy – UAI) imaged: Mare Frigoris.

Level 2 – Example Observations Received

Aristarchus area: On 2020 Jul 12 UT 09:37-10:55 UAI observers Marina Lorena Grandolio, Gabriel Re and Aylen Borgatello Alaniz imaged this area under similar illumination to the following two reports:

On 1995 Apr 03 at UT 03:30 Unknown Observer (Transparency good) saw a darkening in the Cobra Head, Schroter's valley area of Aristarchus - the best example that he had ever seen. The Cameron 2006 catalog ID=474 and the weight=3. The ALPO/BAA weight=. Reference - BAA Lunar Section circular 1995 Oct, p125 and personal communication from David Darling to the BAA on 6/6/1995. Note it is uncertain whether this refers to the Clementine mission or to somebody who observed during the Clementine mission, or somebody with that surname. Anyway, if it is the Clementine mission then the date is wrong - possibly the year should have been 1994? The Cameron catalogue does actually mention a TIFF on Clementine mission? The Cameron 2006 catalog ID=474 and the weight=3. I am assuming that the year should be 1994 and not 1995? The ALPO/BAA catalog weight=1 until we can find out what the correct date is?

Aristarchus 1964 Jul 31 UT 02:00-02:23 Observed by Bartlett (Baltimore, MD, USA, 5" reflector x180) "Deep ravine on E.glacis interrupted midway of its length by apparent break just below rim of craterlet assoc. with EWBS. Normally, ravine is seen continuous. Probable obscuration at pt, of break." S=7, T=5. NASA catalog weight=4. NASA catalog ID #834. ALPO/BAA weight=2.

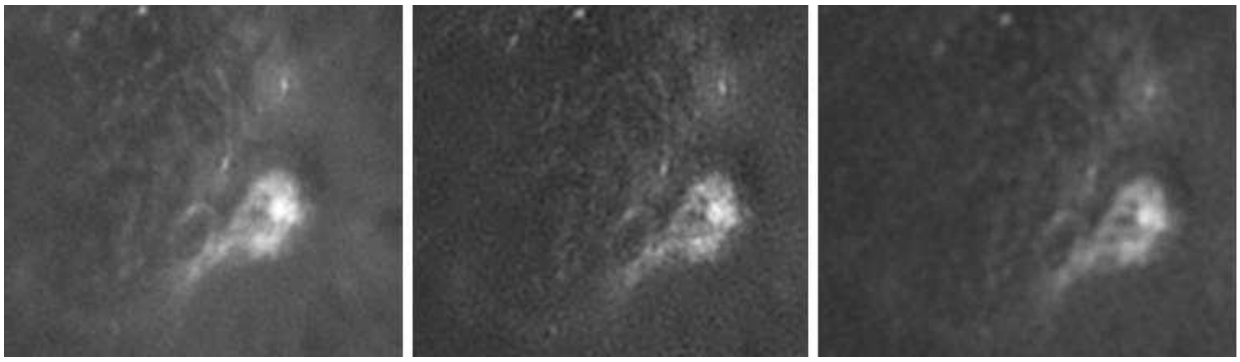


Figure 1. *The Aristarchus region as imaged by AEA observers on 2020 Jul 12 and, orientated with north towards the top.* ***(Left)*** *Taken by Aylen Borgatello Alaniz at 09:27 UT.* ***(Centre)*** *Taken by Marina Lorena Grandolio at 09:38 UT.* ***(Right)*** *Taken by Gabriel Re at 10:54 UT – N.B. this image was outside the Vallis Schröteri similar illumination window.*

Plato: On 2020 Jul 12 UT 10:54 Walter Elias (AEA) imaged Plato under similar illumination to the following report:

On 1944 Aug 12 at UT 04:00 H.P. Wilkins (Kent, UK, 8.52" reflector) observed that central craterlet in Plato was unusually bright and shows up as a bright white spot on his sketch - though this might have been artistic

license in his sketch. His written notes refer to the unusual lack of a rim (especially the northern part) to this craterlet. The ALPO/BAA weight=2.

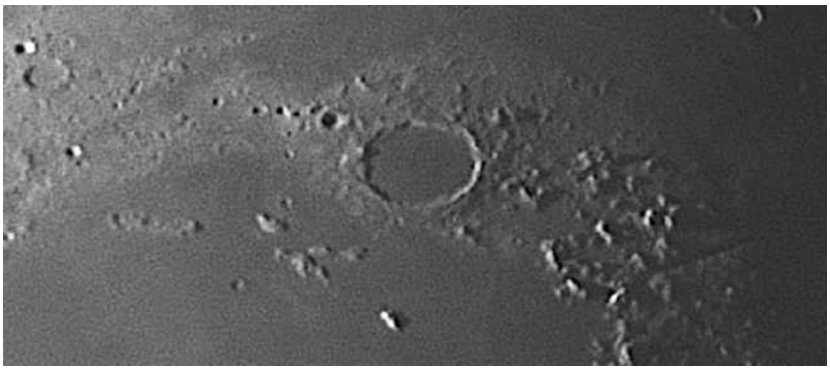


Figure 2. *Plato on 2020 Jul 12 UT 10:54 as imaged by Walter Elias (AEA) and orientated with north towards the top.*

Walther: On 2020 Jul 25 UT 23:25-23:35 Alberto Anunziato (SLA) observed visually this crater under similar illumination to the following report:

On 1962 Sep 05 at UT 00:48-00:55 Chalk (USA?) observed in the vicinity of Walther a faint point of light, near the terminator. Cameron suspects an illuminated peak in the dark. The Cameron 1978 catalog ID=767 and weight=1. The ALPO/BAA weight=1.

Figure 3. *A sketch, by Alberto Anunziato (SLA) of the region in the vicinity of where Walther should be on the terminator. Made on 2020 Jul 25 UT 23:25-23:35.*

Alberto, using a Meade EX 105 (x154 magnification) commented that he could not identify Walther in the dark, although he could see some bright points near the terminator but located west of Mutus, quite far from Walther – See Fig. 3.

Adams D: On 2020 Jul 27 UT 20:00-20:20 Trevor Smith (BAA) observed visually this crater for a comparison with a TLP report of his:

Adams D On 2019 Sep 06 UT 21:44-22:20 T. Smith (near Great Yarmouth, UK, 90 mm Maksutov, x80, Seeing IV) saw a very bright spot on the SW. rim of Adams D - at first sight looked perhaps raised above the lunar background, but this was just due to its brightness. It was by far the brightest object on the NW quadrant of the Moon. In terms of brightness it was almost but not quite bright as Proclus, but only half the size of Proclus. No colour was seen to the spot. The spot was not emitting any false colour, there was no change in appearance, and there was no ray structure visible either. Observations ceased when the Moon got too low. ALPO/BAA weight=1.

Trevor used the same 90mm Maksutov as used back in 2019, but this time nothing unusual was observed in particular no bright spot was seen to the south rim. He commented that the general area looked quite unremarkable. The selenographic colongitude in 2019 ranged from 1.7º-2.0º and in this 2020 session it was 1.9º-2.0º so the illumination should have been very similar on both occasions although the topocentric libration (viewing angle) may have been different.

Agrippa: On 2020 Jul 27 UT 20:47 Bob Stuart (BAA/NAS) imaged the whole Moon and captured this area under similar illumination to the following report:

Agrippa 1961 Oct 17 UT 00:32-00:52 Observed by Bartlett (Baltimore, MD, USA) described in NASA catalog as: "Shadow of c.p. medium gray, compared with black wall of shadow" 5" reflector x180. NASA catalog weight=4

Figure 4. *Agrippa from a larger image by Bob Stuart (BAA/NAS), taken on 2020 Jul 27 and orientated with north towards the top.*

Mare Frigoris: On 2020 Jul 29 UAI observers Franco Taccogna, Aldo Tonon and Fabio Verza imaged this area under the following lunar schedule request:

UAI Request: Mare Frigoris between Plato and Fontenelle (colongitude from 23-27deg or from 185-190deg), a study of the area by Maurizio Cecchini (member of the PNdR Luna UAI) for the confirmation of a probable volcanic dome in the area. The highest possible resolution achievable, with telescopes at least of 8" aperture or larger, is needed. All images, sketches and visual reports should be e-mailed to: u a i . l u n a . l g c @ g m a i l . c o m

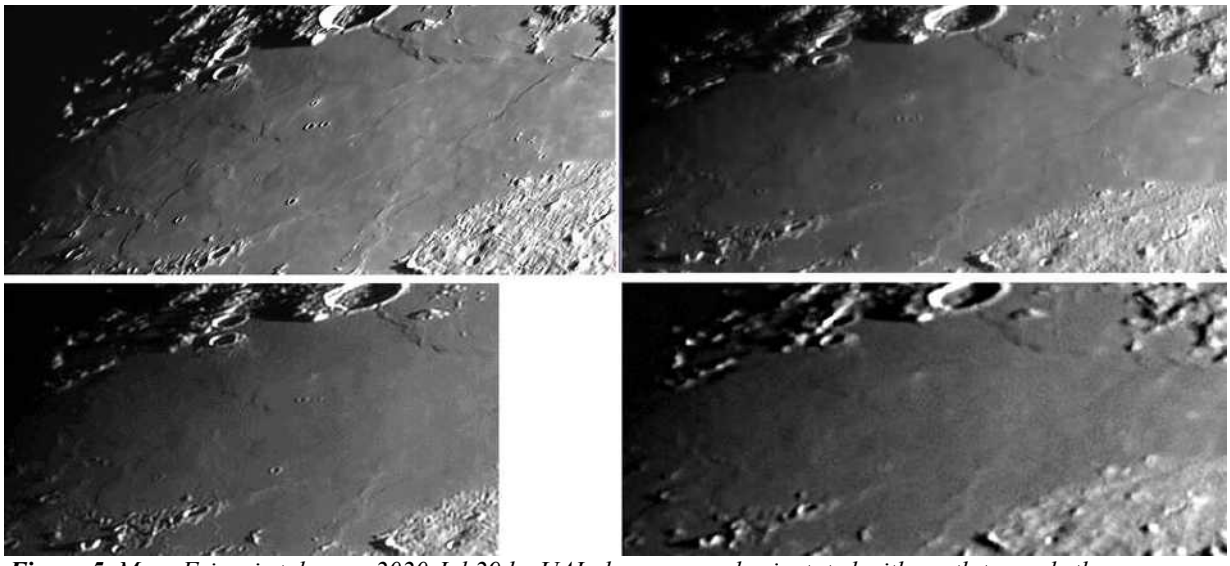


Figure 5. *Mare Frigoris taken on 2020 Jul 29 by UAI observers and orientated with north towards the top.* ***(Top Left)*** *19:34 UT by Vincenzo della Vecchia.* ***(Top Right)*** *19:47UT by Franco Taccogna.* ***(Bottom Left)*** *20:07UT by Fabio Verza.* ***(Bottom Right)*** *21:12UT by Aldo Tonon.*

Alphonsus: On 2020 Jul 30 UT 22:59 Leandro Sid (AEA) imaged the crater in colour when under similar illumination to the following report:

Alphonsus 1959 Feb 18 UT 21:00? Observed by hole (Brighton, England, 24" reflector) "Red patch (Moore in Survey of the Moon says Jan. '59). Moore says, Warner, in Eng. saw it bright red in an 18-in refr. Hedervari & Botha in Hungary saw red patch & several in US (indep. confirm. ?)" NASA catalog weight=5. NASA catalog ID #714. ALPO/BAA weight=5.

Figure 6. *Alphonsus as imaged by Leandro Sid (AEA) on 2020 Jul 30 UT 22:59 and orientated with north towards the top. This image has been colour normalized and had its saturation increased to 70%.*

Level 3 - In Depth Analysis:

Atlas, Censorinus, and Eudoxus: On 2020 Jul 26 UT 07:15 Maurice Collins imaged the whole lunar disk under similar illumination to the following reports:

On 1965 Oct 30 at 23:30-23:50UT Fehring and Garris (Parasmus, NJ, USA, using a 2.4" refractor x88, seeing very good) saw a fuzzy area -- variations in shape and distinctness, seen in an area east of Atlas crater. A drawing was made. It was noted that no other area had a similar effect. Cameron 1978 catalog ID=909 and weight=3. ALPO/BAA weight=3.

On 1881 May 04 at UT 20:00? Trouvelot (Meudon, France) observed an unexplained light inside Eudoxus crater. The Cameron 1978 catalog ID=222 and the weight=3. The ALPO/BAA weight=3.

On 1991 May 19 at UT 22:59 M. Cook (Frimley, UK, 12"? reflector, seeing III-IV) noted that Censorinus was a dull greyish white in colour and the apron was not diffuse. The Cameron 2006 catalog ID=426 and the weight=1.

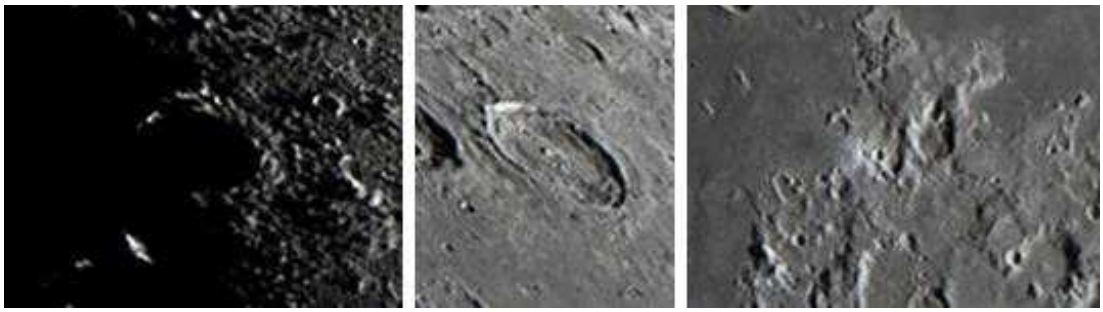


Figure 7. *Sections of an image taken by Maurice Collins (ALPO/BAA/RAS NZ) on 2020 Jul 26 UT 07:15 and orientated with north towards the top.* ***(Left)*** *Eudoxus.* ***(Centre)*** *Atlas.* ***(Right)*** *Censorinus.*

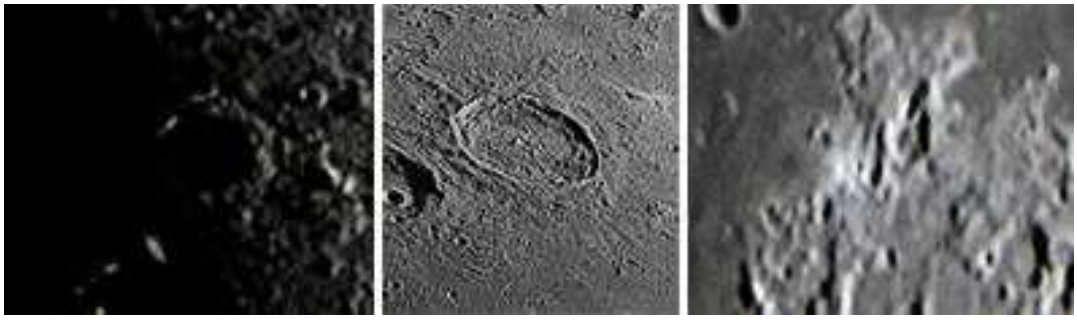


Figure 8. *The following images have north orientated towards the top.* ***(Left)*** *Eudoxus by Maurice Collins (ALPO/BAA/RASNZ) taken on 2016 Feb 14 UT 07:45-07:47.* ***(Centre)*** *Atlas by Rik Hill (ALPO/BAA) taken on 2018 May 21 UT 02:07.* ***(Right)*** *Censorinus by Maurice Collins (ALPO/BAA/RASNZ) taken on 2016 Feb 14 UT 07:45-07:47.*

Just out of interest I looked through the ALPO/BAA archives to see if I could find similar illumination images to those that Maurice took in July (Fig 7) this year and came across those shown in Fig. 8. Apart from resolution issues, they look remarkably similar. Alas the images (Fig. 7 – Left and Fig. 8 – Left) don't really help to explain away Trouvelot's unexplained lights inside Eudoxus. Although I notice that the '20:00' given for the UT may have been guessed at since 20:00 crops up in the Cameron catalog a lot for European observers if the original observation did not mention the time of day. We shall leave the weight at 3 for now, but I will perhaps put a wider range of colongitudes into the Lunar Schedule web site so that we can gain a comprehensive set of sunrise images for this crater. For the Atlas TLP we don't appear to have a drawing in our archives, but at least Maurice's and Rik's images (Fig 7 – Centre and Fig 8 – Centre) show that normally there is nothing which might resemble a fuzzy area east of the crater. We shall therefore leave the weight at 3. Finally, for the Censorinus TLP I was able to track down one of Marie Cook's sketches (See Fig. 9). Looking at Maurice's images (Fig. 7 – Right and Fig. 8 – Right) the appearance looks quite normal at this early stage in illumination, so therefore we shall lower the weight to 0 and remove it from the ALPO/BAA TLP database. Indeed the original observation makes no mention that it is a TLP so this interpretation must have been made at a later date, perhaps when the second Cameron catalog was compiled.

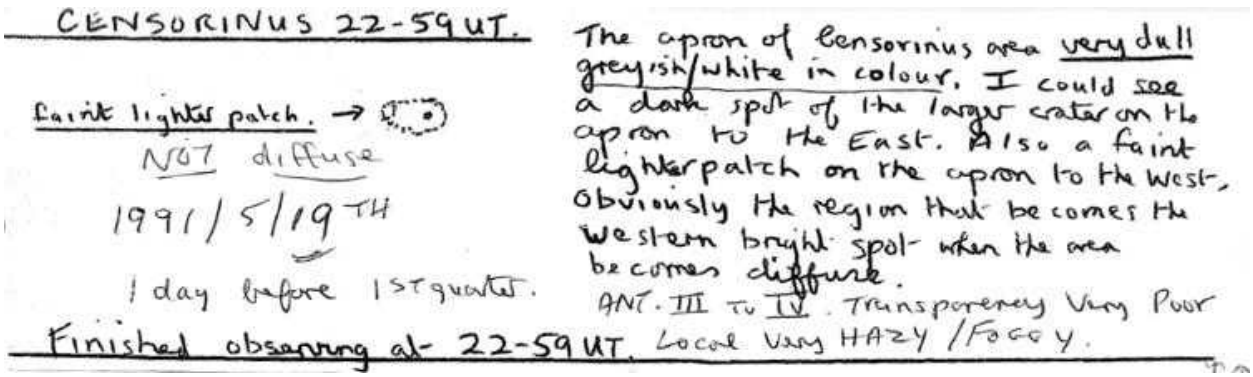


Figure 9. A sketch and handwritten note by Marie Cook (BAA) describing the appearance of Censorinus on 1991 May 18 UT 22:59. The sketch has been re-orientated to place north at the top and re-annotated so that the labels aren't upside down.

Ptolemaeus: On 2020 Jul 28 UT 20:37-21:07 Valerio Fontani (UAI) made a time sequence of images of this crater for the following Lunar Schedule request:

BAA Request: Examine the floor visually, sketch, or image to show the progression of the shadow spires across floor and the emergence of the centre of the floor into sunlight. If observing visually, how would you describe the appearance of the central lit area on the floor? If imaging, do a time lapse e.g. 1 image per minute to show the progression of the shadow spires. We are asking for these observations following an observation by P. Shepherdson (BAA) on 2020 Feb 01 UT 19:40-19:50 who commented on an unusual appearance to the floor. However, an image supplied suggests it is just shadow spires. Nevertheless, we would like to check at a repeat illumination. As another challenge, because the light illuminating the floor may come from narrow horizontal gaps on the eastern rim, and maybe slightly polarized see if you can use a polarized filter in the field of view at the eyepiece, or in front of the camera, and rotate through different angles. Do you see any change in the appearance of the illuminated area of the floor? Any sketches, visual descriptions, or images taken, should be emailed to: a t c @ a b e r . a c. u k

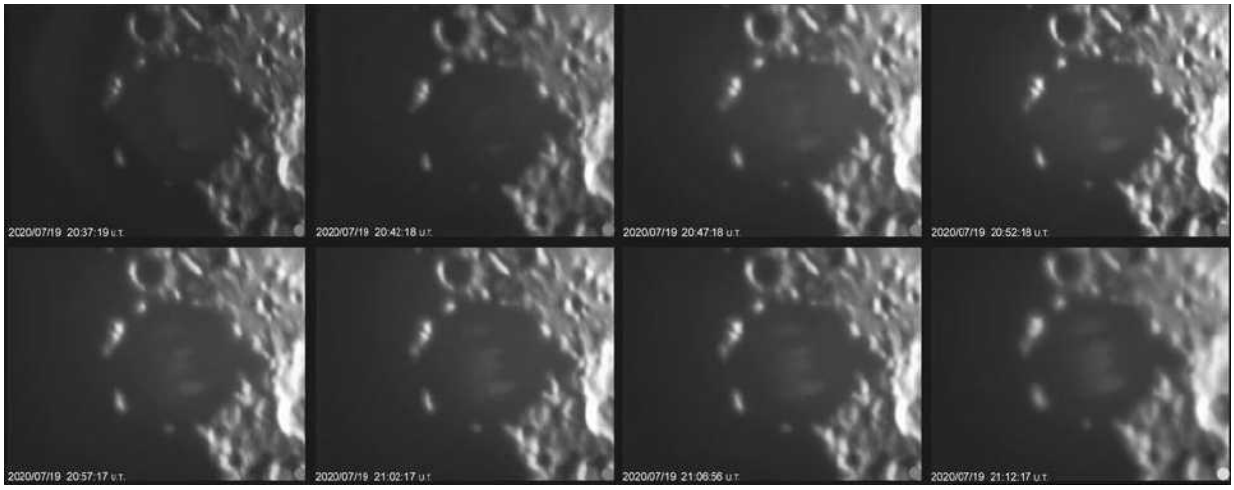


Figure 10. *A time sequence of sunrise over the crater Ptolemaeus, taken on 2020 Jul 28 UT 20:37-21:07 by Valerio Fontani (UAI). Orientated with north towards the top.*

I showed Valerio's image sequence (Fig. 10) to Phil Shepherdson and Phil commented that after scrutinizing them carefully, that they all looked perfectly normal, and different to the 'ashen sliver of light' effect that he saw across the floor back in February this year. We shall therefore leave the weight of this report at 1 for now and hope that some other repeat illumination set of observations may one day repeat what Phil saw.

Plato: On 2020 Jul 30 UT 01:50-02:15 Jay Albert (ALPO), using an 8" SCT (x290) under transparency magnitude 2 and seeing 8-9 out of 10, observed visually the crater under similar illumination to a previous TLP report of his:

On 2009 Apr 05 at UT 01:03-01:31, 01:44 and 02:30 J. Albert (FL, USA, 11" reflector, x224 and x311, transparency 4-3 and seeing 5-6/10) noted a tiny point on the south east rim of Plato, adjacent to the east wall shadow. It was first seen at x311 without filters, then in both Wratten 25 (red) and Wratten 38A (blue) - it was faintest in the latter. The spot was probably a high point on the south east rim. By 01:28UT the spot was no longer visible in the blue filter, but could still be seen well in red and white light. No change was seen during rechecks at 01:44 or 02:30. The observer considers that this was not a TLP as it was on the limits of detectability and anyway observing conditions were poor. The ALPO/BAA weight=1.

Jay commented that he had an excellent view of Plato. The central craterlet, N pair and S craterlet were easily visible. A tiny dot of a craterlet was also visible with

difficulty by the west wall landslip. That specific west craterlet had been seen before with his former C11, but this was the first time that he had seen it in his 8". The bright point of light on the SE rim described in 2009 TLP report was visible next to the east wall shadow and he noticed what appeared to be a slight extension of the east wall shadow below the bright point on the rim. So, Jay now thinks that this bright spot is the normal appearance at this particular illumination. The only difference though was that Plato's central craterlet was clearly seen with interior shadow and the bright west wall had no 'white splodge'. We shall remove this TLP from the ALPO/BAA database by assigning a weight of 0.

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 . Only by re-observing and submitting your observations 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 TLP, firstly read the TLP 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 TLP alerts can be accessed on https://twitter.com/lunarnaut .

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