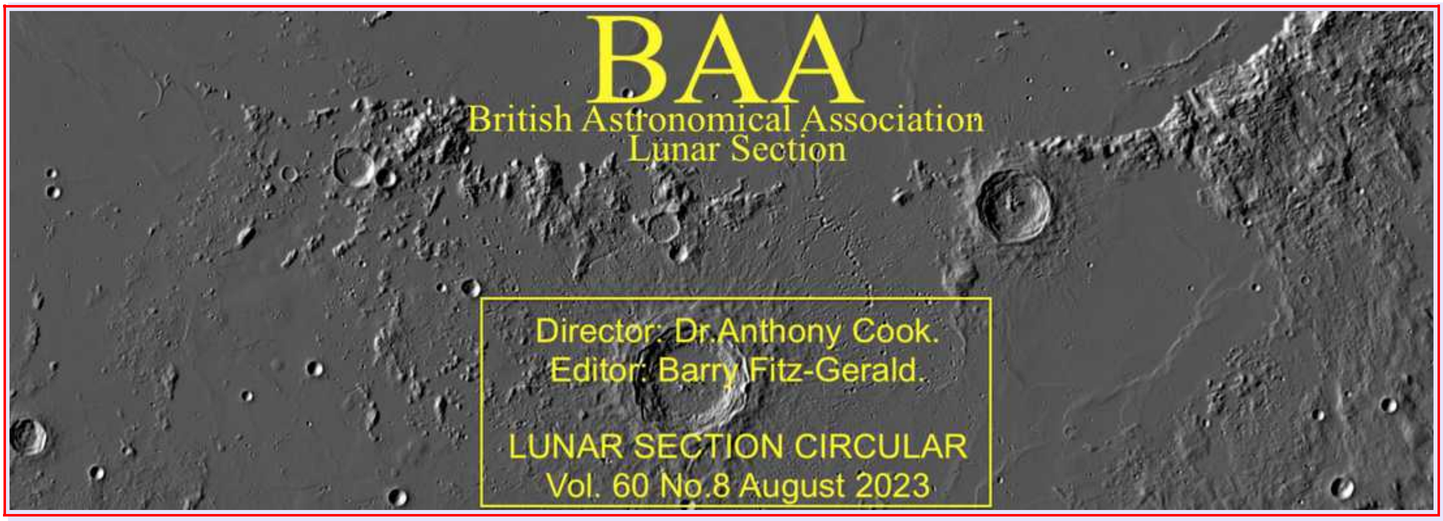

From the Director.

(Left) India's Chandrayaan-3 lander (ISRO). **(Right)** Russia's Luna 25 lander (Roscosmos).

This month will be a busy month for the Moon with a couple robotic landers due to touch down. Firstly India's Chandrayaan-3, which was launched from the Satish Dhawan Space Centre on 2023 Jul 14, and is due to land near the lunar south pole on 2023 Aug 23 at a primary landing site of 32.3E, 69.4S. This is somewhere between Boguslawsky C and Manzinus U, or about 22 km away from the rim of the latter, on a flat, relatively rock free, light plains area. The duration of the mission is expected to be 1 lunar day (14 Earth days). There will be 7 experiments on board, the most important will be a seismometer, the first one flown since the Apollo era, though without a network of 3 or more it will be difficult to locate the epicentre of any quakes, unless they are impact related and we spot either a flash or a new crater that matches the time of the quake. No seismometers have been placed in the southern high latitude highlands before, so it should be interesting to see if there are any differences related to ice deposits or a thicker crust here? According to the NASA LROC QuickMap web site, ice could, if there is any here, be just 1 meter beneath the surface, though the lander does not have the ability to dig. Also on the lander will be rover, which although it does have a drill, probably cannot go down very far – it is expected to travel up to half a kilometre from the lander, and has a lifespan of about 14 days.

The second lander is the much delayed Luna 25, built by the NPO Lavochkin organization in Russia. Russia's last successful planetary surface mission was Venera 14 in 1982, and its last successful lunar lander was the sample return Luna 24 in 1976. Since the invasion of the Ukraine, most international collaborators have pulled out of working on this mission. The launch is due on 2023 Aug 10, from the new space port of Vostochny, and the landing is intended to be on at 43.5E, 69.5S (midway between Boguslawsky, Boussingault F and Boussingault K), with a backup site at 21.2E, 68.8S (midway between Manzinus E and Manzinus F), but unlike the Indian mission the lander, it could survive a year and has a robotic arm that can dig up to 30 cm into the soil. Luna 25 is on a faster trajectory towards the Moon and may in theory land before Chandrayan-3. There is some suggestion by the media that India and Russia may be competing to be the first to discover lunar ice from direct surface measurements.

As both spacecraft are at high southern latitudes, and will probably be landing close to sunrise, there is a remote chance that dust clouds kicked up could be imaged as they would be seen through a longer optical path length to the observer unlike more traditional equatorial landings. Also as the area is less illuminated at high southern latitudes, as sunlight is coming in at an angle, any dust clouds maybe easier to see against this darker background. You can see that the sunlight will be coming in almost sideways as the solar panels, as shown on the spacecraft in both images, are mounted horizontally. I for one will be trying to do time lapse imaging of both landings, should the Moon be visible from the UK. Keep a look out for the date and UT of the landing sites on: https://twitter.com/lunarnaut/ as and when I hear about them. I would certainly be interested to hear from our observers if they do detect anything with a camera or visually. Anyway we wish both missions whole hearted success in the landing and surface operations.

Tony Cook.

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Communications Received.

Erratum by K.C.Pau.
The following section in my article "Two new rilles are found near crater Beer" published in the June 2023 LSC:
"*Unfortunately, this name has been abandoned by the IAU. For convenient communication, I will call it Rima Beer I (not IAU official name). Not far away and north of Rima Beer I, ………. particularly visible as if they have been missing. The whole length is about 35 km. I name it Rima Beer E (not IAU official name). Both Rima Beer I and Beer E are running parallel to each other (Fig. 1).*

should now read :

"Unfortunately, this name is not in current use by IAU and a new designation of a group of 5 rilles as Rimae Archimedes is now used instead. Not far away and north of Rimae Archimedes, ………. particularly visible as if they have been missing. The whole length is about 35 km. I name it Rima Beer E (not IAU official name). Both Rimae Archimedes and Beer E are running parallel to each other (Fig. 1).

…......

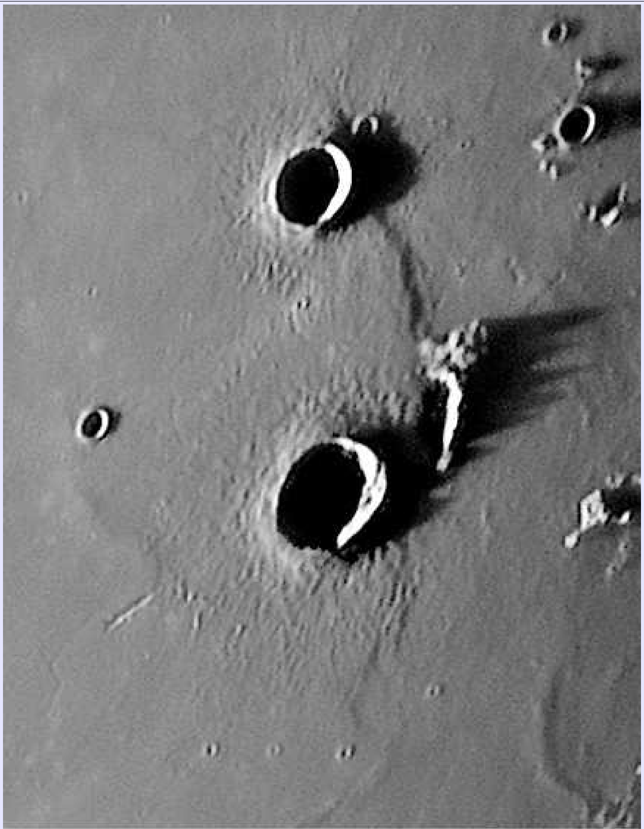
Women in Astronomy & Journey into Space by Geoff White
I was about eleven or twelve years old when I bumped into Paul Murdin in Foyles book shop in London - Paul became the director of the observatory in the Canary Islands. He gave me Patrick Moore's address and, as a result, I joined the Junior Astronomical Society and then their Croydon Branch. Later on they became the Croydon Astronomical Society and I was a committee member for many years. Rossie Atwell was also a member of the CAS - by the way, I'm now 76, so it was quite a long time ago. You mentioned Rossie in your introductio to the July LSC. Another member was Jennifer North who edited Altair, the CAS magazine for some while.

In the July newsletter you've included a photo of Sinus Iridum, the Bay of Rainbows. For those of a certain age this was where Jet Morgan and his crew landed in the first Journey Into Space, first broadcast back in the early 50s and still available to download from the internet and on YouTube.

…......

Feedback to the response by Dr. Paul Abel regarding my article on Diophantus-Delisle published in the June LSC issue 2023.
By KC Pau.

I am much grateful to Dr. Paul Abel's response about my article of Diophantus-Delisle published in the LSC May issue, 2023. Firstly, I must express my sincere thank to Dr. Abel. His fantastic drawing which was published in March issue aroused my great interest to have a detail study of Diophantus-Delisle area and I learned a lot from this study. However, I must give my feedback to clarify what Dr. Abel mentioned in his response. He stated "… *he (Pau) suggests that the ray I included in my sketch between the tiny crater Samir, and the Larger Diophantus B may have been the result of observing a line of hillocks in poor seeing. Alas I'm afraid I must disagree with this!"* When I re-read my article with utmost care, I could not find any wordings that I had suggested that his drawing might have been the result of observing a line of hillocks in poor seeing. Throughout the whole article, I can only find the following statements that had related to seeing: "*Searching and searching, eventually another photo pops up (Fig.3a). This photo has almost the same colongitude (37.4°) as Paul's drawing (37.8~38°) but on a different date and time. Traces of a ray now appears on the photo but all*



30 May 2023 12h16m UT
Colongitude: 37.7 deg
S: 6~7/10 T: 7/10
250mm f/6 Newtonian + 2.5X barlow + QHYCCD290M camera
South is up

other detail is blurred due to poor seeing. I wonder if the seeing has played a role to intensify the appearance of the ray as the line of hillocks mentioned above may overlap or mix with one another under turbulent seeing." These statements only relate to my photo but not his drawing. Moreover, his data with the drawing clearly shown the seeing was AII. I don't think I intended to give the impression that the ray in his drawing was the result of observing a line of hillocks in poor seeing, and therefore, I am uncertain which statement in my article Dr. Abel reacted to. I would be grateful if Dr. Abel would be kind enough to let me know where I may have misunderstood his comments.

Recently, I had a chance to observe Diophantus-Delisle area both visually and photographically with the same colongitude as Dr. Abel's drawing. On 30 May 2023, the sky was clear and the Moon was about 62^{o} above the horizon. I began my observation at around 12h16m UT and last to 13h12m UT. The average seeing was 6~7/10 and transparency was 7/10. Colongitude was 37.7~38.2^{o}. However, the morning terminator was a bit more westward than Dr. Abel's drawing and thus Samir was a bit far away from the terminator. Within this hour, I used my 250mm f/6 newtonian reflector with 370X to observe Samir visually. The image was very steady with only a few moments of shaking. I could only detect a small halo around Samir but not any trace of ray coming out from it. I spent almost half an hour with a variety of magnification on Samir but still in vain. Then I began to take photos around Samir area. Again, I could not detect any trace of ray on the screen. May be, my eyesight is not keen enough to detect any delicate feature. However, experiences tell me that it is very difficult to detect any trace of rays when they are close to the terminator even for those large bright ray systems like Copernicus or Tycho. Therefore, I will not be disappointed this time.

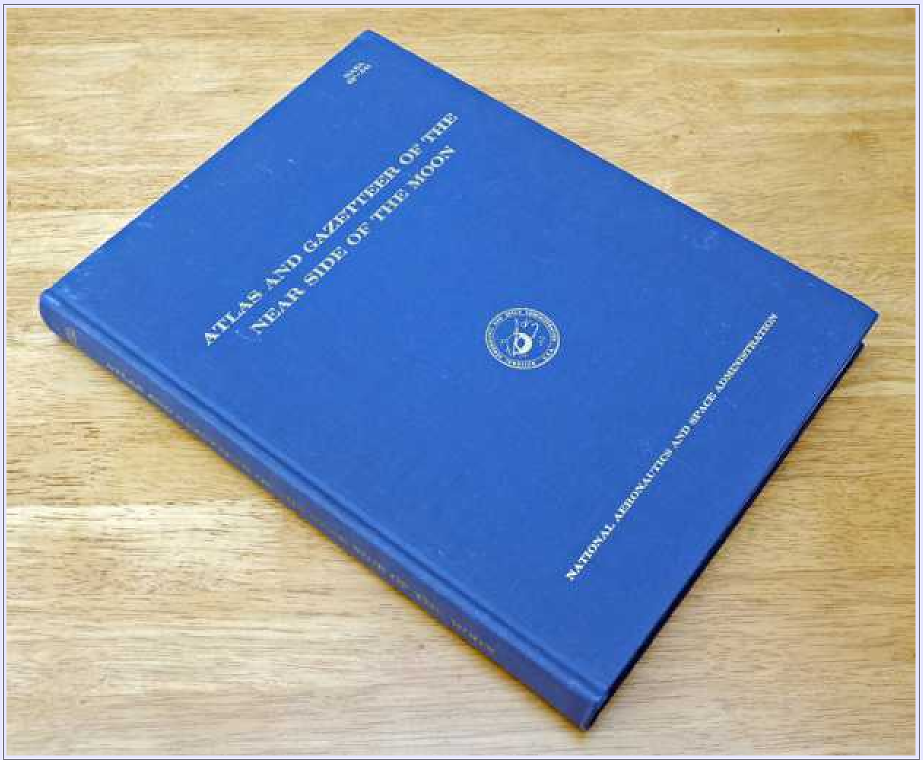
Finally, I must thank Dr. Abel once again that his high quality drawings always stimulate my attention on certain area of the Moon. Moreover, I can only admire his keen eyesight that enables him to detect very delicate and vague features on the Moon.

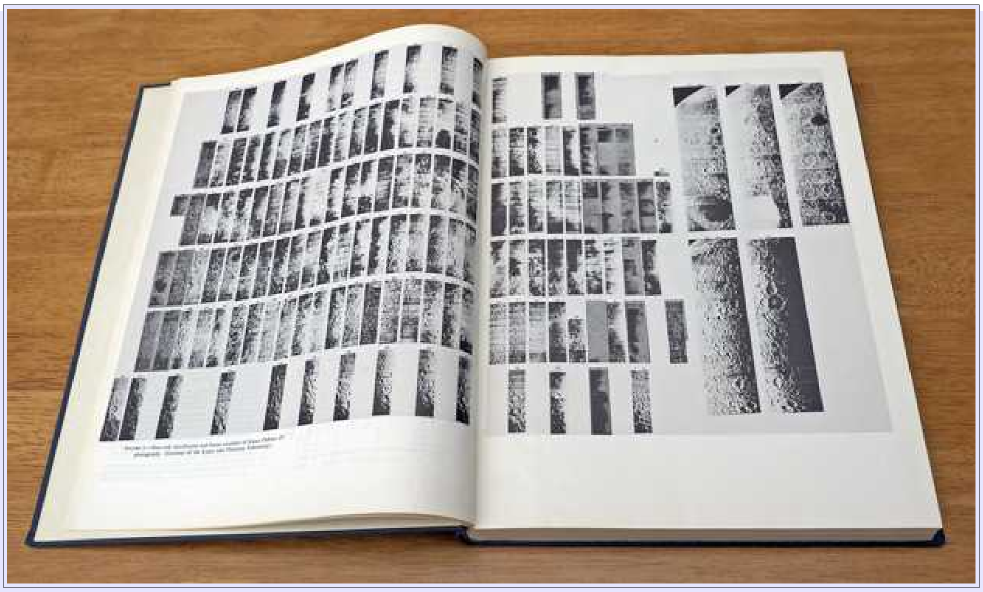
…......

NASA Book for Sale by Ivor Clarke
On page 7 of the July LSC, Robert Garfinkle mentions the NASA book Atlas and Gazetteer of the Near Side of the Moon (NASA SP-241).

I have a copy of this in good order apart from some wear on the cover. This was purchased many moons ago from the USA and I would like to get an offer from anyone who would like it in the Lunar Section.
If you could mention it in a LSC I would be grateful.

Below are a couple of pics of this large book showing the pages.





NASA HB book SP-241 from 1971, it is 10½" x 14" (27 x 36cm), 538 pages. This large book weights 3kg and can be sent 2nd class for £7, 1st class for £8 or Signed For for £8.50.

Director's Comment: *Please email me on: atc@aber.ac.uk and I will pass your contact details onto Ivor.*

…......

Pioneer Lunar Astronomer: Marry Blagg by Kevin Kilburn.
I'm always pleased to see mention of Mary Adella Blagg as she is remembered on a memorial in the centre of Cheadle just six miles from my home here in Staffordshire. I was fortunate in being invited to join a group of local historians who commemorated her service to lunar astronomy a few years ago and as a FRAS I was able to assist in raising money for the memorial.

P.S. The Society for the History of Astronomy has just received a new book, privately published '***A Treatise on Moon Maps 1610-1910***' by US author Francis J Manasek. It's lavishly illustrated and quite a large A4 350+pp tome. I understand that the SHA ordered a dozen books from the USA and got them almost at cost, £25 apiece! I had to wait several months for mine to arrive last week. It might be available from https://wwwmappingthemoon.org if you are interested.

Ed Comments: *Articles on Mary Blagg and featuring Kevin were published in local papers in 2016 and 2018, unfortunately due to copyright these cannot be reproduced in the LSC, but should you wish to have further details please contact me and I will try and point you in the right direction!*

…......

To Graze or Not to Graze! By Peter Anderson
The following is a comment regarding the item and image titled 'Grazing Occultation 62 Tauri' on page 8 of the July LSC. If the bright star shown on this image is 62 Tauri it would appear that the event was not a grazing occultation from the site where the image was taken. At times when the Moon is also moving rapidly in declination the angle of approach can be deceptive but this certainly looks like 'A bridge too far'.

So having too much time on my hands I investigated.

Have a look at the centre plot on line 2 of Fig.1 (below). Our friend is in North America. The only clues were the star and the date! (Dave Herald's occult is a good programme!). So unless he was in Canada and up near

Hudson Bay, there weren't no graze! From the appearance of the image, I would place him in the southern part of the Western United States. I could go further and throw in a few nominal geographic locations, and do graphics from those positions on the appearance relative to the Moon, then look at track along which he might be situated but there is little point. I have already adequately demonstrated my eccentricity! Still this has been fun enough.

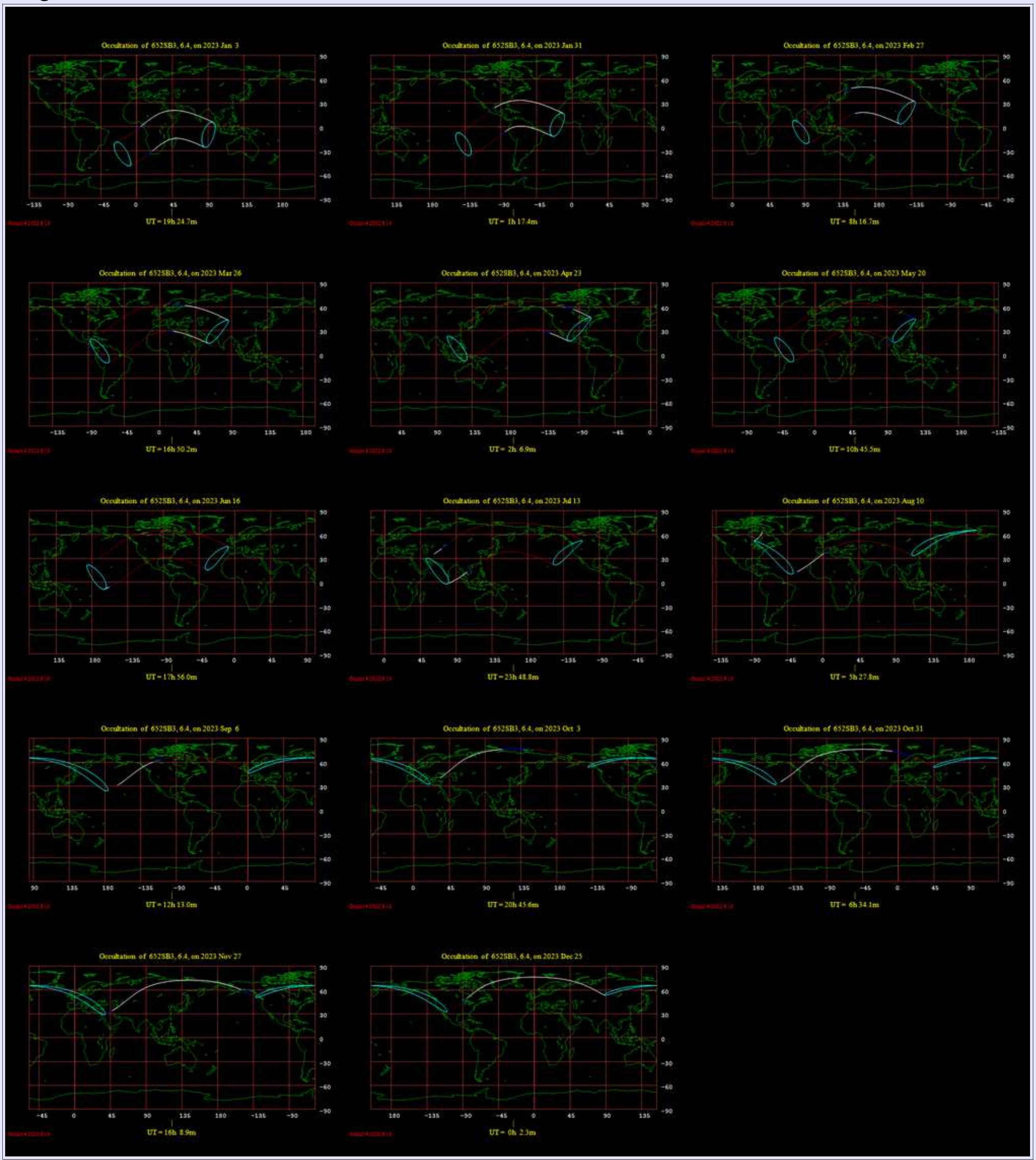


Fig.1

The message though is there was not a grazing occultation of this star anywhere near him.

Director's Comment: *Yes you are absolutely right – this one slipped past us in the proof reading process! Also see Tim Haymes comments below.*

……...

Lunar Occultations July 2023 by Tim Haymes.

Time capsule: 50 year ago: in Vol 8 No.8

W.B.Caunter (Totnes) comments on "recent" reported fade events (1955-1973). He used a 152mm O.G. x60. A considerable instrument, and his visual observation of occultations were particularly detailed. Three observations are included in the LSC Vol.8 No.8.

[With thanks to *Stuart Morris* for the LSC archives.]

T. Haymes adds:

I've been an LS member since about 1974, but did not encounter W. B. Caunter's observations until now. Looking at the Occult-4 database, I am pleased to see his reports are archived from 1951 to 1978, a long history of continuous observation, over 350 in number. The fade stars are given as double in the WDS. It's a pity that not all the observation details are in Occult4. This is because certain electronic or paper files were misplaced over time and were not included, or matched up. But the basic timing data is preserved. His timing accuracy is good and consistent. There are no entries in Occult on how the timing was done, only the Personal Equation he used. (*See searches below)

I entered "W.B Caunter" into Google. There is a Mars Section report 1970, **81**, 1, with drawings, and an observatory listed in the American Ephemeris and Nautical Almanac 1970. Also a Mercury and Venus Section Report for 1970. Clearly a keen and well informed amateur. [N.B: His observatory coordinates are also in Occult4].

JBAA (CD) Searches:
Jupiter section Report 1959
*Loan of instrument 160: "Pulsynetic" Observatory Clock (Purchased) to W. B. Caunter, 1957 to 1975
http://pulsynetic.eu/master-clocks/

JBAA Vol 66 No 6 (1956 May) Ordinary Meeting: On the accuracy of timing occultations.

Mr D.H.Sadler [Superintendent of NAO, https://en.wikipedia.org/wiki/Donald_Sadler] showed a slide of the accuracy of lunar occultation timings of the instantaneous disappearance of a star at the dark limb of the Moon. [Very interesting read..] In the discussion I find:

***MR W. B. CAUNTER**.—I time my observations with a ' split-seconds chronometer —a stop-watch with two seconds hands, one of which can be stopped without also stopping the motion of the watch. The watch is started at a B.B.C time signal, and by using the single seconds hand for comparisons with the clock and for the observation, the time of the occultation and the rate of the watch can be ascertained without again stopping the movement. I bought it some years ago in Switzerland, but I believe they can now be obtained in this country. Very recently I heard time signals being broadcast by the National Physical Laboratory during the night on 2-5, 5-0, and 10 Mc/sec from the Rugby transmitter. I think these are new transmissions.*
***DR BAROCAS**.—The station is M.S.F…*

The full report of the 1956 May meeting can be read here:

https://britastro.org/journal/journal-of-the-british-astronomical-association-vol-66-no-6

Occultation Reports:

Tim Haymes: Re: Graze of SAO 76070 on July 13, 2023.

I had made plans to observe the graze of this m7.2 star at the waning crescent (see previous circular).
A suitable location in a carpark on the Ridge Way was identified on Google Earth and added to the shared folder, together with a postcode of a nearby property. A post-code is an obvious way to find a remote site if the route is unfamiliar, which it was, although I had used street view to take a virtual drive.

The journey time was 1 hr for the 35 miles, so I would have departed at 1am, observed at 3am, and returned by 4.15am. I allow about 1 hr to set up a telescope controlled by a laptop. Typically this is 30 to 45 min but I allow for mishaps. Its easy for lunar, as the Moon is obvious.

Unfortunately the weather was bad, so the trip was abandoned.

<u>Grazes in August</u>
SAO 77028 on Aug11, 0144 UT (see July Circular)
Details are on HBAA 2023, page 44. The graze zone is from Aberdeen, passing Dundee and Dublin.
The most contacts will be seen between 2 and 3.5 Km South of the mean limb (kml file).
Prediction files can be found at this shared link: https://1drv.ms/f/s!AlzLfUm3imzPpWz0oXjOQSBp-sUC

<u>Images and Drawings (LSC July 2023) - comment by Tim Haymes</u>
Re: Grazing Occultation of 62 Tauri
I read with great interest the image of the grazing occultation of 62 Tauri by Klaus Brasch made on April 23rd, 2023. This is exactly the sort of bright event that stirs the astronomical blood. This is a beautiful image of Earth shine and the wide double star.

This was not a graze from Europe, but it would have been quite spectacular. I carried out a prediction with Occult4 software, and the graze phenomena would have been seen from the Great Lakes/Hudson Bay area. In the diagram (Fig-1) the white line through Canada is the region were the graze was observable at the Northern cusp in darkness.

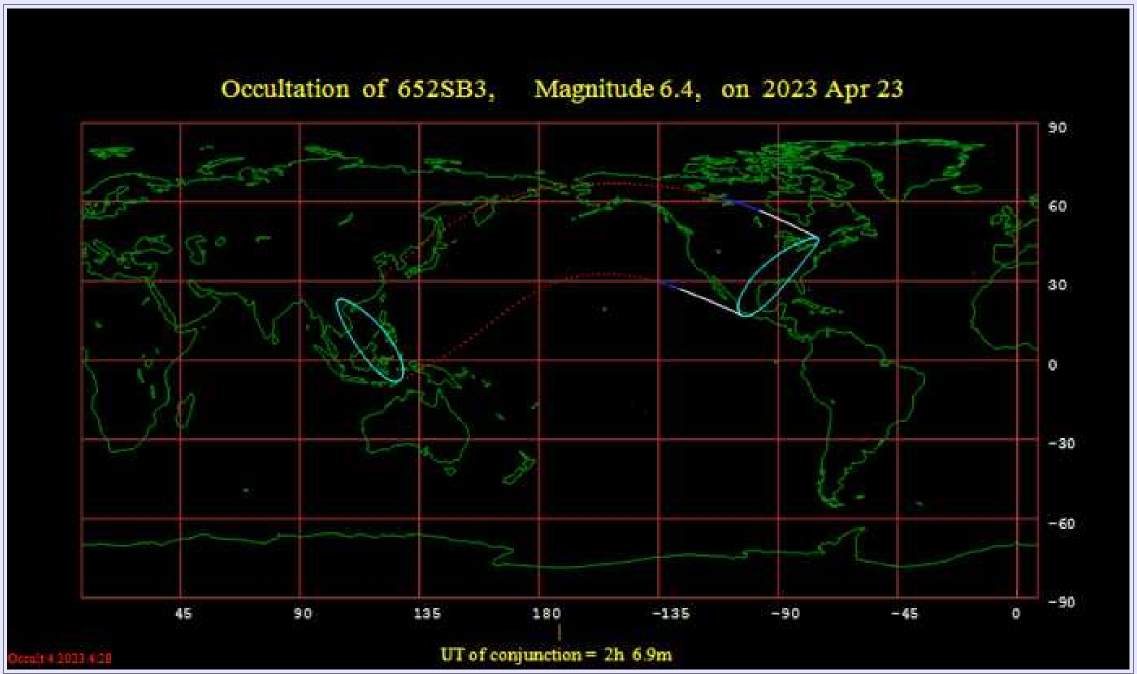


Fig.1 World plot for 62 Tau (ZC 652), spectral type B3 and spectroscopic binary.

<u>IOTA 2023 Annual Zoom Meeting</u>
Occultation observers across the world, logged in to the Zoom meeting held in the US over two evenings on July 15/16. A recording of all the presentations is here:

https://www.youtube.com/playlist?list=PLPYvLiLF-6zsVP4-tFsbsalAQWEaxYW-a
In session 11, Mitsuru Soma (jp) (Global IOTA Graze Coordinator) explained the importance of graze occultation results in the Gaia / LOLA "age" when the apparent uncertainty in star and lunar limb profiles are

now minimal. However, grazes are revealing small difference in the Observed and Computed residuals. The origin of these differences need more observations. Thus more graze observations are encouraged.

In the period 2021-2023, Japan recorded 32 grazes and Poland 2 (Fig-2). The other countries with one result include the US and UK. The UK graze was 14Ceti on 2022-07-19 observed by T. Haymes.

Graze observations by the Coordinator are recorded on his web site:
http://www.stargazer.me.uk/grazes/GrazeObs.htm

Number of grazes since 2021 according to countries

Country	No. of grazes	Country	No. of grazes
Japan	32	Germany	1
Poland	2	Hungary	1
Australia	1	Italy	1
Austria	1	Russia	1
Belgium	1	U.K.	1
Canada	1	U.S.A.	1

(2021 January－2023 June)

Fig-2 : Table of graze observations. Credit: Dr. Mitsuru Soma.

<u>Recording / monitoring Lunar Meteoroid Impacts.</u>
Meteor impacts on the dark side is an offshoot of lunar occultation observing. The idea is that the un-illuminated side is video recorded to catch the brief phenomena. There is no requirement to time occultations though, and the equipment is simpler to setup.

Use a CMOS camera, PC time +/- 1sec, and take a sequence of SER recordings at 25 fps. I would suggest recordings of about 5 min duration to keep the file size down. I would also suggest using SharpCap to control the sequences. A colour camera can record in three wavelength bands (RGB) and photometry might reveal physical phenomena such as temperature.

Another way would be to use Virtual Dub to record AVI, with Largarith Lossless video compression codec. https://lags.leetcode.net/codec.html.

These ideas are not new ideas. Please contact the LS Director (Tony Cook) for further Advice.
I was prompted to mention this topic, when I was invited to join the Lunar-impacts ALPO-Lunar Meteoritic Impact Search (LMIS) user group.

There is a mirror site here: https://www.pvamu.edu/pvso/cosmic-corner/lunar-meteor-watch/

Note there is a request to observe the dark side during the Perseid shower from Aug 7-13 (Waning crescent).

Occultation predictions for 2023 August (Times at other locations will +/- a few minutes)

```
Oxford:  E. Longitude -001 18 47, Latitude  51 55 40
To magnitude ca 8 ,  Moon altitude >=8 degrees.

       day  Time      P   Star  Sp  Mag  Mag    % Elon Sun  Moon   CA   Notes
yy mmm  d  h  m   s        No         v    r   ill      Alt Alt Az   o

23 Aug  4  1 58 36.0 R    3392 A2  7.3  7.1   92- 147     28 173  89N
23 Aug  5  1 30 52.4 R    3526 G9  4.9  4.4   84- 134     31 150  52N  27 Psc
23 Aug  5  2 44 43.4 R  147026 K2  7.9  7.3   84- 133     35 171  74N
23 Aug  5  3 35 49.5 R    3535 B7  5.1  5.2   84- 133  -8 35 187  66N  29 Psc
23 Aug  6  1 34 40.2 R  109494 M*  8.2  7.4   75- 120     33 135  29N
```

23	Aug	6	2	18	34.6	R		109	K0	6.4	5.8	75-	120		37	147	75N	
23	Aug	9	0	6	59.3	R		93394	K0	6.9	6.3	44-	83		14	75	65N	
23	Aug	9	1	30	56.3	R		489	K5	6.8	6.0	43-	82		26	91	35S	
23	Aug	9	2	46	54.8	R	X	4443	A5	8.4		43-	81		38	106	58S	
23	Aug	9	3	52	5.9	R		75941	A3	8.2	8.1	42-	81	-7	47	122	52S	
23	Aug	9	3	52	15.3	R		500	A3	7.1		42-	81	-7	47	122	53S	
23	Aug	10	0	34	45.0	R		624	K0	6.8	6.2	33-	71		14	69	68N	
23	Aug	10	0	36	56.2	R		76516	G3	8.1	7.7	33-	71		14	69	83S	
23	Aug	10	2	27	40.3	R		76552	A0	7.6	7.5	33-	70		30	89	3S	
23	Aug	10	2	43	51.6	R		76545	G5	7.9	7.4	33-	70		33	92	85N	
23	Aug	11	1	57	3.6	R		780	G5	6.8	6.3	24-	58		20	72	39N	
23	Aug	11	2	13	50.5	R		77031	F8	8.4	8.2	24-	58		22	75	82S	
23	Aug	12	1	36	52.6	R		77961	B8	8.6	8.6	16-	47		10	59	40S	
23	Aug	12	2	17	14.0	R		927	G0	8.0	7.7	16-	47		16	66	60N	
23	Aug	12	2	54	24.0	R		78041	G5	7.8	7.3	16-	47		21	72	51S	
23	Aug	13	2	47	36.8	R		1075	G0	8.5	8.2	9-	36		13	62	77N	
23	Aug	13	2	54	18.5	R		79022	K0	8.0	7.6	9-	36		13	64	62S	
23	Aug	27	20	46	2.7	D		2831	B2	6.0	6.1	85+	134		10	175	22N	
23	Aug	28	21	51	58.2	D		2998	A0	6.4	6.4	93+	149		13	175	84N	
23	Aug	29	21	37	36.2	D		3160	F7	6.7	6.5	98+	162		15	157	85N	38 Cap
23	Aug	29	22	0	25.9	D		3158	F5	5.7	5.5	98+	163		17	163	42N	37 Cap
23	Aug	30	0	4	16.2	D		164544	F7	7.3	7.0	98+	163		18	193	53N	
23	Sep	2	0	15	47.5	R		55	G8	6.4		94-	153		35	151	43S	10 Cet
23	Sep	3	2	22	51.4	R		204	G5	7.3	6.9	87-	138		46	173	12S	
23	Sep	3	23	44	50.2	R		319	B9	7.7	7.6	79-	126		32	110	83N	
23	Sep	4	22	19	17.7	R		442	A0	6.7		70-	114		15	80	35S	50 Ari
23	Sep	5	3	36	17.6	R		460	A0	6.9	6.8	68-	111		57	161	79S	

See the December 2022 issue of LSC for an explanation of the table.
Detailed predictions at your location for 1 year are available upon request. Ask the **Occultation Coordinator**: tvh dot observatory at btinternet dot com, or the LS Director.

Interested in Grazes only? – Indicate your travel radius in Km and your home post code or nearest town. An aperture of 15cm will be used unless advised. More predictions will be generated by this process.

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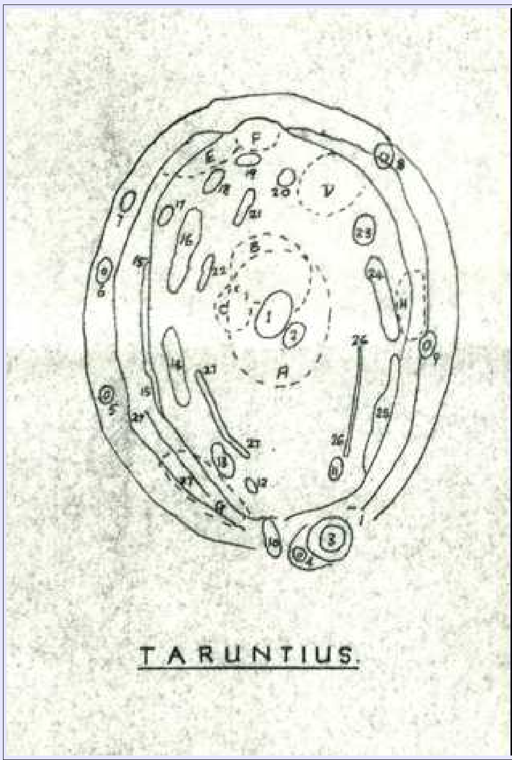
Drawing and notes by A.P. Lenham from (almost) 70 years ago! The Moon, Vol.2 No.1 September 1953



Note North is Down.

TARUNTIUS.

This formation, usually dismissed as a simple concentric crater structure, seems on closer examination to be rather more complex.
The higher levels of the outer wall are bright and show well under high sun, and the inner lower slope is dull, of the same shade as the floor. On the bright wall are four small craters, 5, 6, 8, and 9, of which 8 and 9 are the most prominent, also a small bright peak 7. On the inner slope is a valley 27-27 in the NW, and a ridge 15-15 bounding it to the west interior.
There is a depression on the south inner slope which is lower than the mean surface of this area. The crater 3 on the north is deep, and to its west is a small shallow crater 4, standing on a long downward slope from 3. The junctions between this crater and the walls are curiously ill-defined and difficult to observe.
A small block 10 stands west of 3. From 5, 6, 7, 8, and 9 bright rays extend across the plain, short but distinct.
The normally charted inner ring is composed of the blocks 25, 24, 23, 19, 18, 16, 14, 13, and 12. Under very low illumination the inner ring may appear almost complete, being connected by an extremely shallow, narrow ridge. Under high sun the inner ring appears bright and almost complete except for gaps to the south and north. There seem to be remnants of a third ring inside the one already charted. This is made up of the ridges 27-27and 26-26, with blocks 22, 21, 20, and 11.
The central mountains 1 and 2 seem to be clearly separated mountain blocks. The dotted areas G, E, and H are dark under high illumination, and F very dark. Under low illumination the area A around the central mountains is slightly darker than the rest of the floor. B, C, and D also appeared darker under low illumination as follows - B on 12/2/52, C on 13/2/52, and D on 13/2/52.
On 29/2/52 the S-E- interior was brighter than the rest of the floor, even the shadows appearing grey. Under similar conditions on 2/12/51 this area was quite normal. Mist or surface solid gas deposits ?

A. P. Lenham.

Images and Drawings submitted.

Note to contributors: ***Readers are encouraged to add the UT with any observations they submit as this enables us to conduct repeat illumination observations in future.***

Lunar Mosaic.

Image submitted by Jane Clark and taken between 21:54 and 22:33 UT on 24th June 2023.

Jane listed her setup as follows:
Mount: Celestron CGX (German equatorial), unguided; Celestron C11 SCT, 2800mm f/10; ZWO ASI 1600MM camera; IR filter from the Baader Besell UBVRI series; SharpCap 4.0 capture of 100 frames per image, Autostakkert!3 stacking, Registax 6 sharpening, manual panoramic stitching of 5 different frames in Gimp 2.10.34.

Waxing Gibbous Moon.

Image submitted by Nick Evetts and taken at 22:19:33 UTC, 29th July 2023. The details of the equipment and location are shown in the image.

9 – Day old Moon.

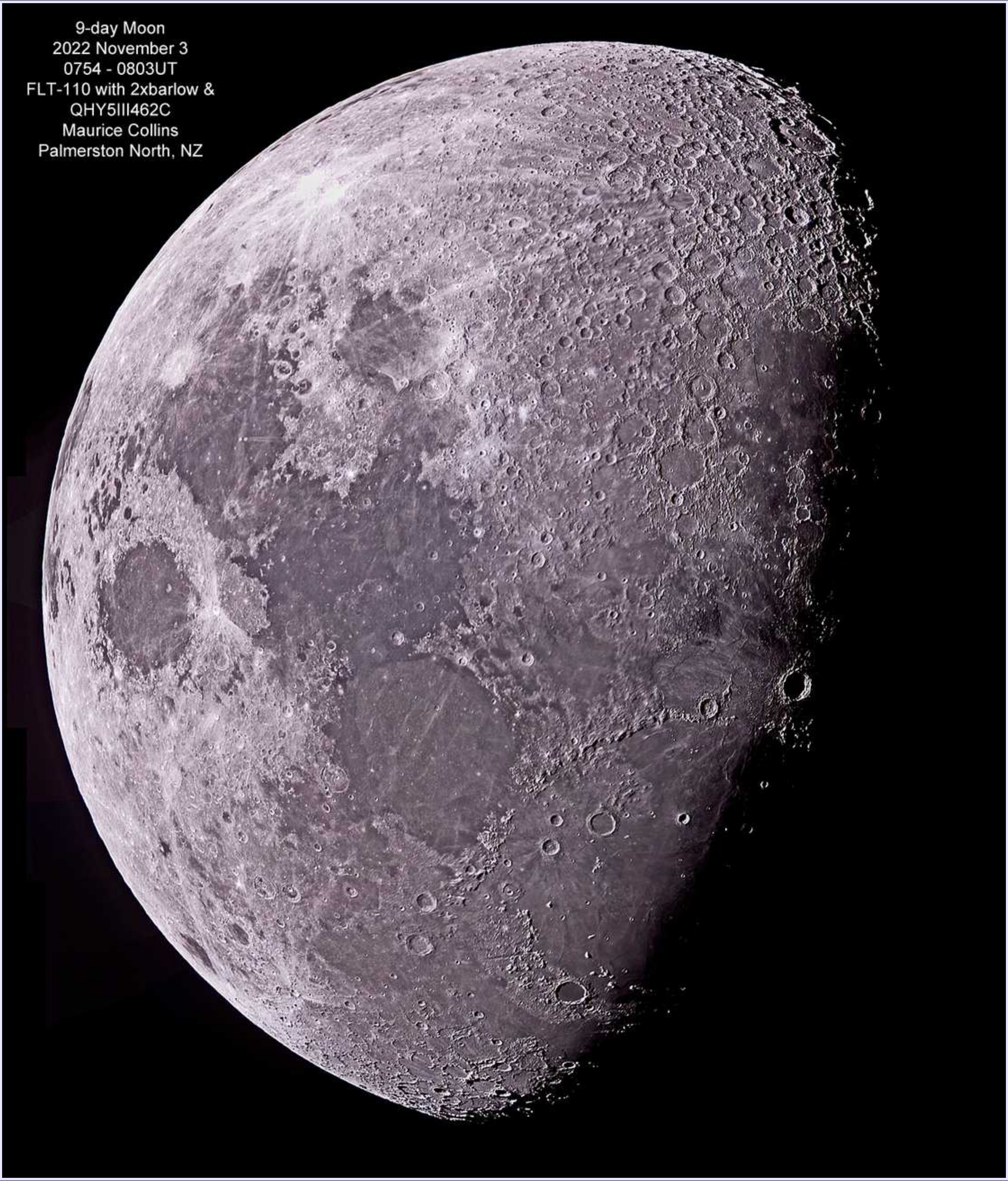


Image by Maurice Collins with time/date, equipment and location as shown.

Pitatus

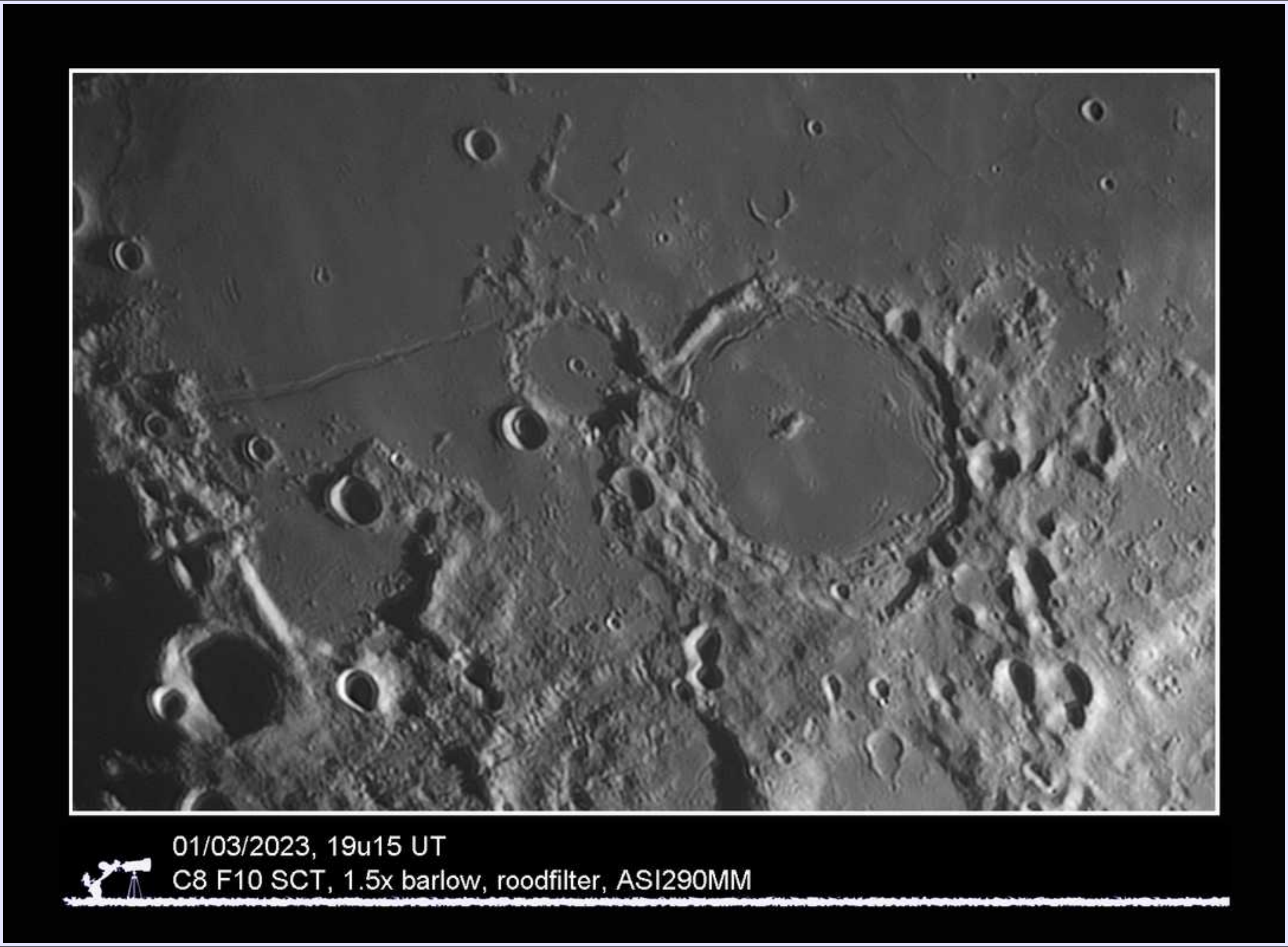


Image by Alexander Vandenbohede made on 1 March 2023 using a Celestron C8, 1.5x barlow, red filter and ASI290MM and in good seeing conditions.

Geological Notes: The floor of Pitatus appears smooth and flat, but this is far from the case. It is, as you can see a Floor Fracture crater (FFC), and its floor is crossed by a number of fractures, with those around the periphery being the most prominent. There are probably several generations of fractures here, as the floor was uplifted at different times during the past, and the level of the floor itself varies dramatically with the south eastern quadrant forming a deep depression and the north-western one a raised plateau. All this deformation is due to the injection and movement of magma beneath the crater floor. To the SW of the offset central peak you can see two white patches, these are bright ejecta associated with two secondary crater clusters which originate from Tycho some 350kms away to the south. These patches led visual observers in the past to suggest the presence of domes on the crater floor*, but this appears to be a contrast effect, a conclusion suspected back in the 1960's. This effect is probably exacerbated by the undulating nature of the crater floor and the fact that the westernmost bright patch is draped over as small isolated nubbin of material that projects above the basalts covering the interior of Pitatus. The cleft running between Pitatus and Hesiodus is clearly visible in this image, this being the source of the shaft of sunlight that crosses the floor of the latter crater at lunar sunrise.

The western edge of the torus of the Concentric Crater Hesiodus A is just visible, and it is quite probable that the episodes of uplift that affected Pitatus and gave rise to Rima Hesiodus to the north are also implicated in the formation of this odd crater.

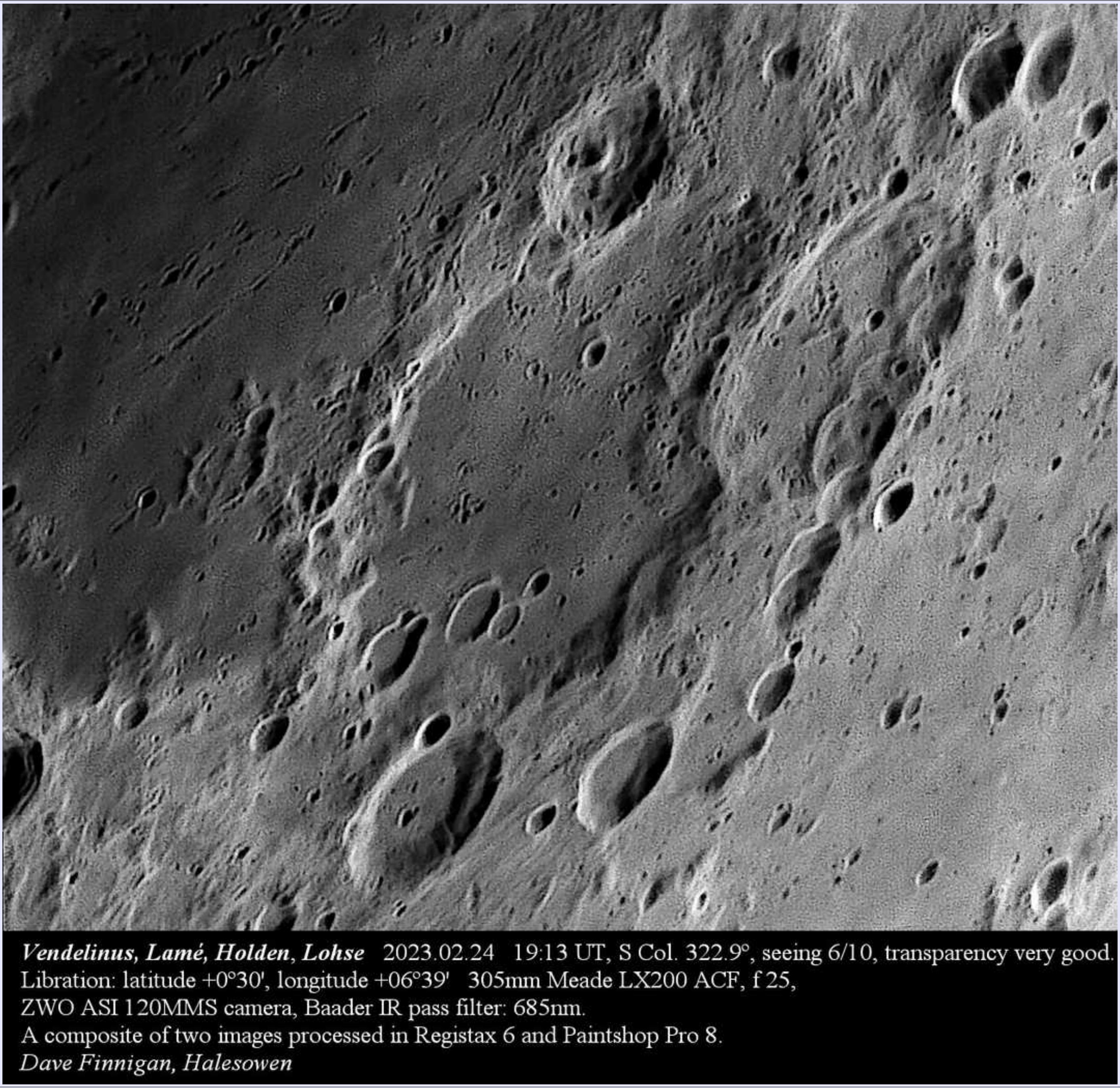
* see The Moon Vol.12, No.2, pp.38-39.

Torricelli.

Image by Bob and Sophie Stuart with details of time/date and equipment as shown.

Geological Notes: The 48km diameter crater Capella with the vertical scar of Vallis Capella running through it (vertical in this frame at least) is one of those unusual craters with hardly any crater floor visible, and where the collapsed material from the rim reaches up to and even partially covers the central peak. Other examples include Godin, Ukert and Alpetragius, with the crater Neander being a 'half way house' where the northern part of the crater is completely obscured by rim collapse but part of the original crater floor is still visible to the south. All of these are highland craters, which may be a significant factor in the development of this morphology, but in the case of Capella it is also possible that the formation of Vallis Capella, which appears to be part of the Imbrium Sculpture (and strictly speaking a crater chain so c*atena* not a *vallis* – but I won't argue with the IAU) had something to do with the rim collapse we see. The vallis appears to cut across Capella, suggesting it is the younger feature, and it is possible that the multiple impacts that formed it caused the rim of Capella to collapse and completely fill the crater with debris. Madler towards the bottom left of the image is a low angle impact crater, but unusually only one of the rays marking the Zone-of-Avoidance in its ejecta is visible, heading off in the 5:00 o'clock direction. Why this should be the case is a bit of a mystery, but varying composition of the rocks at the impact point may be partly responsible.

Vendelinus.



Images by David Finnegan with details of time/date and equipment as show.

Geological Notes: Langrenus is just out of view at the top of this frame, but the terrain we see is smothered by ejecta from that 131km diameter crater. Secondary craters scour the surface of Mare Fecunditatis in the top left of the frame as well as the floor of Vendelinus. Herringbone pattern ejecta also smothers the surface around Lohse at the top of the frame, and it looks like this material as well as debris that has collapsed off the rim of has filled this 43km diameter crater. In many ways Lohse is similar to Capella (shown in another image in this section) in that the crater floor is completely obscured by rim debris and ejecta, which also appears to have draped the central peak as well. The zone-of-avoidance (ZoA) in the ejecta of the crater Petavius B can be seen in the lower left of the frame, with the bright rays bordering this ZoA forming a wide V shaped notch. The 141km diameter Vendelinus was studied by Harold Hill with two drawings of the crater shown in his 'Portfolio of Lunar Drawings'. He comments on a disputed rille that was reported by visual observers, running north from Vendelinus H (the simple crater on the northern floor, at 5:00 o'clock to Lohse). Hill did not observe this feature and LRO images only show a number of herringbone pattern secondary clusters which must have, under certain conditions of illumination, given the impression of being a rille.

Petavius.

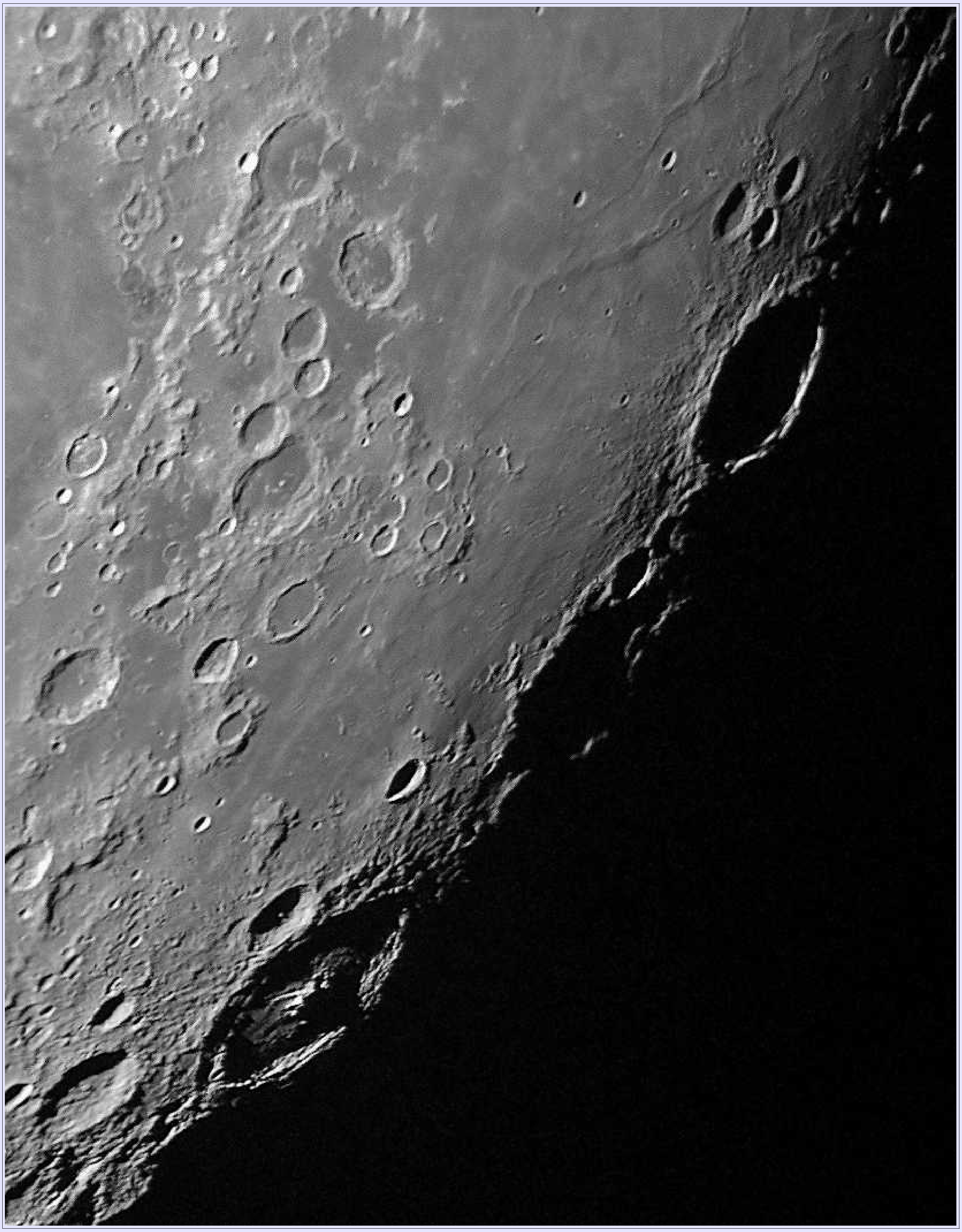


Image by K.C Pau taken on 9 March 2023, 14h42m UT using a 250mm f/6 Newtonian prime focus with QHYCCD290M camera.

K.C. Comments: *The photo shows the area between Petavius and Langrenus under evening sunlight. Langrenus is completely filled with shadow and only the rims are lit up by evening sunlight. The central massif of Petavius casts a shadow touching the eastern rim. Petavius is almost filled up with shadow with the western flank of the central massif still receiving sunlight.*

Archimedes and Palus Putredinis.

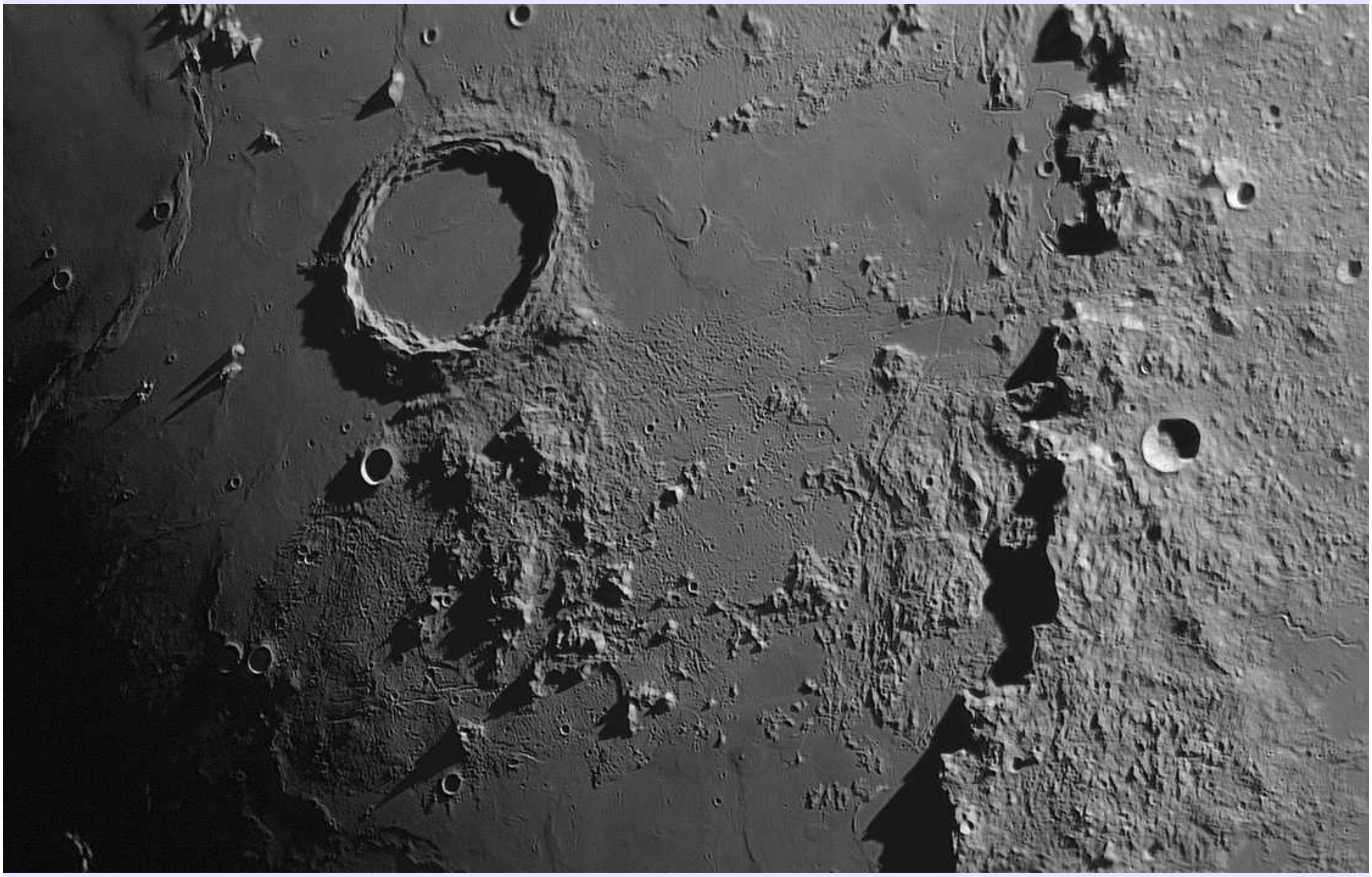


Image by Leo Aerts taken with a Celestron C 14 a using Baader red filter and ASI 290MM on February 28th 2023 with the Moon high in the evening sky. Seeing was excellent.

Geological Notes: Archimedes looks pretty much like many other mare filled craters such as Plato, but if we could drain the basalt infilling away, we would find that its interior had two rings, rather like a mini multi ringed impact basin*. Why this should be the case is a bit perplexing as at 81kms in diameter it is well below the threshold diameter at which peak rings are thought to form instead of a central peak**. The bowl shaped crater in the middle of the Apennines is Conon (30kms diam.) and below this is the squiggly line of Rima Conon that runs SE through Sinus Fidei towards Mare Vaporum. It appears to be a sinuous rille, originating in a lava lake type structure at the head of the sinus, running for 36kms and then mysteriously and abruptly ending as opposed to petering out as we see with most sinuous rilles. It is about 250m deep and well over 1.5kms wide for most of its length, so a most unusual example of this type of feature. The surface of the sinus itself is slightly bowed upwards, probably indicating a sub-surface intrusion of magma which may have fuelled this rille and another lava lake type structure visible in Leo's image which you can see if you zoom in sufficiently. The surface drops some 600m down from Sinus Fidei in to Mare Vaporum, and it is *possible* that lavas (probably with a high TiO content) flowed out of the sinus and into the mare to the south, contributing to the depth of mare basalts that accumulated there. There has been a lot of volcanic activity to the east of the Appenine front, and this may well be a consequence of magmas exploiting the fracture system around the edge of Imbrium Basin to ascend to the surface and produce prolonged and diverse volcanic activity. Of course lavas also flowed to the west and we can also see Hadley Rille nestled beneath the front at the head of Palus Putredinis.

* Kumaresan, P. R. & Saravanavel, J.. (2019). Pre- Basaltic Morphological Mapping of Archimedes Crater Using Grail Data. 10th Planetary Crater Consortium Meeting - August 7-9, 2019 at US Geological Survey, 2255 N. Gemini Drive, Flagstaff, AZ (Abstract #1906)

**Baker, David & Head, James & Collins, Gareth & Potter, Ross. (2015). The formation of peak-ring basins: Working hypotheses and path forward in using observations to constrain models of impact-basin formation. Icarus. 273. 10.1016/j.icarus.2015.11.033.

Lacus Bonitatis and Macrobius.

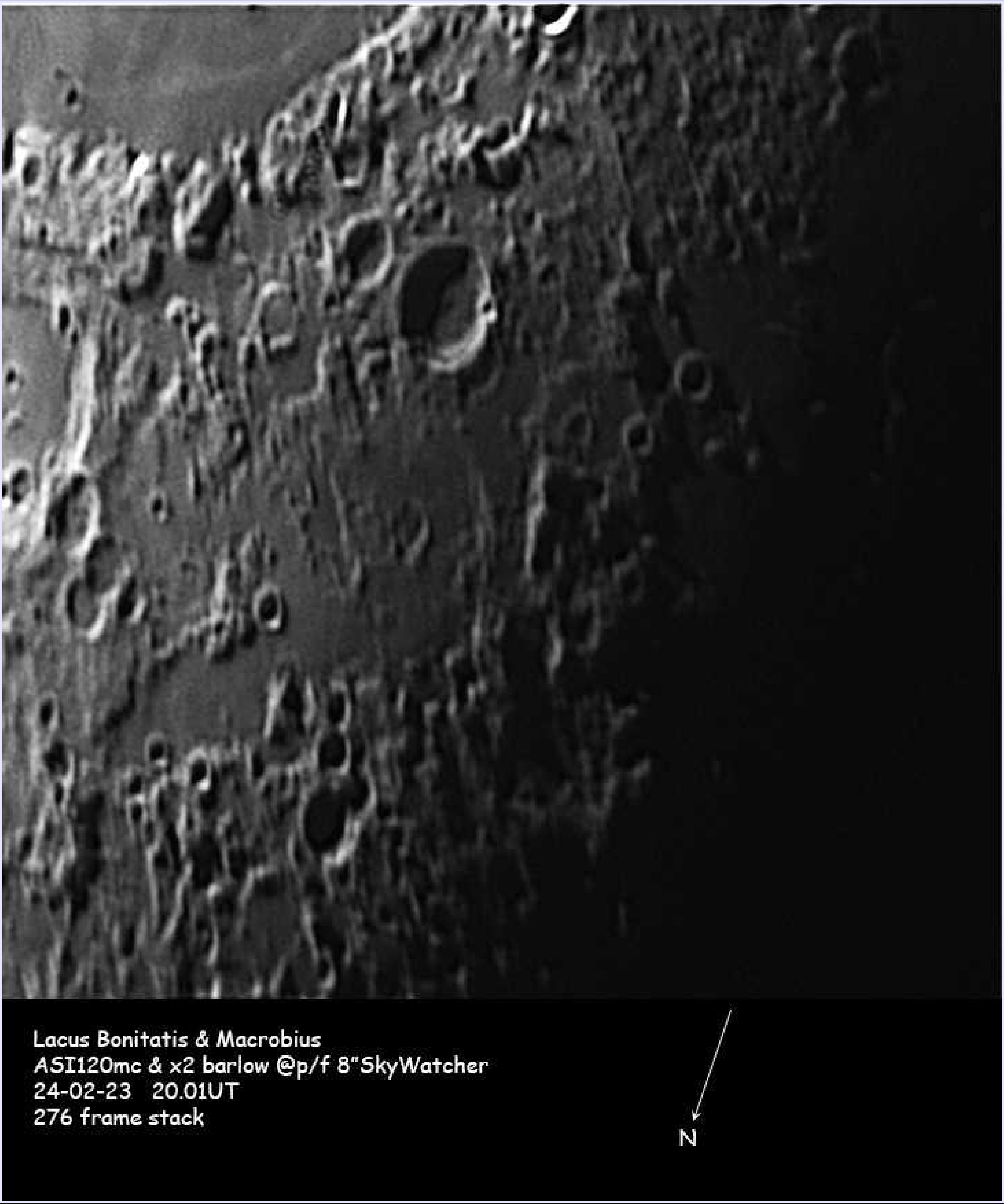


Image by Les Fry with date/time and equipment as shown.

Geological Notes: Bearing in mind its respectable diameter of 62kms Macrobius, has a decidedly unimpressive central peak, consisting of a cluster of hills about 600m high located slightly offset to the SE from the crater centre. The crater is however 4000m deep, so the peak(s) is probably not obscured by collapsed rim or other material such as basin ejecta smothering the crater floor, but is intrinsically small.

Rupes Recta.

Image by Mark Radice with details of time/date and equipment as shown.

Geological Notes: The pre-Nectarian Ancient Thebit crater which occupies the middle of this frame is bisected by the Straight Wall or Rupes Recta. The vital statistics of this feature vary depending on the source, and heights quoted vary around the several hundred meters figure (Quickmap gives a height of around 350m), slope at anywhere up to 40° (Quickmap suggests something around 15° depending on where you measure it) and a length of some 110kms, again depending on where you take the start and end points. Modelling of the structure however suggests that the fault responsible for the rupes dips downwards at 85°, which is not exactly reflected in the gradient estimates based on the visible slopes, that it extends to a depth of 35kms and has a vertical displacement of 400m*. So, despite being extremely well known there appears to still a lot of uncertainty regarding this familiar feature.

Mark's image shows a slight dark halo around the small 3.5km diameter Arzachel K which is on the floor of Arzachel itself. Is this an artefact from the image processing? There is nothing visible in the various mineral data sets to suggest a halo of different composition to the rest of the floor, though being a Floor Fracture Crater, Arzachel may well have older volcanic deposits buried beneath a surface veneer of younger, brighter impact derived material. Do any of your images show this effect?

*Nahm, A.L et:al (2011) Forward mechanical modelling of the Rupes Recta normal fault in eastern Mare Nubium, the Moon. Geophysical Research Abstracts. Vol. 13, EGU2011-8785.

Montes Caucasus.

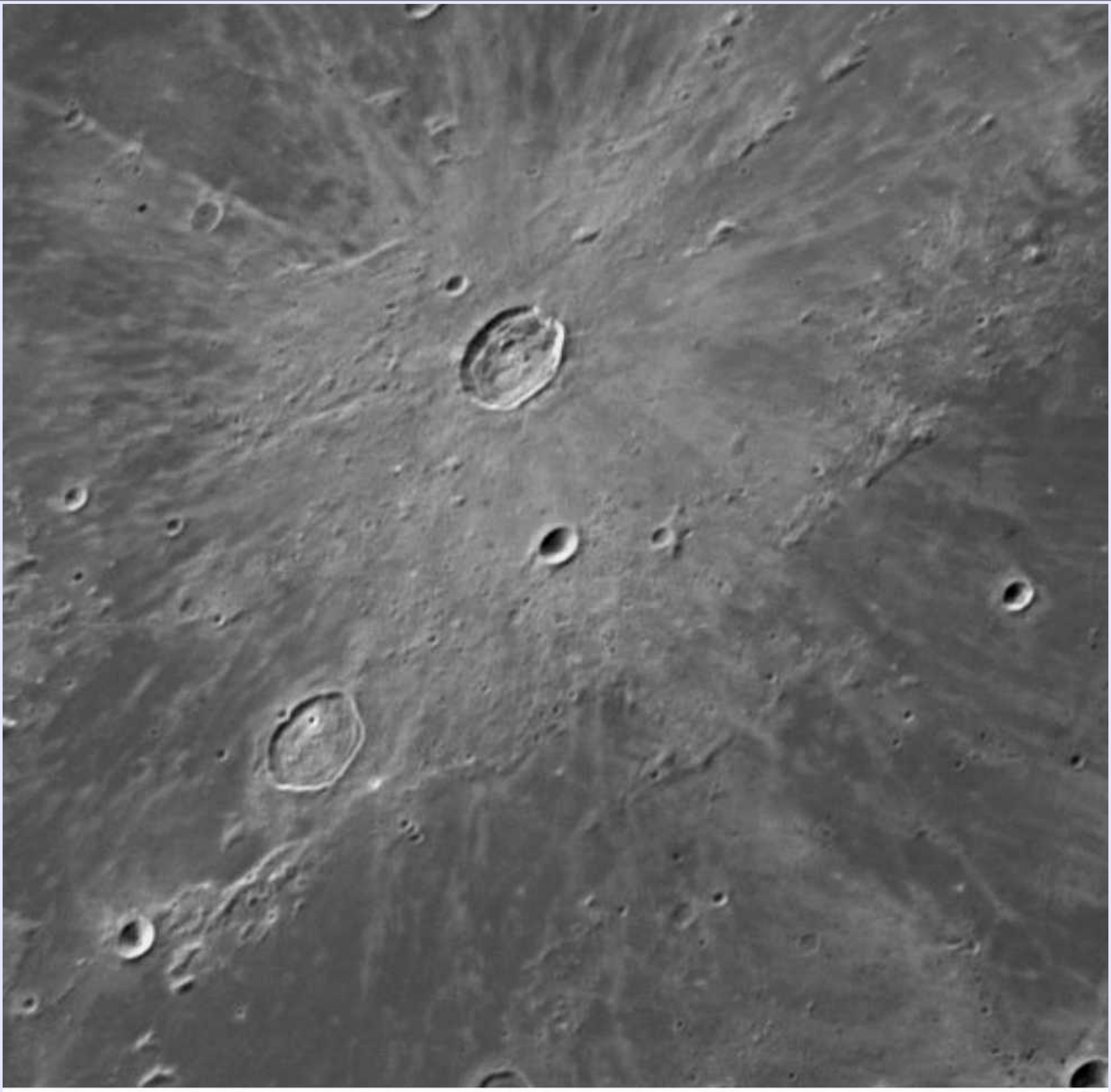
Image by Rik Hill with details of date/time and equipment as shown

Rik Comments: *Dividing Mare Imbrium from Mare Serenitatis, is the triangular mass of peaks, the Montes Caucasus, my favorites of all the lunar mountains, running down the middle of this image. On the left side of this image we see two large craters still in shadow, Aristillus (56km dia.) above and Autolycus (41km) below. Note the splash pattern of the ejecta about the larger crater and the tighter crosshatch pattern around Autolycus. To the right (east) of Aristillus up against the Montes Caucasus, is a mild swelling that is the dome Ari1 about 54x35km in area and 85m (±10m) high. Rima Thaetetus can be seen on the eastern side of this dome. Then east of Autolycus is a large low circular swelling that is another dome, Au1 some 28km diameter (±0.5m) and only 75m (±10m) in height.*

A small piece of the great crater Archimedes (85 km) can be seen in the lower left corner. In the upper left is the bright Mon Piton rising abruptly 2250m above the surrounding plain of Mare Imbrium. What a sight that must be! Just right of that rampart is the very identifiable crater Cassini with Cassini A (15km) and the smaller Cassini B (9km) contained within its low walls. The ejecta blanket surrounding this crater is best seen on the right (east) side. Below Cassini is the odd shaped crater Thaetetus (24km) and in the north of the Caucasus is another non-round crater Calippus (32km). These two craters point north to a U shaped feature that is Alexander (85km). Some references list this at 95km but it is hard to see a circular feature here at all!

This image was made from two 1800 frame AVIs stacked with AVIStack2 (IDL) and finish processed with GIMP and IrfanView.

Kepler with Encke.

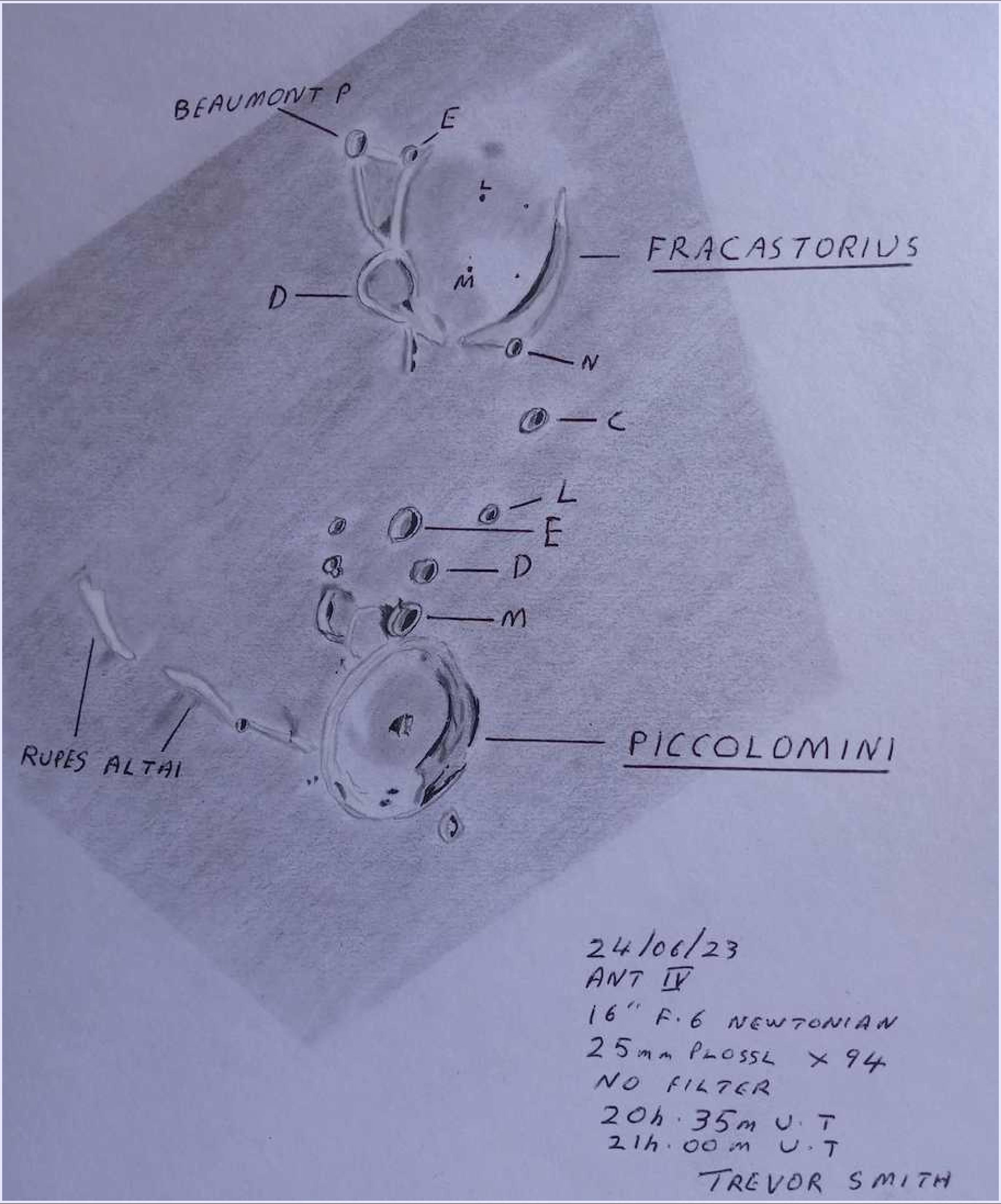


Kepler with Encke to the south. 2022.08.19 - 06.39 UT
300mm Meade LX90, ASI 224MC Camera with Pro Planet 742nm I-R Pass Filter.
750/3,000 Frames. Seeing: 8/10. Rod Lyon

Image by Rod Lyon with details of time/date and equipment as shown.

Geological notes: Both Kepler and Encke are about the same size, 29 and 28kms in diameter respectively, but their depths are dramatically different, with Kepler being about 3,500m deep compared to about 700m for Encke. The difference is of course the consequence of Encke being a Floor Fracture Crater, where a sub-surface magmatic intrusion has forced the floor upwards – in this case (assuming originally a comparable depth for Encke) an impressive 2,800m or so. Also notice their somewhat polygonal outline with a number of conspicuous straight section to their rims. This is probably a consequence of the craters forming on a highland terrain already fractured and faulted, which produced 'lines of weakness' to be exploited during the excavation process or subsequently when their rims collapsed during the post-impact modification phase. This network of fractures *may* contribute in some cases to the perception of the hypothesised 'Lunar Grid' system.

Piccolomini and Fracastorius.



Drawing and observing notes on following page submitted by Trevor Smith of Codnor, Derbyshire. Details of time/date and equipment as shown in the drawing.

PICCOLOMINI AND FRACASTORIUS

PICCOLOMINI IS SOME 87km IN DIA AND IS VERY MUCH LIKE A SMALLER VERSION OF THEOPHILUS WHITH IT'S SUBSTANTIAL CENTRAL PEAK SYSTEM AND FLAT FLOOR. IT'S WALLS ARE ALSO VERY TERRACED.

TO IT'S NORTH AND JUST TOUCHING IT'S EXTERIOR WALL IS THE RELATIVELY NEW CRATER OF PICCOLOMINI M. NEARBY ARE THE CRATERS D, E AND L. THIS IS A BUSY AREA AND IS HOME TO A MYRIAD OF CRATERS OF ALL SIZES.

FURTHER NORTH IS THE 128KM DIA LARGE HORSESHOE SHAPED CRATER CALLED FRACASTORIUS. A NUMBER OF SMALL CRATERS COULD BE SEEN ON IT'S SOMEWHAT FLAT FLOOR.

A LARGE CRACK IS OFTEN SEEN ON THE FLOOR RUNNING FROM EAST TO WEST BUT DUE TO THE POOR SEEING TONIGHT THIS FEATURE STUBBORNLY REFUSED TO SHOW ITSELF.

FRACASTORIUS IS ONE OF MY FAVOURITE CRATERS ON THE MOON AND ON NIGHTS OF GOOD SEEING A WEALTH OF INTRICATE DETAIL CAN BE SEEN.

Trevor Smith – observing notes.

Maurolycus and Janssen

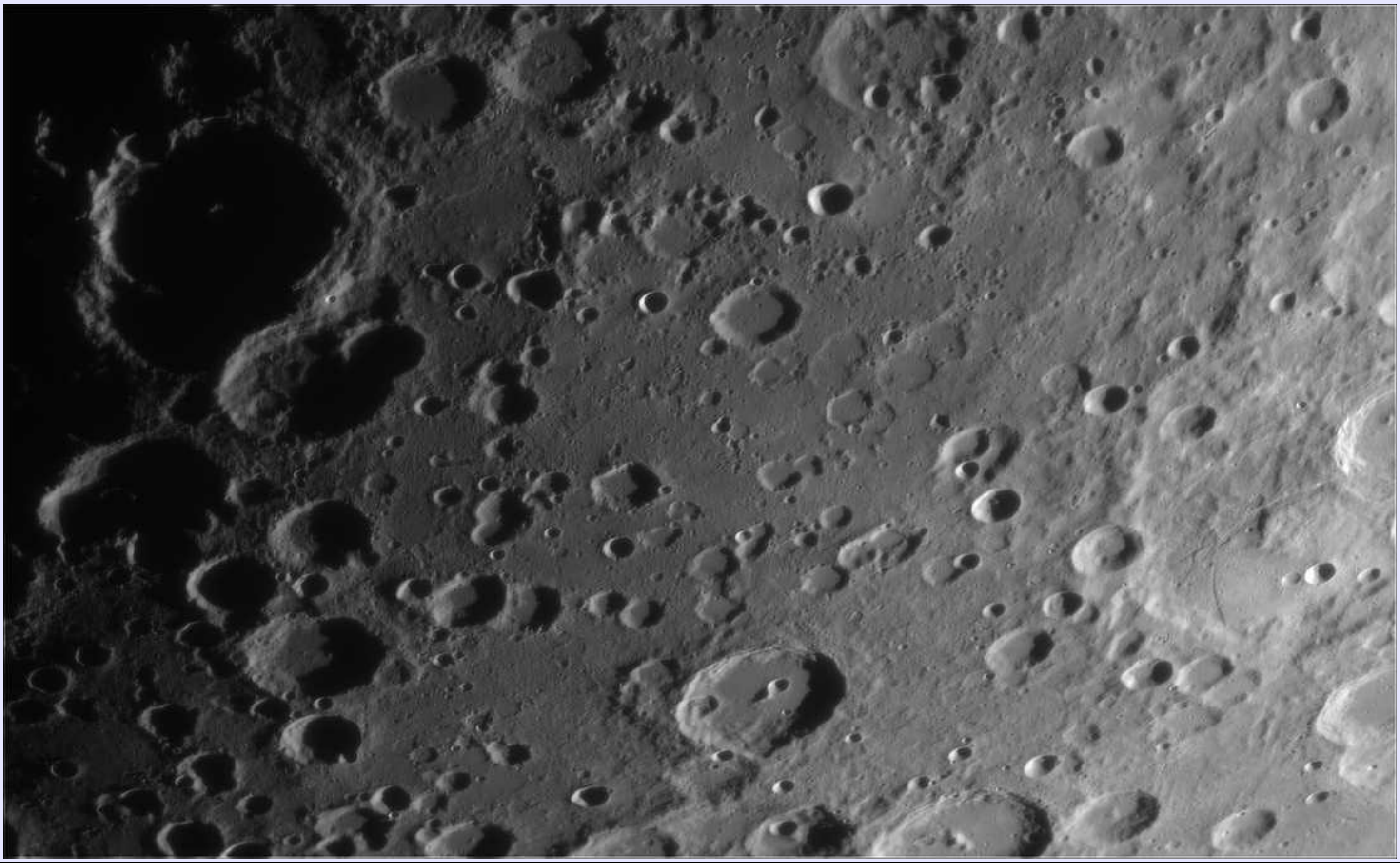


Image by William Leatherbarrow taken on 26th February 2023 at 1917UT using an OMC300 Mak-Cass.

Geological Notes: The distance between the central peaks of Maurolycus and Janssen is some 600kms, so this image covers a large piece of the southern highlands. But the term 'highlands' is a bit of a misnomer here because there are a lot of fairly flat inter crater plains compared to the crater saturated appearance of other parts of the highlands. This is possibly a result of the presence of the buried Mutus-Vlaq basin, with a topographic low point just to the SW of Pitiscus (middle bottom of frame), and corresponding to an area where the crustal thickness is reduced to some 20kms compared to the usual 30-40kms. The topographic low over this buried basin may have resulted in the accumulation of a thick pile of impact derived debris that obscured many of the older craters that had formed on the original basin floor. The nearby Mare Australe occupies another topographic low over a buried basin, but in this case eruptions of basalt lavas filled the depression and obscured any pre existing craters.

Volcanism indeed appears to have taken a back seat in this particular corner of the Moon, as there is hardly any evidence for it on the surface. Tannerus, some 200kms to the SW of Pitiscus is a Floor Fracture Crater and therefore indicative of sub-surface volcanism, but other than that there is nothing really obvious. There are however tantalising hints of *buried* volcanic deposits in the form of iron rich, dark material surrounding some small craters, with the best example being Buch B which unfortunately is out (just) of the frame at the top of the image. This crater was thought to possibly be a volcanic structure that had erupted dark material onto the surface, but it is a simple young crater that has excavated volcanically derived material from beneath the light inter-crater plains surface. This might suggest the existence of 'cryptomare' type deposit beneath the surface, the result of ancient pre-mare volcanism which is only really visible where impact craters have punched through younger surface deposits to expose these ancient layers beneath.

Basin and Buried Crater Project by Tony Cook.

No images or sketches have been sent in specifically for the BBC project, taken during June or July, however Bob Stuart (BAA) did managed to find an archive image of his which portrays the buried crater, discovered by A. Gabriel (See the BAA's Lunar Section Circular: Vol 2, No. 11, Oct 1967, p3) back in 1967, and which is of diameter of 81 km and is located at 9.7˚E, 53.4˚S.

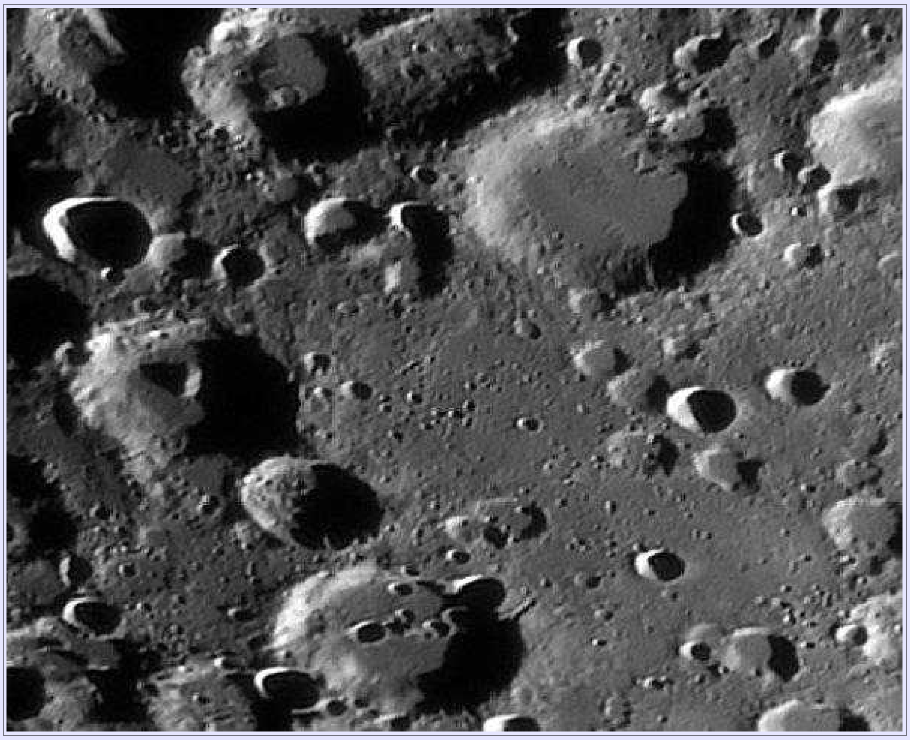


Figure 1. The proposed ghost crater located at 9.7˚E, 53.4˚S, as found by Bob Stuart in his archive – located at the centre of this image.

Interestingly, there is a hint of another buried crater just to the bottom right of the one that A. Gabriel proposed, and that would be at diameter of 80 km and located at 14.6˚E, 54.4˚S, with Jacobi B close to its centre.

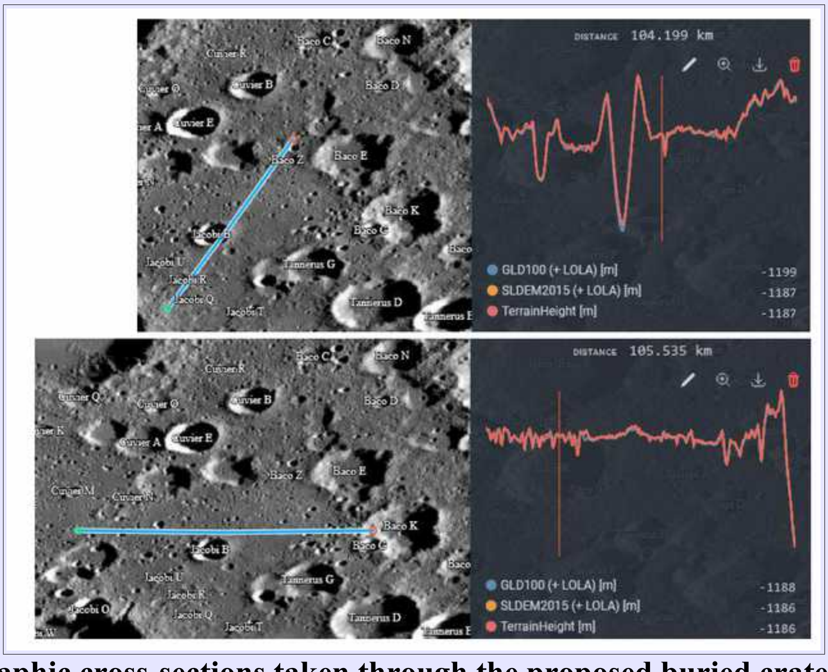


Figure 2. Topographic cross-sections taken through the proposed buried crater using the LROC Quickmap web page.

Fig 2 shows two almost perpendicular cross-sections through it. The N-S one is a bit more convincing, but not as convincing as last month's buried crater. I shall assign a weight of 1 to this proposed buried crater for now.

If you think that you have discovered a new impact basin, or unknown buried crater, please check whether it has been found previously on the following web site, and if not email me its location and diameter so that I can update the list.

https://users.aber.ac.uk/atc/basin_and_buried_crater_project.htm.

Alternatively, if you want an observational challenge, try to see if you can image one of more of the basins or buried craters at sunrise/set and establish what colongitude range they are best depicted at. Or you can even do this "virtually" with LTVT software. As you can see from the tables on the web sites there are lot of blank cells to fill in on the sunrise and sunset colongitude columns – so a good opportunity for you to get busy!

……

Bino-Viewers for Visual Observations? By Barry Fitz-Gerald.

I had always assumed that bino-viewers were a relatively recent addition to the amateur astronomers inventory, but the above advert, culled from one of the BAA Journals from the 1920's shows that they have been around for a lot longer. At a recent viewing evening I took along an Skywatcher 80mm ED Apo refractor equipped with a bino-viewer and two 24mm eyepieces. The visual experience, based on the reaction of many attendees was that the views of the Moon were far superior both in terms of clarity and detail to the views through other instruments which included a 10inch Newtonian with a premium eyepiece. This came as no surprise to me as this setup, which is my usual 'Grab and Go' one for lunar viewing provides very impressive high resolution images, far superior to single eyepiece viewing with the same instrument. Bino-Viewers can be a little tricky depending on the instruments used, requiring either Barlow Lenses or Glass Path Correctors to reach focus, and not everyone can merge the images at high magnification, but the potential faff is (in my opinion) more than adequately rewarded with the spectacular 3D images you end up with.

What is your experience of these bits of kit – have you used them and if so do you find them an improvement over single eyepiece viewing – specifically for lunar viewing? What make/type do you use? Do you use one with a refractor or reflector? I use a Tele-Vue Bino Viewer (unfortunately no longer made) which came with a x2 amplifier and this works, as far as coming to focus is concerned, with every refractor I have used it with from f5 to f7.9. Please let us know your experience!

Kuiper by Barry Fitz-Gerald.

Central Mare Cognitum is bereft of any really big craters, with only two, Euclides D (5.7 kms diam) and Kuiper (6.2 kms diam) marring the surface (Fig.1). The latter rather modest crater is named after Gerard Peter Kuiper (1905-1973) one of the giants in Solar System astronomy. It is a simple bowl shaped crater and has very little, so it would appear, to distinguish it from the countless other craters in this size range that pepper the lunar surface.

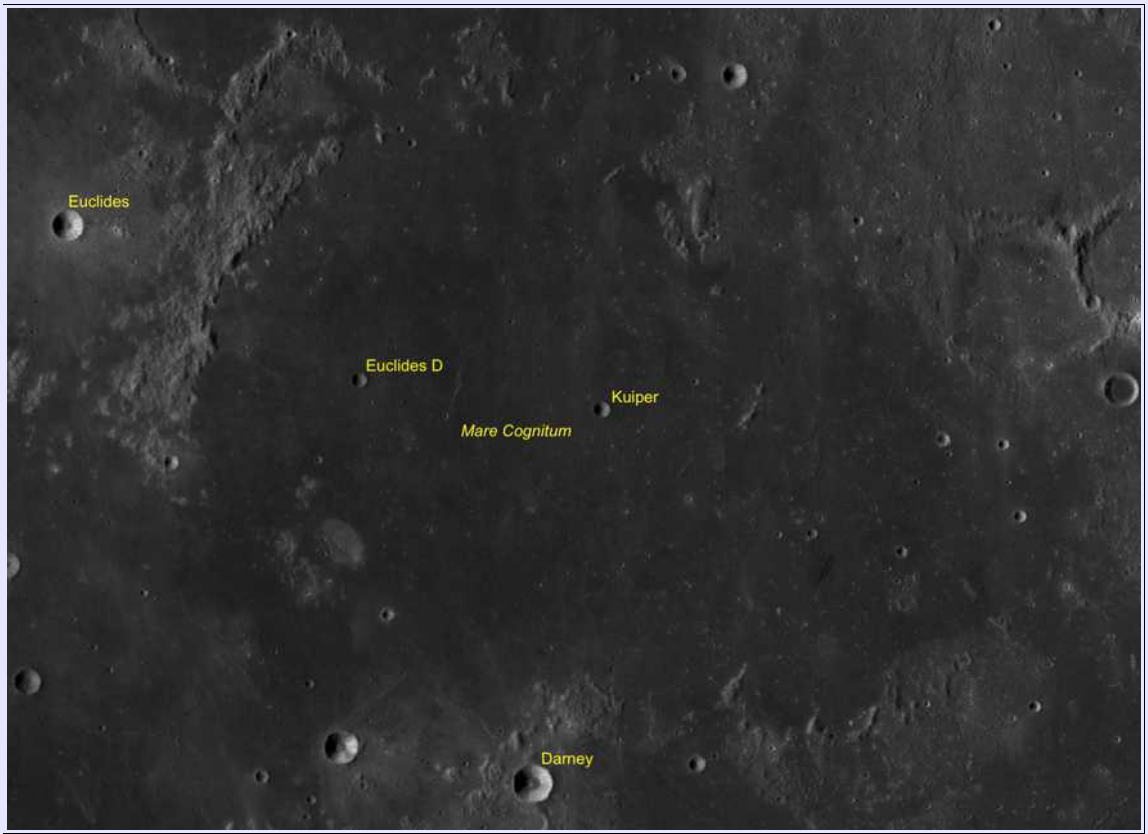


Fig.1 Mare Cognitum and Kuiper.

Due to its size, telescopic views of Kuiper reveal nothing, apart from a small dark wedge of material apparently visible within its eastern wall under high magnification[1]. Spacecraft images however reveal an unusual bit of topography just outside the eastern rim which may provide information on how it formed.

Fig.2 is a SELENE image of Kuiper, and as can be seen it is a simple bowl shaped crater, with an ejecta blanket visible in the form of the dune and trough like deposits which are quite conspicuous to the north, south and west. There are no bright rays, and the rim is not particularly bouldery indicating an Eratosthenian age. To the east, this ejecta is inconspicuous, but what is present is a low triangular ridge with its base along the eastern rim and extending for some 8kms to the east-south-east, tapering as it goes. This ridge consist of a number of hills and smaller ridges (Fig.3) with an average height of some 90m high near the crater rim, dropping to 50m at a distance of 5kms from the rim and to 10m at 8 kms from the rim. The ridge probably continues further east than this, but becomes inconspicuous and difficult to see and measure.

So what is this ridge – is it associated with the crater or is it a pre-existing feature of the mare surface that Kuiper just happens to have cut. There are no nearby wrinkle ridges orientated in this direction, the closest one being 28 kms away to the east and orientated north-south, so it is unlikely to be a wrinkle ridge. There are also no other positive relief features nearby to indicate an isolated highland peak peeking above the mare surface, and in any case the ridge shows no spectral or mineralogical signs of being composed of highland material. This leaves the possibility that it is a feature of the crater and its ejecta, and evidence for this can be found in Mare Serenitatis and the 9.2 km diameter crater Luther.

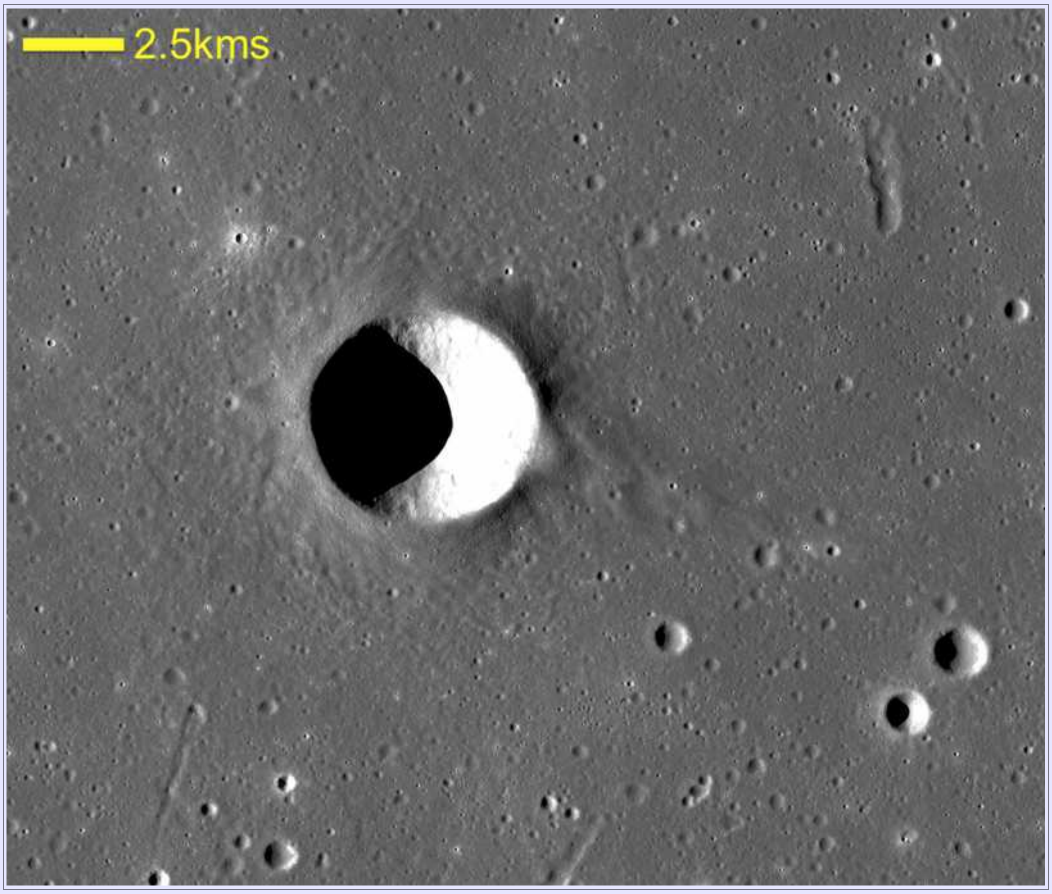


Fig.2 SELENE evening image of Kuiper showing the triangular ridge tapering away from the eastern rim in an ESE direction.

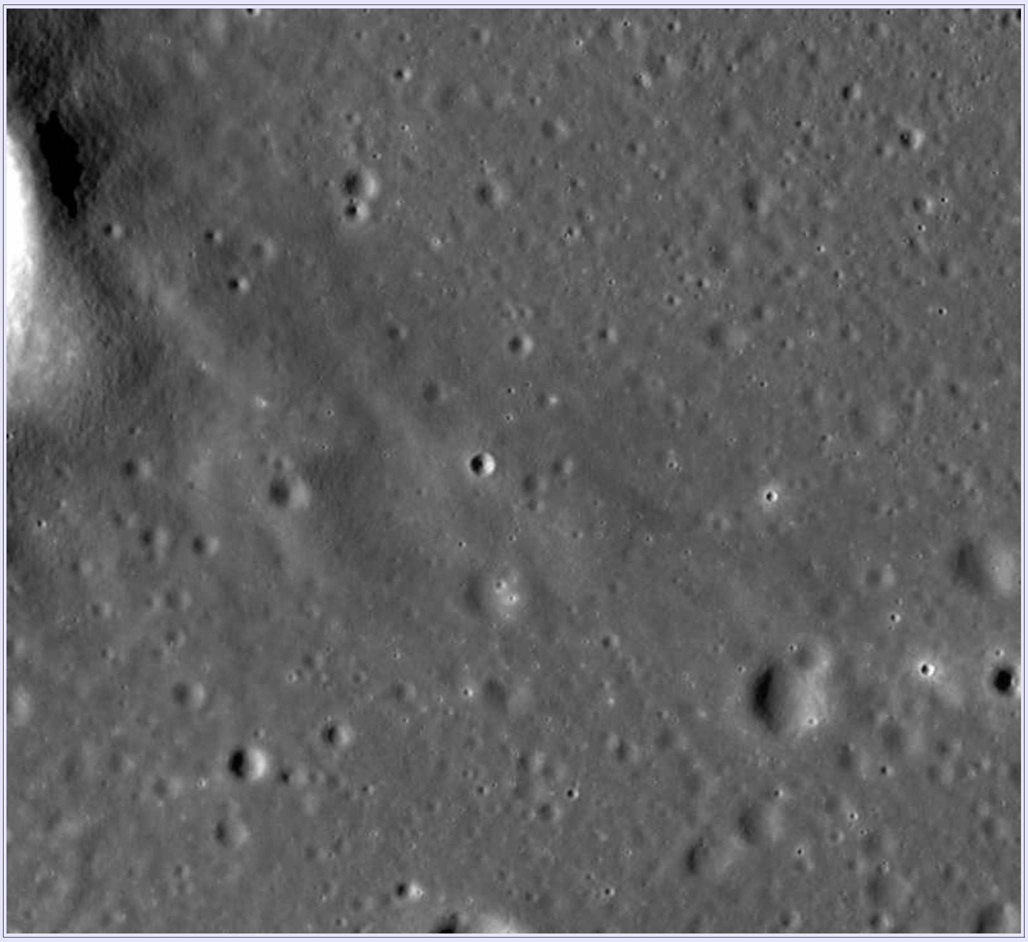


Fig.3 Enlargement of the ridge shown in Fig.2, Note the uneven nature of the ridge surface.

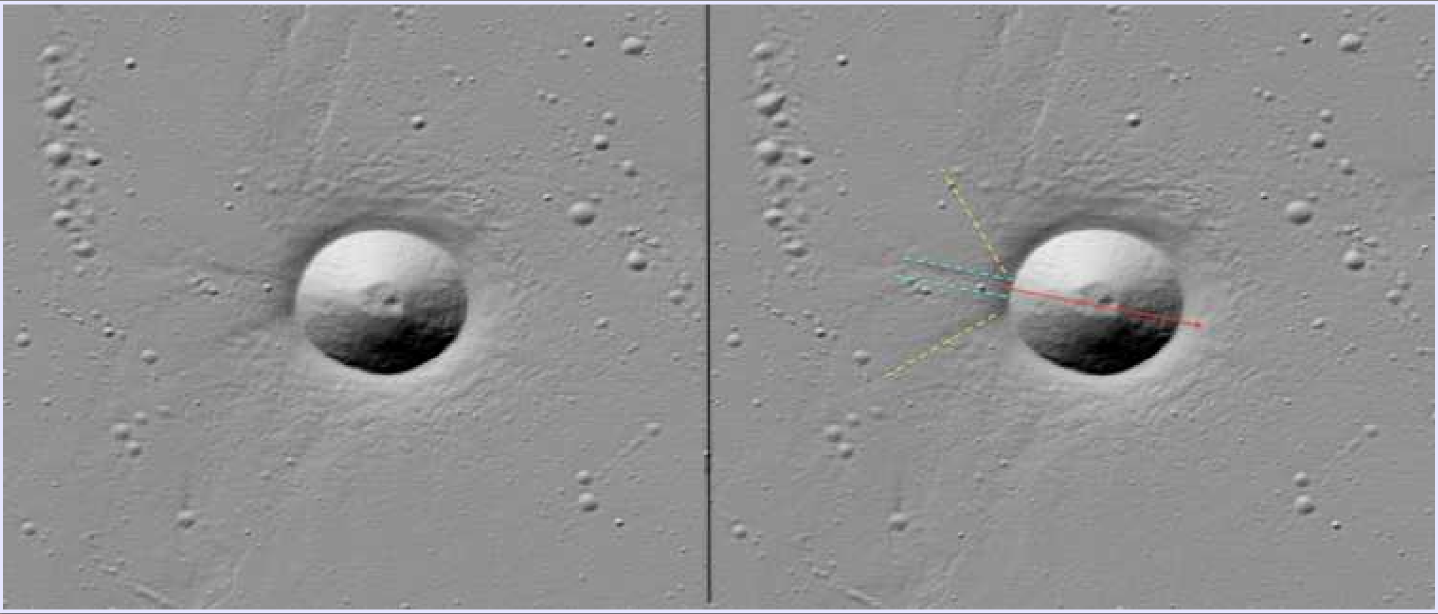


Fig.4 Crater Luther with as shown in the 'TerrainHillshade' mode in LRO Quickmap. The right panel identifies the various features, with the ZoA outlined with yellow dashed lines, the up-range ridge in blue dashed lines and the impactor trajectory with a red arrow.

If you compare the images of Luther in Fig.4 with that of Kuiper in Fig.3, you will see several similarities, helped by the fact that they are not too dissimilar in size and both are lacking bright rays due to their age. Both have ejecta visible on on 3 sides, with Kuiper's to the N, S and W, and in Luther's to the N, S and E. In Kuiper there is a ridge like feature on the east side where the normal ejecta is inconspicuous or absent, and in Luther there is a ridge on the west side, where similarly the normal ejecta is inconspicuous or absent. In the case of Luther however we have more information in the form of topography to play with, so you can see from Fig.4 that the dearth of ejecta to the west of Luther is actually a wedge shaped 'Zone of Avoidance' (ZoA) typical of the ejecta pattern seen in low angle impacts. Indeed the distribution of ejecta is consistent with Luther having formed from a low angle impact from the west, implying that the ridge is an up-range ejecta feature. This interpretation is supported by the observation that the western rim (in the up-range direction) is slightly depressed relative to the rest of the rim, which is another characteristic of low angle impact craters.

Taking a more detailed view of this up-range ridge in Luther using NAC images (Fig.5) we can see that in this case it is more parallel sided than the example in Kuiper, but exhibits the same somewhat uneven surface consisting of a number of hills and ridges, with a height in the 10's of meters, and a length of some 6 or 7 kms. It neatly bisects the ZoA, and lines up with the low point in the western rim of the crater. An up-range ray/ridge interpretation for these features as seems likely, would therefore imply that Kuiper is a low angle impact crater – and if we look at a topographic profile orientated west to east across the crater (Fig.6) we can see that it has a typical profile of such a crater, with a depressed rim to the east suggesting an impact from direction. With this in mind, if you go back to Fig.2 you will now probably be able to see a ZoA in the ejecta to the east of Kuiper, which I think more or less confirms the identification of the ridge as an up-range ejecta feature.

Up-range rays are not new, an up-range plume was observed during the collision of the Deep Impact probe with Comet 9P/Tempel 1 in 2005[2] and then a physical up-range ray was reported associated with a lunar crater (Fig.7) and which was thought to owe its origin to a similar process[3]. In a nutshell, experiments suggested that a low angle impact (< 30°) in to a surface with a low density mantling (as you would have with a comet) results in a *'long penetration funnel'* which develops along the impactors trajectory. At a late stage in the impact process an ejecta plume, collimated in to a jet and orientated back along the impactor trajectory escapes along up this funnel to form an up-range plume. In the lunar example however the RADAR technique used to detect the rays indicated the presence of boulders in the decimetre size range in the ray, possibly suggesting a 'rebound effect' ejecting solid target material as opposed to a vapour dominated jet Whatever the precise mechanism, the existence of these rays and ridges as distinct features of some low angle impacts seems fairly well established.

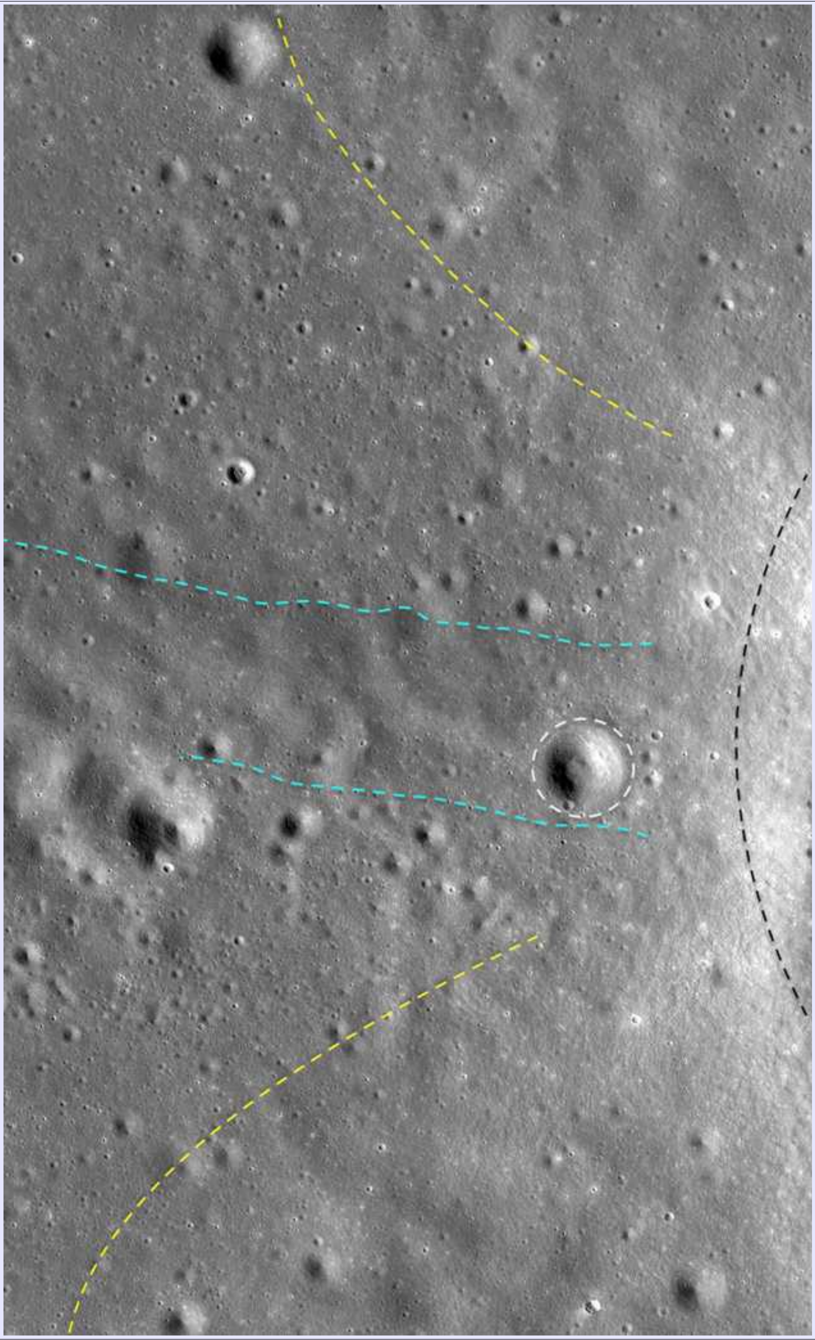


Fig.5 An LRO NAC image of the up-range ray of Luther using the same coloured dashed lines as in Fig.4 to identify the ZoA and the ray. The western rim of Luther is shown with the black dashed line.

As with everything lunar and impact related however, there is probably a range of expression of these features which is dependent on many factors ranging from impact angle, speed of the impactor, target lithology, depth of regolith and so on. So we are likely to see a range of morphologies - from the obvious to the questionable. A nice example of the questionable is the case of Cauchy, which has one of the most perfect examples of a ZoA that I can think of. This is shown in Fig.8 which is a SELENE evening image, and you can see a short fan of material, which near the crater rim is about 80m high, but diminishes rapidly in heigh to the west. This might be a stunted version of one of these up-range ridges or rays, and if the parameters of this particular impact had differed slightly it might have presented us with a spectacular version of what we see in Kuiper and Luther.

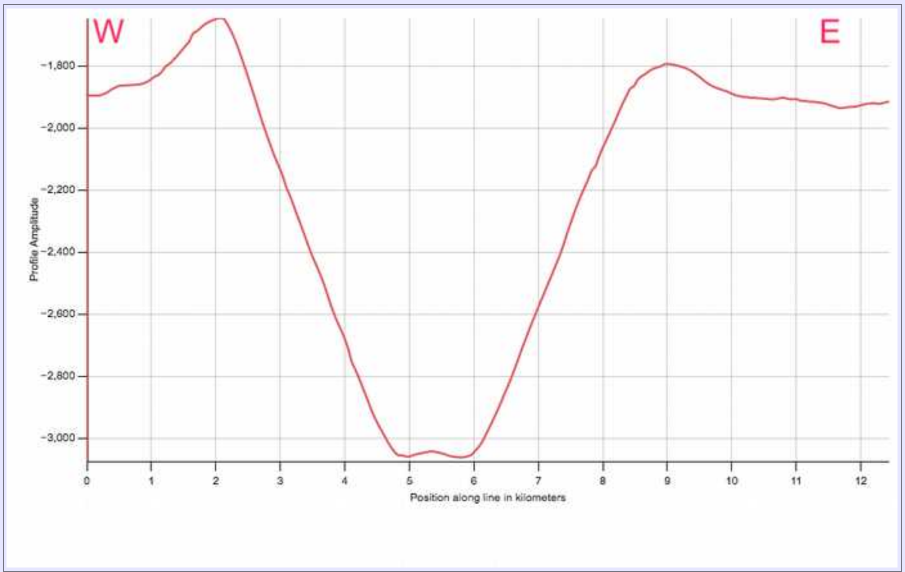


Fig.6 Topographic profile from W to E of Kuiper. Note the eastern rim, which is the up-range one is depressed relative to the western down-range one.

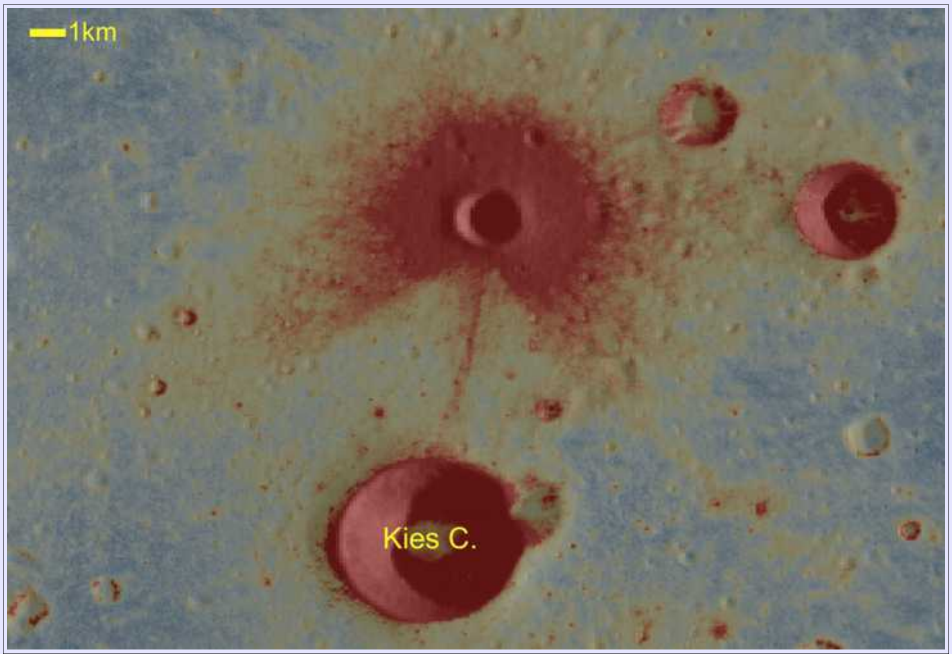


Fig.7 A false colour Optical Maturity image of a crater discussed in Reference 3 to the north of Kies C which has an up-range ray bisecting its ZoA. This was originally identified from RADAR images.

Returning to Kuiper, you will recall the comments regarding the presence of a dark wedge on the eastern wall of the crater, this may also be a result of the low angle impact that formed the crater in the first place. Fig.9 is an image of the 3km diameter Encke X, and as you can see it has a narrow ZoA to the north-west, so is a product of a low angle impact from that direction. It is much younger than either Kuiper of Luther and has a well preserved ejecta blanket which shows many interesting features and landforms. Despite being a low angle crater, the up-range and down-range rims (NW and SE) are virtually the same height, indicating (along with the narrow ZoA) that the impact angle was approaching the point where these low angle features fail to develop.

When we look at the ZoA in detail we see that the glacis adjacent to it is draped in impact melt, with a 1km long impact melt flow which dribbles down towards, but just stops short of the actual start of the ZoA. Inside the crater the north western wall has a dark band, and this is in all probability a reflection of the presence of abundant melt derived rocks and not any pre-impact geology at 'ground zero'. Interestingly there is no such concentration of melt outside of or beyond the south eastern or down-range rim.

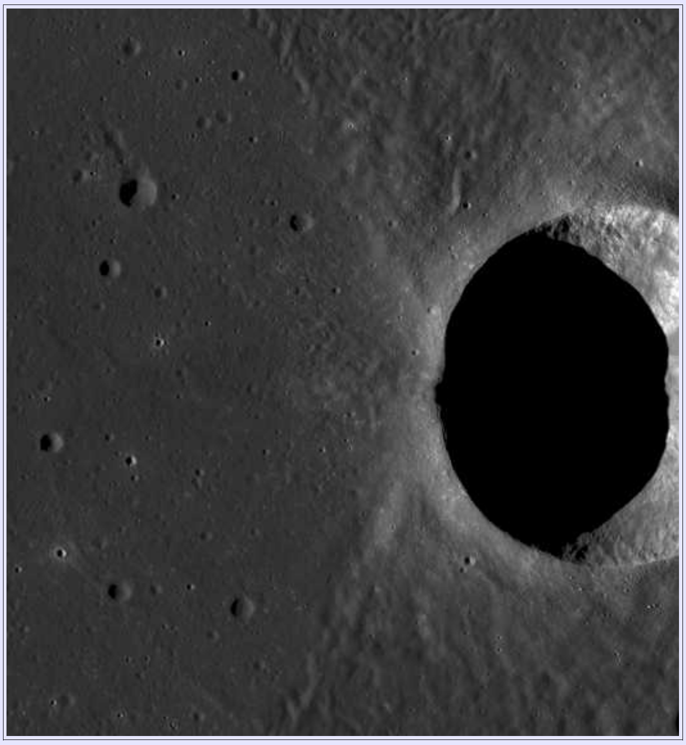


Fig.8 SELENE image of Cauchy showing the broad ZoA and a small fan shaped ridge bisecting it and extending away for a short distance to the west.

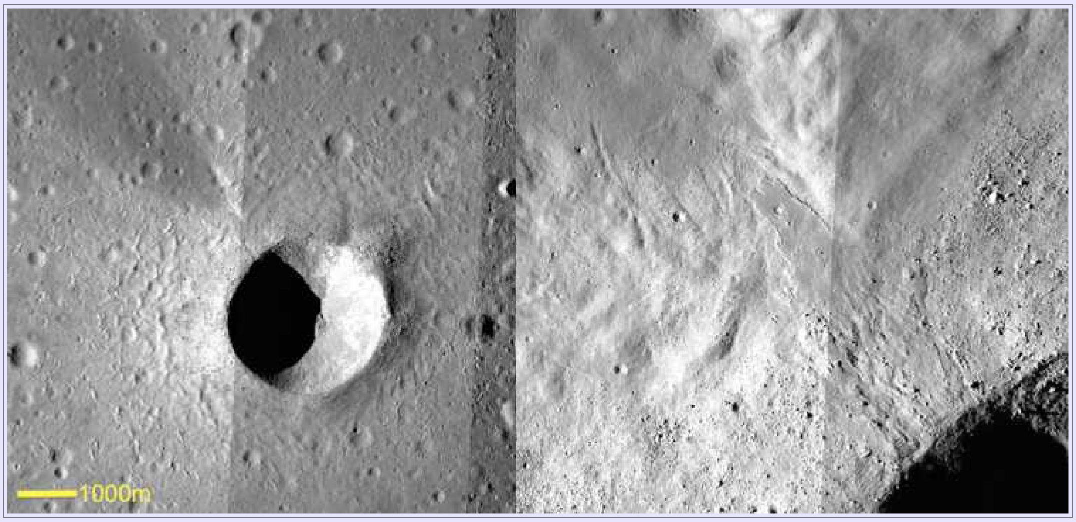


Fig.9 LRO image of Encke X (left) showing in, contrast to Cauchy, a very narrow ZoA probably a result of the impact angle here being higher and (right) a flow of impact melt which extends down the glacis in the up-range direction and down towards the ZoA. The interior wall of the crater adjacent to this flow has a dark band probably consisting of abundant melt derived rocks.

Impact melt can often be seen outside impact craters in the down-range direction where it is blasted during the impact or opposite low points in the rim which the melt has exploited to flow over. In this case some mechanism has propelled the melt up and over the rim in the up-range direction, and maybe a similar mechanism can account for the dark wedge on the eastern wall of Kuiper, and what we see in the dark band is the presence of melt rock, and not a feature of the pre-impact local geology.

References:

1. Craters of the Near Side Moon. John Moore (2014) CreateSpace Independent Publishing Platform, ISBN 9781497324442.
2.P. H. Schultz (2009) Uprange Plumes and nature of the Comet 9P/Tempel 1. 40th Lunar and Planetary

Science Conference.
3. S. W. Bell and P. H. Schultz (2012) Detection of a radar signature of the uprange plume in fresh oblique lunar craters. 43rd Lunar and Planetary Science Conference.
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Lunar Geological Change detection Programme BY by Tony Cook.

TLP Reports: No impact flash observations have been received since the last newsletter, nor any TLPs reported.

Routine reports received for June included: Jane Clark (Risca, UK - BAA) imaged: several features. Maurice Collins (New Zealand - ALPO/BAA/RASNZ) imaged: Abenezra, Agrippa, Janssen, Lacus Mortis, Plinius, Rima Ariadaeus, Theophilus and several features. Anthony Cook (Newtown & Mundesley, UK – ALPO/BAA) imaged/videoed: several features & earthshine in the Short-Wave IR and in visible light. Cervoni Maurizio (Italy – UAI) imaged Montes Teneriffe and observed Stoffler. Fabio Verza (Italy – UAI) imaged: Eudoxus, Montes Tenneriffe, Stofler and Tycho,, Luigi Zanatta (Italy – IAU) imaged: Eudoxus and Stofler.

Analysis of Reports Received (June):

Montes Teneriffe: On 2023 Jun 23 between 19:58 and 20:44 UT UAI observers: Fabio Verza and Cervoni Maurizio imaged this crater according to the following lunar schedule request:

BAA Request: please image this area as we want to compare against a sketch made in 1854 under similar illumination. However if you want to check this area visually (or with a colour camera) we would be very interested to see if you can detect some colour on the illuminated peaks of this mountain range, or elsewhere in Mare Imbrium. Features to capture in any image (mosaic), apart from Montes Teneriffe, should include: Plato, Vallis Alpes, Mons Pico and Mons Piton. Please note that we are especially interested in the appearance of the individual peaks of the Montes Teneriffe, when the Moon is at a low altitude e.g. flaring and colours seen. Any visual descriptions, sketches or images should be emailed to: a t c @ a b e r . a c . u k

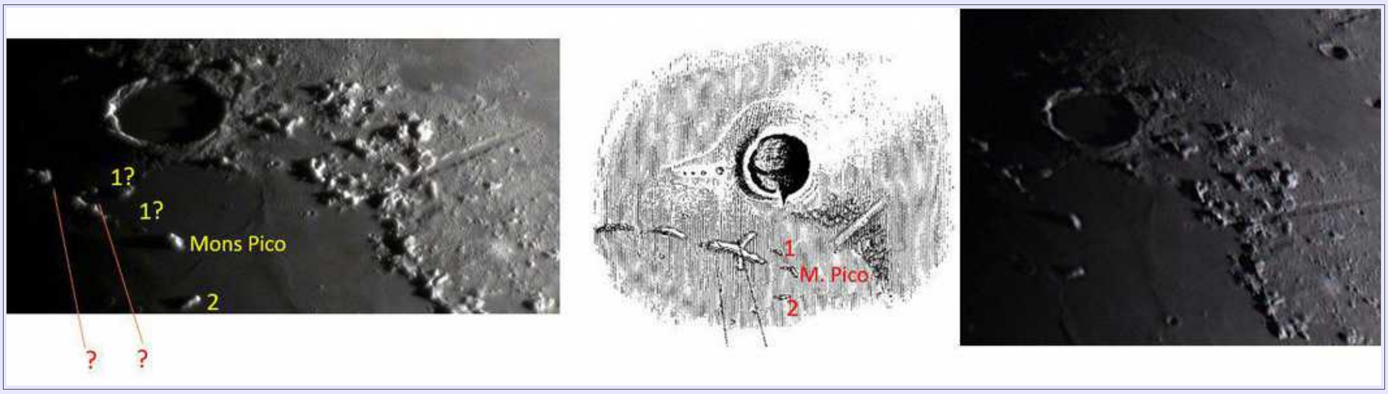

Figure 1. Plato orientated with north towards the top approximately. Note that annotation in red and yellow has been added. **(Left)** An image taken by Fabio Verza (UAI) on 2023 Jun 23 UT 19:58. **(Centre)** A sketch about the 1854 TLP observations by Robert Hart (RAS) from p164 of the Monthly Notices of the Royal Astronomical Society, Vol 15. **(Right)** An image taken by Cervoni Maurizio (UAI) on 2023 Jun 23 UT 20:44.

We have covered this 1854 TLP report many times before in the: 2018 Jun, 2019 Feb, 2020 Aug & Dec, 2021 Jan, 2022 Dec and 2023 Apr newsletters. What appears to have happened is that Robert Hart made their observation, then tried to locate the positions of the TLP in another sketch made on another day, when more of Montes Teneriffe was visible. Although I can recognize Plato, Vallis Alpes, Mons Pico and the mountain just to its south, inaccuracies in the sketch (Fig 1 Centre) make it difficult to identify the mountain to the NW of Mons Pico. In Fig 1 (Left) I have depicted two possible locations of that latter mountain peak and also tried to add a couple of lines to show where Hart may have seen their TLP – but much of this is uncertain. However because of the cartographic inaccuracies I don't think we can get any further in this study and so will remove this from the Lunar Schedule website. It will however be kept on the repeat illumination website, with a footnote to observe only when the Moon is very low in order to see if we can replicate the colours seen on the peaks –

assuming this was due to atmospheric spectral dispersion and seeing conditions?

Eudoxus: On 2023 Jun 24 UT 21:53-22:33 Jane Clark (BAA) imaged the whole Moon, some 7 min after the following repeat illumination observing window:

On 1969 Jul 20 at 22:50-23:15UT Jean Nicolini (Sao Paulo, Brazil, 12" reflector x430, S=II.5-III.5) saw a weak reddish area on the north west(east?) wall of Eudoxus crater. An English Moon Blink device showed it dark in blue and opaque in red. Reddening remained unchanged while comparing it to adjacent region and Aristotles. Colour index was toward dirty orange. Colour most apparent in the good moments of seeing and disappeared in the poorer moments of seeing, Cameron says that this is opposite to what was expected if the effect was atmospheric in origin and no colour was seen in Aristotles. Apollo 11 watch. Cameron 1978 catalog ID=1177 and weight=3. The ALPO/BAA weight=3.

Figure 2. Eudoxus crater captured in monochrome by Jane Clark on 2023 Jun 24, from a larger mosaic obtained during 21:53-22:33UT. Eudoxus is just below the centre of the image. North is towards the top.

Although Jane's image (Fig 2) is in monochrome, it is nevertheless a useful context image for what that part of the Moon would have looked like to Nicoloni back on 1969 Jul 20 - though the libration would have been different.

Descartes: On 2023 Jun 25 UT 06:14-06:35 Maurice Collins (ALPO/BAA/RASNZ) imaged the whole Moon, but under similar illumination to the following report:

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

Figure 3. Descartes at the centre of this image as captured by Maurice Collins on 2023 Jun 25 UT06:14-06:35. This has been colour normalized and then had its colour saturation increased to 5.0 using GIMP image processing software. The image is orientated with north towards the top.

No tint of orange can be seen here (Fig 3). We shall leave this report at a weight of 1 as no other information was provided on whether the observer in Minsk checked for chromatic aberration effects in the refractor that they were using.

Stofler: On 2023 Jun 25 UAI observers Fabio Verza and Luigi Zanatta (technically Luigi was slightly outside the time slot) imaged and Cervoni Maurizio observed visually for the following Lunar Schedule request:

BAA Request: Images or sketches of this crater needed. We are trying to see if a curious gray band is visible across the crater floor as seen by T. Smith on 2020 Nov 22.
Any sized scope can be used from 5" or upwards.
All images should be sent to: a t c @ a b e r . a c . u k

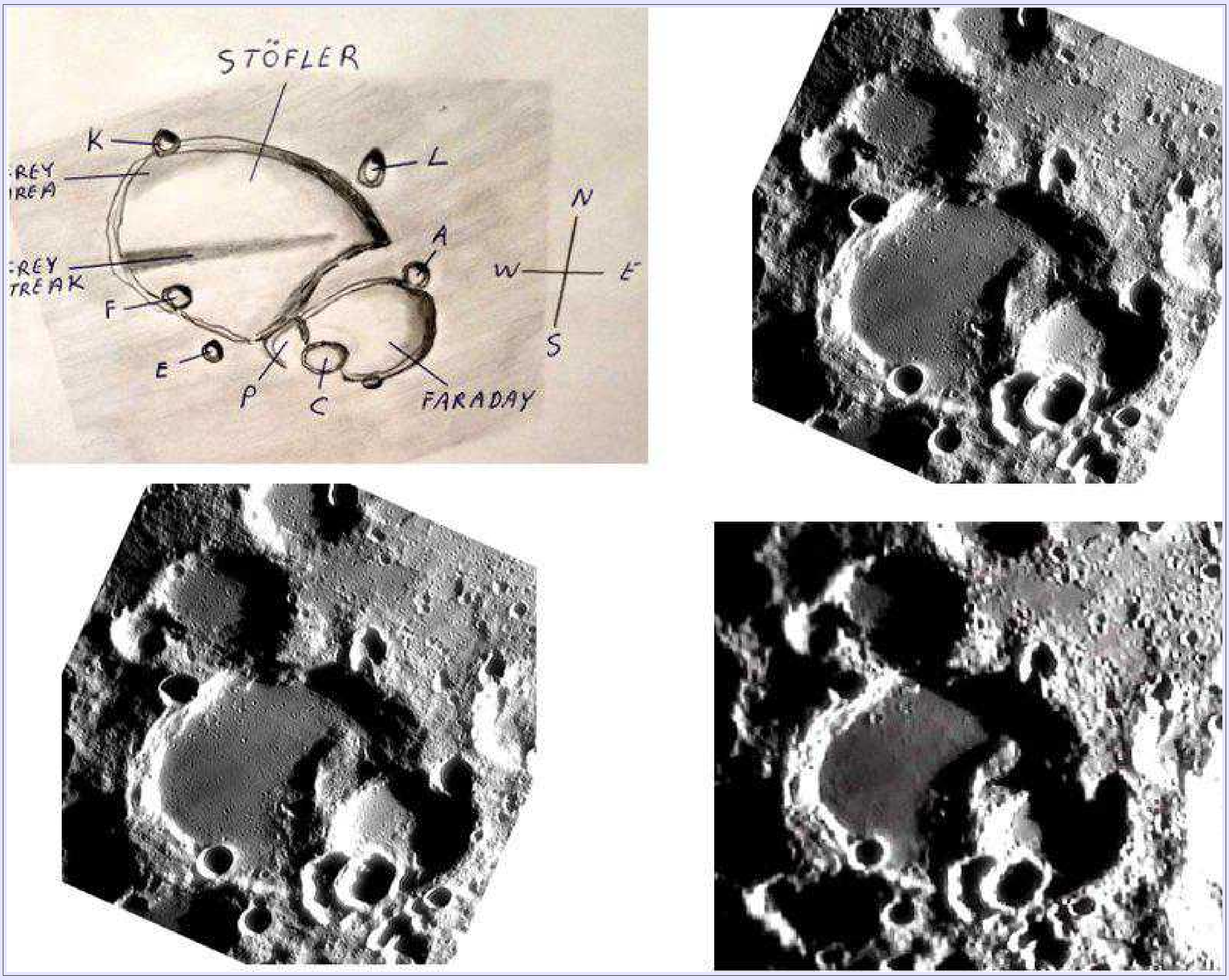

Figure 4. Stofler orientated with north towards the top. **(Top Left)** A sketch by Trevor Smith (BAA) from 2020 Nov 22 UT 18:15-18:45. **(Top Right)** An image by Bill Leatherbarrow (BAA) taken on 2020 May 29 UT 19:57. **(Bottom Left)** An image by Fabio Verza (UAI) taken on 2023 Jun 25 UT1955, **(Bottom Right)** An image by Luigi Zanatta taken on 2023 Jun 25 UT 20:06.

When Trevor made his initial report in 2020 (Fig 4 -Top left), Bill Leatherbarrow (BAA) commented *"I am pretty certain that you saw is a normal albedo variation on the floor of Stofler, although it appears to have been particularly obvious under the conditions of your observation. It shows up on many of my own images of this crater, and can be discerned on the attached image from earlier this year."* – see Fig 4 (Top Right). Note that I have contrast enhanced all the images in Fig 4 to bring out the detail on the floor of Stofler. The bottom row of Fig 4 contains images taken by UAI observers on the repeat illumination night of 2023 Jun 25. In all the images you can just about see the darker grey streak across the floor in about the right place as seen in Trevor's sketch. This is simply an albedo marking across the floor of the crater, maybe related to a slightly different era of volcanism on the floor, or perhaps the light and/or dark bands across the floor are ray ejecta material? Another possibility could be a change in slope across the floor – so we might have shading from slope angle?

Another UAI observer, Cervoni Maurizio, was observing visually and made a sketch (not shown here) using a 127mm Maksutov/Cassegrain (x224) and saw no sign of the dark streak across the floor, but other details in the crater looked fine. Seeing was Antoniadi III. It maybe that telescope aperture matters here as Trevor was using a 16" Newtonian back in 2020, albeit under Antoniadi IV (poor) seeing conditions. But at any rate, I think we can lower the weight of this TLP report to 0 as the dark streak is normal on the crater floor and we have replicated it in the right place in the images.

General Information: For repeat illumination (and a few repeat libration) observations for the coming month - these can be found on the following web site: http://users.aber.ac.uk/atc/lunar_schedule.htm . By re-observing and submitting your observations, only this way can we fully resolve past observational puzzles. 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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Items for the September circular should reach the Director or Editor by the 25th August 2023 at the addresses show below – Thanks!

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