THE LUNAR OBSERVER

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

EDITED BY: Wayne Bailey wayne.bailey@alpo-astronomy.org
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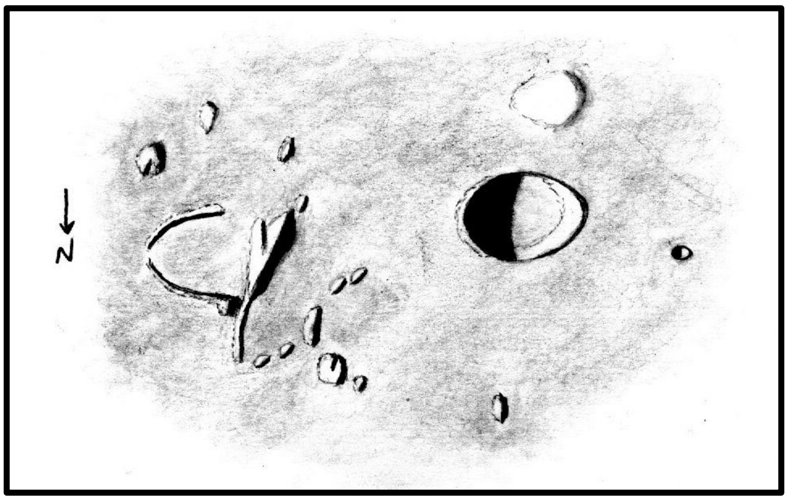
RECENT BACK ISSUES: http://moon.scopesandscapes.com/tlo_back.html

FEATURE OF THE MONTH – JULY 2015

PROTAGORAS



Sketch and text by Robert H. Hays, Jr. - Worth, Illinois, USA
February 28, 2015 02:58-03:38 UT, 15 cm refl, 170x, seeing 6-8/10

I drew this crater and vicinity on the evening of Feb. 27/28, 2015 before the moon hid the double 20/21 Geminorum. This crater is in Mare Frigoris northwest of Aristoteles. Protagoras is a crisp, slightly egg-shaped crater with the pointed end to the west. Protagoras B is the small pit to the west. There is a conspicuous bright patch to the south. This feature is also slightly egg-shaped, but with the pointed end to the east. It may be a low elevation based on shadowing that was noted. A bright, isolated peak is north of Protagoras. There is a variety of peaks and ridges to the east. Some of them appear to form two or three partial rings. A large mountain, elongated nearly north-south, is the main elevation in this area. This mountain has a forked southern end with a small peak nearby, and a narrow ridge protruding northward. A delicate horseshoe-shaped ridge with at least one gap is east of the large mountain. An assortment of peaks between the large mountain and Protagoras are arranged in semicircular patterns. There are three peaks south of the large mountain and the horse-shoe ridge. The middle one is brighter than its neighbors, but it has relatively little shadow. None of the detail east of Protagoras is shown on the Lunar Quadrant map.

LUNAR CALENDAR

JULY-AUGUST 2015 (UT)

2015		UT	
Jul	01	06:48	Moon South Dec.: 18.4° S
	02	02:20	Full Moon
	05	18:54	Moon Perigee: 367100 km
	08	00:07	Moon Descending Node
	08	20:24	Last Quarter
	12	17:55	Moon-Aldebaran: 0.9° S
	14	04:24	Moon North Dec.: 18.4° N
	16	01:24	New Moon
	18	17:34	Moon-Jupiter: 4.5° N
	19	01:06	Moon-Venus: 0.5° N
	21	11:02	Moon Apogee: 404800 km
	21	19:32	Moon Ascending Node
	24	04:04	First Quarter
	26	08:43	Moon-Saturn: 2.4° S
	28	17:34	Moon South Dec.: 18.3° S
	31	10:43	Full Moon
Aug	02	10:11	Moon Perigee: 362100 km
	04	02:53	Moon Descending Node
	07	02:03	Last Quarter
	08	23:22	Moon-Aldebaran: 0.7° S
	10	11:11	Moon North Dec.: 18.3° N
	14	14:54	New Moon
	16	14:34	Moon-Mercury: 2.2° N
	17	23:05	Moon Ascending Node
	18	02:33	Moon Apogee: 405900 km
	22	17:21	Moon-Saturn: 2.8° S
	22	19:31	First Quarter
	25	03:44	Moon South Dec.: 18.2° S
	29	18:35	Full Moon
	30	15:24	Moon Perigee: 358300 km
	31	10:16	Moon Descending Node

AN INVITATION TO JOIN THE A.L.P.O.

The Lunar Observer is a publication of the Association of Lunar and Planetary Observers that is available for access and participation by non-members free of charge, but there is more to the A.L.P.O. than a monthly lunar newsletter. If you are a nonmember you are invited to join our organization for its many other advantages.

We have sections devoted to the observation of all types of bodies found in our solar system. Section coordinators collect and study members' observations, correspond with observers, encourage beginners, and contribute reports to our Journal at appropriate intervals.

Our quarterly journal, **The Journal of the Association of Lunar and Planetary Observers-The Strolling Astronomer**, contains the results of the many observing programs which we sponsor including the drawings and images produced by individual amateurs. Additional information about the A.L.P.O. and its Journal is on-line at: **http://www.alpo-astronomy.org.** I invite you to spend a few minutes browsing the Section Pages to learn more about the fine work being done by your fellow amateur astronomers.

To learn more about membership in the A.L.P.O. go to: **http://www.alpo-astronomy.org/main/member.html** which now also provides links so that you can enroll and pay your membership dues online.

2015 ALPO CONVENTION

The 2015 ALPO Convention will be held in Las Cruces, NM Monday –Saturday, July 6-11, 2015.in conjunction with the Astronomical League's ALCON2015. Details are available in the Spring 2015 issue of the Journal of the ALPO (vol. 57 #2). Registration, schedule and accommodation information is available on the ALCON2015 website (alcon2015.astroleague.org). Las Cruces is the home of Walter Haas, the ALPO's founder, who recently passed away. There will be a special tribute to Walter at the Star-B-Que on Friday evening.

There will be a separate session for ALPO papers. You are encouraged to submit a paper for presentation. The Spring JALPO includes instructions for submission.

When submitting observations to the A.L.P.O. Lunar Section

In addition to information specifically related to the observing program being addressed, the following data should be included:

Name and location of observer
Name of feature
Date and time (UT) of observation
Size and type of telescope used
Magnification (for sketches)
Filter (if used)
Medium employed (for photos and electronic images)
Orientation of image: (North/South - East/West)
Seeing: 1 to 10 (1-Worst 10-Best)
Transparency: 1 to 6

Full resolution images are preferred-it is not necessary to compress, or reduce the size of images. *Additional commentary accompanying images is always welcome.* **Items in bold are required. Submissions lacking this basic information will be discarded.**

Digitally submitted images should be sent to both
Wayne Bailey – wayne.bailey@alpo-astronomy.org
and Jerry Hubbell –jerry.hubbell@alpo-astronomy.org

CALL FOR OBSERVATIONS:

FOCUS ON: Dionysius

Focus on is a bi-monthly series of articles, which includes observations received for a specific feature or class of features. The subject for the **September 2015** edition will be the **dark ray crater Dionysius.** Observations at all phases and of all kinds (electronic or film based images, drawings, etc.) are welcomed and invited. Keep in mind that observations do not have to be recent ones, so search your files and/or add this to your observing list and send your favorites to (both):

Wayne Bailey - wayne.bailey@alpo-astronomy.org

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

Deadline for inclusion in the Dionysius article is August 20, 2015

FUTURE FOCUS ON ARTICLES:

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

Subject	**TLO Issue**	**Deadline**
Deslandres	November 2015	October 20, 2015

Focus On: Mare Tranquillitatis - A Not So Tranquil Mare

Alberto Martos, Carlos de Luis, Ruth Ortega, Fernando Bertrán,
Manuel Guzmán and Luis Alonso
The Lunar Group of Madrid Amateur Astronomy Society (AAM).

Tranquillitatis is by extension (421 000 sq km) the third *mare* basin in the Moon’s near side, after Procellarum and Imbrium. It became famous in 1969, as host of the Tranquillity Base, when men from planet Earth first set foot east of crater Sabine, in peace for all mankind. Some members of this team are old enough to have witnessed this event.

Tranquillitatis basin was formed by a huge meteoritic impact, during the so called Cataclysmic Epoch (or Late Heavy Bombardment, LBH) of the Solar System. Later on, it was filled by lava uplifted from the deep mantel by the heat developed by radioactive elements, present in the lunar interior. Currently it proclaims its old age to the telescopic observers, just showing its smashed contour, cropped by intrusions of borders and rings of younger basins that formed in its neighborhood; its lack of arcuate mountains surrounding its magmatic central flatland; and its absence of the concentric rings that characterize the large basins visible on the Moon surface, and on the surfaces of the rest of terrestrial planets of the Solar System. As most lunar basins dating from Prenectarian Period, it lacks a *mascon*.

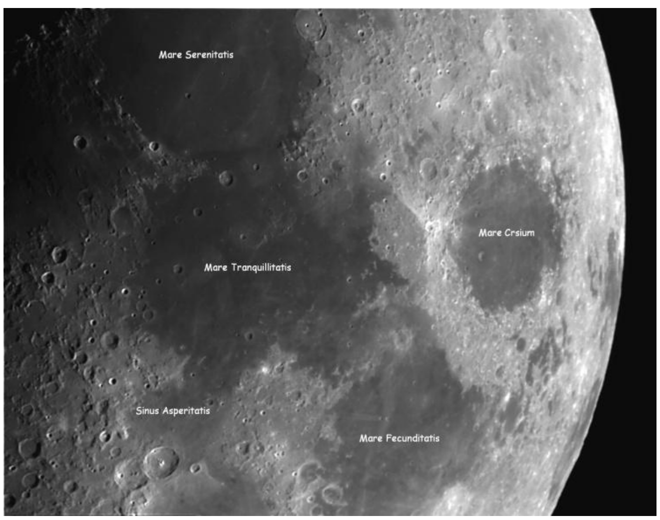


Photo 1.- The Mare Tranquillitatis and its neighborhood.

Mare Tranquillitatis lies between selenographic latitudes 15º north and 1º South and selenographic longitudes 17º and 40º east. As seen in photo 1, it is bordered to the North by Mare Serenitatis, to the East by Mare Crisium, to the south by Mare Fecunditatis, a strip of highlands intruding the basin ring, and Sinus Asperitatis and to the west by old highlands (terrae) cluttered with minor impact structures (craters).

Photo 2 shows the basin contour with greater detail. To the north, a narrow “strait” is seen, that communicates to Mare Serenitatis. It stretches from Promontorium Archerusia to Mons Argaeus, two elevations on the main ring of the Mare Serenitatis basin. To the east, a marelike terrain, called Palus Somni (Marsh of Sleep) because its gray surface is not as dark as those of the maria, separates Mare Tranquillitatis from Mare Crisium. To the south there are two “straits”,

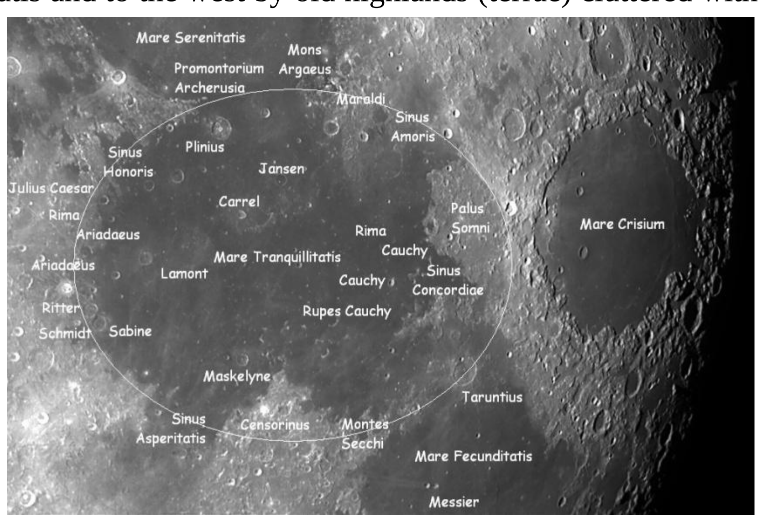


Photo 2.- Topographic features lying in Mare Tranquillitatis.

one stretching east of Montes Secchi and communicating with Mare Fecunditatis, and other, Sinus Asperitatis (Bay of Roughness), that extends southward and communicates to Mare Nectaris (off the photo). Finally to the west, the rough highlands show a crack (Rima Ariadaeus) pointing at the Imbrium basin center. This radial configuration between the cleft and the basin is understood as a cause and effect relationship, which means that the huge impact that excavated the basin, cracked the lunar crust upon its tremendous shock. (The energy liberated by the impact has been calculates as 10^{32} erg).

In photo 2 we have drawn a white circle that corresponds to the basin's main ring (as depicted in P. Spudis' The Geology of Multi-Ring Basins). Its oblate aspect obeys the picture perspective. One can observe two "wings" protruding from NE and NW edges, Sinus Amoris (Bay of Love) and Sinus Honoris (Bay of Honor). One is puzzled about what triggered these two outgoing mare features, beyond the edge of the ring.

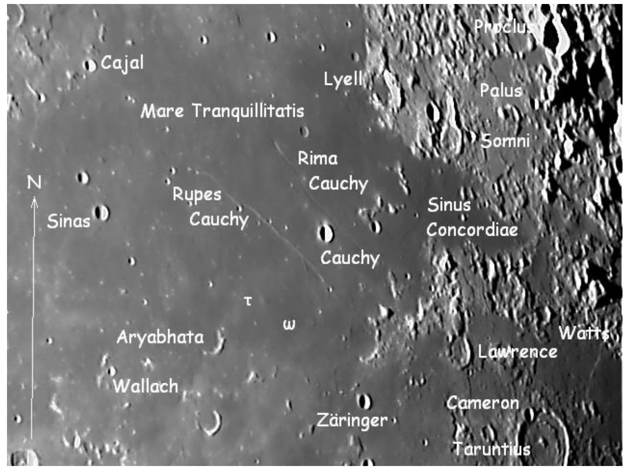
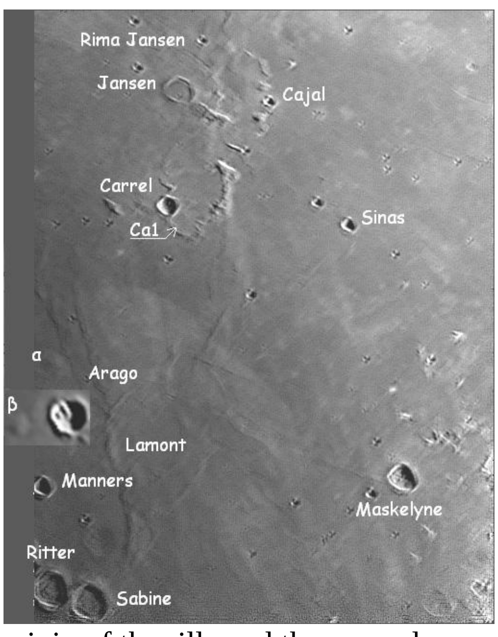


Photo 3.- The eastern section of Mare Tranquillitatis.

The eastern section of the mare is dominated by the Cauchy Group (photo 3). This group is located due west of Sinus Concordiae (Bay of Harmony) and includes the 12.4 km wide crater that nominates the group, a 210 km long rille, Rima Cauchy and the 120 km long escarpment (a tectonic fault), Rupes Cauchy. These two long features run parallel to each other enclosing the crater in between. The common point they are aiming at is doubtful, having been stated the center of either Mare Serenitatis or Mare Imbrium basins, by the same author (C. Wood). We believe that for an orthodromic path, there is a very little difference between both opinions.



Telescopic exploration at high power (400x) of Rupes Cauchy, reveals that the escarpment, at the ends, does not seem a fault-like structure, but a cleft-like one. The 300 m tall ravine comes to an end slowly and continues its way as a trench. This structural change in both ends has been documented and described as a metamorphosed ending.

Photo 4.- The central area of Mare Tranquillitatis. Arago patch is an inset.

Similar to the case of Rima Ariadaeus, the origin of these two features is said to be a knock-on effect of the impact that formed either one of those two basins. However, there is a great difference between both events: while Rima Ariadaeus cracked the highlands at the eastern edge of Tranquillitatis basin, the two features we are concerned here, lie on the magma, and according to the current geologic sequence, the uplift of lava occurred almost a billion years after the impact. So the origin of the rille and the scarp does not seem exogenous. Subsidence of the basin soil along some cracks carved by the impact might be a complementary explanation.

Another endogenous phenomenon, volcanism, is present in this area. Photo 3 shows south of Rupes Cauchy, two floor swells called Cauchy τ and Cauchy ω. They are true lunar volcanoes, commonly called domes. Although not visible in photo 3, there are up to 13 domes in the region, some of them between the escarpment tip and the Cajal crater.

Besides the above features, we were concerned in some degree about some "open ring" structures lying on the magma. Aryabhata is the best example. They all show only about half of their rim, with the other half ring covered by the magma. But what shocked us, is that the opening of all the rings is oriented same way, towards northwest.

Some of these open-ring structures located close to the basin edge (at the eastern end of Cauchy rille and scarp) can be easily identified as floor fractured craters (FFC). Or at least, tilted craters partially filled by lava. But Aryabhata and the southern one do not fit in this pattern: they do not lie on the basin floor, but on the magma.

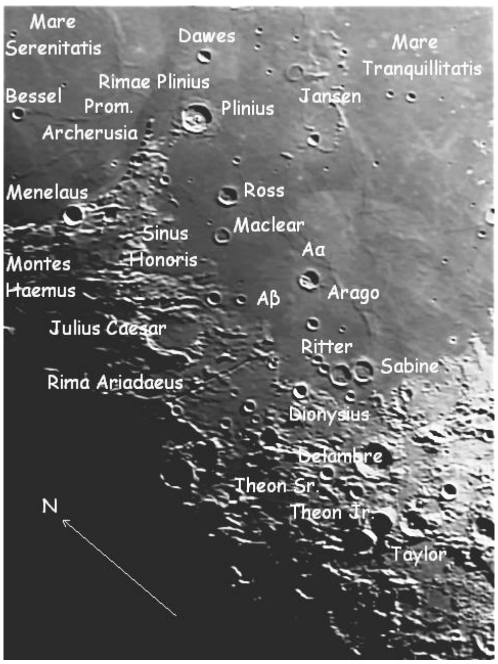


Photo 4 shows the central area of Mare Tranquillitatis. The main target here is Lamont, a supposed complex impact structure, formed on top of an Oceanus Procellarum ring that crosses the basin, and composed of annular and straight ridges. Annular ridges form two rings [at least], one internal complete and one external incomplete. The

Photo 5.- The western region of Mare Tranquillitatis.

radial ridges are believed to have been created by subsidence of the floor they sit on, while the central ring stood still on the Procellarum ring. Since the Space Age times it is known that this basin possesses a small *mascon*.

Data from Project GRAIL have identified Lamont as a huge old volcanic crater whose lava flows run across the bottom of the basin northwards. Another volcano has been spotted underneath crater Jansen and a third one underneath Maraldi, close to the point where planetary scientist C. Wood discovered the existence of an enormous dome due south of crater Gardner, the Gardner Megadome.

The volcanic content of this region continues with crater Jansen, which sits amidst a pond of lava. A closed loop of mare ridges seems to recreate a small Lamont structure, east to Jansen. The craterlet Cajal sits on the middle of the eastern ridge.

South of crater Jansen is crater Carrel, sitting on a large "open ring" crater. This half-ringed structure houses one of the more difficult domes to see, Carrel 1. Its visibility is jeopardized by a white stone standing close to it. When a novice observer struggles to distinguish the flattened dome, the more conspicuous rock deceives him.

Both ridge structures close to Jansen and Carrel mark a limit in the texture of the magma. Doubtlessly, there were different lava outpours.

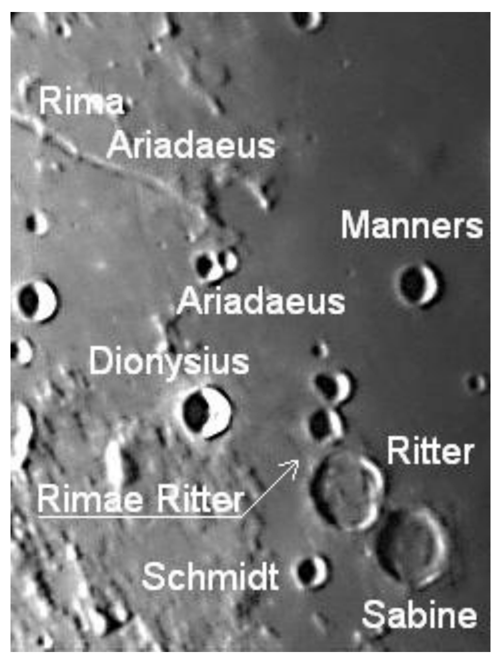


Photo 6.- FFC impact structures and concentric rills.

The open-ring crater close to Carrel is far from the basin border, so as Aryabhata, it does not sit on the basin floor. But looks north, that's to say towards Jansen. One might ask, where is Aryabhata pointing at? A quick look at photo 1 answers this question: towards Jansen! This common orientation suggests that late lava flows outpoured by the hidden volcano underneath Jansen, spilled over the rim of the open-ring craters and filled their interiors, forcing them to tilt.

Photo 5 shows the western region of Mare Tranquillitatis. Here, at the edge of the basin are seen several topographic formations, that are usually found in the borders of other basins, which are well known to have a collapsed floor. The largest one is the crater Julius Caesar, a typical FFC impact structure.

Photo 6 offers a smaller area of the same region, but some more detail. It is easy to discover a second FFC structure, Boscovich, near Julius Caesar. Two more can be seen at the bottom right, Ritter and Sabine. These two young craters, believed of volcanic origin (De Hon) a long time ago, because of their elevated floors and the lack of rays and secondary craters, are currently thought to be FFC structures with raised floor, modified by the magmatic process.

Another FFC structure, even greater than Julius Caesar, may be Sinus Honoris, the left "wing" that we have identified "out of the main ring" mare extensions in photo 2. Seen at the telescope, its aspect is very similar to that of a crater.

Other geologic structures that suggest collapse of the basin floor, are the concentric rills. Although our pictures unfortunately do not show them (although we have marked their positions), they form a long chain that borders the edge: Rimae Maclear, Rimae Sosigenes, Rimae Ritter and Rimae Hypatia.

Looking closely at photo 6, we may notice that Rimae Ritter crosses Ritter and Sabine. The outcome of this finding is clear: it hints that both craters are older than the rill, so that the collapse of the floor occurred once the two craters sere already formed. Definitely, they are FFC impact structures.

What is the conclusion of our observation and study? The surface features are meaningful. Since Mare Tranquillitatis basin lacks a *mascon*, but the Lamont basin has one: the floor of the former collapsed deeper on the western region than on the eastern. This strange behavior is supported by the small number of floor subsidence features shown in the eastern region, only Rima and Rupes Cauchy. But no FFC (just a few of a very small size).

Information about pictures and telescopes.

Observatory coordinates: Lat: 40º 21' 35" N; Lon: 3º 54' 38" W; Alt. 656 m

Two telescopes were used for this three-day observation:

Skywatcher refractor 150 mm f/8 for visual observation;

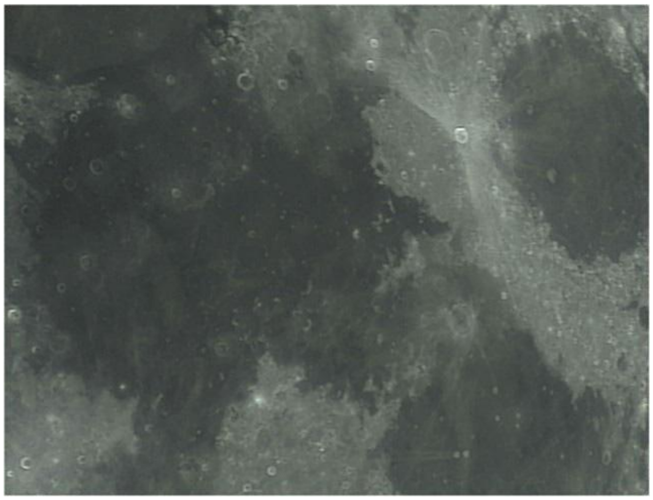
Newtonian reflector 20o mm /f/7.2

All pictures were taken at prime focus and include markings indicating the position of lunar North Pole. When this marking is absent, north is upwards.

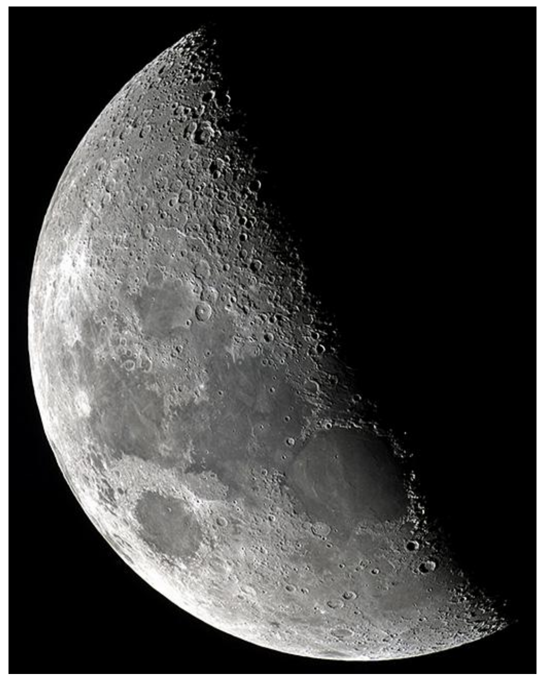
LUNAR EPHEMERIS								
Photos	Date	Hour	Age	Colong	Ang size	LLat	LLon	Visibil.
0 - 1	2015-01-09	21:22	07,56	359º 30'	30,21'	5º 40'	3º 55'	4/6
2	2015-01-07	00:45	15,96	108º 00'	30,08'	6º 24'	2º 23'	4/6
3	2011-08-17	03:02	17,35	126º 48'	29,91'	-6º 03'	0º 41'	5/6
4	2011-02-09	19:22	06,70	348º 54'	30,08'	-5º 23'	-5º 38'	4/6
5	2008-05-11	21:49	06,40	350º 18'	31,70'	0º 04'	6º 43'	4/6
6	2011-08-19	02:15	19,32	150º 24'	29,84'	-4º 58'	-1º 24'	4/6

PHOTOGRAPHS				
PHOTO	**CAMERA**	**BARLOW**	**FILTER**	**Frames**
0-1-2	QHY 5	x1	No	150
3	TouCam Pro	x2	UV + IR	300
4	TouCam Pro	x2	UV + IR	300
5	TouCam Pro	x2	UV + IR	200
6	TouCam Pro	x2	UV + IR	300

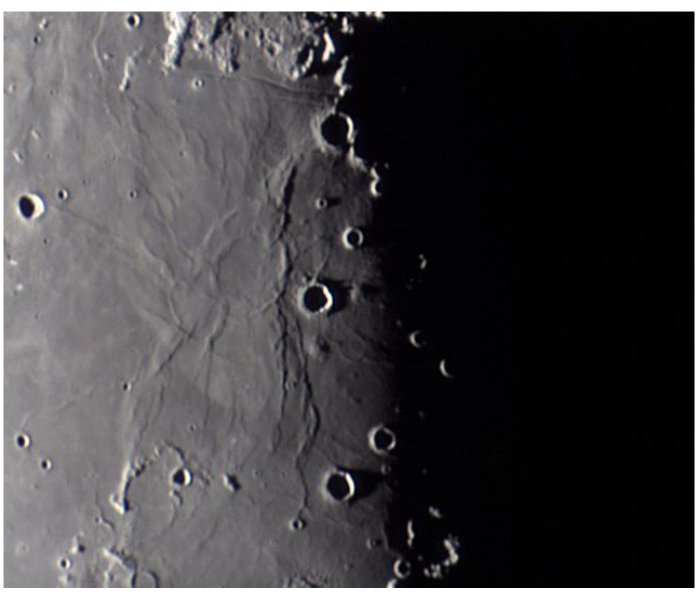
<u>ADDITIONAL MARE TRANQUILITATIS OBSERVATIONS</u>



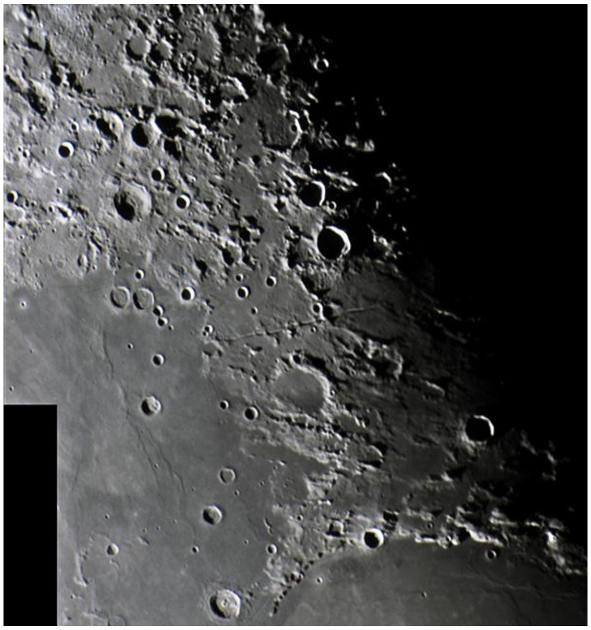
<u>MARE TRANQUILITATIS</u> - Rafael Benavides, Posadas (Córdoba), Spain December 11, 2005 22:38 UT. Skywatcher 150 mm refr. f/8, Seeing 3/10, transparency 3/6. ToUCam Pro I.



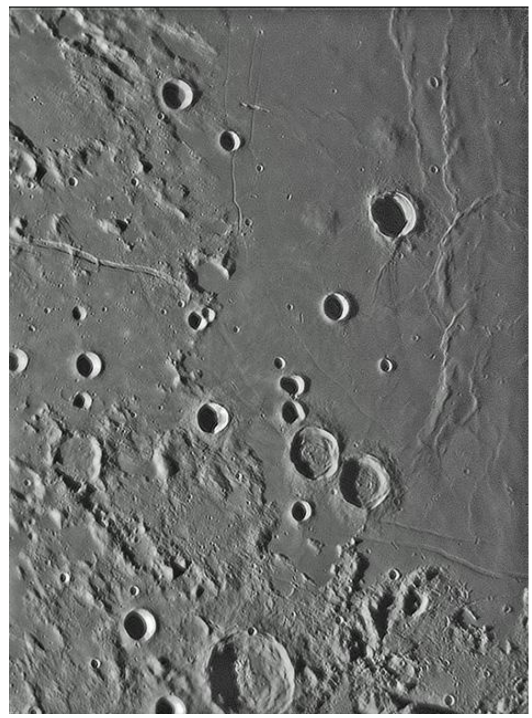
<u>7 Day Moon</u> - Maurice Collins, Palmerston North, New Zealand. May 25, 2015 08:51 UT. FLT-110, ASI120MC.



<u>ARAGO</u> - Maurice Collins, Palmerston North, New Zealand. May 24, 2015 06:21 UT. FLT-110, f/21

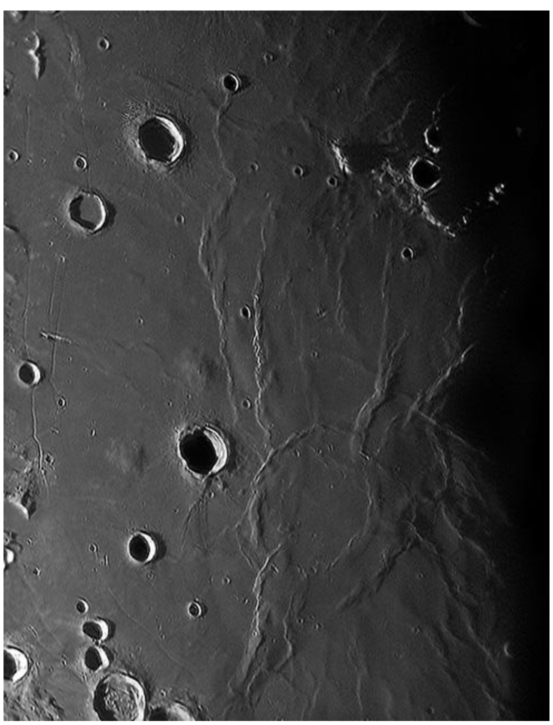


ARIADAEUS - Maurice Collins, Palmerston North, New Zealand. May 25, 2015 07:00 UT. FLT-110, f/21



ARAGO - Howard Eskildsen, Ocala, Florida, USA. June 7, 2015 10:20 UT. Seeing 8/10, Transparency 4/6. Mewlon 250, 1.5 barlow, W-25 red filter, DMK 41AU02.AS.

Another favorite area with the large domes near Arago (prominent crater upper right of image), wrinkles, rilles and other features. Much to be learned about lunar geography in this area.

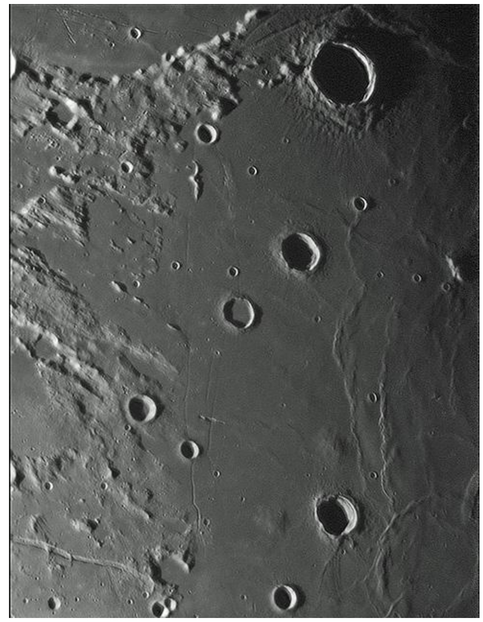


LAMONT - Howard Eskildsen, Ocala, Florida, USA. June 7, 2015 10:16 UT. Seeing 8/10, Transparency 4/6. Mewlon 250, 1.5 barlow, W-25 red filter, DMK 41AU02.AS.

Wrinkle ridges on the Sea of Tranquility merge into a rounded arc that has been interpreted as evidence of a buried crater and is called Lamont. Is there really a crater hidden beneath the basalt wrinkle ring, or is this just a physical manifestation of compressive forces caused by settling of the basalt? I wonder.

ROSS-MACLEAR - Howard Eskildsen, Ocala, Florida, USA. June 7, 2015 10:19 UT. Seeing 8/10, Transparency 4/6. Mewlon 250, 1.5 barlow, W-25 red filter, DMK 41AU02.AS.

Starting near the bottom center of the image, the major craters on the surface of Mare Tranquillitatis are: Manners, Arago, Maclear, Ross, and Plinius. It is interesting to compare the detailed features, from the rugged fresh rim of Plinius at the top of the image to the partly filled crater Maclear near the center of the image. Much happened in the time interval between their formation.



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LUNAR TOPOGRAPHICAL STUDIES

Coordinator – Wayne Bailey - wayne.bailey@alpo-astronomy.org

Assistant Coordinator – William Dembowski - dembowski@zone-vx.com

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

Website: http://moon.scopesandscapes.com/

OBSERVATIONS RECEIVED

MAURICE COLLINS - PALMERSTON NORTH, NEW ZEALAND. Digital images of 13(2) & 14 day moon, 1st Qtr terminator, Alphonsus(2), Archimedes(2), Aristarchus(3), Bailly(2), Byrgius, Copernicus, Cruger, Descartes, Earthshine(3), Eddington, Gassendi, Hevelius, Mare Serenitatis(2), Mons Rumker(2), Montes Apennines, Montes Riphaeus, Phocylides, Plato(2), southern Highlands, Tycho(3), Vallis Alpes & Wargentin.

HOWARD ESKILDSEN - OCALA, FLORIDA, USA. Digital images of Arago, Aristarchus, Delambre, Lamont, Pallas(2), Reiner gamma & Ross-Maclear.

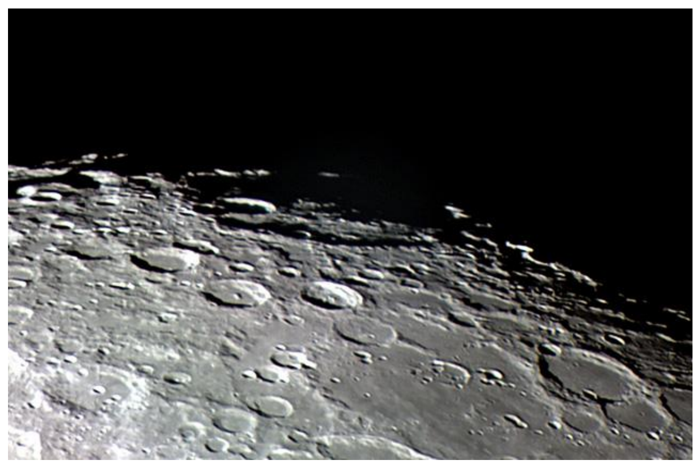
RICHARD HILL – TUCSON, ARIZONA, USA. Digital image of Archimedes.

ALBERTO MARTOS, CARLOS DE LUIS, RUTH ORTEGA, FERNANDO BERTRÁN, MANUEL GUZMÁN & LUIS ALONSO – MADRID, SPAIN. Digital images of Mare Tranquilitatis(6).

STEVE TZIKAS-RESTON, VIRGINIA, USA. Drawings of Proclus(18).

RECENT TOPOGRAPHICAL OBSERVATIONS

13 Day Moon - Maurice Collins, Palmerston North, New Zealand. May 31, 2015 07:40 UT. FLT-110, ASI120MC.

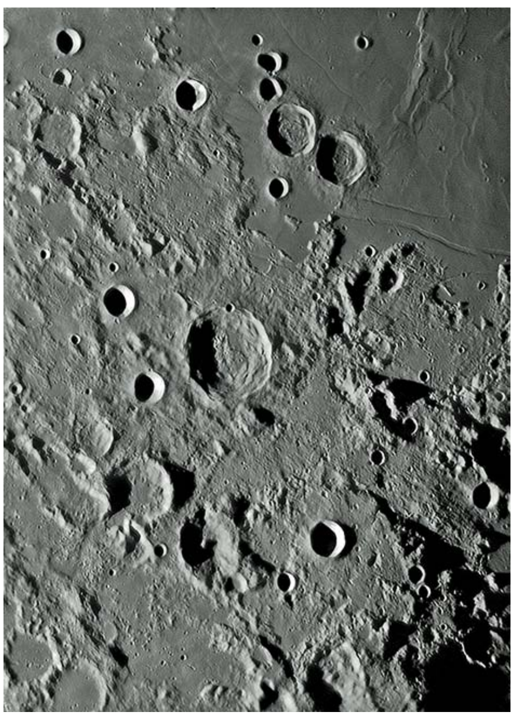


BAILLY - Maurice Collins, Palmerston North, New Zealand. May 31, 2015 07:04 UT. FLT-110, f/21.

DESCARTES - Maurice Collins, Palmerston North, New Zealand. May 26, 2015 07:32 UT. FLT-110, f/21.

RECENT TOPOGRAPHICAL OBSERVATIONS

MONTES RIPHAEUS - Maurice Collins, Palmerston North, New Zealand. May 28, 2015 07:23 UT. FLT-110, f/21.



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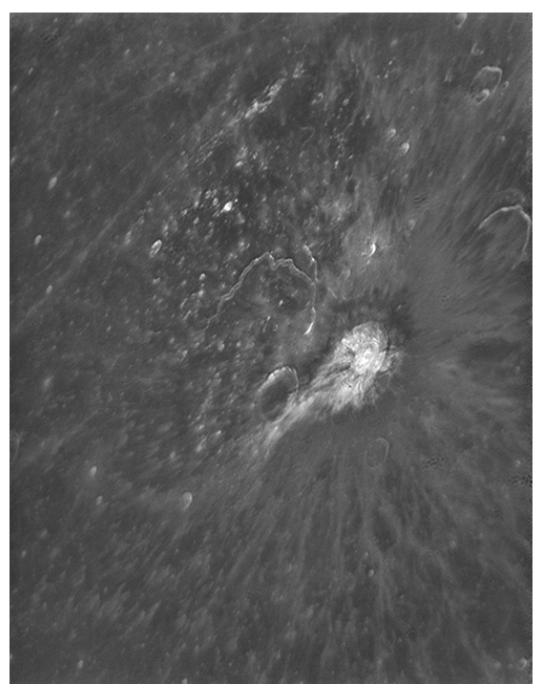
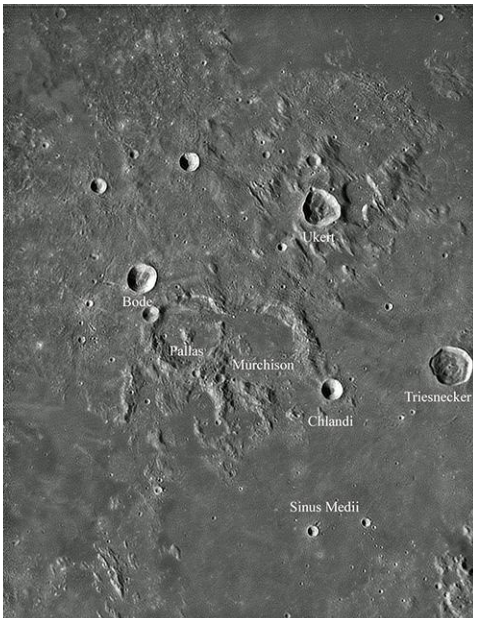
DELAMBRE - Howard Eskildsen, Ocala, Florida, USA. June 7, 2015 10:22 UT. Seeing 8/10, Transparency 4/6. Mewlon 250, 1.5x barlow, W-25 red filter, DMK 41AU02.AS.

ARISTARCHUS - Howard Eskildsen, Ocala, Florida, USA. June 7,, 2015 10:32 UT. Seeing 8/10, Transparency 4/6. Mewlon 250, 1.5 barlow, W-25 red filter, DMK 41AU02.AS.

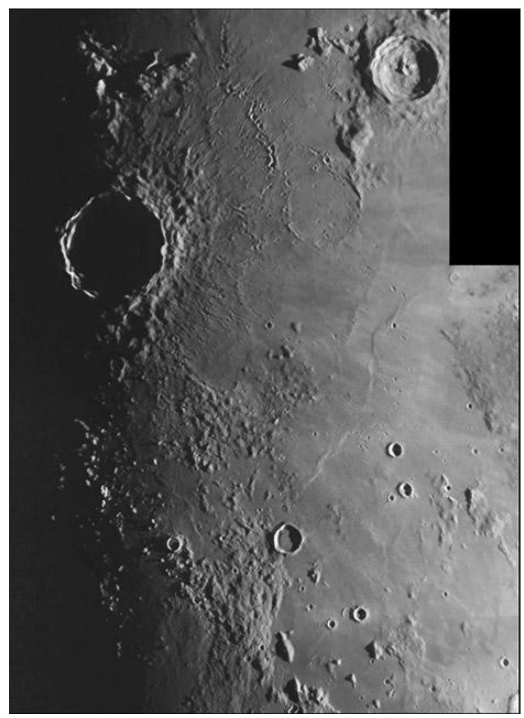


RECENT TOPOGRAPHICAL OBSERVATIONS



PALLAS - Howard Eskildsen, Ocala, Florida, USA. June 7, , 2015 10:24 UT. Seeing 8/10, Transparency 4/6. Mewlon 250, 1.4x barlow, W-25 red filter, DMK 41AU02.AS.

I actually like this neglected part of the moon with relatively young craters of Bode, Ukert, Chlandi and Treisnecker around the old battered pair of Pallas and Murchison. The latter pair were scoured by the Imbrium impact and also filled with basalt as were the surrounding low lands including sinus medii.



ARCHIMEDES – Richard Hill – Tucson, Arizona, USA April 28, 2015 01:52 UT. Seeing 9/10. TEC 8" f/20 Mak-Cass, SKYRIS 445M, 656.3 nm filter.

My wife and I have just returned from an extended vacation to Glacier National Park in Montana, celebrating our 41st anniversary. While there, we greatly impressed with 3,000-5,000 meter mountains that jutted abruptly out of the landscape with no outwash plain or foothills, just solid rock spires pointing skyward. But on the moon this is a normal circumstance like the Montes Apenninus seen here at the bottom of this image. It would be a breathtaking experience to stand at the base of such mountains. Near the center of this image, on the north end of this chain, is the Apollo 15 landing site better seen when nearer the terminator.

On the mid-right side of this montage is the large 85km crater Archimedes. There are a couple craterlets seen here on the floor. This crater has been known in observational lunar history as a source for transient color phenomena. To the right is the 41km crater, Autolycus, and above that the larger 56km Aristillus. These three form a very identifiable triangle when near the terminator. Immediately below Archimedes are the Montes Archimedes looking in this image like a large 3 toed footprint. Above Archimedes are the roughly triangular group of summits called Montes Spitzbergen. These mountains seem to sparkle when on the terminator.

At the top of this image is the 60km crater Cassini with it's two contained, smaller craters. Just to the left of Cassini is the dramatic peak Mons Piton, my favorite isolated mountain on the moon. Over in the upper left corner of this montage is the triangular mass of mountains Montes Caucasus with the deep valleys and passes between the individual peaks. ain.

LUNAR GEOLOGICAL CHANGE DETECTION PROGRAM

Coordinator – Dr. Anthony Cook – atc@aber.ac.uk
Assistant Coordinator – David O. Darling - DOD121252@aol.com

Observations/Studies for May: Jay Albert (Lake Worth, FL, USA - ALPO) observed: Alphonsus, Censorinus, Eimmart, Eratosthenes, Gassendi, Manilius, Mons Piton, Pallas, Posidonius, Torricelli B, and the West Limb. Kevin Berwick (Ireland, ALPO) observed: Sulpicius Gallus. Bruno Cantarella (Italy, UAI) imaged earthshine. Maurice Collins (New Zealand, ALPO) imaged: Arago, Archimedes, Aristarchus, Bailly, Bullialdus, Copernicus, Descartes, earthshine, Eudoxus, Gassendi, Kepler, Mare Crisium, Mare Orientale, Mare Serenitatis, Merton, Montes Appeninus, Plato, Rima Ariadaeus, Schiller, Sinus Iridum, Southern Highlands, Theophilus, Tycho, Vallis Alpes, Wargentin, the western limb, and also made some whole Moon image mosaics. Anthony Cook (Newtown, UK – BAA) imaged: several features, and videoed earthshine. Marie Cook (Mundesley, UK – BAA) observed: Aristarchus, Plato, and Promontorium Laplace. Thierry Speth (France) imaged: Censorinus, Mons Piton, Plato, and Ramsden. Franco Taccogna (Italy, UAI) imaged: Promonorium Laplace. Derrick Ward imaged Erathosthenes, Plato, Proclus, and Sulpicius Gallus.

News: The repeat Selenographic Colongitude observational scheduling website is now operational and is being gradually populated with features to observe. Again I would welcome requests from organizers of other observing programs – just email me on: “atc @ aber.ac.uk” stating: **Feature**, **Organization** (e.g. ALPO/BAA/GLR/REA/UAI etc), **Email** of who to send observations to, **Start & End dates** of the intended Observing Program, **Start & End Selenographic Colongitudes**, a paragraph **Description** of the purpose of the request for observation - you can include a web link if you have illustrative images – in the description you can state the type of observation e.g. images, visual description, sketches, minimum size of scope etc. Additional/optional information can include: a **Minimum Altitude** to observe the Moon at, what the **Altitude the Sun** must be below the local observer’s horizon before observing can begin, upper and lower limits of **Topocentric Librations** in longitude and latitude, and upper and lower limits on the **sub-solar latitude** on the Moon.

I would like to thank Nigel Longshaw for sending me a copy of the page from the Astronomical Register, concerning 1867 Apr 09 Elger report of Aristarchus in Earthshine. This helps me assess the 1867 observation I mentioned last month.

I would also like to correct a figure error that crept into last month’s newsletter, where I said that the streak off the limb in Fig 4 was a satellite. Maurice has said that it was more likely a star off the limb that trailed during the exposure, Instead Fig 1 here shows the correct motion blurred streak of a slow moving satellite in Earth orbit, projected against earthshine

. **LTP Reports:** Only one LTP report was submitted in May (this was mentioned last month), and I will remind observers again to check any images they may have taken that correspond to: 2015 May 24 UT 19:10-19:45(55?). On this date/time Lajos Bartha (Budapest – Hungarian Astronomical Society), using a 3” refractor, x83, at 19:10 observed in the Aristarchus-Herodotus area a conspicuous 10-15” extremely bright spot that was brighter than Copernicus, and about the equivalent to a naked eye magnitude 3 star (if viewed without a telescope) – it did not fluctuate in brightness. Below is my image from May 24th (Fig 2 Left) and to the right one from Bruno Cantarella (UAI) from May 25th. In my image, taken 86 (76?) minutes after the end of Lajos Bartha’s observation, Aristarchus is just visible, but no other features can be seen. However observing conditions were hazy, so there was quite some flare from the bright part of the Moon. In the Bruno’s image (Fig

2 Right) the observing conditions were more difficult due to the increased phase, and extra scattered light, and although the limb was just visible, there were no clear indications of any other features in earthshine.

Figure 1. *2014 Apr 15 UT 07:27 earthshine image by Maurice Collins. Orientated with north towards the top. The diagonal streak is due to a passing satellite during this 0.7 sec duration exposure.*

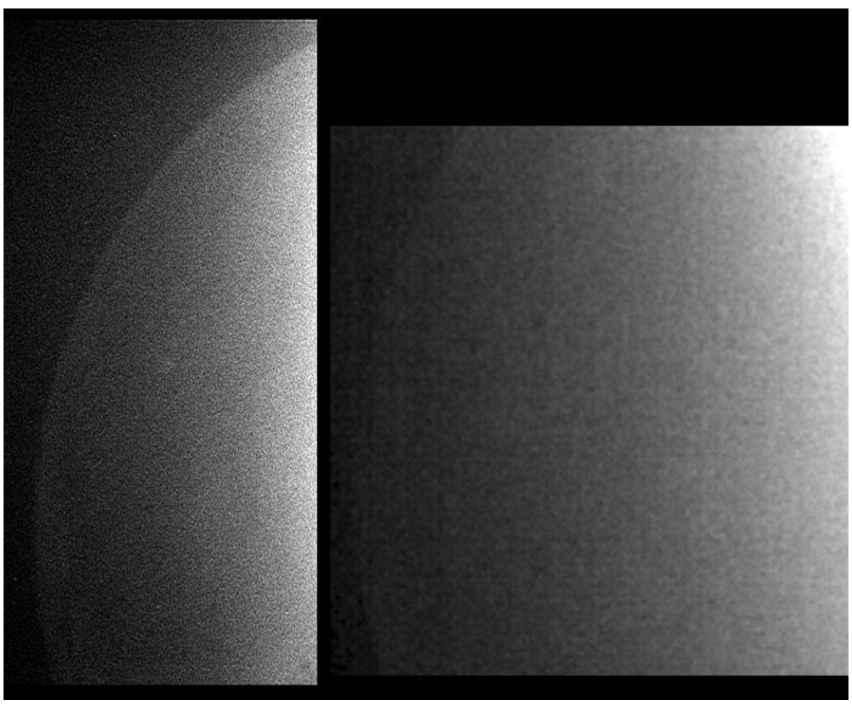


Figure 2. *Earthshine images of the Moon orientated with north towards the top* ***(Left)*** *Average of 3 TV frames by Tony Cook (BAA) taken on 2015 May 24 UT 21:11 (86 (76?)) min after Lajos Barth's visual observation.* ***(Right)*** *image by Bruno Cantarella (UAI) taken one day later on 2014 May 25 UT 21:40.*

Unfortunately I cannot really comment on whether Aristarchus was abnormally bright when Lajos Bartha observed it, as I have not heard from anybody else observing at the same time. He is probably correct in his conclusion about Aristarchus, after the decades of experience that he has had studying the Moon visually. However in the image from Maurice Collins (See Fig 3) I would like to warn all novice observers to be very cautious when observing earthshine. In the image that Maurice took, Aristarchus clearly looks bright because you can barely see Kepler or Copernicus. However when I move the cursor over the image on my computer I get a brightness measurement of 79 for Aristarchus, but 119 for Copernicus, and yet Aristarchus looked brighter to the eye. A better test is to subtract the brightness of each crater from an average of their surroundings. When this is done Aristarchus has a relative brightness difference of 16, whereas Copernicus is 4, which suggests that Aristarchus might be brighter – however Copernicus is surrounded by ray material, so it is difficult to get a good representative background measurement. To illustrate how tricky it is estimating brightness of features where there is a gradient of scattered light, try out the test rectangles at the bottom left of Fig 3 by reading the instructions in the caption.

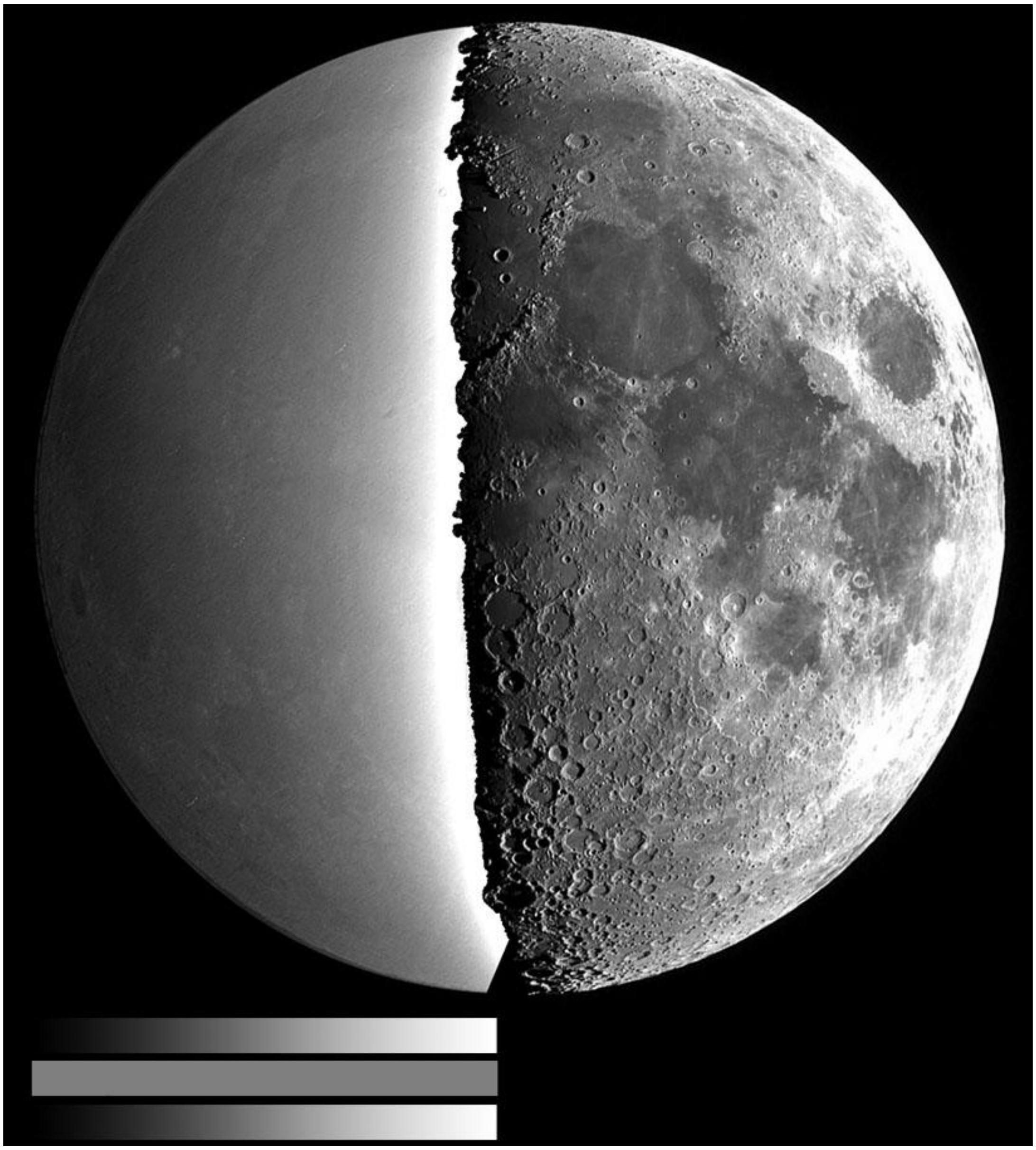


Figure 3. *An earthshine/Illuminated composite image of the Moon by Maurice Collins (ALPO) taken on 2015 May 26 UT 07:56, orientated with north towards the top. Note that there is some glare from the dayside of the Moon, which contaminates our view of Earthshine. The three rectangles on the bottom left of the image have been added, by myself, to illustrate the difficulty of judging relative brightness with a brightness gradient in the background. Which way do the brightness gradients go? Perhaps dark on left to bright on right for the top rectangle, bright on right and dark on left for the middle rectangle, and again dark on left to bright on right for the top rectangle? Now take two pieces of card, and hide the top and bottom rectangles. Which end, the left or the right, of the middle rectangle is darker now?*

Spot the Difference: No further contributions have been received to the Apollo 14 landing site images, which show some examples of specular reflection from heat insulation material strewn across the surface. As far as I am aware this is the first time this technique has been used to detect spacecraft parts, using specular reflection. This month I have introduced a new area, the NNE rim area of the crater Picard, and hopefully it is completely uncontaminated by spacecraft parts - so do not expect to see many (any?) changes between the two images. This uses images taken almost two years apart, imaged by NASA's LRO spacecraft, and the slope of the crater rrm is approximately 45° - so quite a good place to look for land slide effects. Click here to begin Spot the Difference and email me a copy of one of the images with arrows, or circles, indicating any changes you have found. Also please expect the images not to register together perfectly – this is due to stereo parallax effects.

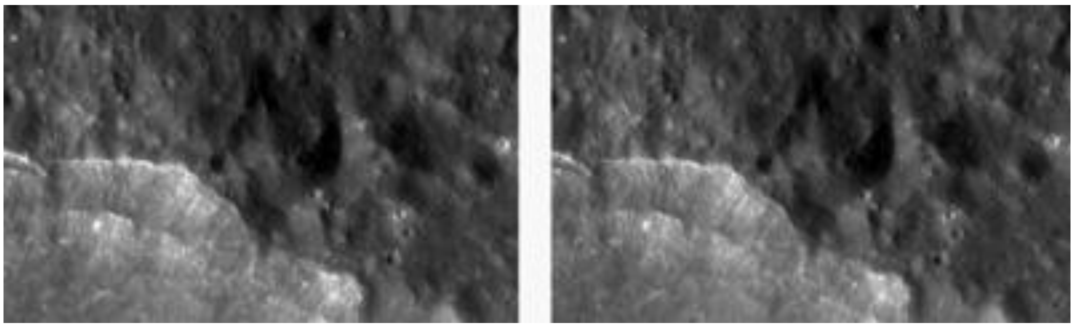


Figure 4. *NASA LROC images **(Left)** M1098494476LE **(Right)** M1159742485RE*

Routine Reports: Below are a selection of reports received for May that can help us to re-assess unusual past lunar observations.

Aristarchus: On 2015 May 03 UT 07:37 Maurice Collins (ALPO) imaged Aristarchus under the same illumination and topocentric libration (to within ±1° to the following 1968 observation by Olivarez:

Aristarchus 1968 Mar 14 UTC 01:32-02:06 Observed by Olivarez, Maley, Etheridge (Edinburgh, TX, USA, 17" reflector, x125 + Moon Blink) and Corralitos Observatory (Organ Pass, NM, USA, 24" reflector, Moon Blink) "S=5 (F-G) for the TX observations. "Trident Moon Blink on S. wall crest & c.p. & white spots in crater. No color seen vis. Blink not seen earlier or later. Other craters blinked some but not as strongly. Only Aris. areas blinked when Moon blink was moved around. Observers consider blinks real. Alt. of moon was 50 deg. Drawings. Corralitos say they did not confirm, but they rep't Copernicus, not Aris." NASA catalog weight=5. NASA catalog ID #1062. ALPO/BAA weight=4.

So Fig 5 is the view that Olivarez should have seen using the 17" reflector at a relatively low magnification of x125under seeing (F-G) condition. Despite enhancing the color saturation, there is no sign of red on the south rim of the crater, or anywhere else. But also surprisingly, the image that Maurice has taken does not show up much blue in this naturally blue crater. I will keep this LTP report at a weight of 4 because it was witnessed by 3 observers in 1968, they were using an electronic moon blink device., the Moon was at an altitude of 50° above their horizon, and the effect lasted only for about half an hour.

Sulpicius Gallus: On 2015 May 26 UT 21:30-22:33 Kevin Berwick (ALPO) and Derrick Ward (BAA) observed this feature under the same illumination conditions to within ±0.5° to the following Victorian era observation by Dawes:

Sulpicius Gallus 1867 Jun 10 UT 22:00? Observed by Dawes (England?) "3 distinct roundish black spots. Absent on 13th" NASA catalog weight=3. NASA catalog ID #184. ALPO/BAA weight=2.

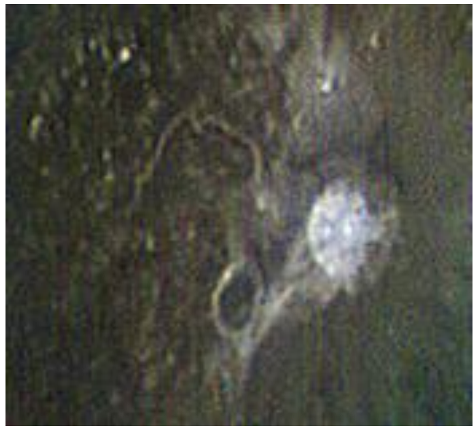


Figure 5. *Color Image of Aristarchus (2015 May 03) by Maurice Collins, orientated with north towards the top. The image has had its color channels re-aligned to remove atmospheric spectral dispersion, sharpened slightly, and then the color saturation has been boosted by 65%.*

Kevin, did indeed see three dark spots (see Fig 6) – but at a distance 46 km from the crater, to the north east, and along the Serenitatis basin shore line. They were just the shadows of three well rounded sections of 1.5km high slopes. You can see them quite plainly in Derrick's image. Unfortunately, as with many of these old Victorian reports, the original details are hard to come by and we are just left with the summarized account from the Cameron catalog. I will therefore lower the weight of this report from 2 to 1. Another reason for doing this is that Cameron gives an estimated UT of 22:00 as indicated by the (?) in the description above.

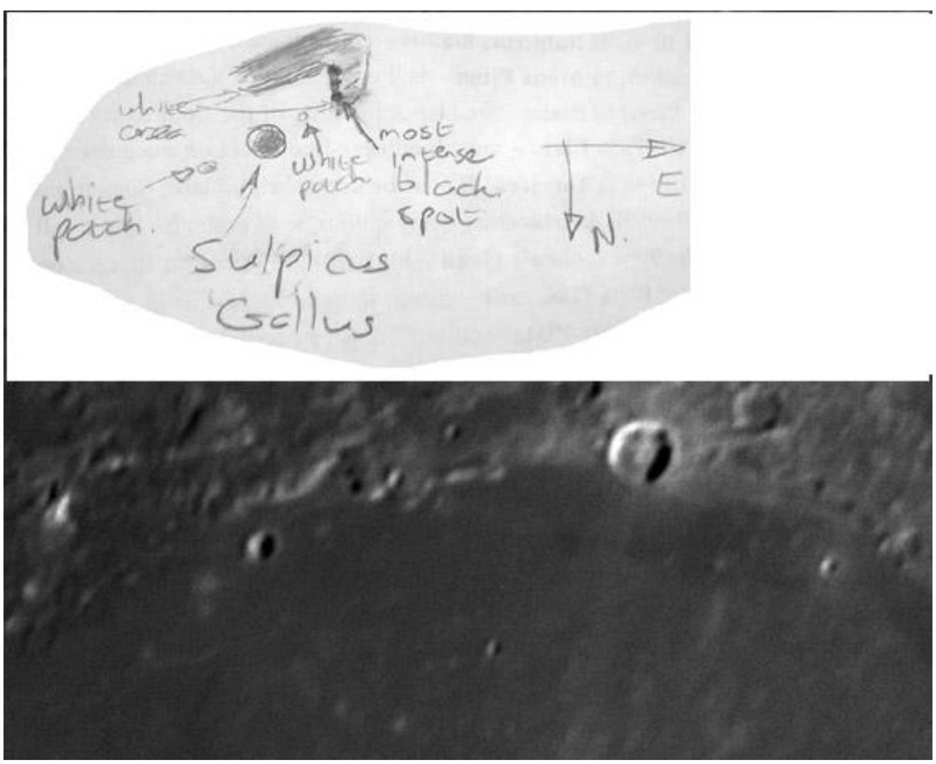


Figure 6. *Observation of the Sulpicus Gallus area from 2015 May 26 - note that the orientation of the following is mirror image with north towards the bottom, to match the orientation of the labels in Kevin Berwick's sketch.* ***(Top)*** *Sketch by Kevin Berwick (ALPO) from UT 21:30-22:33****.*** ***(Bottom)*** *Image by Derrick Ward (BAA) from UT 22:04.*

Ramsden: On 2015 May 28 UT 20:39 Thierry Speth (BAA) observed this feature under the same illumination conditions to within ±0.5° to the following report by Clive Brook:

Ramsden 1999 May 25 UT 20:57 Observed by Brook (Plymouth, England, 4" refractor, seeing II-III) "Bright spot on W wall (brightness)" BAA Lunar Section observation. ALPO/BAA weight=2.

The account of the report by Clive Brook is detailed in the 1999 June edition of the BAA Lunar Section Circular, p2-3, written by Patrick Moore. To briefly summarize I can say that Patrick received a phone call from Clive Brook (x216, and clear sky) who reported Ramsden to be full of shadow, but that there was a bright point/area of light on the west side of the crater. He observed this for 5 minutes (Col.=37.2°) , then phoned Patrick Moore. Upon returning, the spot of light was still bright, but had faded. At 21:22 (Col.=37.4°) there was a slight revival of this bright area. Clive examined other craters of similar distance from the terminator, but none were so bright. Patrick Moore examined the area with his 12” reflector (x360, seeing II) at 21:05, and although he found the west wall bright, he regarded this as normal. He continued observing until seeing became Antoniadi IV at 22:00.Two other observers also confirmed that Ramsden was both bright but looked normal. Patrick Moore ends up by saying that he does not think this was a LTP, but being near to a rille system the crater should be monitored anyway. As you can see from Thierry’s image in Fig 7 (Col.=36.4°), the spot on the west rim is perfectly normal, and actually quite bright. Therefore the only oddity is that Clive Brook thought that it faded and then was bright again at 21:22, though the latter brightening is perhaps contradicted by Patrick Moore saying that he thought it was normal all the time that he was observing. So I think the fairest thing to do is to lower the weight from 2 to 1, because probably it was not a LTP, but it would still be nice to receive some additional high resolution images so that we can track the way that the spot changes in brightness.

Figure 7. *Ramsden as imaged by Thierry Speth (BAA) orientated with north towards the top, taken on 2015 May 28 UT 20:37.*

Gassendi: On 2015 May 29 UT 01:15-02:05 Jay Albert (ALPO) observed and imaged this cater under the same illumination conditions to within ±0.5° to the following report by Peter Grego from 2011:

On 2011 Oct 07 UT 21:45 Gassendi observed by P. Grego (St Dennis, UK,300m Newtonian, x150, seeing III, intermittent cloud)- whilst producing some sketches of the crater - observer noticed a faint point of light inside the shadow filled interior, two thirds of the way out from where the central peaks should have been, towards the SE rim. Some uncertainty in being sure about this spot and after interruption by cloud it was not seen later that evening. ALPO/BAA weight=1 to reflect uncertainty of observer.

Jay observed visually over colongitudes 38.8°-39.2° and obtained one image (Fig 8). He immediately saw a bright point within the shadowed floor - it seemed to be roughly halfway between what might have been the centre of the shadowed crater and its east wall. He also saw a tiny bright point on what was the west wall and another on the west wall of Gassendi A. These points held their brightness, but twinkled in the rough seeing. As time went on he was starting to see additional points pop into view on Gassendi's west rim. When he rechecked Gassendi at 03:15UT, he saw that another bright point had materialized next to the first and that both were clearly part of the central peak complex. Jay observed a little after the stage in illumination when Peter Grego saw his suspect bright point, located by yellow markers in Fig 8. If what Peter saw in 2011 was due to highland then it should have resurfaced in Jay's image at the later colongitude, but it does not. I shall therefore leave the weight at 1 due to Peter Grego saying that he was uncertain anyway. This is an example perhaps of a LTP event that cannot be resolved by the method of repeat illumination observing, and so will consider dropping it from the schedule web site after we have received a few more images/sketches closer to a colongitude of 38.3°-38.5°.

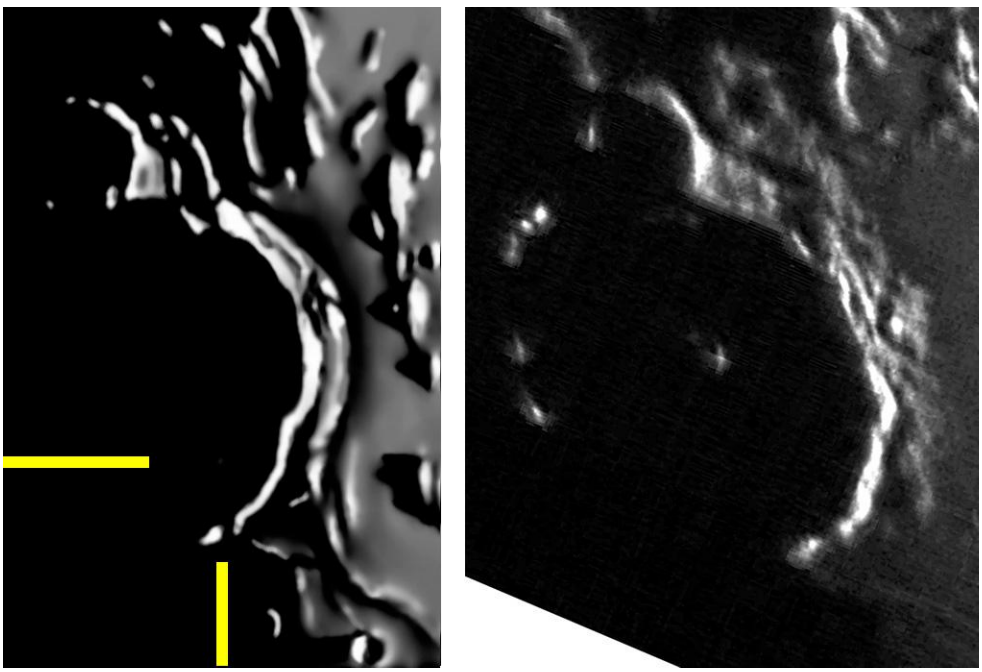


Figure 8. *Gassendi with north orientated towards the top.* ***(Left)*** *Sketch by Peter Grego 2011 Oct 07 UT 21:30-21:55 (Col.=38.3°-38.5°). The yellow bars indicate the location of a suspected spot on the dark floor area that was "possibly" glimpsed.* ***(Right)*** *Image by Jay Albert 2015 May 29 UT 02:01 (Col.=39.2°).*

Promontorium Laplace: On 2015 May 29 UT Franco Taccogna (19:05-19:44) and Marie Cook (21:20-21:25) observed this mountain under the same illumination conditions, to within ±0.5°, to the following observation by a former director of the BAA Lunar Section::

> *On 1978 May 18 at UT20:45-21:53 J.D. Cook (Frimley, UK, 12" reflector, x240) observed Promitorium Laplace to have visually a brown color - though no Moon Blink (red and blue filters) effect was detected. Cameron comments that this is probably a subjective effect - also others have reported something similar at times. The Moon's altitude was between 35° and 33°above the local horizon at the time of the observation. The Cameron 2006 catalog ID=30 and weight=3. The ALPO/BAA weight=2.*

Franco was the first to observe during the repeat illumination window (Fig 9) using an 8" Newtonian. Marie Cook observed later from the UK using a 3.5" Questar, and reported no brown or any other color seen in the area. She tried red and blue filters, but again there was no sign of any color. To test out a theory that the 1978 observation was due to some form of atmospheric spectral dispersion, I tired offsetting the red and blue components of Franco's image. I was able to produce a faint tinge of brown on Promontorium Laplace, but ended up with horribly obvious atmospheric spectral dispersion elsewhere. Also the Moon was not that low in the sky back in 1978 to suffer significantly from spectral dispersion. One problem with the 1978 event though is that if color was seen, it should have given a blink when red and blue filters were used, and did not. Therefore although the repeat illumination observations have not resolved what the effect could have been, I think we should lower the weight from 2 to 1.

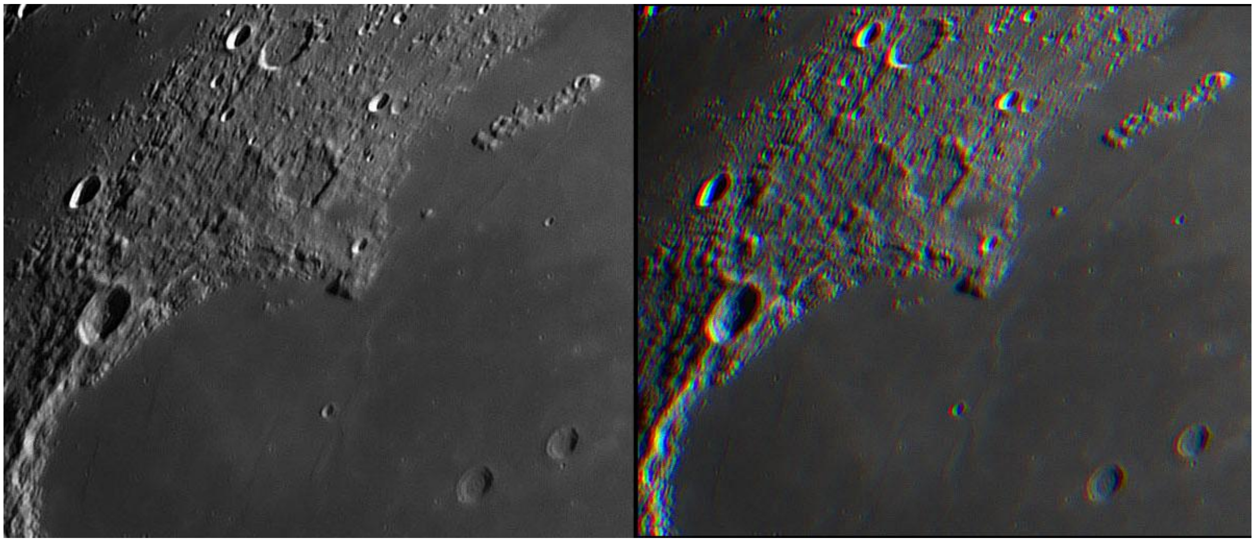


Figure 9. *Sinus Iridum (2015 May 29) orientated with north towards the top, taken by Franco Taccogna (UAI).* ***(Left)*** *Franco's from 19:19UT image****.*** ***(Right)*** *Same image, but separated into red, green, and blue components and offset 2 pixels to the right (red) and 2 pixels to the left (blue), then color saturation enhanced by 50%.*

Suggested Features to observe in June: For repeat illumination (and a few repeat libration) observations for the coming month - these can be found on the following web site: http://users.aber.ac.uk/atc/lunar_schedule.htm . By re-observing and submitting your observations, only this way can we fully resolve past observational puzzles.

To keep yourself busy on cloudy nights, why not try "Spot the Difference" between spacecraft imagery taken on different dates? This can be found on: http://users.aber.ac.uk/spot_the_difference.htm .

If in the unlikely event you do ever see a LTP, firstly read the LTP checklist on http://users.aber.ac.uk/atc/alpo/ltp.htm, and if this does not explain what you are seeing, please give me a call on my cell phone: +44 (0)798 505 5681 and I will alert other observers. Note when telephoning from outside the UK you must not use the (0). When phoning from within the UK please do not use the +44! Twitter LTP alerts can be accessed on http://twitter.com/lunarnaut.

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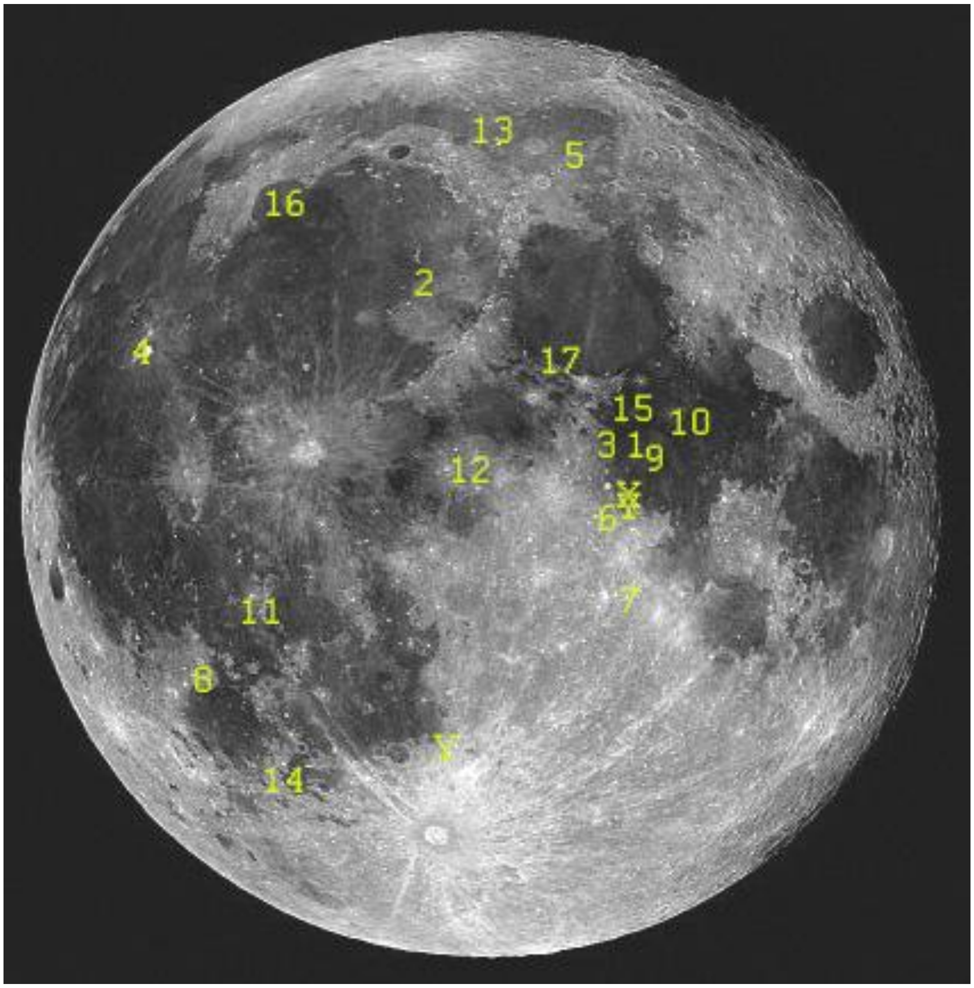
KEY TO IMAGES IN THIS ISSUE

1. **Arago**
2. **Archimedes**
3. **Ariadaeus**
4. **Aristarchus**
5. **Bailly**
6. **Deslandres**
7. **Descartes**
8. **Gassendi**
9. **Lamont**
10. **Mare Tranquilitatis**
11. **Montes Riphaeus**
12. **Pallas**
13. **Protagoras**
14. **Ramsden**
15. **Ross**
16. **Sinus Iridum**
17. **Sulpicius Gallus**



FOCUS ON targets

X = Dionysius
Y = Deslandres