



# THE LUNAR OBSERVER

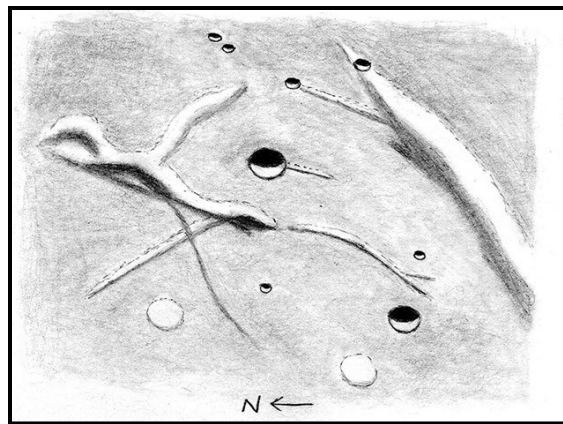
A PUBLICATION OF THE LUNAR SECTION OF THE A.L.P.O.

EDITED BY: Wayne Bailey [wayne.bailey@alpo-astronomy.org](mailto:wayne.bailey@alpo-astronomy.org)

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RECENT BACK ISSUES: [http://moon.scopesandscapes.com/tlo\\_back.html](http://moon.scopesandscapes.com/tlo_back.html)

## FEATURE OF THE MONTH – OCTOBER 2017 MESSIER G & GOCLINIUS A



**Sketch and text by Robert H. Hays, Jr. - Worth, Illinois, USA  
May 30, 2006 02:16-02:44; UT, 15 cm refl, 170x, seeing 8-7/10.**

I drew these craters and vicinity on the evening of May 29/30, 2017. This area is in central Mare Fecunditatis between Messier and Langrenus. Messier G is the largest crater in this sketch, and the slightly smaller Goclenius A is to its southwest. These are crisp, moderate-sized craters with no noticeable irregularities. The surrounding detail adds interest to this area. The crater nearest Messier G to the southeast is Langrenus FE, and Langrenus FF is the similar crater to its south. Langrenus FD is probably one of a close pair of pits east of Messier G. The Lunar Quadrant map shows one crater there, but I saw two. The tiny crater east of Goclenius A is Goclenius AA, and an unlabeled pit makes a right angle north of Goclenius A and west of Messier G. All of these small craters are miniature versions of the two main craters. There are several wrinkles in this area. A wide ridge starts south of the drawn area east of Goclenius A and continues to the northeast, tapering to a point just east of Langrenus FF. A narrow branch extends northward to Langrenus FE. A short ridge protrudes from the south rim of Messier G. This ridge appears to be parallel to the branch near Langrenus FE. A complex wrinkle has its south end just east of Goclenius A and snakes northward west of Messier G. This wrinkle has a small gap near Messier G. Its southern portion is narrow and gently curved with a small branch near Goclenius AA. The northern portion is much wider with varied shadowing. The northernmost shadowing is darkest and gives the impression of the wrinkle being split lengthwise. I have tried drawing it as well as possible. A wide, dull branch curves toward the crater pair east of Messier G. Two narrow dusky strips branch off to the west. One is a narrow ridge angling to the northwest, and the other goes to the southwest, ending near the unlabeled pit west of Messier G. This latter branch showed no sunlit side. These strips intersect just west of the main wrinkle. A vague bright spot is between these strips, and a similar patch is just west of Goclenius A. These spots may be low elevations based on hints of shading.

# LUNAR CALENDAR

## OCTOBER-NOVEMBER 2017 (UT)

2017		UT	EVENT
Oct	05	18:40	Full Moon
	09	05:51	Moon Perigee: 366900 km
	09	18:05	Moon-Aldebaran: 0.6° S
	11	18:21	Moon Extreme North Dec.: 19.6° N
	12	12:25	Last Quarter
	15	10:54	Moon-Regulus: 0.2° S
	17	10:04	Moon-Mars: 1.9° S
	18	00:21	Moon-Venus: 2.1° S
	19	19:12	New Moon
	24	11:54	Moon-Saturn: 3.6° S
	25	02:25	Moon Apogee: 405200 km
	25	18:13	Moon Extreme South Dec.: 19.7° S
	27	22:22	First Quarter
Nov	04	05:23	Full Moon
	06	00:09	Moon Perigee: 361400 km
	06	02:19	Moon-Aldebaran: 0.7° S
	08	01:28	Moon Extreme North Dec.: 19.8° N
	10	20:37	Last Quarter
	10	22:40	Moon Ascending Node
	11	16:07	Moon-Regulus: 0.4° S
	15	00:40	Moon-Mars: 3.4° S
	18	11:42	New Moon
	21	00:34	Moon-Saturn: 3.3° S
	21	18:52	Moon Apogee: 406100 km
	22	02:06	Moon Extreme South Dec.: 20° S
	26	17:03	First Quarter

# LUNAR LIBRATION

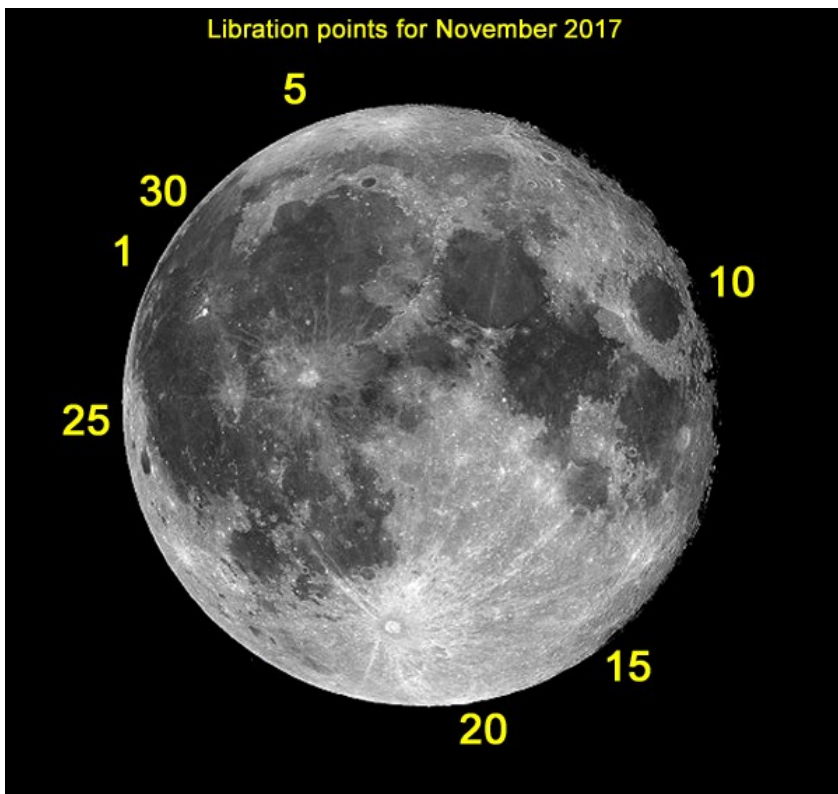
## OCTOBER-NOVEMBER 2017



### Size of Libration

10/01	Lat -01°32'	Long -04°41'
10/05	Lat +04°12'	Long -05°26'
10/10	Lat +06°12'	Long +00°20'
10/15	Lat -00°09'	Long +04°36'
10/20	Lat -06°05'	Long +04°09'
10/25	Lat -05°09'	Long -00°49'
10/30	Lat +01°03'	Long -06°35'

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



### Size of Libration

11/01	Lat +03°49'	Long -06°54'
11/05	Lat +06°32'	Long -02°14'
11/10	Lat +01°30'	Long +05°10'
11/15	Lat -05°16'	Long +05°30'
11/20	Lat -05°54'	Long +01°13'
11/25	Lat -00°31'	Long -05°29'
11/30	Lat +05°42'	Long -07°23'

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

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

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

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

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

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

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

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

**Name and location of observer**

**Name of feature**

**Date and time (UT) of observation (use month name or specify mm/dd/yyyy, dd/mm/yyyy)**

**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: 0 to 10 (0-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](mailto:wayne.bailey@alpo-astronomy.org)

and Jerry Hubbell – [jerry.hubbell@alpo-astronomy.org](mailto:jerry.hubbell@alpo-astronomy.org)

Hard copy submissions should be mailed to Wayne Bailey at the address on page one.

## CALL FOR OBSERVATIONS: FOCUS ON: Dorsa-Wrinkle Ridges

*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 **November 2017** edition will be **Dorsa (also known as wrinkle ridges)**. Observations at all phases and of all kinds (electronic or film based images, drawings, etc.) are welcomed and invited. Keep in mind that observations do not have to be recent ones, so search your files and/or add these subtle features to your observing list and send your favorites to (both):

**Jerry Hubbell** – [jerry.hubbell@alpo-astronomy.org](mailto:jerry.hubbell@alpo-astronomy.org)

**Wayne Bailey** - [wayne.bailey@alpo-astronomy.org](mailto:wayne.bailey@alpo-astronomy.org)

**Deadline for inclusion in the Dorsa article is October 20, 2017**

## FUTURE FOCUS ON ARTICLES:

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

<u>Subject</u>	<u>TLO Issue</u>	<u>Deadline</u>
Montes & Mons – Mountains and Mountain Ranges	Jan. 2018	Dec. 20, 2017
Rima – Rilles	Mar. 2018	Feb. 20, 2018
Craters – Latest and Greatest	May 2018	Apr. 20, 2018



## ALPO 2017 CONFERENCE ANNOUNCEMENT

This year's Assn of Lunar & Planetary Observers annual conference will be held as part of the Georgia Regional Astronomers Meeting (GRAM) at the University of Georgia in Athens, Georgia, the weekend of October 27 and 28, 2017. THERE IS NO REGISTRATION FEE and only a very minimal prepaid charge for meal arrangements for the ALPO awards dinner.

Amateur astronomers are especially urged to attend and participate in this event. While you are **not** required to give an oral presentation or submit a poster for display, please consider this an excellent opportunity to enlighten other participants regarding your own recent astronomical activities.

The ALPO annual board meeting will be at 2 p.m., on Friday, October 27, at the UGA Physics Building. An informal reception with light refreshments will follow later that afternoon, with viewing through the UGA 24-inch Fecker telescope (weather permitting) that evening.

The conference astronomy talks will be held from 9 a.m. to 5 p.m. on Saturday, October 28 (with a break for a free lunch). In addition, poster presentations will be set up on tables just outside the conference room. There is no limit as to the number of astronomy posters for display.

The grand finale of the weekend will be the ALPO awards dinner beginning at 6:30 p.m., October 28, at the nearby Georgia Center for Continuing Education & Hotel. All who attend this event are also invited to attend the ALPO awards dinner, where official presentation of this year's ALPO Walter H. Haas Observers Award and the

ALPO Peggy Haas Service Award will take place. Afterwards, Dr. Loris Magnani, professor astronomy at UGA and organizer of the GRAM event, will be our keynote speaker. There is a very minimal charge required in advance for the dinner, which makes the event very affordable considering that there is no registration fee.

Please note that our agreement with the UGA Center specifies NO WALK-INS for the awards dinner, thus prepayment is required.

The dinner meal will be a buffet of the following:

- Drag Through the Garden Salad with Lemon House Vinaigrette
- Marinated Five Bean Salad
- Southern Fried Chicken
- Shrimp and Grits
- Yankee Pot Roast
- Collard Greens with Smoked Ham Hocks
- Whipped Potatoes
- Macaroni and Cheese
- Cheddar Biscuits and Cornbread with Honey Butter
- Apple Berry Crisp with Vanilla Sauce
- Chocolate Cake with Double Cream

Non-alcoholic beverages (water, coffee, ice-tea, etc.) will also be available.

Finally, the Georgia Center for Continuing Education & Hotel, site of the ALPO awards dinner, graciously offers a steeply discounted room rate for those who wish to spend Friday, Saturday and even Sunday in Athens.

There are two ways to complete prepayment (\$30) for your ALPO awards dinner:

- Use the PayPal method available at [https://store.astroleague.org/index.php?main\\_page=product\\_info&cPath=10&products\\_id=121](https://store.astroleague.org/index.php?main_page=product_info&cPath=10&products_id=121)
- Send a check (payable to the ALPO) to:

The ALPO  
c/o Matt Will  
P.O. Box 13456  
Springfield, IL 62791-3456

Deadlines are as follows:

- Sunday, October 1 — Lodging at the Georgia Center for Continuing Education & Hotel (voluntary). Complete booking arrangements directly with the hotel; phone 706-542-2134 (state that you are part of Event No. 88950).
- Thursday, October 5 — ALPO Awards dinner payment. Payment info stated directly above. Contact Ken Poshedly for details at [ken.poshedly@alpo-astronomy.org](mailto:ken.poshedly@alpo-astronomy.org)
- Friday, October 13 — Conference oral presentation registration (no charge). Contact Dr. Loris Magnani at [loris@physast.uga.edu](mailto:loris@physast.uga.edu); phone 706-542-2876.
- Friday, October 20 — Conference attendance registration (no charge). Contact Dr. Loris Magnani at [loris@physast.uga.edu](mailto:loris@physast.uga.edu); phone 706-542-2876.

## Conference Registration Info

**For our planning purposes, and because the oral presentations are limited to Saturday, October 28, please note that we may not be able to accommodate all requestors. Therefore, please print out and return this completed form as soon as possible to [loris@physast.uga.edu](mailto:loris@physast.uga.edu) .**

**Registration deadline for submitting 200-word presentation abstracts is Friday, October 13.**

**Your Name:** \_\_\_\_\_

**Institution or Affiliation:** \_\_\_\_\_

**Your e-mail address:** \_\_\_\_\_

**Preference: Talk** \_\_\_\_\_ **Poster** \_\_\_\_\_ **Neither** \_\_\_\_\_

**Title of your presentation or poster:** \_\_\_\_\_

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**Do you have any special audiovisual requirements for your presentation?**

Yes \_\_\_ No \_\_\_

**Abstract** (200 words or less): \_\_\_\_\_

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**I will arrive on Friday \_\_\_ Saturday \_\_\_**

**If you are arriving on Friday, would you like to get together for an informal dinner after the lecture mentioned below?**

Yes \_\_\_ No \_\_\_

**Do you have any dietary restrictions or preferences for Saturday lunch?**

Yes \_\_\_ No \_\_\_

**If yes, please describe:** \_\_\_\_\_

Directions to UGA and a campus map are given at <https://www.architects.uga.edu/maps/current>. On Friday evening (after 5 p.m.) and all day Saturday, you can park in the parking lots adjacent to the Physics Building.

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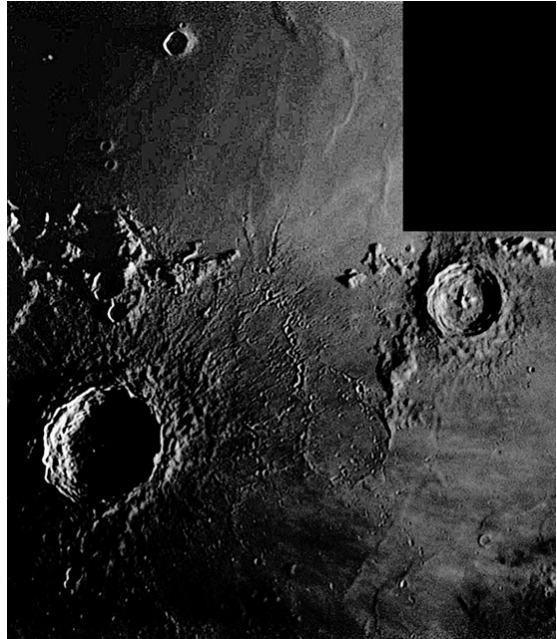
# SECONDARY CONSIDERATIONS

## Richard Hill

As soon as I got my first "serious" telescope one of the ubiquitous 60mm Tasco refractors, I read Patrick Moore's book, *The Moon* and was immediately was interested in what I could see there with my new instrument. Patrick (not having got his "K" in 1964) was a proponent of large scale volcanism to explain the lunar features. I do not know where I got it, but even as a teenager I favored the impact theory. In his book he mentioned how the formation of the crater rays was enigmatic. My father's house was on white sand (with all the Biblical admonishments my mother would quote to him) but where he planted decorative bushes he put a layer of black loam on top. This gave me an idea for an experiment. I got a ladder and from the top of it fired rocks into these layers of soil with a sling-shot. It produced craters with rays! I wrote Patrick and told him of my experiment and that began a friendship that lasted until his passing. He encouraged me to do more such things and I became a regular lunar observer.

***Figure 1. COPERNICUS-ERATOSTHENES.*** Tucson, AZ USA. July 14, 2016 02:51UT. Seeing 8/10. Tec 8" Mak-Cass, f/20, 656.3nm filter, Skyris 445.

One of my goals with that little telescope was to see the secondary cratering between Copernicus (95km diameter) on the left side of this image (fig. 1) and Eratosthenes (60km) on the right side. These craters also pepper the ghost crater Stadius (71km) that is between the larger two. I tried on many nights but they were just beyond the resolution of my telescope. In the telescopes common to amateurs today of 100mm aperture and larger these craters can easily be seen. This is because craters are not formed from the punching effect of the impact like my sling-shot. They are the product of a subsurface explosion of tremendous force. The kinetic energy of the impactor is converted to heat energy after plunging into the surface and being brought to a stop by the friction of the rock and soil. The simple formula to determine the energy or force (F) of an impact is the simple  $F = \frac{1}{2} mv^2$ , a permutation of  $F = ma$  familiar to all first year physics students. This tells you that the velocity (v) being squared, has much more to do with the energy than the constant of the mass (m) of the impacting body. Velocity of impactors is typically 20-60km/sec.! This leads to kilotons to megatons of explosive force.

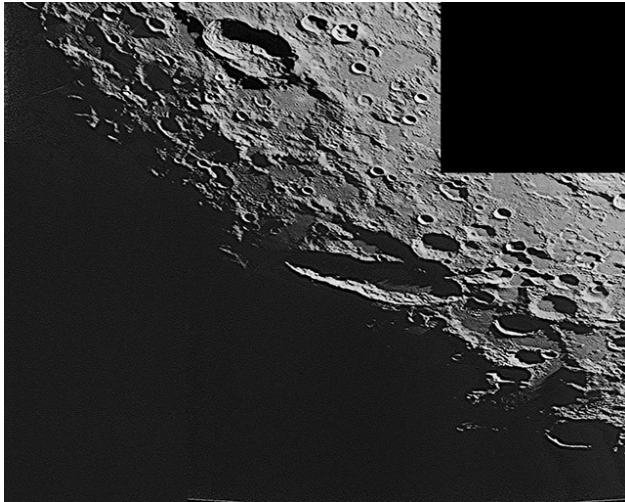


So enjoy these craters in your telescope and see if you can distinguish between the secondary impacts and the primary ones.

# SOME STRANGE IMPACTS

## Richard Hill

Two unusual features are within the confines of this composite image (fig. 1). The one that first jumps out at you is Schiller, the footprint on the terminator. It may be the result of a low angle, large impact or the merger of 3-4 impacts giving it the 179x71km shape created around 3.9 billion years (b.y.) ago, or about 16 rotations of our galaxy! The 3.9km depth begins to be illuminated as the colongitude reaches 39° (41° in this image). Look



at the walls of this huge hole. The walls of the crater just above, Bayer (49km dia.) the same age as Schiller, are also full of great detail. Note the odd flat bottomed crater cluster to the right of Shiller between it and the 51km crater Rost.

*Figure 1. HAINZEL-SCHILLER. Tucson, AZ USA. June 16 2016 02:49UT. Seeing 8-9/10. Tec 8" Mak-Cass, f/20, 656.3nm filter, Skyris 445.*

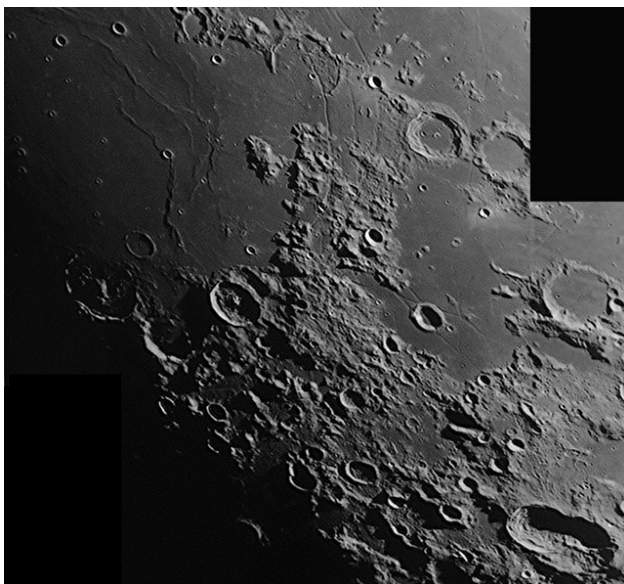
At the top of this image is a figure-8 crater. This is Hainzel (70km), but only the southern lobe is Hainzel. The upper lobe is Hainzel-A (53km) and just coming out of shadow is the wall of the middle crater, Hainzel-C (38km). They all overlap and are different ages. Hainzel itself is as old as Schiller, about 3.9 b.y. old, while C is about 300 m.y. younger and A is between 1.1-3.2 b.y. old. There is some great detail on the bottom of this trio, small rilles and terracing. There are twin craters to the right of Hainzel. The

north or upper one is Epimenides (27km) and below that is Epimenides-B (26km). Look inside these at the very odd floors with bulges and slumping. The bulge in B looks like a dome on LROC QuickMap.

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# PALUS EPIDEMIARUM

## Richard Hill



A lesser known region of the moon for many novice lunar observers is Palus Epidemiarum (PE) the flat region just to the right (east) of center (fig. 1). It's a poorly defined area given the lovely appellation "Marsh of Epidemics". On its east side, on the edge of this image, is the crater Capuanus (61km dia.) 3.8 to 4.5 billion years old. On the west floor of this crater you

*Figure 1. PALUS EPIDEMIARUM. Tucson, AZ USA. June 16, 2016 02:40UT. Seeing 8/10. Tec 8" Mak-Cass, f/20, 656.3nm filter, Skyris 445.*

can see C1, one of three domes contained within its walls. On the west side of PE can be seen the younger 26km diameter crater Ramsden half filled with shadow and crossed by an exquisite system of rilles, the Rimae Ramsden. The rilles appear to cut across the crater in this image but in actual fact the crater sits on top of the rimae as seen in LROC imagery. The edge of the shadow and a

notch in the crater wall makes this superposition illusion. At the top PE is hemmed in by two 49km diameter craters, Mercator on the right and Campanus with nice terraced interior walls on the left. Note the thin unnamed rille that passes between the two craters, concentric with the arcs of the Rimae Hippalus to left of Campanus. Hippalus (60km) itself is the broken circular wall at the top of the image with a rima running right through it, about the same age as Capuanus. The Rima Hippalus trace downwards to a well defined crater with a sharp central peak. This is Vitello (43km) with a strange central peak that is isolated on the floor of its crater by a circular rill system indicating some sort of slumping as the lava infill cooled. Lunar Orbiter 5 got amazing images of it, well worth some study. Between Vitello and Hippalus is a triangular patch of mountains, Promontorium Kelvin, with the shadowy ridge Rupes Kelvin, running vertically between it and the Rimae to the right. This ridge is easy to miss until it's pointed out then it becomes obvious.

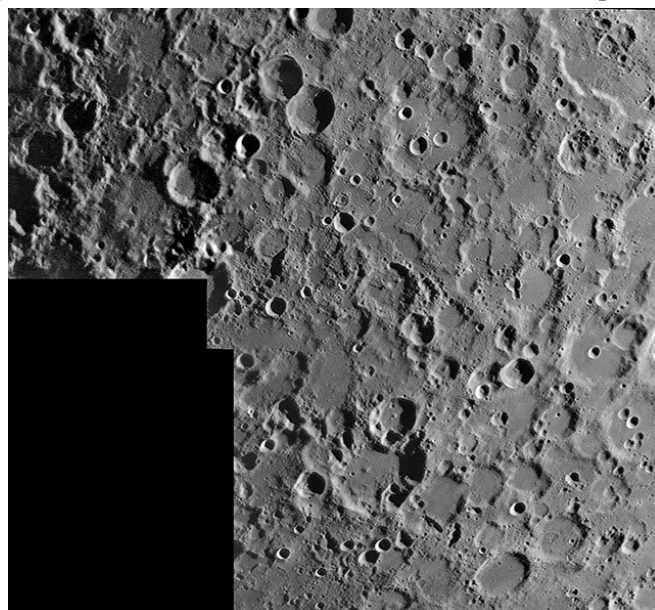
The great mare above Vitello is Mare Humorum bound by the ruined arc of Doppelmayer (66km) with its massive central peak, on the left or sunrise terminator. To its right is the ring that is the remnants of the crater Puiseux (26km) and below an arc that is Lee (43km) the same size as Vitello but half a billion years older. In the lower right corner is the figure-8 crater Hainzel that was mentioned in the article above.

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## PONTANUS REGION

### Richard Hill

Nestled between Rupes Altai and Tycho is a region that many consider just unremarkable lunar highlands. But there are a number of interesting jewels tucked into this region. To orient the reader, a small portion of Rupes Altai can be seen in the upper right corner (fig. 1). Then, peaking out from behind the upper right corner of the nameplate we can see about a quarter of the crater Apianus (65km diameter), part of the famous lunar "X" seen when the colongitude is around 350°, about 17 hours before this image was taken. In the center of this image is the ancient crater Pontanus (60km). At 3.9-4.6 billion years age. its walls and central peak have been given a softened in appearance from all the ejecta of surrounding impacts. An interesting crater chain lies to the east (right) of this crater just past the 13km wide merge of 3 craters that is Pontanus X. Pontanus C to the lower right of the main crater is an amalgam of at least 3 overlapping craters. Between Pontanus and Apianus is a dense field of 1-4km secondary craters. Northwest of Pontanus is a relatively fresh crater Pontanus D (20km). Notice just above this is a smaller crater with double walls, Pontanus E (13km). This a very unusual crater with what appears to be a floor that was raised up post-impact, forming a depressed ring just inside the crater wall. Due east of Pontanus is a flat bottomed crater Wilkins (also 60km), a name familiar to lunar observers. Note the odd pair of craters on the west side of the floor, Wilkins A to the north and Wilkins B south. They form a keyhole appearance with the overlap. To the southeast of Wilkins is the crater Zagut (87km) with the 11km Zagut A on its floor. There are numerous impact scars and secondary crater chains in this region worth exploration.



**Figure 1. PONTANUS REGION.** Tucson, AZ USA. July 12, 2016 02:46UT. Seeing 8/10. Tec 8" Mak-Cass, f/20, 656.3nm filter, Skyris 445.

Below Pontanus is a well defined crater Goodacre (48km), another name well known to lunar observers, that sits on top of Gemma Frisius (90km) to its south. Note the interesting formations on its floor. Then above Pontanus is a large crater with three smaller ones on its floor. This is Sacrobosco (100km). To the west of it are a pair of craters, Azophi (49km) to the south and Abenezra (43km) north. This latter crater has a very interesting swirl of ridges on its floor when seen with higher sun than this image. Between Abenezra and Apianus is the crater Playfair (49km) half filled with shadow.

# LUNAR TOPOGRAPHICAL STUDIES

Coordinator – Wayne Bailey - [wayne.bailey@alpo-astronomy.org](mailto:wayne.bailey@alpo-astronomy.org)

Assistant Coordinator – William Dembowski - [dembowski@zone-vx.com](mailto:dembowski@zone-vx.com)

Assistant Coordinator – Jerry Hubbell – [jerry.hubbell@alpo-astronomy.org](mailto:jerry.hubbell@alpo-astronomy.org)

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

## OBSERVATIONS RECEIVED

TOMAS BIANCO & LIVIANO BOTTI—MONTE SAN LORENZO OBSERVATORY (PU) ITALY. Digital image of Full Moon,

MAURICE COLLINS - PALMERSTON NORTH, NEW ZEALAND. Digital images of 13 day moon, Aristarchus, Aristoteles, Bailly, Copernicus, Darwin, Grimaldi, Mons Rumker, Tycho, Wargentín & western Terminator.

HOWARD ESKILDSEN - OCALA, FLORIDA, USA. Digital images of Babbage-Anaximander, crescent Moon, Earthshine & Schikard– Phocylides.

VALERIO FONTANI—LONDA (FI) ITALY. Digital images of Full Moon(2).

RICHARD HILL – TUCSON, ARIZONA, USA. Digital images of Albetagnius, Atlas, Copernicus, Hainzel-Schiller, Palus Epidemiarum, Pontanus & South Pole.

FRANCO TACCOGNA—ST. PETERSBURG, RUSSIAN FEDERATION. Digital image of Full Moon.

DAVID TESKE - LOUISVILLE, MISSISSIPPI, USA. Digital images of Montes Caucasus & waning Gibbous Moon.

ALDO TONON—COAZZE (TO) ITALY. Digital image of Full Moon.

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## RECENT TOPOGRAPHICAL OBSERVATIONS



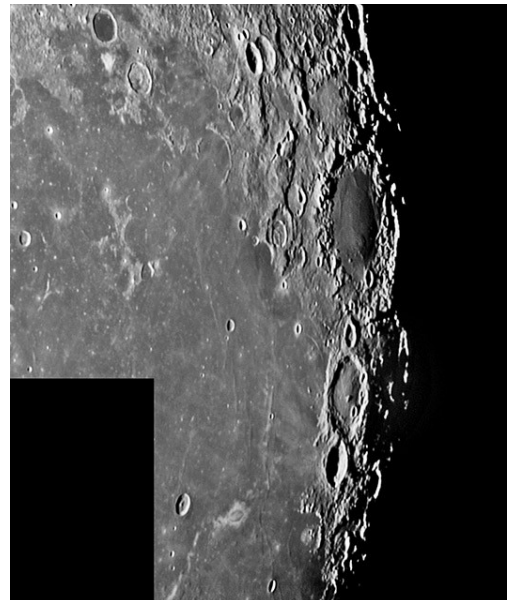
**Full Moon** - Tomas Bianco & Liviano Botti-Monte San Lorenzo Observatory (PU), Italy. September 5, 2017 20:23 UT. Seeing Ant I, Transparency 6/7. 150mm APO Refractor, f/10, Canon 50D.

# RECENT TOPOGRAPHICAL OBSERVATIONS



**DARWIN** - Maurice Collins,- Palmerston North, New Zealand. September 4, 2017 08:35 UT. FLT-110, f/21 ASI120M. North down.

**GRIMALDI** - Maurice Collins,- Palmerston North, New Zealand. September 4, 2017 08:32 UT. FLT-110, f/21, ASI120MC. North down,



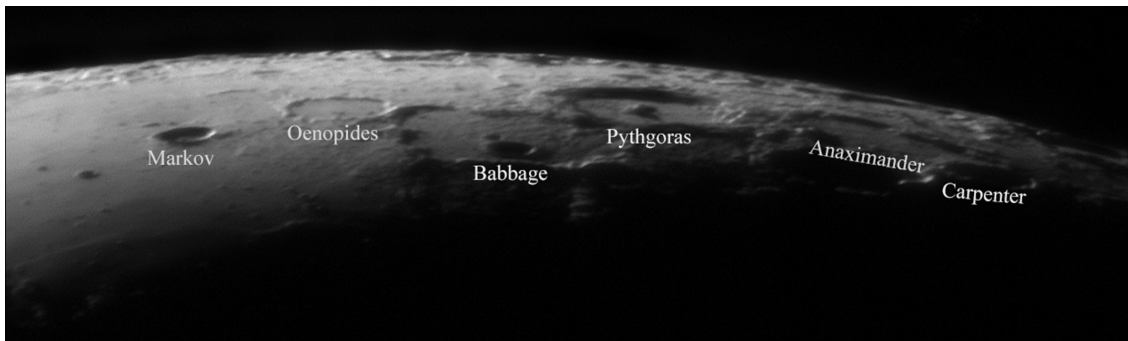
**WARGENTIN**—Maurice Collins,- Palmerston North, New Zealand. September 4, 2017 08:36 UT. FLT-110, f/21, ASI120MC. North down,



## RECENT TOPOGRAPHICAL OBSERVATIONS



**Earthshine & Crescent Moon** - Howard Eskildsen, Ocala, Florida, USA. September 18, 2017 Crescent 08:36, Earthshine 08:32 UT. 6" Refractor, f/8, Canon 40D.



**BABBAGE-ANAXAMANDER** - Howard Eskildsen, Ocala, Florida, USA. May 7, 2017 10:21, UT. 6" Refractor, f/8, 2x barlow. Seeing 7/10, Transparency 6/6. DMK41AU02.AS.

**Full Moon** - Valerio Fontani, Londa (FI), Italy. September 5, 2017 21:16-21:18 UT. Seeing 4/10, Transparency 7/10. 10" LX-200 ACF, Canon 80D.



## RECENT TOPOGRAPHICAL OBSERVATIONS



**Full Moon** - Franco Taccogna, St. Petersburg, Russian Federation.. September 5, 2017 17:47 UT. Nikon D7100, F-105mm.

**Waning Gibbous Moon** - David Teske, Louisville, Mississippi, USA. September 8, 2017 19:18, UT. 102 mm APO Refractor, f/7. Seeing 5/10. ASI120mm-s.



**Full Moon** - Aldo Tonon, Coazze (TO), Italy. September 5, 2017 22:19 UT. 70mm Refractor F=500mm, ASI290MM. 685nm IR-pass filter.



# **LUNAR GEOLOGICAL CHANGE**

## **DETECTION PROGRAM**

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Observations for August were received from the following observers: Jay Albert (Lake Worth, FL, USA - ALPO) observed: Aristarchus, Gassendi, Plato, and Proclus. Alberto Anunziato (Argentina – AEA) observed: Aristarchus, Mare Serenitatis, Riccioli, and Romer. Maurice Collins (Palmerston North, New Zealand – ALPO/BAA/RASNZ) imaged: Aristarchus, Bailly, Copernicus, Earthshine, Mare Fecunditatis, Mare Humorum, Marius, Mons Rumker, Plato, Schickard, Tycho, and the whole Moon. Anthony Cook (E of Sergiyev Posad, Russia, and Aberystwyth, UK, ALPO/BAA) imaged several features. Marie Cook (Mundesley, UK, BAA) observed Aristarchus, Catharina, Censorinus, Copernicus, Cyrillus, Gutenberg, Posidonius, Ptolemaeus, and Tycho. Franco Taccogna (Italy – UAI) imaged Copernicus.

**News:** In the November 2017 edition of Sky and Telescope magazine (p30-33) is an article by Andrew Livingstone entitled: “The 1794 Volcano on the Moon”. The article is about a bright star-like point, apparently seen with the naked eye on the night side of the Moon in 1794 and analyzed by the then Astronomer Royal: the Rev. Nevil Maskelyne. If you read the original Philosophical Transactions reports, it looks like a good clear case of a LTP. One observer, [William Wilkins \(1798-1839\)](#), an architect observing from Castle Hill, Norwich, UK, describes the star like point being seen inside the NW part of the Earthshine and notes that it brightened briefly just before vanishing. He apparently had excellent eye sight, as he could see ships out to sea long before others could. A second independent observer, [Thomas Stretton](#), a servant to the Booth family at St. John’s Square, Clerkenwell, London, UK, sees something identical., but does not note down the day or the time. He later receives a visit by no less the Astronomer Royal, the Rev. Nevil Maskelyne, who though some detective work using chimney pots as direction pointers, and sketches of the phase of the Moon, was able to identify the date and time of Thomas Stretton’s observation (around 8PM), and verify that it was the same event as the Wilkins report, at least to a tolerance of a few minutes. The article by Andrew Livingstone does some additional detective work and suggests that it was in fact an occultation of the bright star Aldebaran that both observers saw as predictions show that the sketch that Wilkins made of the location of the star-like point inside Earthshine, agree well with the latitude that Aldebaran would have been in contact with the lunar limb. Also although the fade would have been pretty much instantaneous, physiological factors sometimes make observers think that stars brighten just prior to an occultation. The problem of seeing the star inside the dark part of the Moon is explained away by saying that at a 40% phase one cannot see the judge the edge of the dark limb well, and maybe short sightedness at night, with the iris wide open (as opposed to daytime), contributed the star appearing inside the limb? The problem with the Sky and Telescope Aldebaran occultation theory is that the occultation was closer to 7PM. This is conveniently explained away as observer error, misjudging the times. Interestingly at the time of writing, I have just been outside and taken a look at a 50% phase Moon and can quite clearly see Earthshine and the location of the dark limb, so one presumes in less light polluted times it would have been even easier to see? However despite this time discrepancy issue, I do like the evidence presented that the latitude of the Aldebaran occultation being very similar to where the flash was seen, and the vanishing act was very reminiscent to an occultation, and so will reduce the weight of this observation from 3 to 1.

At this year’s European Planetary Science Congress (EPSC) in Riga, held on 2017 Sep 18-22 there were three talks and two posters that are of interest to us. Firstly a new impact flash observatory has opened up – this one is a European Space Agency (ESA) funded [NELIOTA](#), project using the 1.2m Kryonen telescope in the district of Corinth, in the northern Peloponnese, Greece. They have been in operation for 238 days, have collected 35 hours of video and recorded 16 impact flashes, or one for every 2 hours of observing. You can read more about this in the conference abstract by [Avdellidou and Kochny](#). Alas I was unable to attend this talk as I had to chair a session of lectures elsewhere. However they are running two cameras, in different wavebands, and using the color

difference to determine the blackbody temperature of each flash – something I suggested back in 2012 on p20 of the Hatfield Lunar Atlas, so it is good to see this concept proven. I gave a talk of Automated Lunar Flash Investigation (ALFI) software that I am developing. This is not intended to replace the existing highly successful [Lunarscan](#) software which is used to identify impact flashes in Earthshine video, but [ALFI](#) (Funded by the Horizon 2020, Europlanet 2020 Research infrastructure: EPN2020 - RI, <http://www.europlanet-2020-ri.eu> ) will in addition be able to look for flashes on the dayside of the Moon, and with drifting video e.g. obtained from Dobsonian telescopes.

There was another presentation, this time as a poster (see this [abstract](#)), which reanalyzed the Leon Stuart photograph of flash on the Moon, near to Pallas crater, and came up with a refined position for the centre of the flash at 3.30° W, 4.29° N ±0.5 km), and also considered the Kolovos flash from 1985. The poster was able to show that the position quoted for the centre of Kolovos flash was further north (43.11°E, 13.0°N ±2.2 km) than published in an Icarus paper (Kolovos, G. *et al.*, (1988) *Icarus*, 76, p525-532), and that its shape was not confined by the surrounding topography. Concerning the theory that it was produced from a sun glint from an orbiting/spinning defunct DMSP military weather satellite as suggested by Rast and Maley (Rast, R.H.,(1991) *Icarus*, 90, p328-329, and Maley, P.D., (1991) *Icarus*, 90, p326-327), the poster found no evidence of any satellite trail.(or elongation along the satellite direction) and suggests that it could have been was an impact flash. Another impact flash related presentation was the work of one of my 4<sup>th</sup> year degree project students, Matthew Menzies, here at Aberystwyth University and examined whether there was any evidence for any impact flashes having shape? Common sense tells us that this should not be the case as the craters formed are well below the angular resolution of our telescopes, However for an observation made on 2017 Jan 01 from widely separated locations in the UK and Switzerland, the flash had an elongation that was similar in alignment. So too for a 2001 Nov 19 Leonid impact seen from Virginia and Nevada in the USA. It was possible to rule out atmospheric spectral dispersion as the cause, leaving four theories as to why the flashes were extended. The most likely one could be that the impact occurred on some highland and the flash illuminated the lowlands below for a distance of several km. The second best guess was that the impactor was actually two or more meteoroids.

Finally, there was a “Late Poster” on photographic evidence of lunar Exospheric dust above the Moon’s Earthlit limb. This used views of the very thin crescent Moon, between lunar phase angles of 160° to 170°, sourced from old Sky and Telescope articles, and from the Internet to show that there were some examples where a continuous half ring could be seen around the Earthshine on the western limb. I was able to talk to the author, Dr Martin Hoffmann, of the Max Planck Institute for Solar System Research, and although I had suspected that the effect was a combination bright highland coming over the NW limb at favorable librations, mixed in with image noise and hardware sharpening effects on the digital color cameras used, he pointed out to me that for one of the images, this was recorded photographically before the era of color CCD cameras. Also I suggested that the effect perhaps ought to be present in Total Solar Eclipse images as a bright ring around the Sun and would reveal itself as dust in any spectra taken – however he pointed out that this does not match the phase angle conditions. Anyway take a look yourself at the images in the [abstract](#) and make up your own mind. I may add this early stage waxing crescent to the [Lunar Schedule](#) web site to see if you can reproduce the effect, though I suspect it is not really exospheric dust for the reasons given above.

Jason Wentworth, has pointed me to an [article](#) describing hidden geology beneath the visible surface, sometimes down to a depth of 15 metres. The Radar images look quite different to optical images and the mare areas are no longer blank but contain a profusion of detail from lava events in the past. He also mentions that the [crash site](#) of ESA’s SMART-1 spacecraft has now been found.

**LTP Reports:** No LTP reports have been received for August.

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

**Copernicus:** On 2017 Aug 01 UT 20:11-20:56 Franco Tacogna (UAI), this crater under the same illumination conditions (to within ±0.5°) to a report from 1980:

*On 1990 Aug 30 at UT02:11-02:36 D. Darling (Sun Prairie, WI, USA, 3" refractor, x90, seeing conditions: "at,. boiling") noted a colored area on the west wall of Copernicus that was unusual in*

*appearance - however other craters along the terminator had a similar effect. There was also a "dazzling bright spot on the E. rim and he witnessed 6 flashes from the lighted part of Copernicus over a very short time interval. Cameron comments that the color may well have been due to chromatic aberration because a refractor was used. The Cameron 2006 catalog ID=408 and the weight=0. The ALPO/BAA weight=1.*

Franco took several monochrome images and a typical one is shown in Fig 1. Whilst it is not difficult to create color artificially on the western rim by sliding the red, green and blue channels around (I have not done this in Fig 1) it is curious that the light spot on the eastern rim is not exactly "dazzlingly bright" as David Darling's report suggests. I therefore think it is fitting to keep this poor observing conditions report from 1990 at the existing low weight of 1. Alas I do not have a copy of David's observation, other than what was described in the Cameron catalog.

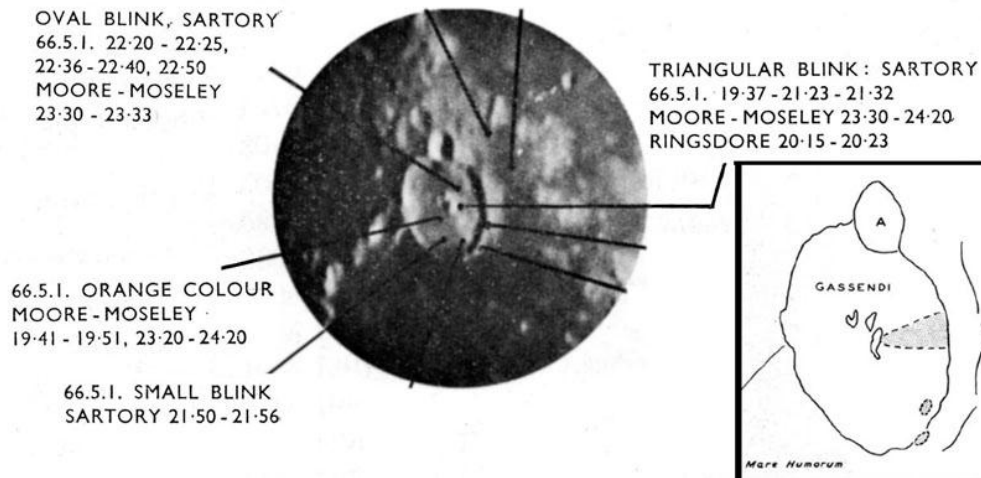


*Figure 1. Copernicus on 2017 Aug 01 UT 20:42 as imaged by Franco Taccona, orientated with north towards the top.*

**Gassendi:** On 2017 Aug 04 UT 00:35-01:05 Jay Albert (ALPO) observed visually and imaged this crater under the same illumination conditions, to within  $\pm 0.5^\circ$ , the following report:

*Gassendi 1966 May 01 UT 19:30-00:21 Observed by Sartory (England, 8.5" reflector, x500, S=G), Moore, Moseley (Northern Ireland, 12.5" reflector x350, S=E) and by Corralitos Observatory (Organ Pass, NM, USA, 24" reflector + moon blink) "Eng. moonblink & obscuration, also vis. confirm (Moore & Moseley alerted by Sartory. Corralitos MB did not confirm.)." NASA catalog weight=5. NASA catalog ID #932. ALPO/BAA weight=4.*

We have covered repeat illumination observations of the 1966 May 01 event before – see on p16-18 of the 2003 Dec BAA Lunar Section circular. Jay performed both visual and imaging observations on the crater. Visually, using a Celestron NexStar 6" SCT, under a hazy sky, seeing 6/10, at x214, he found that the interior of the crater looked the same in red Wratten 25 and blue/green Wratten 44A filters, and saw no color visually. Although some seeing related scintillation was present, he saw fine detail on the central peaks and in the rilles on the crater floor, so definitely no signs of obscurations whatsoever. Fig 2 (Top) shows what Jay caught on his iPhone, placed up against the eyepiece, and again no signs of any of the Moon Blink confirmed colors reported back in 1966 (Fig 2 Bottom Left/Right). I shall therefore keep the weight of this report at 4.



**Figure 2.** Gassendi orientated with north towards the top. (**Top**) An iPhone 6s image Jay Albert (ALPO) taken on 2017 Aug UT 00:56. (**Bottom Left**) A BAA Journal image (JBAA, 77, 1, p49) of the locations of LTP seen on 1966 May 01 by Moore, Moseley, Ringsdore and Sartory – photo by Sartory on 1966 May 01. (**Bottom Right**) A Sky and Telescope (January, 1967 edition, p27) sketch by Patrick Moore, with shading showing the location of a colored triangular area seen on 1966 May 01 by Moore, Moseley and Ringsdore.

**Aristarchus:** On 2017 August 06 UT 23:00-23:20 Albert Anunziato (AEA) observed the Aristarchus during a partial lunar eclipse (though was not eclipsed itself), under similar illumination, to within  $\pm 0.5^\circ$ , to the following three lunar eclipse reports:

*On 1950 Sep 26 at UT 02:52, 03:10 Reid (Montreal, Canada, 6" reflector x48) and Venor (Montreal, Canada, 12" reflector) observed a brightening, fading, and brightening in Aristarchus crater during totality. There was a phosphorescent glow (date not given but times match this eclipse). cameron suggests that this is a confirmation report. The cameron 1978 catalog ID=538 and weight=5. The ALPO/BAA weight=3.*

*On 1975 May 25 at UT 05:00-06:00 an unknown US observer took a photograph of a lunar eclipse that shows Aristarchus gleaming white. The Cameron 1978 catalog ID=1406 and weight=5. The ALPO/BAA weight=2.*

*On 2009 Sep 03 at UT 23:15-23:17 B.Gibbs took some hand held digital SLR images of the Moon (Sky conditions clear). Four images were taken at: 23:14:53, 23:15:59, 23:16:05 and 23:17:23 (uncertainty +/-15 sec offset from actual UT). These showed some apparent variation in the brightness of Aristarchus. However there are ways to explain this through image motion blur when the images were taken. However we cannot be absolutely sure. The ALPO/BAA weight=1.*



**Figure 3.** *Aristarchus* from 2017 August 06 UT 23:00-23:20 Albert Anunziato (AEA), orientated with north towards the top.

Alberto comments that the crater was extremely bright, and there was lots of detail when using a 9.5mm eyepiece at x154 on his Meade EX105, seeing 6/10. He was able to produce a sketch which is shown in Fig 3. I don't propose adjusting any of the weights.

**Earthshine:** On 2017 Aug 24 UT 07:03 Maurice Collins took an image of Earthshine which although had no repeat illumination predictions for that date and time, did offer an interesting experiment, namely to prove that the appearance of the Moon in Earthshine is effectively the same as that of the Full Moon. This of course we know as Earthshine involves illumination close to zero phase and likewise so does Full Moon. So I did a search to look through the archives to see if I could find an image of the Full Moon, taken at similar topocentric libration (to within  $\pm 1^\circ$ ) and a sub-solar longitude and sub-solar latitude to within  $\pm 2^\circ$  of the centre of the prime meridian and equator. Fig 4 Left illustrates the Earthshine view, and the centre image the Full Moon view. The images have been contrast stretched so that they have similar dynamic ranges which allowed a difference image (Right) to be generated. You can see it is not a perfect match due to registration problems – the libration would have to be even more similar in order to reduce this. In the difference image, features become negative in the region of the illuminated part of the Moon in the Earthshine image, There is also a glare effect in the telescope optics, just westward of the terminator.



**Figure 4.** *The Moon* as imaged by Maurice Collins and orientated with north towards the top. (Left) An Earthshine image from 2017 Aug 24 UT 07:03. (Centre) A Full Moon image from 2012 Sep 30 UT 09:41-10:15. (Right) A difference image.

This is an interesting exercise as it illustrates one way to figure out if claimed Aristarchus brightenings in Earthshine, that have been reported as LTPs in the past, are real or not, by comparing to Full Moon images under similar libration. Of course we should expect some differences as illustrated by glare issues, but also from colored craters such as Aristarchus (this has a blue cast) which may appear brighter when Earthshine is blue due to ocean coverage, whereas darker when more brown/reddish desert-like landmass is present on the Earth's disk as seen from the Moon. Franco Taccogna (UAI) has been sending me images of the Full Moon which should prove useful in this study in future.

**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](http://users.aber.ac.uk/atc/lunar_schedule.htm) . By re-

observing and submitting your observations, only this way can we fully resolve past observational puzzles. To keep yourself busy on cloudy nights, why not try “Spot the Difference” between spacecraft imagery taken on different dates? This can be found on: [http://users.aber.ac.uk/atc/tp/spot\\_the\\_difference.htm](http://users.aber.ac.uk/atc/tp/spot_the_difference.htm) . If in the unlikely event you do ever see a LTP, firstly read the LTP checklist on <http://users.aber.ac.uk/atc/alpo/ltp.htm> , and if this does not explain what you are seeing, please give me a call on my cell phone: +44 (0)798 505 5681 and I will alert other observers. Note when telephoning from outside the UK you must not use the (0). When phoning from within the UK please do not use the +44! Twitter LTP alerts can be accessed on <https://twitter.com/lunarnaut> .

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## KEY TO IMAGES IN THIS ISSUE

1. **Aristarchus**
2. **Babbage**
3. **Copernicus**
4. **Darwin**
5. **Gassendi**
6. **Grimaldi**
7. **Hainzel**
8. **Messier G=Lindbergh**
9. **Palus Epidemiarum**
10. **Pontanus**
11. **Wargentini**

