BAA Lunar Section
British Astronomical Association
Director: Bill Leatherbarrow

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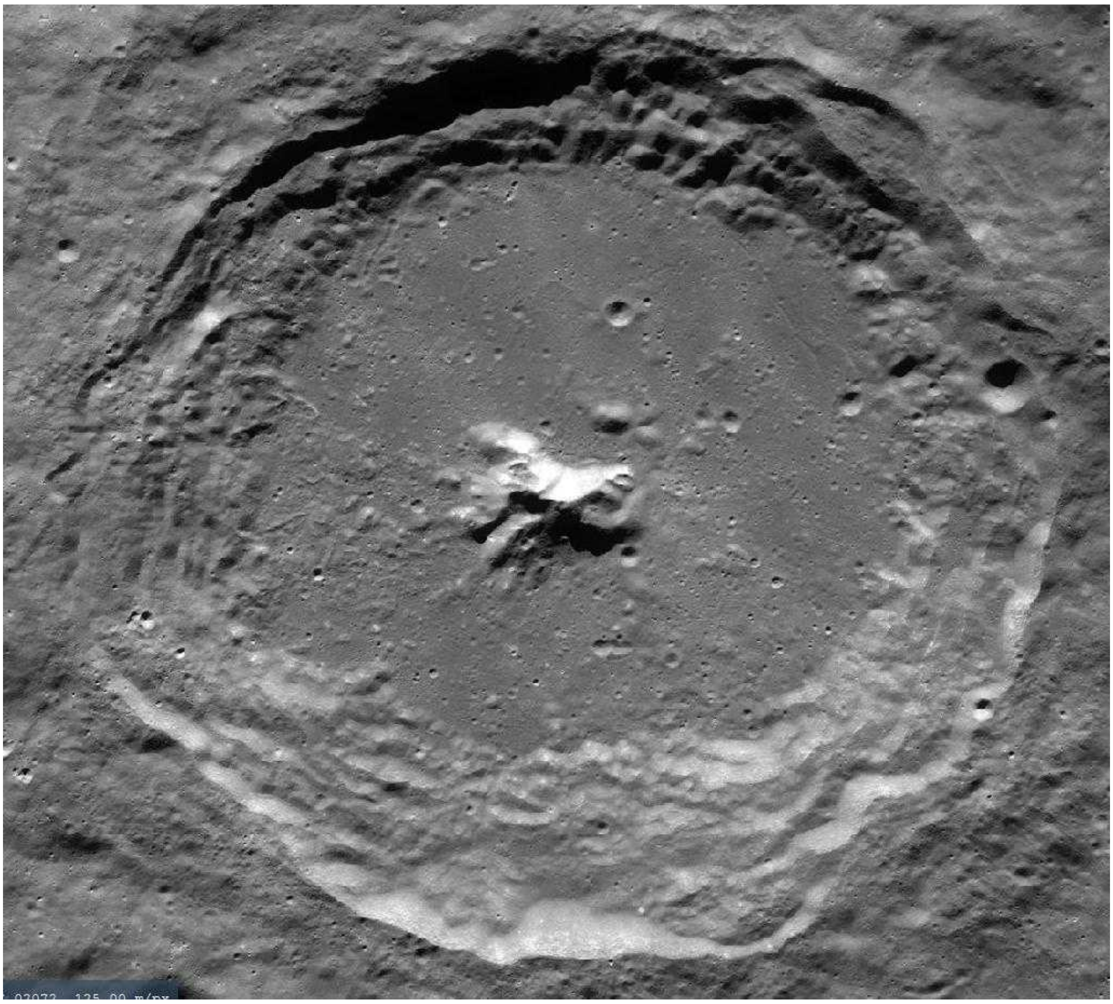
FROM THE DIRECTOR

Moretus (rectified), 2 May 2020 (Alexander Vandenbohede)

On 2 May 2020 Alexander Vandenbohede imaged the South Polar region, using his 8-inch SCT, and he subsequently produced the rectified image of Moretus shown above. I was immediately struck by the eccentric shape of the crater and the unequal width of its inner terraces, those to the south being much broader than those in the north. I think it is probably fair to say that this eccentricity is more marked on Alexander's rectified image than it is in reality, but it is nevertheless discernible in images taken from LRO (see below).



Moretus is a splendid, relatively youthful crater some 114 km in diameter. It was probably formed sometime during the Eratosthenian era and retains complex wall terracing, a high central peak and a flat floor of smooth impact melt that is more extensive in the northern half of the crater. Moretus is similar in appearance to the younger Tycho, apart from the fact that it has not retained any obvious system of bright ejecta rays.

One explanation for the eccentric disposition of the internal terracing is that the crater was the result of an oblique impact. The lack of a bright ray system deprives us of one way of testing that hypothesis, since such a system would most likely be eccentrically distributed around the crater in the case of an oblique impact. However, it is worth noting that the external blanket of ejecta material is more conspicuous and apparently thicker to the south of Moretus.

An alternative explanation is that the broader terracing to the south of the crater is a result of inner wall failure that caused the southern terraces to collapse onto the crater floor, leaving an obvious scallop on the southern rim.

It is possible that the various overlays and tools available in QuickMap might shed further light on the question, and this is something Section members might like to investigate.

Bill Leatherbarrow

OBSERVATIONS RECEIVED

This month images and/or drawings have been received from the following observers:

Paul Abel, Leo Aerts (Belgium), Paul Brierley, Maurice Collins (New Zealand), James Dawson, Dave Finnigan, Mike Foulkes, Tim Haymes, Rik Hill (USA), Ken Kennedy, Rod Lyon, Mark Radice, Bob Stuart, Alan Tough, Alexander Vandenbohede (Belgium), and the Director.

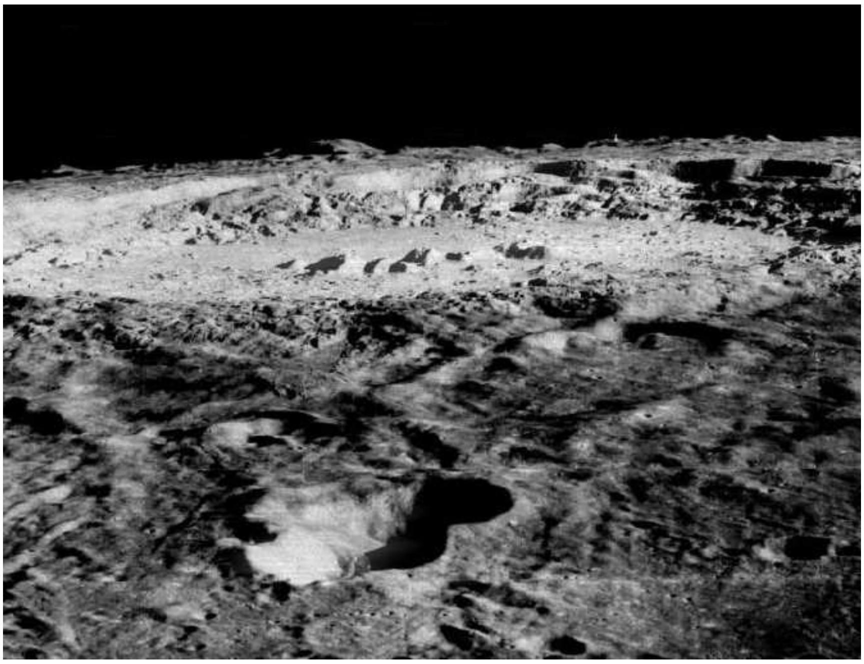
Rik Hill has submitted a dramatic capture of sunrise over Copernicus on 2 May 2020, writing the following:

‘It's hard to ignore some features on the Moon even if you have imaged them repeatedly. Such is the case with this old favorite, Copernicus (95km dia) that the sharp-eyed among us can spot even without optical aid when the lighting is right.

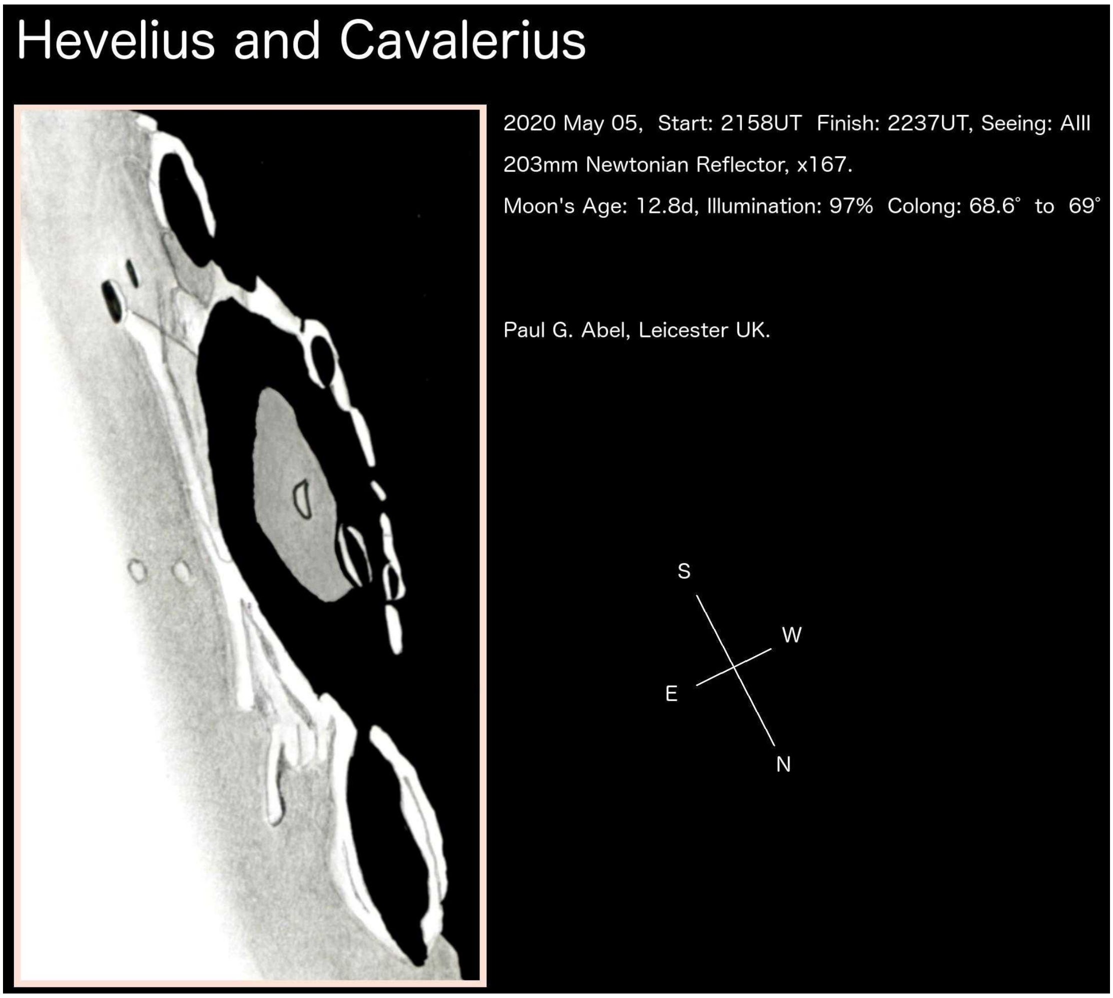
This night I was using the Dynamax 6 with a Klee Barlow (2.8x) for a focal ratio of f/28. What a magnificent view! The hummocky terrain around this large crater is so well shown in this sunrise view. Wonderful shadows on the floor of the crater and the central peaks have not quite caught any light yet. To the upper right are some of the many secondary craters from this massive impact with 2-5km diameters. Below Copernicus is a figure-8 pair of craters. The larger (upper) one is Fauth (12km) and below is Fauth A (9.6km) two very identifiable craters that were made famous in the "Photo of the Century" taken by Lunar Orbiter 2 at 00:05 UT (then GMT) on Nov. 24 1966 from an altitude of 28.4 miles above the lunar surface, 150 miles due south of Copernicus, just about the bottom edge of this image. I've included a copy of that image as well for your enjoyment and comparison.

Not bad for a little 6" Dynamax!!’


Copernicus
2020 05 02 0443 UT
Colong=020.4°
Dynamax6 + 2.8x Klee Barlow
Cam: SKYRIS 445M
Filter: 665nm
Seeing:8-9/10
North Up
Richard "Rik" Hill ©2020
Loudon Obs. Tucson
RHILL@LPL.ARIZONA.EDU



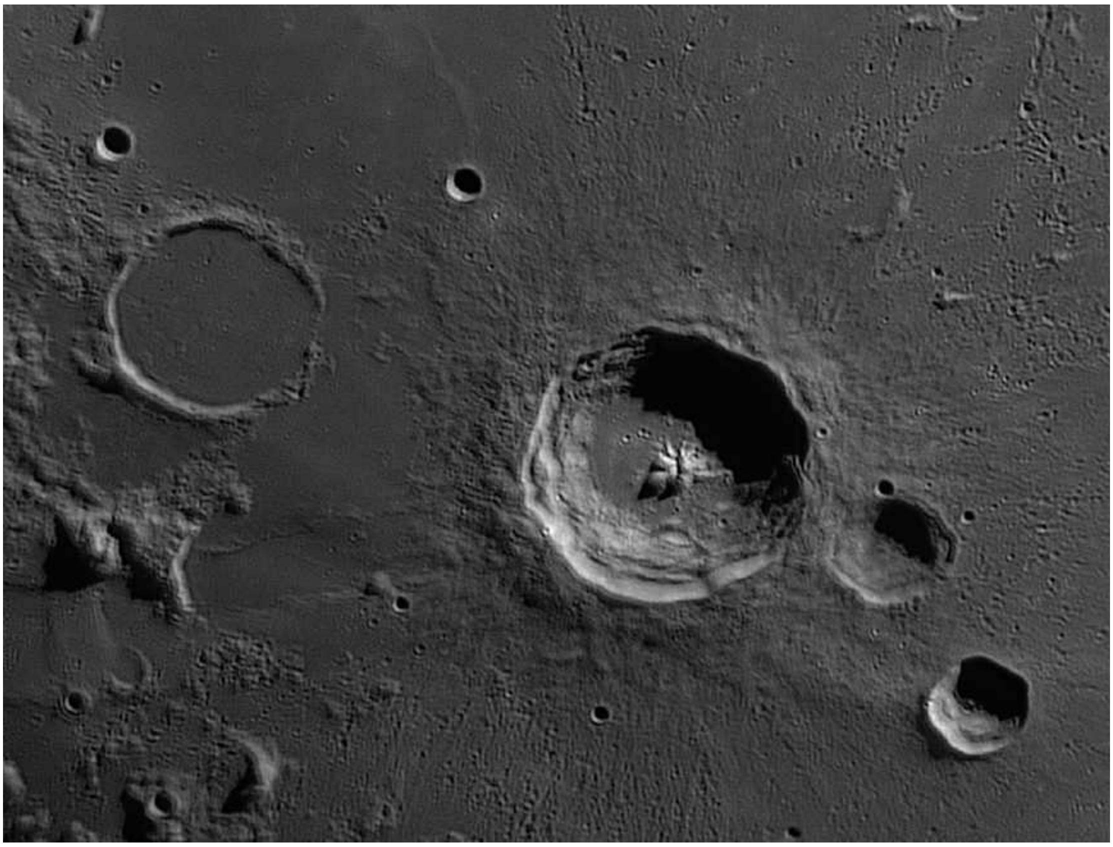
On 5 May 2020 **Paul Abel** sketched the area around Hevelius. Interestingly, his drawing shows clearly the rilles outside Hevelius to the south-east, but he reports that he did not detect those inside the crater. It might be worth repeating this observation under similar colongitude.



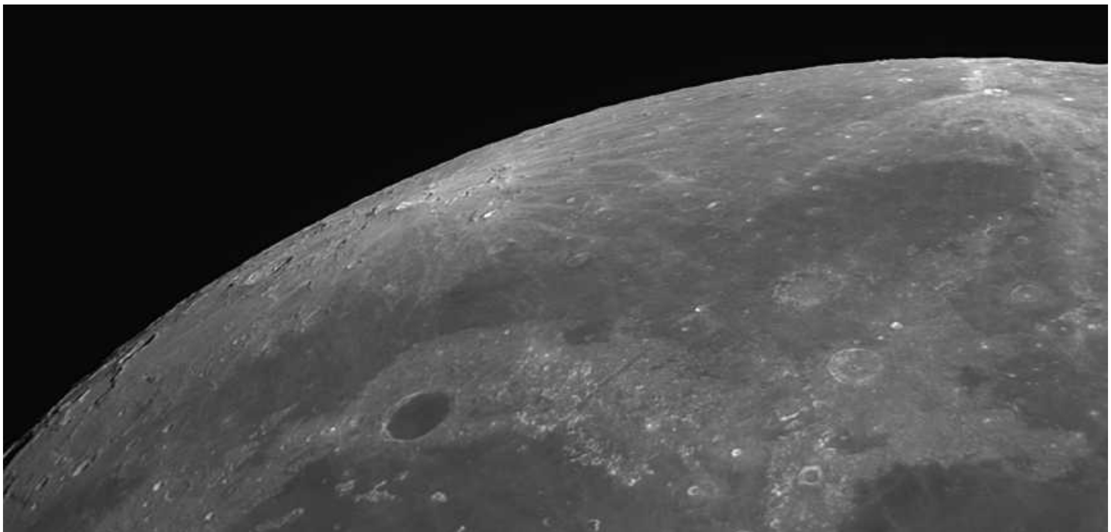
IMAGES GALLERY

Good weather in the UK and Europe over the past month has seen a great deal of observational activity. The following is a selection of the images received, with apologies as usual for those omitted because of considerations of space.

Among many images submitted by **Leo Aerts** the following study of the area around Bullialdus is remarkable for the detail captured.

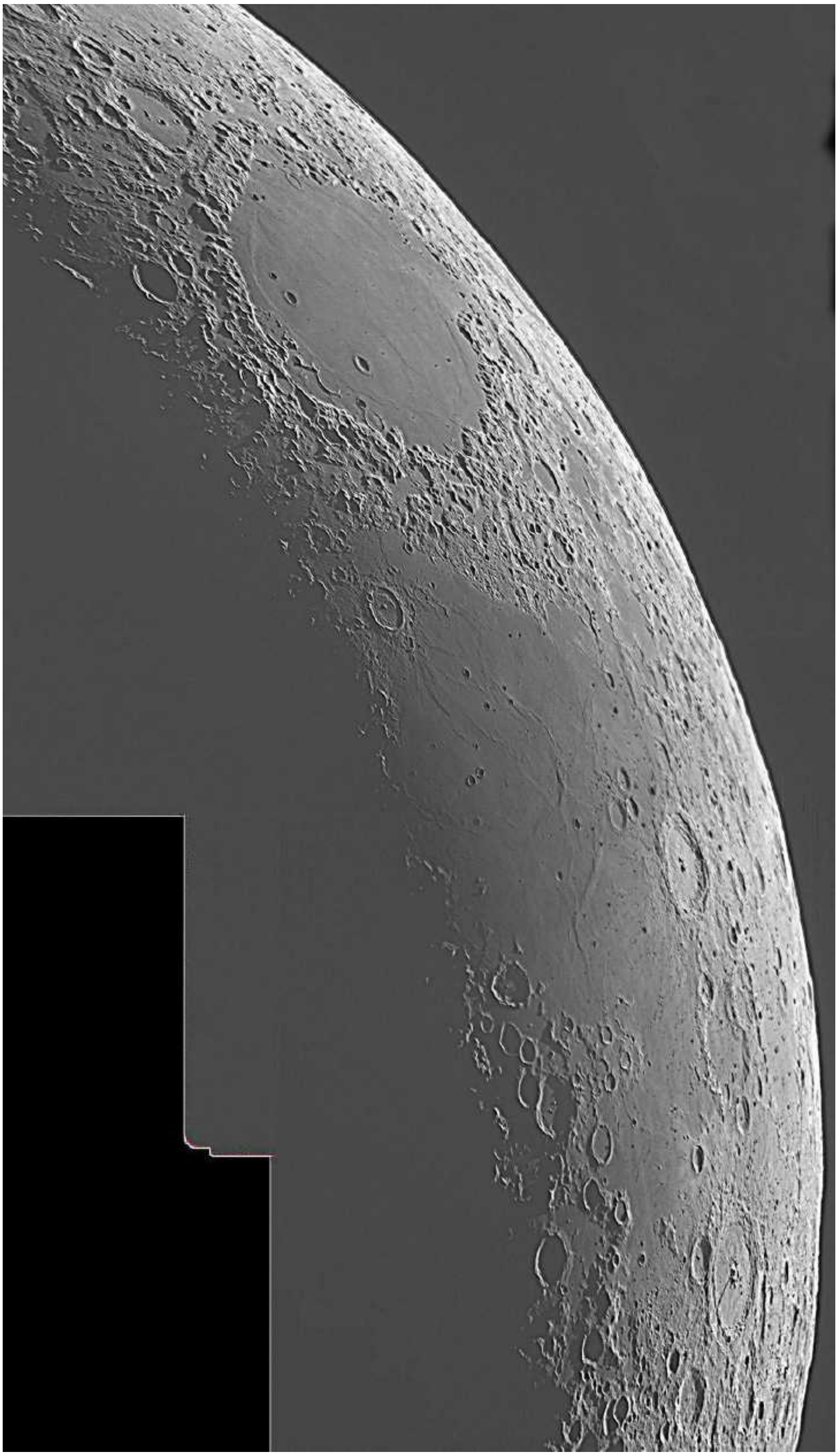


Bullialdus, 2 May 2020, C14 (Leo Aerts)

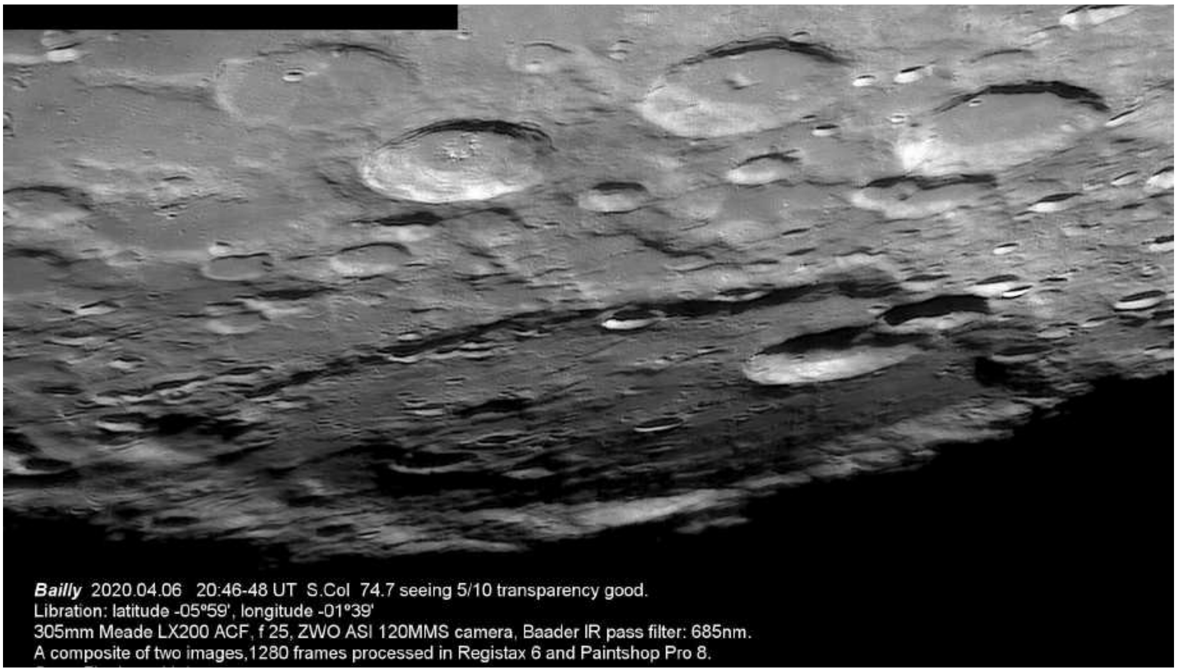


Anaxagoras ray system, 5 May 2020, 23.00 UT, C11 (Tim Haymes)

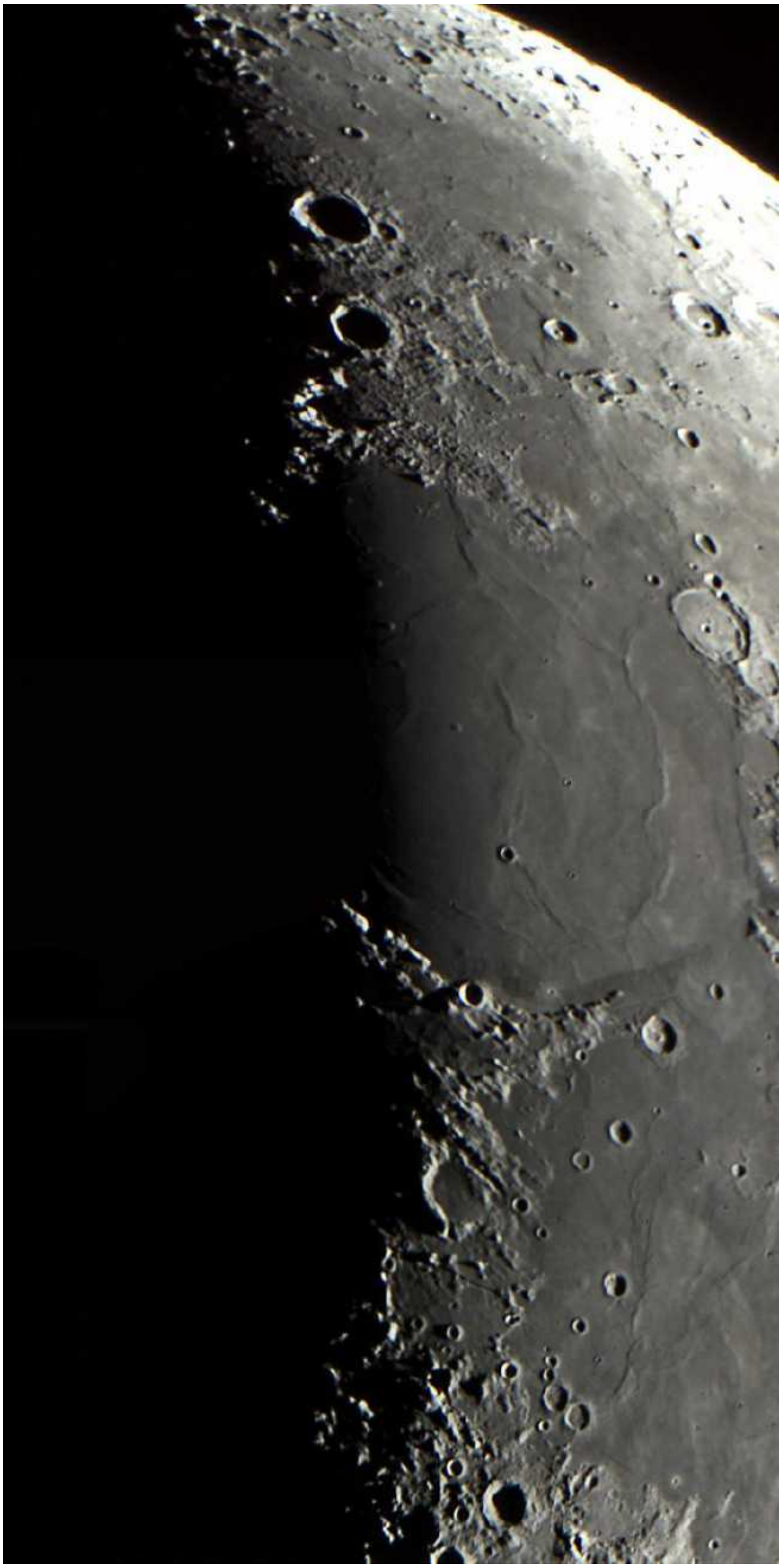
On 26 April 2020 at 19.16 UT **Mike Foulkes** took the following image of the young crescent Moon in bright twilight, using a 203mm SCT.



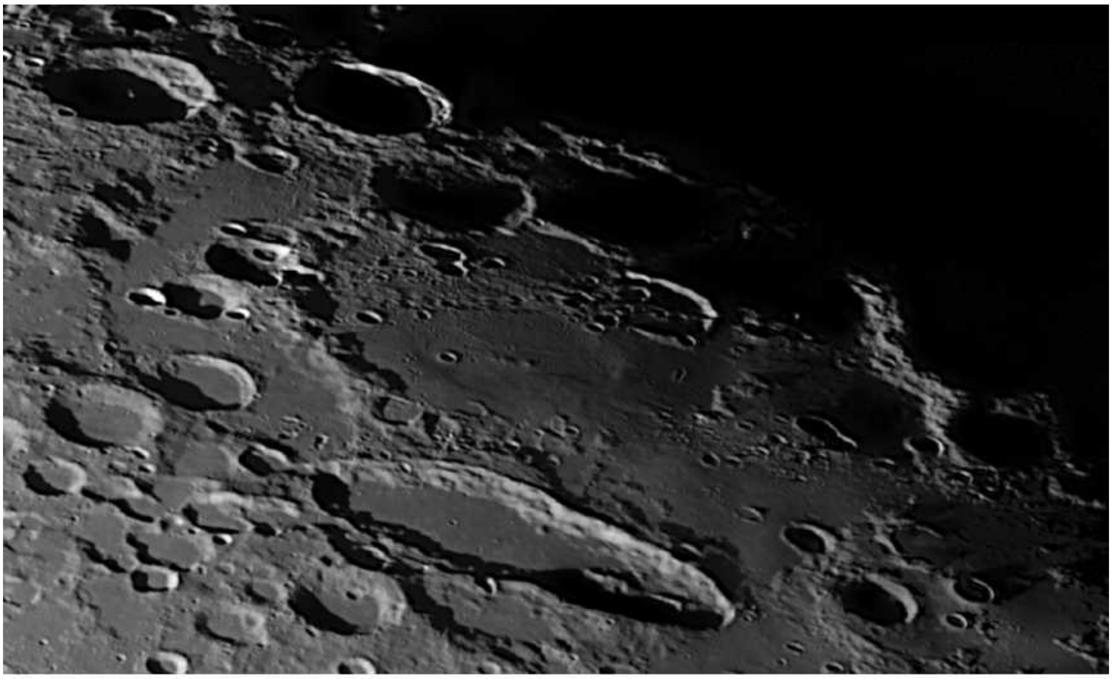
Dave Finnigan nicely caught the wealth of detail inside the vast crater Bailly (below) at a time when the libration was favourable.



Triesnecker rilles, 30 April 2020, 200mm SCT (Ken Kennedy)



Mare Serenitatis, 29 April 2020, 06.44 UT, 200mm SCT (Maurice Collins)



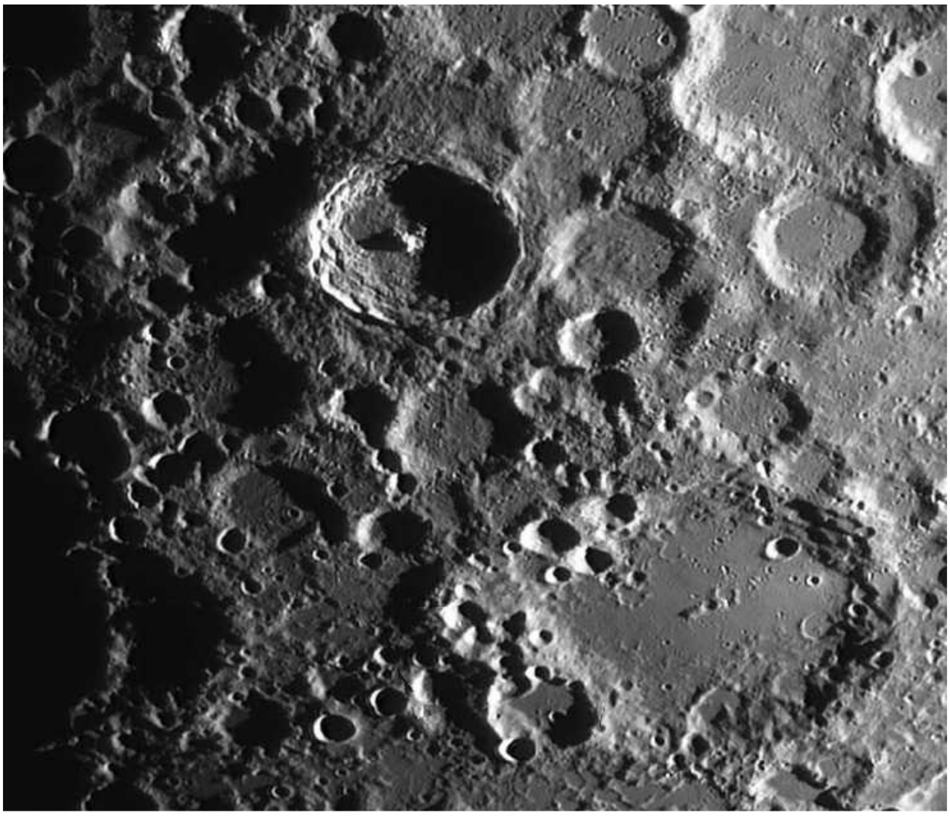
Schiller Zuchius Basin
4 April 2020 2035Z
C11 f15 ASI224MC 742nm IR filter

Mark Radice

RefreshingViews.com

NB. The above image is presented with South uppermost

Clavius-Tycho, 2 May 2020, 20.56 UT, C11 (James Dawson)



Tycho with Maginus to the South-West 2020.05.01 - 19.38 UT
300mm Meade LX90, ASI224 MC Camera with Pro Planet 742nm I-R Pass Filter. 500/5,000 Frames. Seeing: 7/10 with intermittent cloud.

Rod Lyon

Mons Hadley region, 1 May 2020, C9.25 (Paul Brierley)

Young (1.8-day old) crescent Moon, 24 April 2020 (Alan Tough)

LUNAR DOMES (part XXXVIII): Domes in Gambart C Raffaello Lena

In this issue, I will describe some domes located near the crater Gambart C (Fig. 1). Gambart is a lunar crater on the Mare Insularum, near the central region of the Moon. It can be identified to the south-southeast of the prominent ray crater Copernicus. The floor of Gambart has been flooded with lava, leaving a relatively flat surface surrounded by a smooth but somewhat polygon-shaped outer rim. To the southwest of Gambart C is a large lunar dome.

The selenographic coordinates of two examined domes are 2.87° N 12.17° W and 2.63° N 12.60° W, respectively.

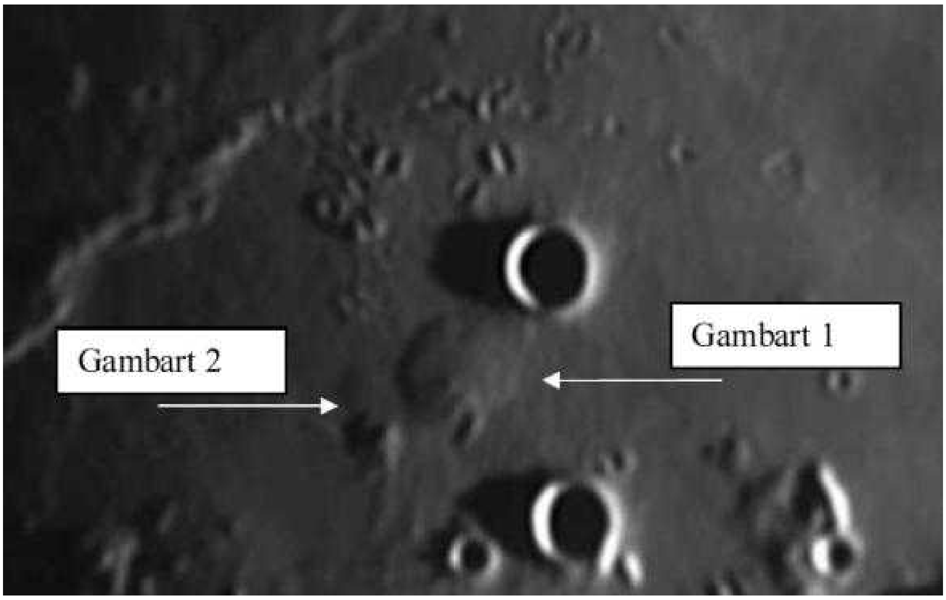


Figure 1. Two examined domes near Gambart. Image by Jim Phillips with a TMB 20cm refractor.

Based on a combined photoclinometry and shape from shading technique applied to telescopic CCD images [1-2], the first dome, here termed Gambart 1 (Gam1), has a diameter of 19.5 ± 0.5km, a height of 190 ± 20m yielding a flank slope of 1.11° ± 0.1°. For the second dome, termed Gambart 2 (Gam2), the diameter amounts to 9.0 ± 0.5km, with height of 50 ± 5m and a flank slope of 0.63° ± 0.06°. Assuming a typical form factor of f = 1/2, the estimated volumes are determined to 30 and 1.6km³, respectively.

In the LOLA DEM, the elevation difference between the domes centre and their western border amounts to about 190-200m for the first dome Gambart 1, yielding a highest hills elevation of 240m, and to about 50 m for Gambart 2, which is in a good agreement with the image-based photoclinometry and shape from shading analysis.

As very low solar illumination angles are required to reveal the gentle slopes of lunar domes, most of these subtle structures do not appear in the available sets of orbital images. Due to the comparably high illumination angle, the examined domes are not clearly visible in the Lunar Orbiter imagery. The Lunar Reconnaissance Orbiter (LRO) WAC image (Fig. 2) shows a large and flat surface for Gam1, with the presence of some embayed hills on its summit.

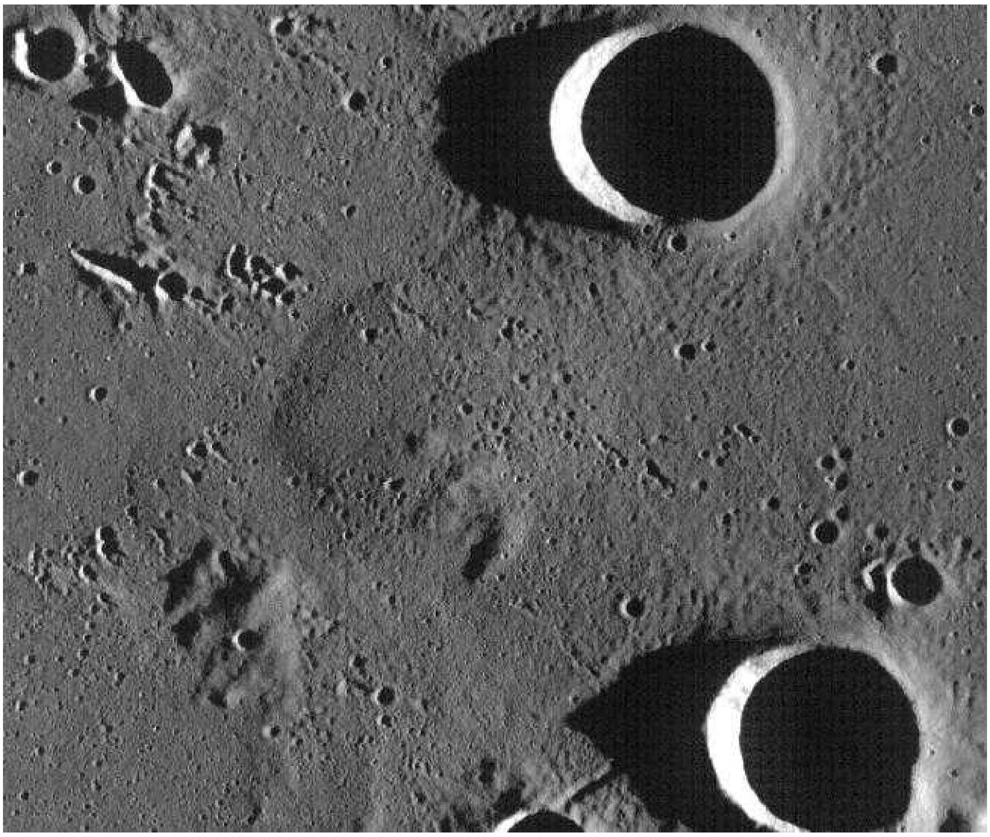


Figure 2. (Top) WAC image M116391672ME of the examined domes.

Figures 3 and 4 show the 3D reconstruction results obtained with the CCD telescopic image and GLD100 dataset.

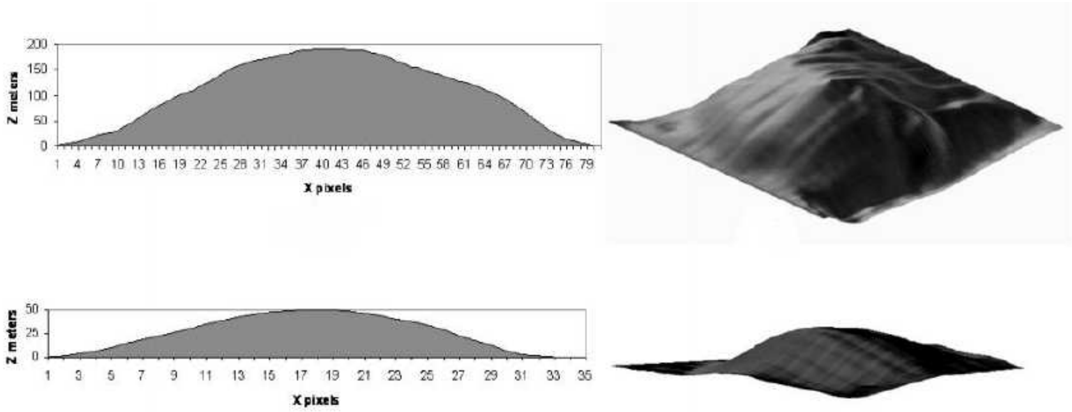
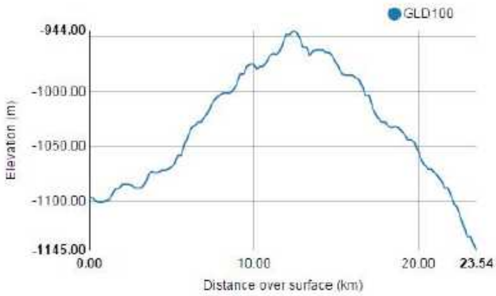
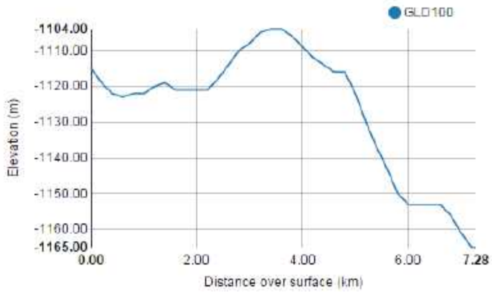


Figure 3. (Top) Gambart 1 dome. (Bottom) Gambart 2 dome.





(a) **(b)**

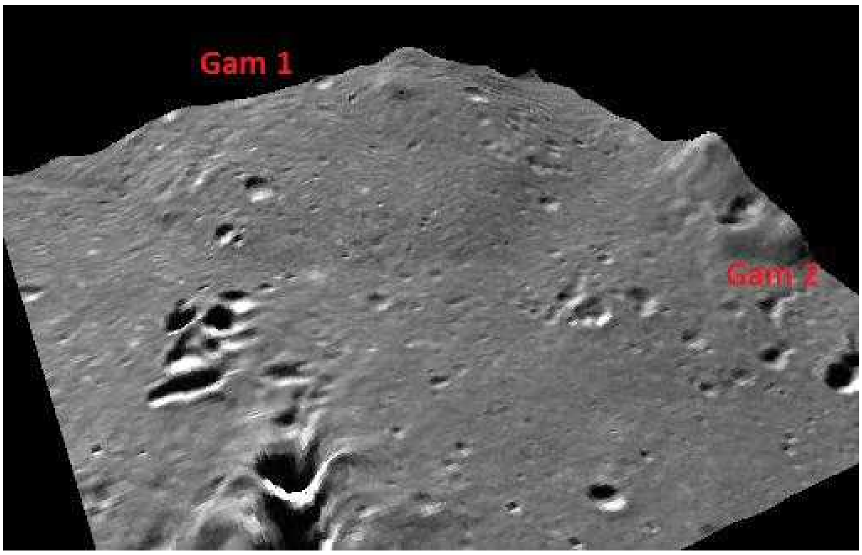


Figure 4. GLD100 dataset. Top, E-W sectional profiles of Gam1 (a) and Gam2 (b) Bottom, 3D reconstruction obtained with GLD 100 dataset, as seen from NW direction.

Although the two domes in Gambart C are located close to each other, their different morphometric and rheologic properties indicate different eruption conditions.
From the petrographic map (Fig. 5b) the soil of two domes appears composed of mare material admixed with highland material (purple color), thus the green colour in the corresponding petrographic basalt map (Fig. 5c).

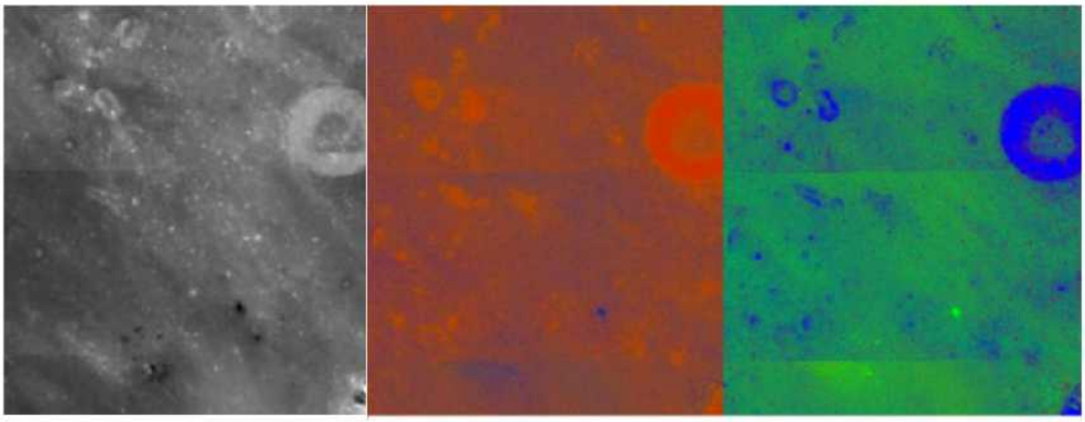


Figure 5. Gambart C region described in the text. (a) 750nm Clementine imagery. (b) petrographic map. (c) petrographic basalt map of the examined region.

A mechanism to explain the presence of highland components in mare soils and vice versa is lateral mixing due to random impacts of small bodies as suggested by Li et al. [3] and modelled in more detail by Li and Mustard [4]. They infer the relative fraction of mare and highland soil along mare highland contacts based on spectral mixture modelling of Clementine UVVIS data and introduce a so-called anomalous diffusion model that fits well the observed relative abundances at distances of up to 10km from the boundary. Hence, the interpretation is that this region was flooded by mare lava and was then contaminated by lateral mixing with highland material from nearby impact craters.

The first dome Gambart 1 belongs to the class C_2 in the classification scheme for lunar mare domes [1]. The second examined dome, Gambart 2, shows a shallow flank slope mainly due to the low viscosity of the lava from which it formed (2.6 x10^3 Pa s). According to its different character the magma rise speed was higher than for Gam1 dome, probably due to a higher lava temperature and thus a decreased degree of crystallisation during magma ascending at higher speed through a narrower and shorter feeder dike (estimated to 4m and 17km, respectively). Due its morphometric properties, Gam2 is situated between classes C_1 and C_2.

The continuum slope, the trough width, the centre wavelengths and relative depths of the individual absorption minima of the domes are extracted from Clementine UVVIS+NIR multispectral images. The spectral data resulted in the automated production of maps concerning a) band centre minimum, b) band depth, and c) FWHM-full height at half maximum.

The individual Clementine spectral plots of two domes are consistent with the presence of an absorption band at 950-970nm which is due to the presence of a pyroxene, of moderate Ca content, with a FWHM between about 160-180nm and band depth of about 8%.
The greater the amount of iron present, the greater the band depth and the more mafic the terrain is. Amounts of iron under about 5% are not very mafic and are typically anorthositic. Such terrain constitutes the majority of the lunar highlands.

More mafic clinopyroxene content is found in mare basalts. Clinopyroxenes show absorption band between 950nm and 1000nm. Their FWHM widths are usually significantly less than 300nm with band depths significantly greater than 5%. In contrast Olivine has a band center above 1000 nm, typically near 1100nm. The FWHM width of olivine is wider than that of pyroxenes and is usually greater than 300nm.

The spectra of two domes are represented as continuum divided UVVIS+NIR spectrum and the result is consistent with the presence of a pyroxene component without the presence of olivine (Fig. 6).

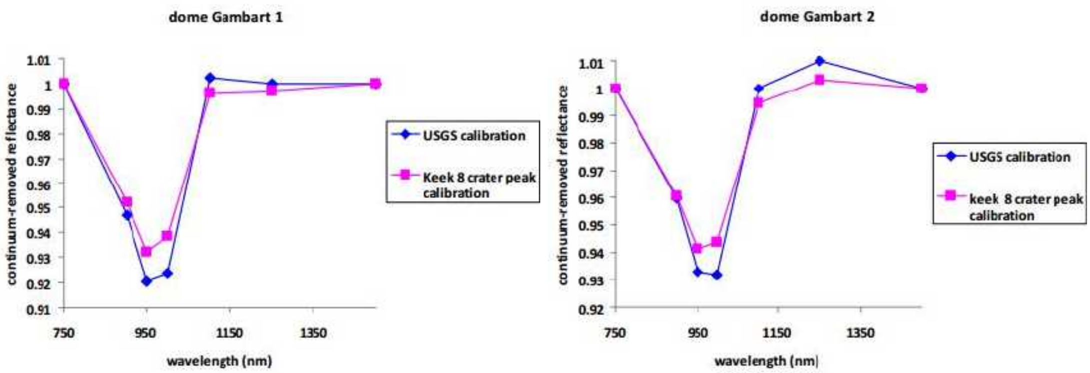


Figure 6. Clementine spectra for two examined domes with two calibrations. The calibrations used do not produce radically different results.

Comparison of the resulting block spectra obtained from Selene imagery (Fig. 7) with the standard Clementine USGS calibration or the Keek calibration (Fig. 6) show that they are quite similar. The continuum divided spectra of the absorption trough near 1000nm is also consistent with a significant pyroxene composition without the presence of an olivine component (Fig. 7).

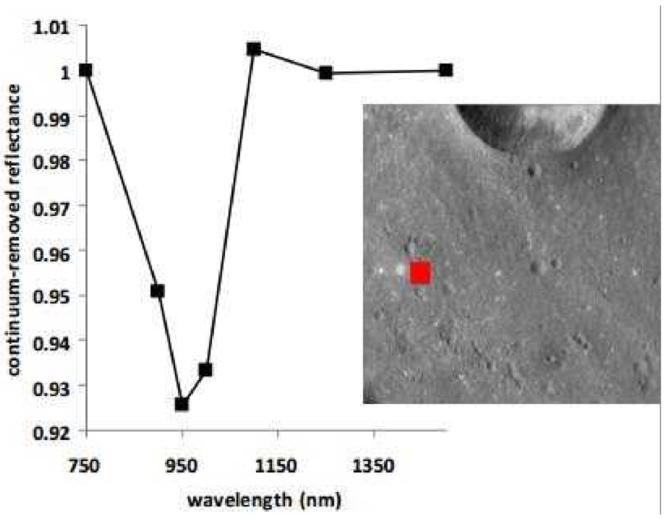


Figure 7. Selene 750 nm imagery. (bottom) Selene spectral data of Gambart 1 dome (target area measured boxed). Calibration obtained using Mauna Kea CVF file HA1013.

As reported in previous issues of the LSC [5-6], the major minerals exhibit absorption bands that differ by their shape and position along the spectral domain. Pyroxenes

(Orthopyroxenes and Clinopyroxenes) have two absorption bands, one centered near 1000nm and another near 2000nm. I used M^3 data, from OP1B orbital period, to confirm the Clementine analysis and the spectrum of two examined domes display a classical pyroxene signature (Fig. 8). The spectrum of the dome summit based on M^3 dataset displays two absorption bands centered at 980nm and a wide band at ~ 2170nm, corresponding to a clinopyroxene spectrum [5-6].

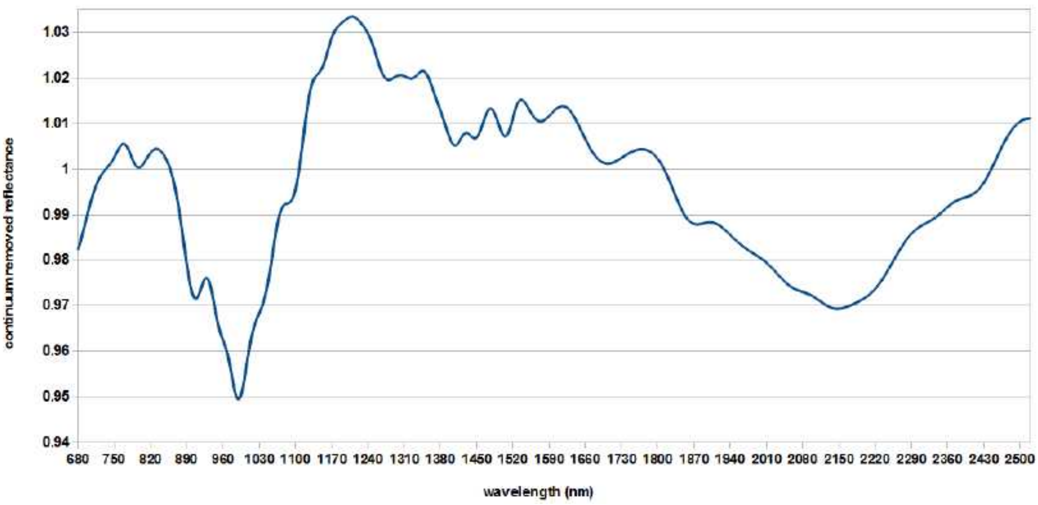


Figure 8. M^3 spectral analysis of the dome Gambart 1.

The Gambart region is a well known volcanic region including the presence of lunar domes. In a future article further domes in this region will be described and compared to the morphometric data obtained for these described lunar effusive domes.

References:

[1] Lena, R., Wöhler, C., Phillips, J., Chiocchetta, M.T., 2013. *Lunar domes: Properties and Formation Processes*, Springer Praxis Books. Wilhems, D. The geologic history of the Moon, USGS Prof. Paper 1348, 1987

[2] B. K. P. Horn, Height and Gradient from Shading, MIT technical report, AI memo no. 1105A, 1989.
http://people.csail.mit.edu/people/bkph/AIM/AIM-1105A-TEX.pdf

[3] Li, L., Mustard, J. F., He, G., 1997. 'Compositional gradients across mare-highland contacts: The importance of lateral mixing'. *Lunar Planet. Sci*. XXVIII, abstract #1724

[4] Li, L., Mustard, J. F., 2000. 'Compositional gradients across mare-highland contacts: Importance and geological implication of lateral transport'. *J. Geophys. Res*.105(E8), 20431-20450

[5] Lena, R. 'Study and Classification of the Lunar Domes'. BAA LSC 2016, 53, 4, pp. 11-14

[6] Lena, R. 'Lunar Domes (part II): The dome Kies π'. BAA LSC June 2016, pp. 10-17

THE SIRSALIS TLP OF JANUARY 30th 1999 Barry Fitz-Gerald

In the February 2020 Lunar Section Circular Tony Cook [1] bought our attention to a suspected TLP event reported by Giuseppe Sorrentino (Italy) which involved the crater Sirsalis [2, 3]. The event took the form of 'a temporary change in appearance to sunlit floor of crater', and a sequence of video frames appears to show some change to the north-western section of the crater wall where it adjoins Sirsalis A. The report appears to have generated a little debate, and I think it worthwhile to look at the available imagery to see if the area involved has any geological features that could have relevance in the discussion.

The most significant claim to fame that the 44km diameter crater Sirsalis boasts is its proximity to Rima Sirsalis, an approximately 400km long graben that passes by some 15kms to the east. Graben are formed where the crust is subject to tensional forces, such as around the edges of subsiding maria or above dikes of magmatic rock which are intruded from below, which might explain why the rima is associated with a strong magnetic anomaly [4, 5]. The graben pre-dates the Eratosthenian age Sirsalis, and the satellite crater Sirsalis J appears to be superimposed on it, indicating that it too is younger than the graben, which is therefore a fairly ancient structure.

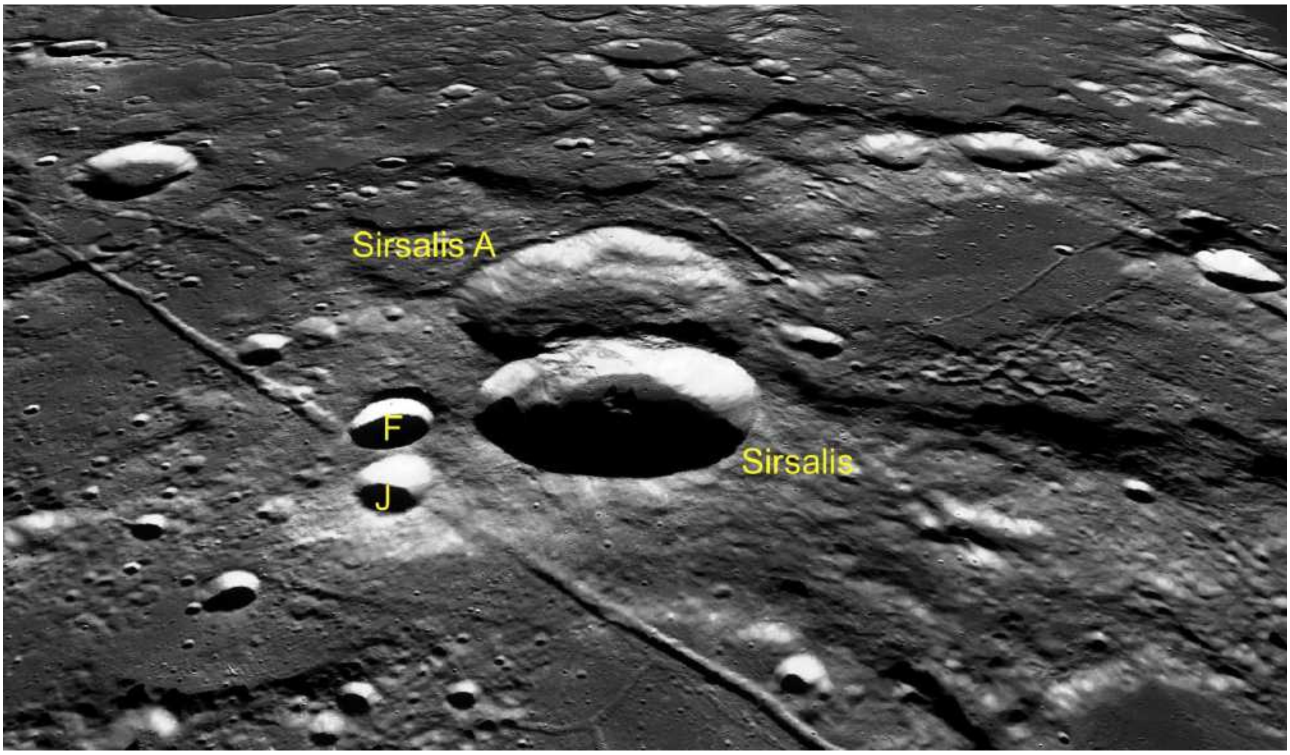


Fig. 1 Quickmap 3D model of Sirsalis and environs as viewed from the north-east.

Fig. 1 shows a 3D rendition of the area using LRO Quickmap, from which it can be seen that Sirsalis has demolished the eastern rim of Sirsalis A and as a consequence the western rim of Sirsalis is some 1500m lower than the rest of its circumference. What is not visible in this image are the collapse terraces that dominate the eastern and southern part of the crater wall, and which cover much of the eastern half of the crater floor and reach as far as the central peak. The western half of the crater floor is mostly flat, with occasional rounded hills, which is probably a mixture of fall back debris and impact melt formed in the original impact event. The western and north western walls are remarkably un-terraced, presenting the earth based observer with quite a steep (~ 30°) slab like aspect. The image also hints at the fact this north-western inner wall has a high albedo, an effect that is clearly visible in telescopic views of the crater. This appears to be the partly the result of the geology the area which is dominated by highland material in the form of bright plagioclase rich anorthosite.

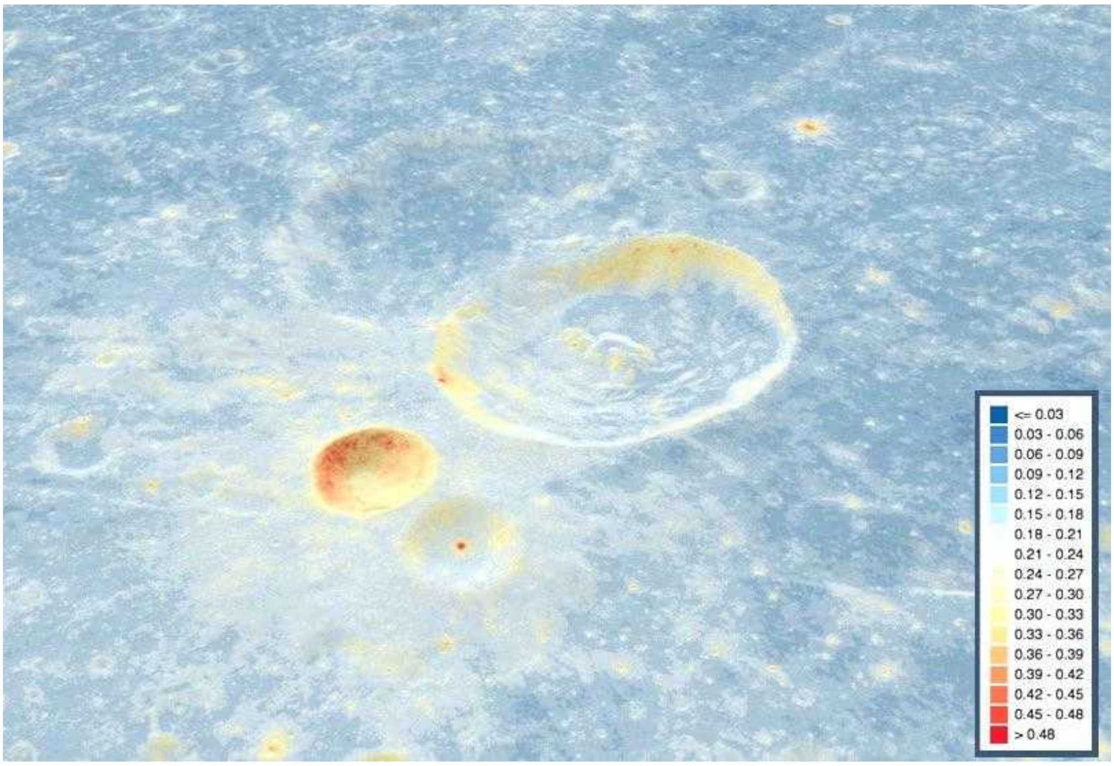


Fig. 2 Kaguya Derived Optical Maturity (OMAT) overlay of Sirsalis showing the optically immature (red and yellow) nature of the north-western inner wall.

Fig. 2 shows a similar perspective view but with the Kaguya Derived Optical Maturity (OMAT) overlay, and what can be seen is that the north-western crater wall is quite optically immature indicating that the regolith here has not been exposed to the effects of space weathering for as long as other more optically mature areas. Interestingly the north-western wall does not show up as being rocky in the LRO Diviner Radiometer data, and shows up as being cooler than average in the Nighttime Soil Temperature data – which suggests that the high albedo/low optical maturity area is dominated by fine grained regolith, as finer grained regolith radiates its heat away more efficiently than coarser deposits. If we take a closer look at the crater wall we can see the cause of this is extensive slope failure which takes different forms, and which has exposed bright high albedo anorthosite rich fine grained deposits as well as rocks and boulders.

Fig. 3 shows a section of the western wall where numerous elongate bright scars can be seen with their long axes parallel to the crater rim. Some of these scars have exposed rocks and boulders but many seem to be dominated by finer grained granular material. These bright scars represent high albedo, optically immature anorthositic material that has been revealed where the darker more optically mature surface regolith has slumped downwards. A ripple like texture can be seen over this part of the crater wall where the regolith has 'crept' downslope rather like that seen on steep terrestrial hillsides. What is not present are extensive scree-like boulder fields indicative of large scale avalanche activity.

The north-western crater wall shows a different sort of downslope movement where large patches of the darker surface regolith have slumped away leaving sharp-edged scars and exposing the brighter material beneath. Fig. 4 shows quite clearly how well defined the upper edges of some of these slumps are, which suggests strongly that the original surface had developed into a sort of 'crust' or more cohesive layer with less cohesive stuff beneath – rather like a snow crust on Earth. This might be explained by the surface layers having become slightly more indurated through the formation and accumulation of impact melt and agglutinates as a result of space weathering, leaving the deeper more protected regolith layers less mechanically cohesive.

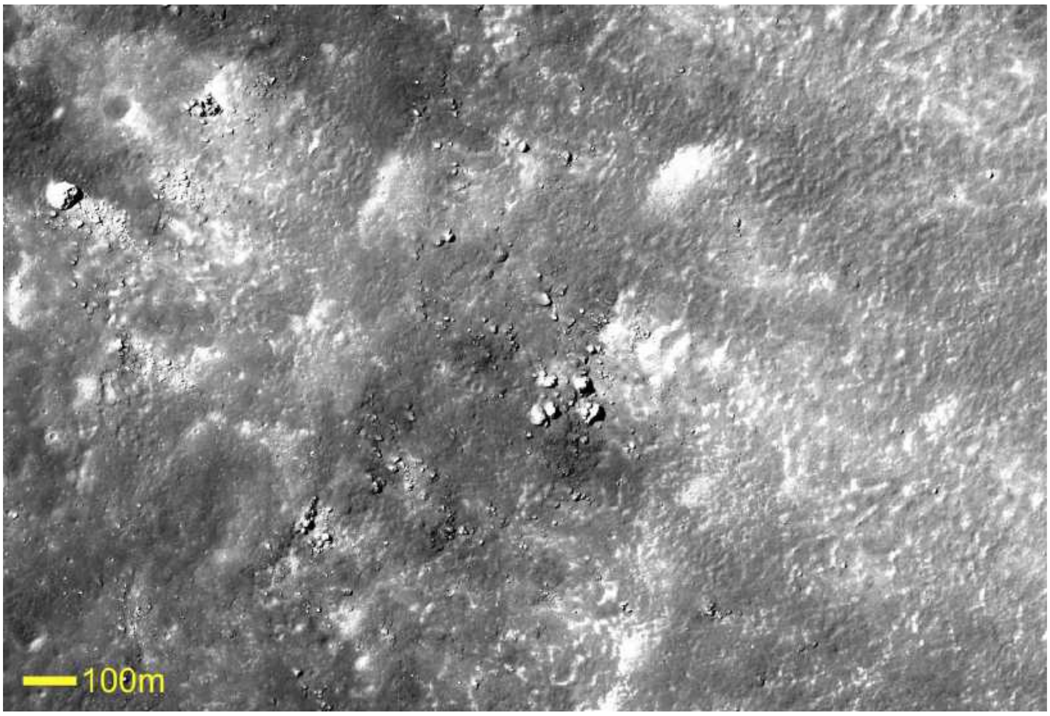


Fig. 3 LROC NAC image of a section of the western wall showing extensive bright elongate scars where the darker surface regolith has slumped downslope to reveal the brighter underlying unweathered material. The crater floor is towards the lower right and crater rim upper left.

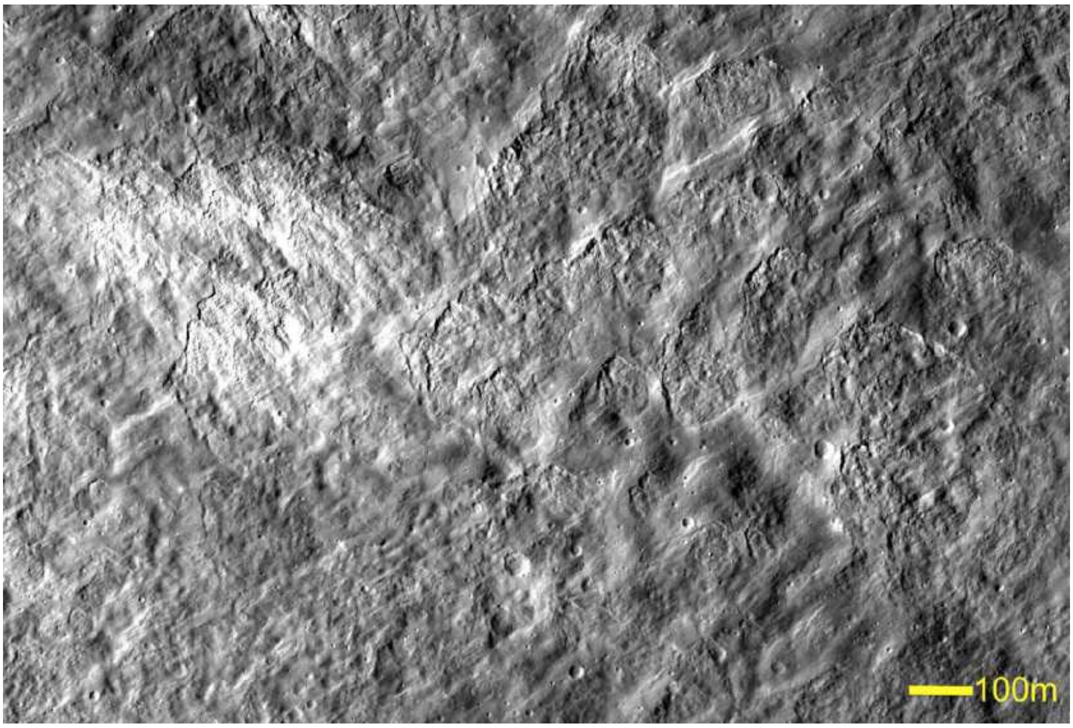


Fig. 4 LROC NAC image of the north-western crater wall showing where large patches of the darker surface regolith have slumped away leaving sharp edged scars and exposing the brighter fine grained material beneath.

A similar type of slope failure can be seen on the western side of the central peak of Pitiscus [6] and indicates large-scale but patchy slumping of the surface layers, leaving isolated patches of the original surface undisturbed. These undisturbed patches preserve a population of small craters, whereas in the disturbed patches these small craters have been largely erased, to be replaced by a sparse population of more recent small impacts. Larger craters in the order of 20m and upwards in diameter have survived this slope failure, albeit in a battered condition, showing that only the shallow surface layers were involved in the collapse. But despite being only skin deep, this has still exposed extensive areas of bright unweathered anorthositic material which gives these slopes their relatively high albedo. Few other areas on the walls of Sirsalis show the same type slope failure that we see along the western and north-western sections with the exception of the southern wall where its location appears to correspond to the presence of very fresh small impact craters on or near the rim.

All of this slope modification explains why the western and north-western walls of Sirsalis are bright; it is the result of the exposure of fresh, unweathered anorthosite rich material. The fact that there is no large concentration of boulders on the crater floor beneath the walls suggests that the slumping mostly involved the upper layers of regolith and not the bedrock beneath. This is supported by the LRO Diviner Radiometer data mentioned above. Does all this have any bearing on the TLP reported to have occurred in 1999? There is nothing obvious to link the state of the crater walls with this event, and unfortunately no earlier detailed imagery is available to compare with that provided by LRO. All one can say is that the crater walls show evidence of recent instability, but in lunar terms 'recent' can mean an awfully long period of time.

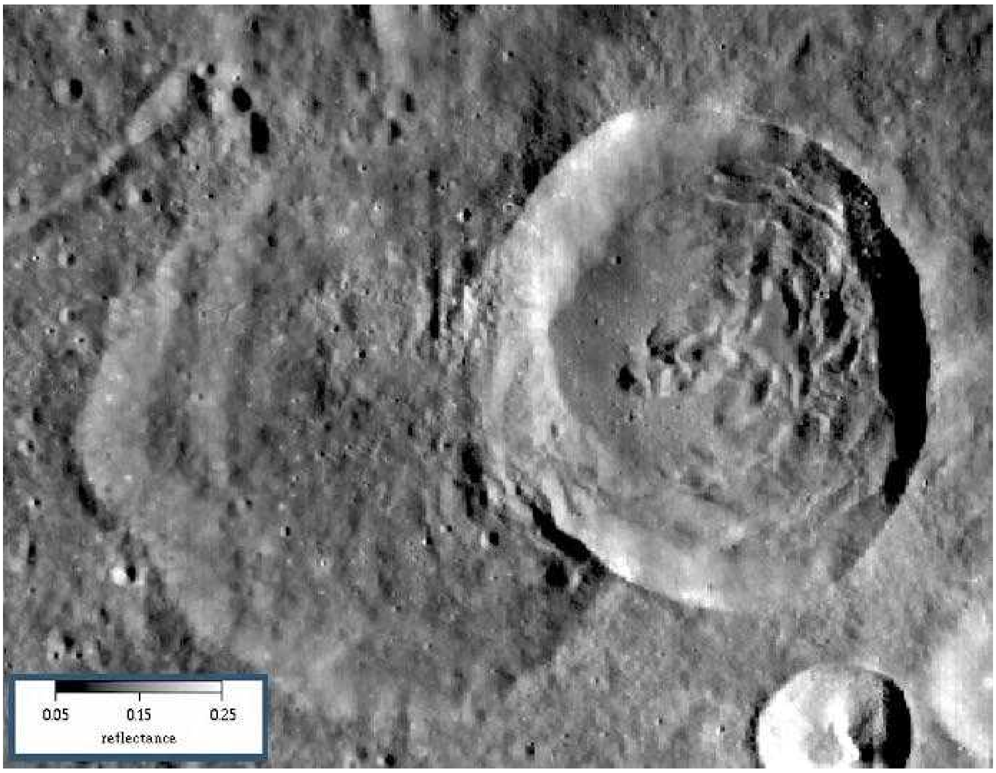


Fig. 5 Chandrayaan-1 M3 Apparent Reflectance overlay from Quickmap showing an apparently lower albedo surface deposit at the foot of the western and north-western wall.

However a working hypothesis, as was suggested in the case of Pitiscus could be that some of these sites of slope failure could be the source of clouds of fine-grained debris dislodged as a result of tectonic or meteoritic disturbance. This would leave little or no trace in the form of rocky avalanche debris on the crater walls and nothing substantial on the crater floor, apart from a thin veneer of fine grained material. Interestingly there is a suggestion of lower albedo deposits at the foot of the western and north-western walls in the Chandrayaan-1 M3 Apparent Reflectance data (Fig. 5) which may have a bearing on this suggestion, but whether this is related to debris derived from the walls above is unknown.

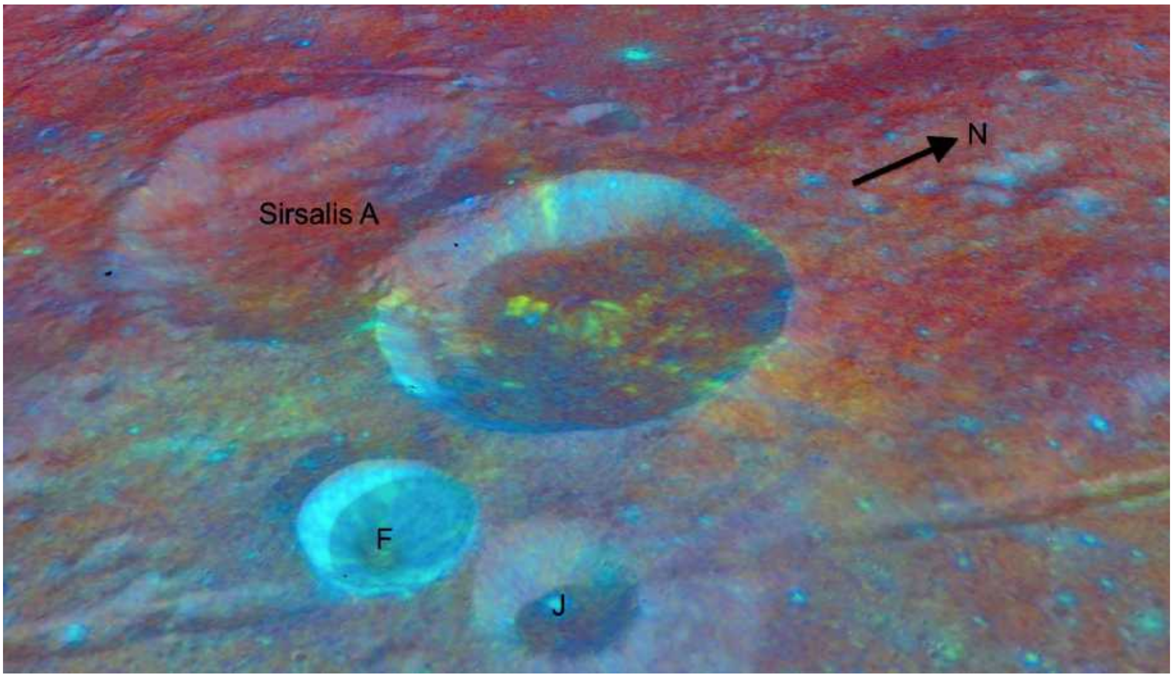


Fig. 6 Clementine UVVIS ratio overlay showing the high north western wall of Sirsalis as blue due to the presence of loose regolith (compare to the fresh inner walls of Sirsalis F). Also note the yellows which indicate pyroxene-rich mare-like deposits which were present at the pre-impact site and were excavated and ejected during crater formation.

Fig. 6 shows a Clementine UVVIS ratio/LROC WAC overlay in which the prominent north-western wall shows up as blue due to the presence of looser regolith deposits, consistent with what is seen in the NAC images. It also reveals that the impact site was not pure highland as orthopyroxene rich deposits (orthopyroxene being abundant in mare lavas) show up in yellow, indicating that a mare or cryptomare unit was present before the impact event, and that this has been dredged up in the central peak and as streaks in the proximal ejecta.

These suggestions on TLPs are pure speculation of course, but they are a possibility worth considering since a number of suspected TLP sites show evidence of mass wastage or avalanche-like deposits. These are, however, only relevant to the dust-cloud TLP hypothesis and would have no significance if these phenomena were the product of some other process or indeed the product of vagaries in illumination.

Acknowledgements:

Many thanks to Tony Cook (Lunar Change project coordinator) for helpful comments and advice.

LROC images reproduced by courtesy of the LROC Website at http://lroc.sese.asu.edu/index.html, School of Earth and Space Exploration, University of Arizona.

Selene images courtesy of Japan Aerospace Exploration Agency (JAXA) at:
http://l2db.selene.darts.isas.jaxa.jp

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LUNAR OCCULTATIONS **June 2020** Tim Haymes

Time capsule: 50 years ago (LSC, Vol.5, No.6)

Director Dr Ron Maddison F.R.A.S, Secretary Phil Ringsdore.
The RGO requests observation of Graze Lunar Occultations.
A theory of TLP involving electrostatic charge is described.
A 'fairly simple' chronograph is explained at the cost of only shillings. [Sub-Ed: It would challenge Heath Robinson in operation!]
The Apollo Log is continued.
Miss C. Botley: Earthshine Observations.
Occultation Observation: J.F Pedler (Bristol) ZC1157, 15cm Rfl x64, 0.1sec stopwatch and GPO speaking clock in misty conditions.

Trevor Smith writes:

On the 5th of May I watched the moon occult 5.7 mag star 80 VIR and decided to time its disappearance with my radio controlled clock in my observatory. This picks up signals four times a day at MSF 60kHz (England). All well and good so far, the star disappeared instantly at 21h 02m 55s U.T with no sign of any fading.

However, I noticed something that hadn't occurred to me before. On looking at my smart phone there was a discrepancy of three seconds in the time displayed on my phone and the time displayed on my MSF clock. After finishing observing I took my phone indoors and compared the time displayed with the time displayed on my wife's phone. I am not sure if I was surprised or not, but both phones showed a slightly different time (a 4 second difference in fact). We also have a radio controlled clock /weather station which also picks up signals from MSF. I took this clock to the observatory and compared the time with my observatory clock. I thought both of the times on display would be exactly the same, but there was a difference of some two seconds.

I now have four separate time displays showing four different times. I wonder which one, if any, is correct?

Reply from Tim Haymes:

It is not uncommon to see difference in time from digital receivers like phones due to the method the phone uses i.e. data link or wireless (WiFi) and the distance of the time server. The UT difference can accumulate but not more than +/- a few seconds. One example is the 'on-the-hour' time pips from Radio-2 digital (DAB) transmission. These are 3 seconds delayed on UT. They were exact in analogue days.

Radio transmissions are more accurate, although these are affected by a propagation delay of 20ms or so. Radio clocks use MSF (UK) and DCF (Germany). These clocks usually update once a day, and sometime the update can be selected by the user. I have several radio clocks and a Casio wave-ceptor wristwatch. If they are sync'ed regularly they will show the same time. If not synchronised they can drift by a second or so over several days. Perhaps one of the radio clocks wasn't synchronised.

The observatory radio clock updating several times a day is the more accurate time piece I would expect.

Occultation observers with video now use dedicated GPS receivers to insert the time on the video exposure with high accuracy. Even so, I check with a radio clock that the seconds are in step before I make an occultation observation. The GPS time depends on an almanac which downloads the number of leap seconds. So I give the receiver enough time to do this if the two clocks don't match.

Time the Sat (Satflare.com)

This is an Android phone app that can record the time of button pushes (stopwatch) but will also provide an audio announcement of the time +/- 1/5 sec (a speaking clock) and the app can update the phone's time. It is a useful tool for observers waiting for a particular event while at the eyepiece. The time is not particularly accurate, but potentially useful. The time server can be selected in the settings, and the nearest server should be used.

80 Virgins (ZC 1950) on May 5th, 2020.

Trevor Smith reports an instantaneous disappearance at the dark limb. The Moon phase was 96% illuminated. There are no light curves from previous video observations in the Occult4 database.

Venus is occulted, morning of June 19th

This can be observed in daylight from the British Isles with care and suitable filtration due to the brightness of the sky. Both the Moon and Venus will be a slender crescent. The use of an IR pass filter should enhance the image in full spectrum cameras. I would be very interested in receiving observations of this event. The contact time is 1-2 min before the computed UT in the table.

		London	Aberystwyth	Edinburgh	Exeter
DB/ca	*	0740:00/-68S	0736:42/-75S	0742:28/-80S	0734:59/-71S
RD/ca		0842:51/ 54S	0841:47/ 61S	0849:27/ 68S	0838:25/ 57S

* Phase/Cusp Angle, where –ve angle indicate the bright limb.

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

		day	Time			P	Star	Sp	Mag	Mag	%	Elon	Sun	Moon		CA	
y	m	d	h	m	s		No		v	r	ill		Alt	Alt	Az	o	Notes
20	Jun	1	20	33	44.0	D	139229	K2	7.3	6.6	80+	127	-2	33	178	27S	
20	Jun	1	22	13	48.4	D	139252	G5	8.9	8.4	80+	127	-11	30	206	27S	
20	Jun	2	20	21	58	m	2022	F2	5.5	5.3	88+	140	0	26	161	-6S	95 Vir
20	Jun	2	23	4	33.0	D	2032	F0	7.2	7.0	89+	141		24	204	60S	97 Vir
20	Jun	2	23	8	10.9	D	139781	G0	8.8*		89+	141		24	205	20S	
20	Jun	3	21	57	34.9	D	159033	G5	8.5	8.1	95+	155	-9	22	173	28N	
20	Jun	3	22	3	39.2	D	159035	M3	8.1	7.3	95+	155	-10	22	174	38N	
20	Jun	4	1	17	17.0	D	159096	K3	7.6*	6.8	96+	156		12	221	31S	
20	Jun	8	3	5	15.1	R	187895	A1	7.6	7.4	93-	150	-5	11	191	43N	
20	Jun	10	2	40	41.8	R	3089	A0	5.3*	5.3	79-	126	-7	14	160	77N	chi Cap
20	Jun	11	2	9	23.0	R	164795	M2	8.1	7.2	71-	114	-9	11	141	81S	
20	Jun	11	3	38	21.7	R	3227	K0	6.3	5.8	70-	114	-1	17	161	47S	
20	Jun	12	1	57	56.3	R	3343	B9	5.7*	5.7	61-	103	-10	8	127	69S	69 Aquarii
20	Jun	12	2	24	16.1	DB	3349	K5	4.1	3.2	61-	103	-8	12	132	-45N	tau Aquarii
20	Jun	12	3	19	28.2	RD	3349	K5	4.1	3.2	61-	102	-3	17	145	49N	tau Aquarii
20	Jun	19	7	39	51.0	DB	**Venus**		-4.4		4-	23	41	42	118	-78S	
20	Jun	19	8	45	16.0	RD	**Venus**		-4.4		4-	23	41	50	136	62S	
20	Jun	19	14	47	25.3	DB	668	K0	3.5*	3.0	3-	20	48	33	258	-16S	epsilon Tauri
							668 is triple: Aa,Ab 3.6 6.0 0.20" 108.0, dT = +1sec										
20	Jun	19	15	1	19	Gr	668	K0	3.5	3.0	3-	20	47	30	**	GRAZE:	
							Southern limit mid-Wales to Foulness in daylight										
20	Jun	23	9	44	10.0	DD	1221	M3	6.0	5.1	5+	27	49	32	95	37N	9 Cnc dbl*
20	Jun	23	10	27	37.9	RB	1221	M3	6.0	5.1	5+	27	54	39	104	-47N	
20	Jun	23	20	54	25.4	D	1269	G5	6.9	6.3	7+	32	-2	13	288	30S	
20	Jun	25	22	13	4.7	D	1520	F0	8.7	8.6	24+	58	-9	11	278	26S	
20	Jun	27	21	25	14.4	D	119237	K5	8.5	7.8	45+	84	-5	24	241	41S	dbl*
20	Jun	27	23	13	36.7	D	119272	F5	7.6*	7.3	45+	85		9	263	81N	
20	Jun	28	18	41	49	m	1856	F5	6.8		55+	96	14	36	181	9N	dbl*
							1856 is double: AB 7.33 7.61 1.08" 101.2										
20	Jun	29	20	59	54.8	D	139602	K2	8.3*	7.6	67+	110	-3	26	205	75S	
20	Jun	29	22	16	14.1	D	1994	F8	6.6*	6.3	68+	111	-10	19	224	62S	dbl*
							1994 is multiple: AB 6.7 7.3 3.6" 101.0, dT = +6sec										
20	Jun	29	22	16	22.9	D	X127461		7.2	6.9	68+	111	-10	19	224	62S	dbl*
							X127461 is triple: BA 7.3 6.7 3.6" 281.0, dT = -6sec										
20	Jun	30	21	18	55.1	D	158804	F3	8.5	8.2	78+	124	-5	23	196	42N	dbl*
							*158804 is double: ** 9.0 9.3 0.008" 80.0, dT = +0.03sec*										
20	Jun	30	21	56	58.3	D	158815	K0	7.7	7.1	78+	124	-8	20	205	55N	
20	Jun	30	22	43	42.5	D	158825	F3	8.0	7.8	78+	125	-11	17	216	72S	
20	Jun	30	23	23	8.2	D	158845	K2	7.7	7.0	79+	125		13	225	78S	
20	Jun	30	23	49	39.4	D	158865	F0	7.8	7.6	79+	125		10	230	62N	
20	Jul	1	23	16	29.4	D	159494	kA3	8.3	8.2	87+	138		14	210	68N	

Predictions up to July 5th

Notes on the Double Star selection.
Doubles are selected from Occult 4, where the fainter companion is brighter than mag 10, 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.
Graze predictions for 2020 are available to download from the Lunar Section link here:
https://britastro.org/downloads/17673

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

LUNAR GEOLOGICAL CHANGE DETECTION PROGRAMME

Tony Cook

Reports have been received from the following observers for April: Jay Albert (Lake Worth, FL, USA - ALPO) observed: Alphonsus, Bullialdus, Censorinus, Copernicus, Eimmart, Gassendi, Messier, Plato and Torricelli B. Alberto Anunziato (Argentina - SLA) observed: Alphonsus, Aristarchus, Bullialdus, Eimmart and Schickard. Bruno Cantarella (Italy – UAI) imaged Mons Piton. Maurizio and Francesca Cecchini (Italy – UAI) imaged Mons Piton and Tycho. Abel Cian (Argentina – AEA) imaged Aristarchus and several features. Maurice Collins (New Zealand – ALPO/BAA/RASNZ) imaged: Alphonsus, Aristarchus, Archimedes, Mare Serenitatis, Theophilus and several features. Tony Cook (ALPO/BAA) videoed the Moon in the thermal IR and imaged several features in visible to near-IR wavebands. Walter Elias (Argentina – AEA) imaged: Plato and several features. Valerio Fontani (Italy – UAI) imaged: Mersenius C, Mons Piton, Tycho and the Full Moon. Les Fry (Mid-Wales, UK – NAS) imaged: Aristarchus, Copernicus, Mare Humorum, Mare Imbrium and Schickard. Rik Hill (Tucson, AZ, USA - ALPO/BAA) imaged Apianus, Clavius, Copernicus and several features. Bill Leatherbarrow (Sheffield, UK – BAA) imaged: Riccioli. Jean Marc Lechopier (France – UAI) imaged: Mersenius C and Mons Piton. Nigel Longshaw (Oldham, UK - BAA) observed: Lichtenburg. Leonardo Mazzei (Italy – UAI) imaged earthshine. Trevor Smith (Codnor, UK – BAA) observed: Aristarchus, Bullialdus, Censorinus, Lichtenburg, Manilius, Plato, Proclus, Timocharis, Torricelli B, Vallis Schröteri, and several features. Bob Stuart (Rhayader, UK – BAA/NAS) imaged: Aristarchus, Bettinus, Hevelius, Mare Crisium, Schickard, and several features. Franco Taccogna (Italy – UAI) imaged: the Full Moon. Aldo Tonon (Italy – UAI) imaged: Mons Piton and the Full Moon. Gary Varney (Pembroke Pines, FL, USA – ALPO) imaged: Plato and Tycho. Fabio Verza (Italy – UAI) imaged: Mersenius C, Mons Piton, and Tycho. Luigi Zanatta (Italy – UAI) imaged: earthshine and Mons Piton.

TLP reports: No TLP were reported in April, although I did received a report from Phil Shepherdson (York, UK – BAA) concerning an ‘ashen’ sliver of light seen across the floor of Ptolemaeus on 2020 Feb 01 UT 19:40-10:50. Having studied this area for many years, both myself and the director of the BAA Lunar Section strongly suspected that these were thee normal shadow spires at sunrise. However, Phil re-observed on 2020 May 30 UT 00:13 and could not see the ‘ashen’ effect. The effect seen back in Feb may have any number of reasons, such as seeing, transparency, and even condensation on the optics, but for safety we shall put this as a weight 1 TLP in the ALPO/BAA database, just so that we may get used to a series of observations under a variety of observing conditions to see if we can replicate what Phil saw.

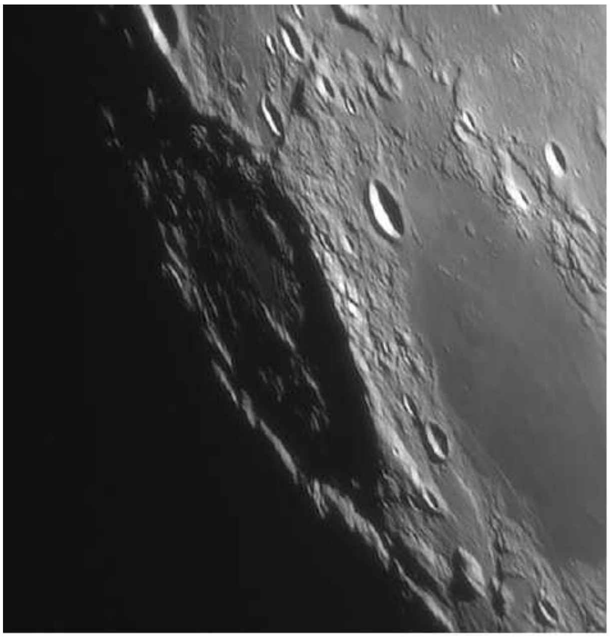
 

Figure 1. *Riccioli orientated with north towards the top.* ***(Left)*** *A monochrome IR image by Bill Leatherbarrow (BAA Lunar Section Director) taken on 2020 Apr 06 UT 22:25.* ***(Right)*** *An image by Anthony Cook (ALPO/BAA) taken on 2020 Apr 07 UT 01:00. This has been colour normalized and then had its colour saturation increased.*

On 2020 Apr 06 UT I was videoing the Moon with a colour webcam coupled to a x2 Barlow. This was picking up some colour such as the blueness of Aristarchus, which is normal. What I was not expecting was to see some green/brown covering the crater Riccioli (Fig. 1 – Right). An email from Bill Leatherbarrow revealed that he had imaged the area earlier in the near-IR (Fig. 1 – Left) – so although not confirming the colour, is of higher resolution. Another email from Nigel Longshaw (BAA) reminded me that colour in Riccioli is mentioned in Walter Haas' 'Does anything ever happen on the Moon?'. Walter says that observers have noted a greenish tint on the floor at sunrise, but purplish grey with a tinge of brown at other times – even a deep purple has been recorded. I will add this to the Lunar Schedule web site so that we can confirm this. Incidentally the LROC WAC mosaic does not exhibit a green tinge here, so the colour seems to be a directional effect – maybe associated with draping of Hevelius formation ejecta from Mare Orientale?

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

Archimedes: On 2020 Apr 01 UT 07:12 and 07:31 Maurice Collins (ALPO/BAA/RASNZ) imaged this crater under similar illumination (±0.5°) to the following report:

Archimedes 1966 Mar 29 UT 21:00 Observed by Hill (England, 24" reflector, x250, S=E) "Brightening of E-W bands across floor. (Obscuration accord. to Moore)" NASA catalog ID #923. NASA catalog weight=3. ALPO/BAA weight=1.

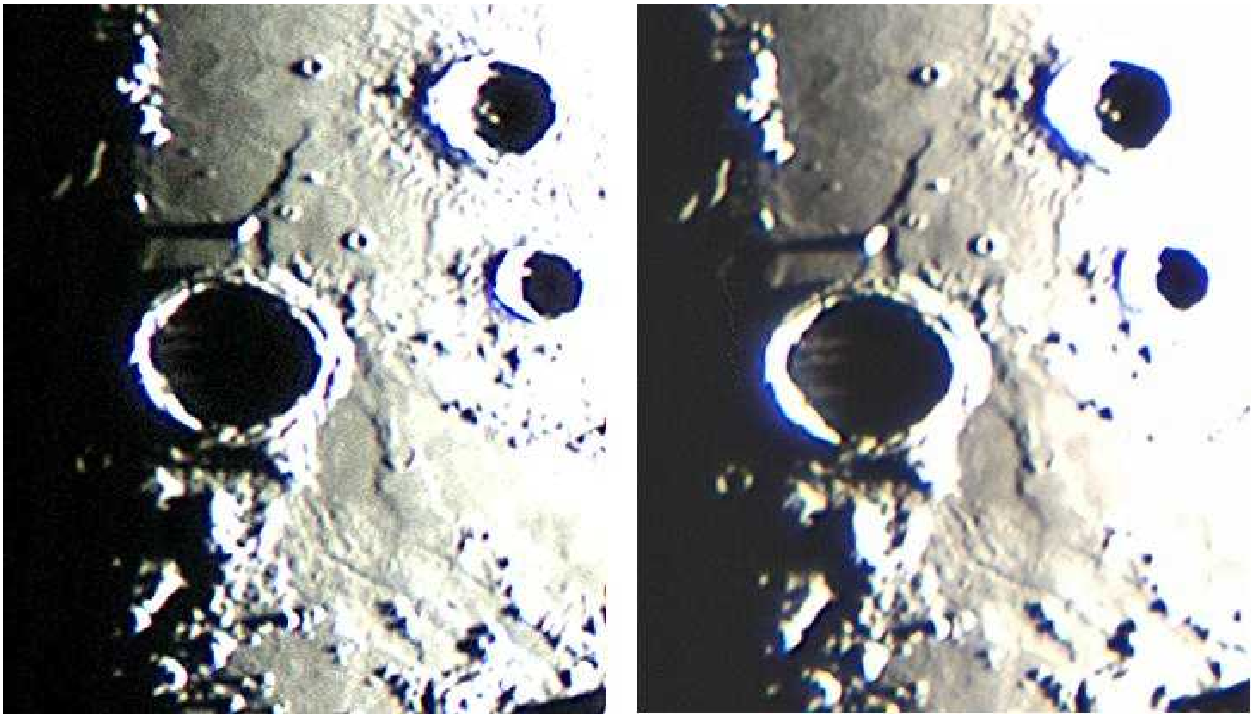


Figure 2. *Archimedes as imaged by Maurice Collins (ALPO/BAA/RASNZ), on 2020 Apr 01, contrast stretched and orientated with north towards the top.* ***(Left)*** *Image taken at 07:12UT.* ***(Right)*** *Image taken at 07:31UT.*

Maurice has certainly picked up the shadow bands on the floor of Archimedes and you can see an apparent change as the Sun rises (Fig. 2) and there is a clear brightening. However, I would not describe this as an obscuration. Unfortunately, I don't have the original observations, so this must stay at a low weight of 1 for now.

Tycho: On 2020 Apr 01 UAI observers: Maurizio and Francesca Cecchini, Valerio Fontani, and Fabio Verza, monitored this crater (Fig. 3) between 19:03 and 19:46UT under a colongitude range of 12.5° to 12.8º as specified in the following Lunar Schedule request:

BAA Request: How early can you see the central peak of this crater illuminated by scattered light off the crater's west illuminated rim? High resolution and/or long exposures needed to capture detail inside the floor shadow. All images should be sent to me on the email address below, whether or not you were successful in capturing the central peak: a t c @ a b e r . a c. u k

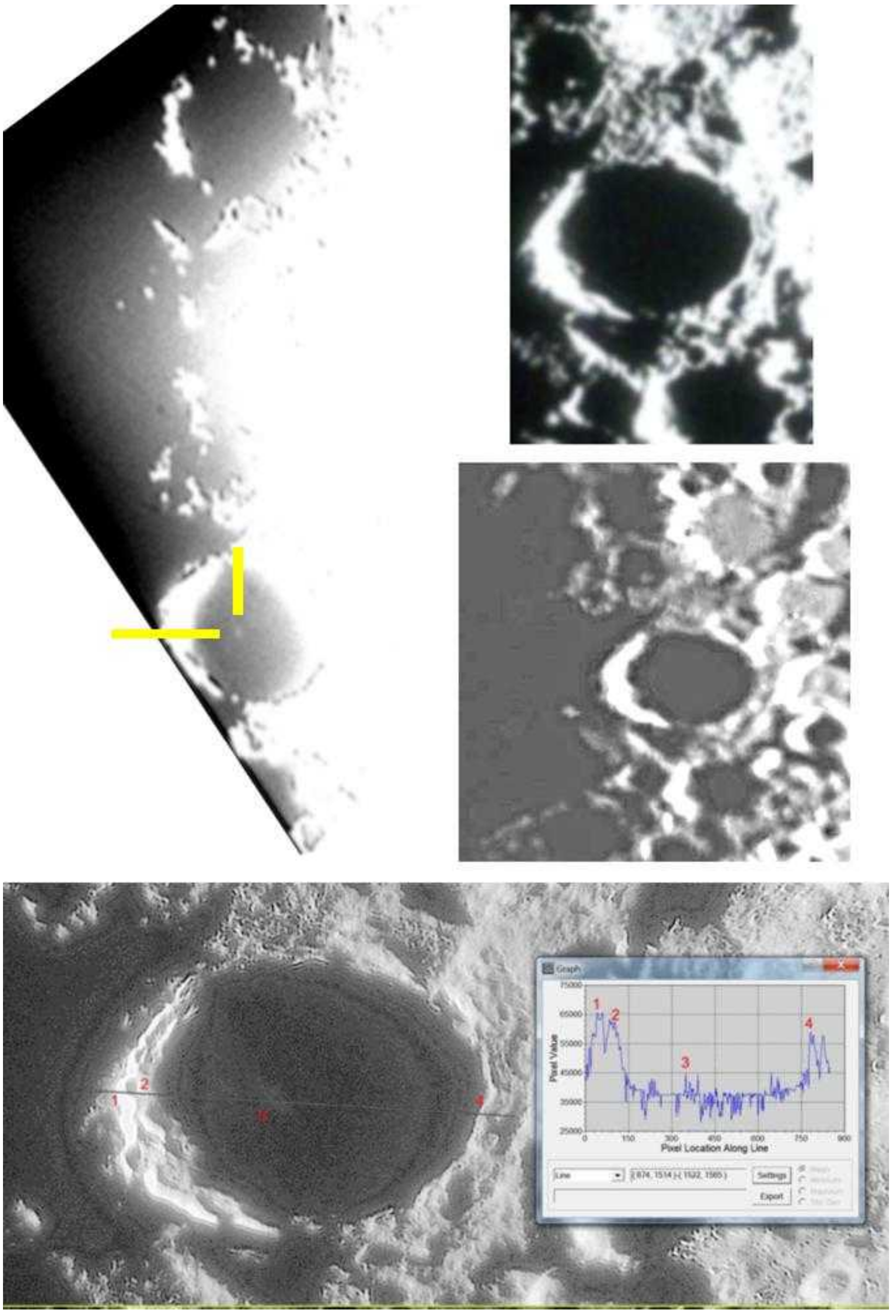


Figure 3. *Tycho orientated with north towards the top and contrast stretched.* ***(Top Left)*** *An image by Brendan Shaw taken on 2003 May 09 UT 21:04 (Col.=12.6°, $Lat_{\odot}$=-0.3º, $Az_{\odot}$=89.3º, $Alt_{\odot}$=1.2º), using a 3" Takahashi refractor, showing the central peak, despite being in shadow.* ***(Top Right)*** *An image taken by Fabio Verza (UAI) on 2020 Apr 01 UT 19:03 (Col.=12.5°, $Lat_{\odot}$=-1.5º, $Az_{\odot}$=90.2º, $Alt_{\odot}$=2.0º), using a Celestron CPC800 scope through an IR807 filter.* ***(Centre Right)*** *Image taken by Valerio Fontani on 2020 Apr 01 UT 19:15 (Col.=12.7°, $Lat_{\odot}$=-1.5º, $Az_{\odot}$=90.1º, $Alt_{\odot}$=2.1º) using a Meade LX200 telescope with a red filter.* ***(Bottom)*** *Image taken by Maurizio and Francesca Cecchini (C14 XLT telescope, 630nm Astronomik red filter, seeing 5-6/10) on 2020 Apr 01 UT 19:32 (Col.=12.5°, $Lat_{\odot}$=-1.5º, $Az_{\odot}$=90.2º, $Alt_{\odot}$=2.0º) with a brightness cross-section profile taken through the shadowed area of the floor.*

We have covered this TLP before in the 2011 Aug, 2014 Oct, and 2016 Mar newsletters. Interestingly the original sighting of the central peak by Brendan Shaw back in 2003 (Fig. 3 – Top Left) was at a much lower solar altitude than the UAI team were observing at, and seems to have been more prominent, and made with a smaller instrument. Only the Cecchini observation (Fig. 3 – bottom), made with a 14", just about detects the peak. The solar altitude is too low for direct illumination, so most probably is being illuminated by reflection of light off of the western rim. The puzzle is why was the central peak so bright back in 2003 but hard to detect in the UAI observations, and similarly problematic to detect at a solar altitude of 1.2º?

Mons Piton: On 2020 Apr 01 UAI observers observed for the following Lunar Schedule request:

BAA Request: Can you see a point of light emerging from the shadow of this mountain? Any sketches, visual descriptions, or images taken, should be emailed to: a t c @ a b e r . a c. u k .

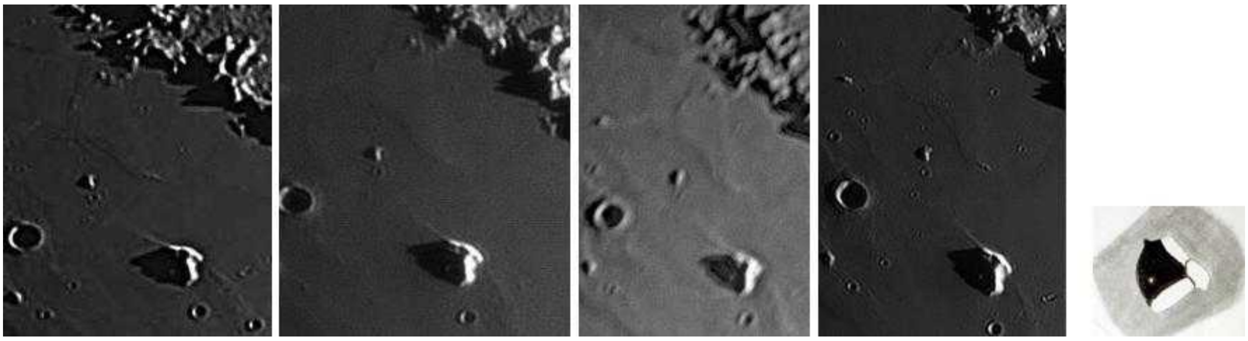


Figure 4. *Mons Piton orientated with north towards the top.* ***(Far Left)*** *An image by Luigi Zanatta (UAI) taken on 2020 Apr 01 UT 19:40.* ***(Left)*** *An image taken by Fabio Verza (UAI) taken on 2020 Apr 01 UT 29:30.* ***(Centre)*** *An image by Valerio Fontani (UAI) taken on 2020 Apr 01 UT 20:36.* ***(Right)*** *An image by Aldo Tonon made on 2020 Apr 01 UT 20:50.* ***(Far Right)*** *A sketch by Trevor Smith (BAA) Made on 2019 Nov 05 UT 20:10.*

This actually corresponds to a 2004 Jan 30 UT 15:52 TLP report from some unknown Italian TLP observer. I think I recall at the time that I was in discussion with Raffaello Lena (GLR) and we both agreed that it was probably an isolated peak on the slopes of Mons Piton. Our four UAI observers show the peak effect quite nicely in Figs 4 (Far Left – Right). In addition, I recalled that we had a sketch by Trevor Smith (Fig. 4 – Far Right) that shows the same effect. Having investigated the mountain in LROC images, and seen later images by the UAI, we can definitely be sure that this is topography sticking out of the shadow and can now safely remove this TLP from both the Lunar Schedule website and the TLP website.

Plato: On 2020 Apr 03 UT 00:53 Gary Varney (ALPO) imaged the crater at similar illumination (±0.5º) to the first report below, and 41min prior to the second report. Jay Albert (ALPO) observed from 01:25-01:50 UT, some 27 min after the end of the first observing window but during the second:

Plato 2005 Dec 10 UT 20:46 Observed by Brook (Plymouth, UK, 4" refractor. Conditions excellent with the Moon at a high altitude) "2 second duration white flash seen on the floor of the crater" - BAA Lunar Section Report.

On 1980 Apr 24 at 23:35UT Marco Petek (Porto Alegre, Brazil, using a 7.5" refractor noticed that the center of Plato was bright and opaque and the observer thought it was similar in appearance to Linne. A sketch was made and two other observers confirmed the appearance. Cameron mentions that Petek is an experienced observer. Cameron 2006 catalog extension TLP ID=91 and weight=5. ALPO/BAA weight=3.

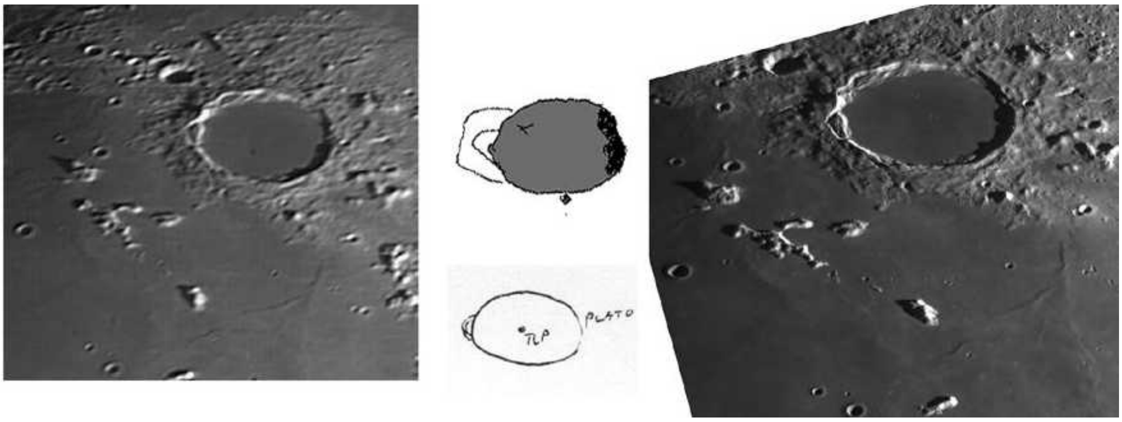
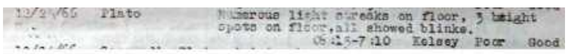


Figure 5. *Plato orientated with north towards the top.* ***(Left)*** *Image by Brendan Shaw taken on 2005 – note the black dot on the floor of Plato is a dust speck in the camera system.* ***(Centre Top)*** *An electronic sketch by Clive Brook on 2005 Dec 10 UT 20:46.* ***(Centre Bottom)*** *A sketch by Petek on 1980 Apr 24 UT 23:35.* ***(Right)*** *An image by Gary Varney on 2020 Apr 03 UT 01:53.*

Jay comments that the crater was mostly sunlit with some shadow remaining along the inner E wall. The floor was lacking in detail and only the central craterlet was sometimes visible. The crater floor seemed brighter than usual in comparison with Mare Frigoris and Mare Imbrium. A very faint, very slightly darker, indistinct dusky band ran E-W across the N part of the crater floor. No colour or brightness variations were observed. A hand-held iPhone image was taken (Not shown here). Plato was observed from 01:25 to 01:50UT at 290x and rechecked from 02:05 to 02:15UT with no sign of change. We shall leave both weights as they are.

Plato: On 2020 Apr 04 UT 02:15-02:30 Jay Albert (ALPO) observed and 02:43UT Walter Elias (AEA) imaged the crater under similar illumination to the following 1960's era report:

Plato 1966 Dec 23 UT 06:15-07:10 Observed by Kelsey (Riverside, CA, USA, 6" reflector, S=P, T=G) and Coralitos Observatory (Organ Pass, NM, USA, 24" reflector + Moonblink) "3 brilliant spots on floor, all showed blinks, (permanent colored Ground features ?). Not confirmed by Corralitos MB." NASA catalog weight=2. NASA catalog ID #1005. ALPO/BAA weight=1.


12/2[illegible]/66 Plato Numerous light streaks on floor, 3 bright spots on floor,all showed blinks.
06:15-7:10 Kelsey Poor Good

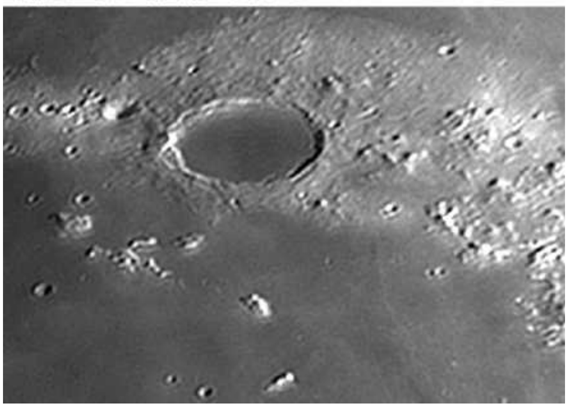


Figure 6. *(Top) A section from the BAA Lunar Section Circular from Vol No. No. 4, p9 – the only evidence we have of the 1866 TLP report from H.W. Kelsey.* ***(Bottom)*** *A repeat illumination image of Plato taken by Walter Elias (AEA) on 2020 Apr 04 UT 02:43, and orientated with north towards the top.*

Jay noted that he didn't see the '3 brilliant spots on floor'. Actually, there were no brilliant spots at all on the floor. He saw the dim central craterlet and sometimes saw the S craterlet with difficulty. The N pair of craterlets was not seen. The crater floor was darker than the previous night and clearly darker than Frigoris and Imbrium. He used 290x from 02:15 to 02:30UT. Walter's image (Fig. 6 - bottom) confirms Jay's account that there were no signs of 3 brilliant spots on the floor. Interestingly all we have on the Kelsey report is the BAA Lunar Section report (Fig. 6 – Top). Is it possible that local time was given for Kelsey's location: Riverside, California, USA? We shall leave the weight as it is for the moment.

Eimmart: on 2020 Apr 03/04 23:30-23:40 UT Alberto Anunziato (SLA) and 01:06-01:22 UT Jay Albert (ALPO) observed visually this crater under similar illumination to the following report:

On 1981 Apr 15 at UT06:27-06:40 D. Louderback (South Bend, WA, USA using a 3" refractor x134 and S=4.5-5 and T=5-0) saw a bright spot on the western wall of Eimmart (sketch supplied) have an unusual brightening and shade. Variations occurred over 2-3-minute intervals. Louderback commented that the spot looked like a flare with its apex located at the crater wall and there was some blurring effect on the spot - it decreased in size during the phenomenon. Seeing worsened later. Apparently on the 18th and 19th of April everything was back to normal. Cameron comments that there is no bright spot on the Moon at this location. Lunar Orbiter IV plates 192-3.2 shows evening conditions. Cameron 2006 Catalog Extension TLP ID=130 and weight=3. ALPO/BAA weight=3.

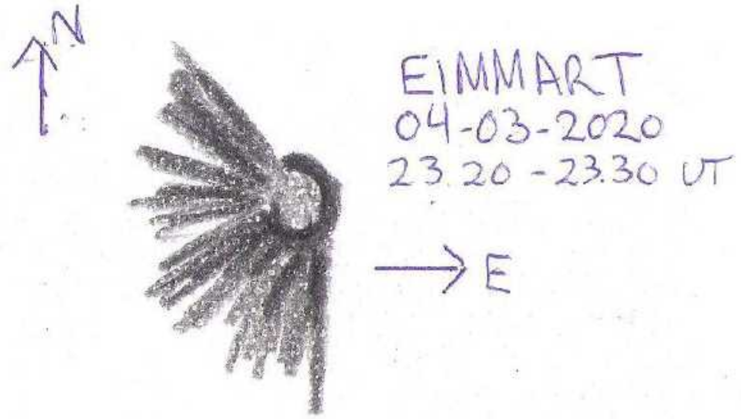


***Figure** 7. The bright spot on the western wall of Eimmart crater as sketched by Alberto Anunziato (SLA) on 2020 Apr 03 UT 23:30-23:40. This sketch has been reoriented so that north was towards the top and labels adjusted accordingly.*

Alberto made a sketch (Fig. 7) of the appearance of Eimmart (colours inverted). The crater was very bright, with some zones brighter than the rest (to the east) marked as darker in the sketch. Only Proclus appeared brighter in the Mare Crisium. Jay comments that there was a bright spot on the W wall of the crater. The entire crater was lit up very brightly, was much foreshortened near the limb and was not at all sharp. The spot on the W wall was a brilliant white and stood out like a flare. There was some seeing-related image movement, but the intense brightness didn't seem to vary. An image taken by Walter Elias (AEA) at 23:44UT, but not shown here as the area is quite small in the image, also reveals the bright spot. We shall therefore lower the ALPO/BAA weight of this report 3 to 1 because there is normally a bright spot here, despite what Cameron says. The variations seen in 1981 are probably seeing related, but we shall have one further repeat illumination round of observing to check out this theory of Jay's.

Bullialdus: On 2020 Apr 04 UT 21:53-22:19 Trevor Smith (BAA) observed visually during the following repeat illumination (±0.5°) window, and at 20:52 UT Les Fry (NAS) imaged Mare Humorum just 36 min prior to the start of the window:

2006 Dec 02 at 03:30UT observer noticed a hint of yellow colour on the floor of the crater and by 03:57UT the south east and central parts of the floor and the circular feature on the south west floor had turned a deep yellow colour. The rest of the crater remained colourless. Other craters also remained colourless. By 04:05UT the colour was fading and by 04:15UT it was gone. Maurice Collins in New Zealand took some low-resolution colour images about 4 hours later but these failed to show any yellow colour. Zac Pujic obtained colour images at a different time of natural surface colour on the Moon and finds that Bullialdus does actually have a natural yellow cast to most of the floor. However, this does not explain the variability in colour strength seen by Robin Gray. ALPO/BAA weight=3.

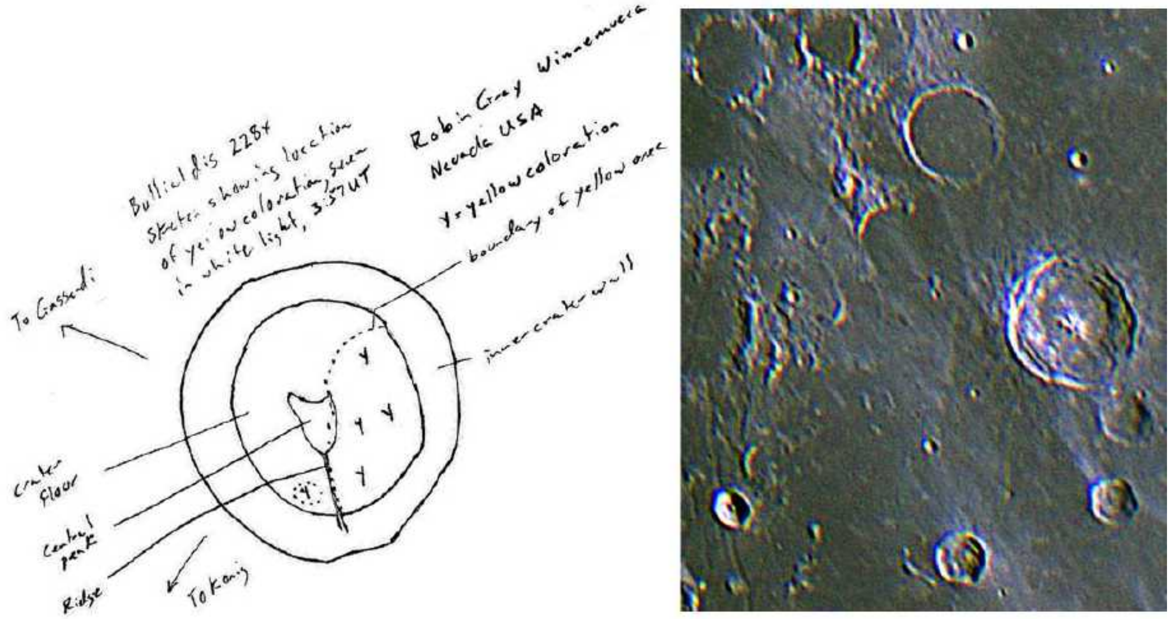


Figure 8. *Bullialdus orientated with north towards the top.* ***(Left)*** *A sketch by Robin Gray made on 2006 Dec 02 UT 03:30-05:18 using a 152mm f/9 refractor at x228, seeing 5, transparency 3-6.* ***(Right)*** *A colour image by Les Fry (NAS) which has been colour normalized and then had its colour saturation increased to 50%.*

Trevor, using a 16" Newtonian at x247, stated that the crater looked normal with no yellow glows, no haze, nor any spurious colour (atmospheric spectral dispersion). He found the central peaks easy to see, as was other detail. Although the image from Les was before the similar illumination prediction, you can quite clearly see that at the locations where Robin Gray wrote 'Y' for yellow (Fig. 8 – Left), there is no obvious signs of yellow on the floor in Les' image (Fig. 8 – Right). Despite the fact that apparently you can see colour here at a different illumination, because Les' image does not show any yellow, I think we shall have to leave the weight at 3 for now.

Mersenius C: On 2020 Apr 04, UAI observers: Valerio Fontani, Jean Marc Lechopier, and Fabio Verza, imaged the Moon under similar selenographic colongitudes (50.4° to 50.8°) to the following Lunar Schedule web site request:

ALPO Request: Color images or visual inspection needed of the area just SW of this crater. If taking images, do not over expose on bright slopes. Can you detect any natural surface color here or mistiness? Minimum aperture needed 4", and if you have a choice, use a refractor instead of a reflector. Please send any images, or sketches, to: a t c @ a b e r . a c. u k

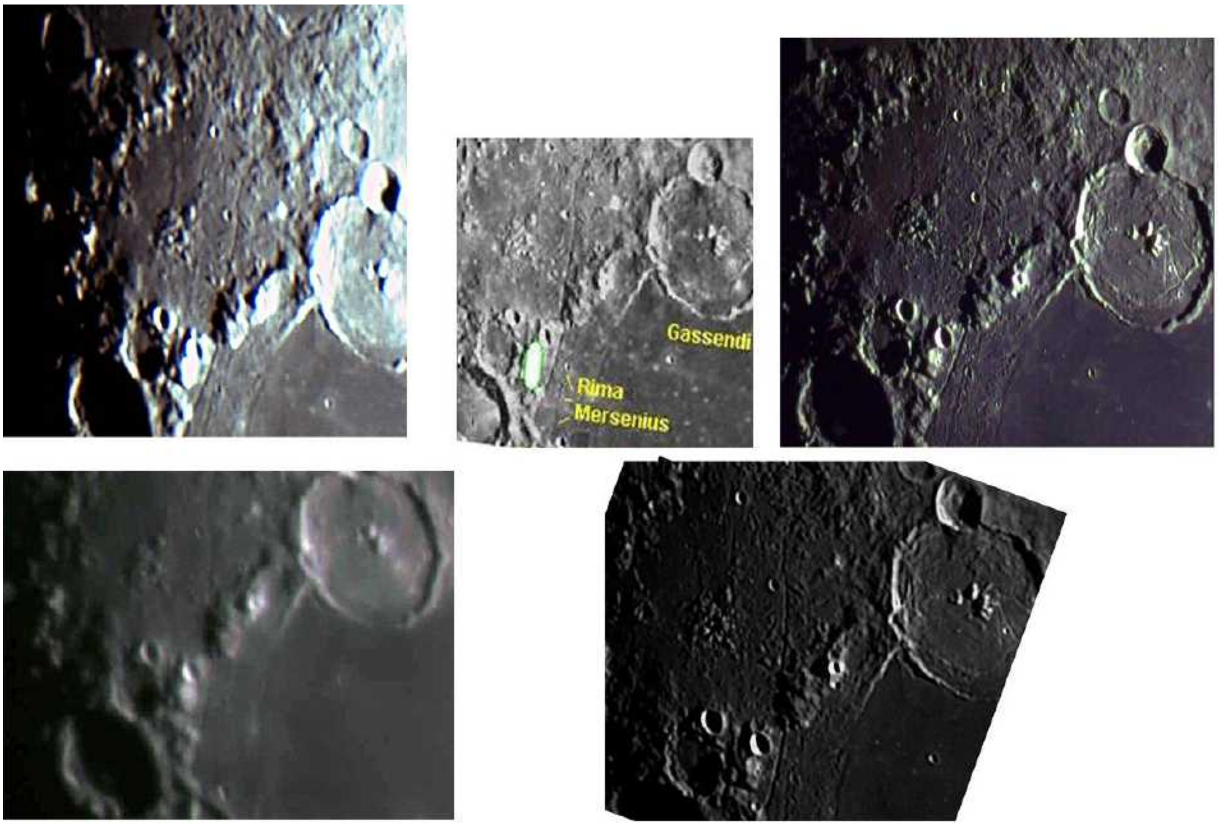


Figure 9. *The region around Mersenius C, orientated with north towards the top.* ***(Top Left)*** *2005 Nov 12 UT 04:48 image by Wayne Bailly – colour normalized image (Col.=50.6°, Az$_{\odot}$=89.4º, Alt$_{\odot}$=4.3º).* ***(Top Centre)*** *A annotated image by Glen Ward (LPO) showing where they saw a light green glow on 2005 Nov 12 UT 04:30-04:57 (Col.=50.6°, Az$_{\odot}$=89.4º, Alt$_{\odot}$=4.4º).* ***(Top Right)*** *2020 Apr 04 UT 22:02 colour image, by Fabio Verza (UAI) which has been colour normalized and then had its colour saturation increased to 75% (Col.=50.5°, Az$_{\odot}$=89.9º, Alt$_{\odot}$=4.5º).* ***(Bottom Left)*** *2020 Apr 04 UT 22:14 colour by Valerio Fontani (UAI) which has been colour normalized and had its colour saturation increased to 30% (Col.=50.6°, Az$_{\odot}$=89.9º, Alt$_{\odot}$=4.6º).* ***(Bottom Right)*** *2020 Apr 04 UT 22:32 (UAI) monochrome image by Jean Marc Lechopier (UAI) (Col.=50.8°, Az$_{\odot}$=89.8º, Alt$_{\odot}$=4.7º).*

This ALPO request for observation actually refers to a 2005 Nov 12 UT 04:50-04:57 observation by Glen Ward, where a light green colour was seen on a mountain SW of Mersenius (See Fig. 9 – Top Centre). We covered this before in the 2020 April newsletter, so it is welcome to see some additional images to add to our arsenal of evidence as to what the area should normally look like. Wayne Bailly, who obtained video just prior to the onset of the Ward observation, has very kindly sent me a copy of his original colour video. I have examined this carefully, and although still hindered by the glare (saturated pixels) from the bright sunlit slope where Glen Ward saw colour, I cannot see any colour in the immediate surrounds which isn't similar to colour associated with other bight saturated areas elsewhere in the image. So alas inconclusive about confirming/disproving Glen's report – but at least we have the original video now which can always be re-examined using improved future techniques. Moving onto the UAI similar selenographic colongitude images, Fig. 9 (Top Right, Bottom Left and Bottom Right), in Valerio's image (Fig. 9 – Top left), there is perhaps a very slight hint of turquoise blue/lime green in the location of the 2005 TLP, but it is by no means unique because if you look at other bright peak locations, you can sometimes see a similar effect. It may be due to telescope chromatic aberration (always present to some extent where you have glass in the optics, even the camera window) or something to do with the camera (if it is of a Bayer matrix type?). It might also just be natural colour as geologically young slopes tend to be bluer. I will leave the weight of the original report at 3, but change the request on the Lunar Schedule web site so that we stick to larger apertures with colour cameras. I may also tighten up the libration requirements so that the viewing angle is similar – in case it is something unusual like internal reflection from pyroclastic glass beads on the surface?

Lichtenberg: On 2020 Apr 06/07 three BAA members: Nigel Longshaw (22:00-22:25, 23:00-23:36 UT), Trevor Smith (22:40 & 23:30 UT) and Anthony Cook (00:38-00:40UT) studied this crater under both similar illumination and topocentric libration (±1ºto the following past TLP report:

Lichtenberg 1951 Jan 21 18:19.2-18:38.5 UT observed by Baum (Chester, England). Tiny red spot noticed initially and then faded. Location of spot 31.403N 66.167W. 20cm refractor x90-x100. Seeing fair-extremely good. NASA catalog assigns a weight of 3. NASA TLP ID No. #542. ALPO/BAA weight=2.

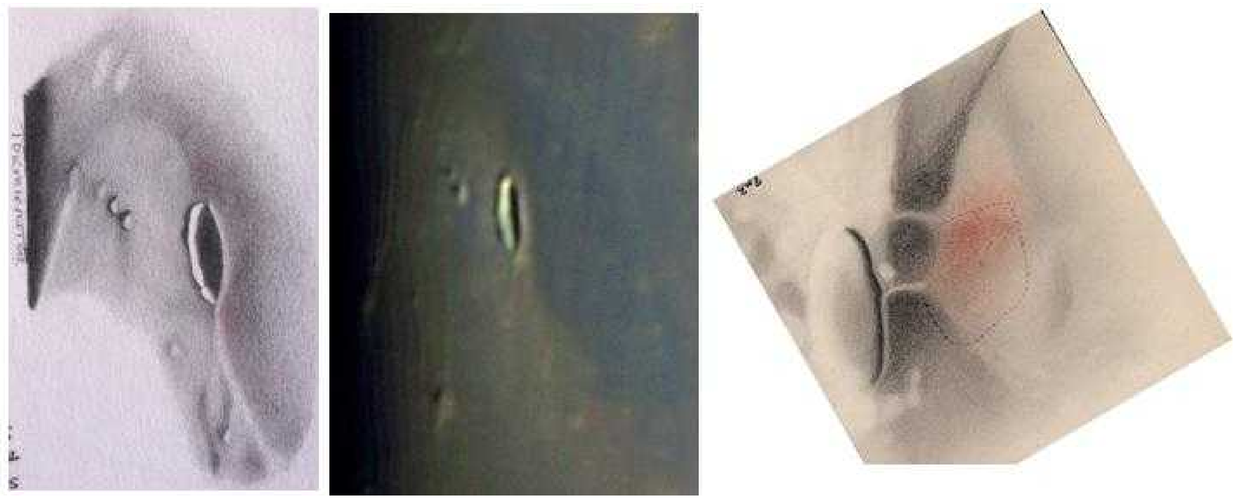


Figure 10. *Lichtenberg orientated with north towards the top.* ***(Left)*** *A sketch by Nigel Longshaw (BAA) made on 2020 Apr 06 UT 22:00-22:25.* ***(Centre)*** *A CCD image captured by Anthony Cook (ALPO/BAA) made on 2020 Apr 07 UT 00:38-00:40.* ***(Right)*** *A sketch by Richard Baum (BAA) made on 1951 Jan 21 UT 18:19-18:38.*

Trevor reported seeing no tiny red spot at either of the times he observed despite using a 16" Newtonian. Nigel made a sketch (Fig. 10 – Left) and noted a very slight pink and red colour (perhaps even reddish/brown grey?) to the dark region N/S and E of the crater. This became more pronounced at 23:36UT. Note that I have summarized Nigel's detailed notes here quite considerably. My own image (Fig. 10 - centre) has red colouration to the W/N & S of the crater – different to what Nigel saw visually? It is interesting that Richard Baum's sketch (Fig. 10 – Right) has relatively little shadow inside the crater compared to Nigel's sketch and my own image. This might suggest a date error in Richard's log book? We shall keep the TLP weight as it is but a date of one day later in the Lunar Schedule web site.

The Full Moon: On 2020 Apr 07 UAI observers (Aldo Tonon, Valerio Fontani, and Franco Taccogna) imaged the whole lunar disk to help with a lunar schedule request:

ALPO Request: Please take images of the Full Moon, but make sure you under expose as we want to avoid bright ray craters like Aristarchus, Tycho, Proclus etc from saturating. The purpose behind this is we want to compare with images of Earthshine which are essentially zero phase illumination images, like at Full Moon. There have been reports in the past that Aristarchus varies greatly in brightness compared to other features. David Darling (a past TLP coordinator) has suggested this was simply due to libration effects, i.e. viewing angles, so we would naturally like to test this theory out. Also, if you have any past images of close to Full Moon, please send these in too if the above-mentioned craters are not saturated. Pretty much any size telescope can be used to take these images so long as we can clearly see the above craters. Obviously do not attempt this if the sky is cloudy or hazy. Observations will be presented in the "Lunar Observer" - a monthly publication of the Lunar Section of ALPO. All reports should be emailed to: a t c @ a b e r . a c . uk

UT	Observer	Brightest	<------------	--------------	--------------	--------------	--------------	--------------	------------->	Darkest
19:23	Tonon	Proclus	Censorinus	Hell	Dionysius	Aristarchus	Tycho	Copernicus	Kepler	Plato
20:13	Taccogna	Proclus	Dionysius	Censorinus	Hell	Aristarchus	Tycho	Copernicus	Kepler	Plato
20:37	Taccogna	Proclus	Hell	Aristarchus	Censorinus	Tycho	Dionysius	Kepler	Copernicus	Plato
21:07	Fontani	Hell	Proclus	Censorinus	Aristarchus	Dionysius	Tycho	Copernicus	Kepler	Plato
21:43	Tonon	Hell	Proclus	Aristarchus	Censorinus	Tycho	Dionysius	Copernicus	Kepler	Plato

***Table 1**. Relative brightness measurements of different lunar features made using images taken on 2020 Apr 07.*

Table 1 summarizes the relative brightness of some selected features. It clearly shows that Aristarchus was not the brightest feature on the Moon that night, instead Proclus or Hell were. There is some variability in the ordering – this is caused by image resolution and relative sizes of features. The more point-like/compact the features are the more they will be affected by image resolution.

Aristarchus: On 2020 Apr 18 IUT 09:15 Abel Cian (AEA) imaged this crater under similar illumination to the following events:

Aristarchus 1787 Oct 07 UT 03:00? Observed by Schröter (Lileinthal, Germany). Cameron 1978 catalog weight=1. Cameron 1978 catalog ID=36. ALPO/BAA catalog weight=1.

***Figure 11.** Aristarchus on 2020 Apr 18 UT, imaged by Abel Cian (AEA). North is towards the top.*

Abel's colour mage (Fig. 11) is the first look we have at the normal appearance of what the crater should have looked like to Schröter, back in 1787. Unfortunately, the Cameron catalog does not say what the TLP actually was, so one can only speculate – maybe it was the lack of the SW ray? If anyone has access to historic records and knows something more about the 1787 Oct 07 event, please let me know. For now, I will leave the weight at 1.

Earthshine: On 2020 Apr 24 UT 19:00 Leonardo Mazzei (UAI) and at 19:07 Luigi Zanatta (UAI) imaged the Moon to see if they could detect the following Lunar Schedule phenomena:

BAA Request: Please try to image the Moon as a very thin crescent, trying to detect Earthshine. A good telephoto lens will do on a DSLR, or a camera on a small scope. We are attempting to monitor the brightness of the edge of the earthshine limb in order to follow up a project suggested by Dr Martin Hoffmann at the 2017 EPSC Conference in Riga, Latvia. This is quite a challenging project due to the sky brightness and the low altitude of the Moon. Please do not attempt if the Sun is still above the horizon. Do not bother observing if the sky conditions are hazy. Any images should be emailed to: a t c @ a b e r . a c . u k

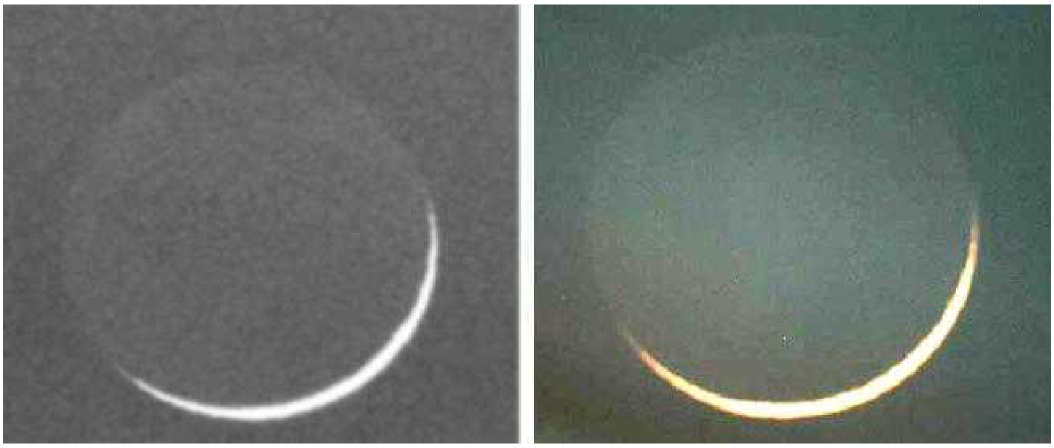


Figure 12. *Earthshine on 2020 Apr 24.* ***(Left)*** *Image by Leonardo Mazzei (UAI) taken at 19:00.* ***(Right)*** *Image by Luigi Zanatta (UAI) taken at 19:07UT.*

The effect we are looking for, which might indicate forward scattering of light by dust particles above the sunset limb, would be an illuminated arc around the earthlit limb. This is clearly not visible in the images (Fig. 12), so we will keep on looking, trying even smaller lunar phases.

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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