ASSOCIATION OF LUNAR & PLANETARY OBSERVERS
ALPO
Founded in 1947

THE LUNAR OBSERVER

A PUBLICATION OF THE LUNAR SECTION OF THE A.L.P.O.
EDITED BY: Wayne Bailey wayne.bailey@alpo-astronomy.org
17 Autumn Lane, Sewell, NJ 08080
RECENT BACK ISSUES: http://moon.scopesandscapes.com/tlo_back.html

FEATURE OF THE MONTH – JULY 2014

HERCULES A

Sketch and text by Robert H. Hays, Jr. - Worth, Illinois, USA
March 7, 2014 02:15-03:05 UT, 15 cm refl, 170x, seeing 8-6/10

I drew this crater and vicinity on the evening of March 6/7, 2014 between the occultations of two 8th-magnitude stars. This is the most conspicuous crater north of the Atlas/Hercules pair. Hercules A is a fairly large, flat-floored crater with no noticeable interior detail. There is some evidence of interior terracing. Hercules F is south of A. This crater appears to be the deeper of the two. Hercules F also showed substantial exterior shadow and a rather pointed east end. Two small peaks are southeast of Hercules A, and a low half-ring is to its northeast. This feature is higher on its west side than its east side, and is open to the southeast. A small pit, not labeled on the Lunar Quadrant map, is north of Hercules A, and a low mound with a nearly straight northwest side is nearby. There is a substantial hill just northwest of Hercules A, and a long ridge is farther to the northeast. This ridge is widest at its north end and showed some confusing shadowing. Two more small pits are west of Hercules A. The larger and more westerly of this pair is Hercules H. A low domelike feature is near these two pits. It is larger than the hill northwest of Hercules A, but it must be much lower judging from its weak shadowing.

ALPO ANNUAL MEETING

The ALPO annual meeting will be held in conjunction with the Astronomical League's ALCON 2014 (**alcon2014.astroleague.org**) July 10-12, 2014 at the San Antonio Airport Hilton (1-888-728-3031 **www.sanantonioairport.hilton.com**). Registration forms and accommodation information is on the website. Reservations must be made by June 14th to receive the ALCON convention rate at the Airport Hilton. Register before May 21st to receive an ALCON 2014 commemorative lapel pin.

The following information on submitting a paper is from the ALPO Journal:

ALPO 2014 Call for Papers

This year, only a selection of several ALPO papers will be presented as part of the main program; the remainder of the ALPO papers will be presented, as usual, at a separate room near the main presentation hall.

Participants are encouraged to submit research papers, presentations, and experience reports concerning various aspects of Earth-based observational astronomy. Suggested topics for papers and presentations include the following:

- New or ongoing observing programs and studies, specifically, how those programs were designed, implemented and continue to function.
- Results of personal or group studies of solar system or extra-solar system bodies.
- New or ongoing activities involving astronomical instrumentation, construction or improvement.
- Challenges faced by Earth-based observers such as changing interest levels, deteriorating observing conditions brought about by possible global warming, etc.

The preferred format is Microsoft PowerPoint, though 35mm slides are also acceptable. The final presentation should not exceed 20 minutes in length, to be followed by no more than five (5) minutes of questions from the audience. A hard-copy version of the paper should be made available for future web site publication.

Please submit by June 1, 2014, the following:

- Title of the paper being presented.
- A four- or five-sentence abstract of each paper.
- The format in which the presentation will be.
- A 100-word biography and a recent photograph of the presenter for posting on the ALCon 2013 website and inclusion in the printed program guide.

E-mail is the preferred method for contact:

ken .poshed/y@a/po-astronomyorg

If regular mail must be used, address all materials to:

ALCon 2014
c/o Ken Poshedly
1741 Bruckner Court
Snellville, Georgia 30078 USA

All fees and other details are listed in the registration form.

LUNAR CALENDAR

JULY-AUGUST 2014 (UT)

	05	11:59	First Quarter
	06	01:21	Moon-Mars: 0.2° S
	06	06:32	Moon-Spica: 2.2° S
	06	09:50	Moon Ascending Node
	08	02:48	Moo Jul n-Saturn: 0.4° N
	10	17:29	Moon South Dec.: 19° S
	12	11:25	Full Moon
	13	08:27	Moon Perigee: 358300 km
	18	21:21	Moon Descending Node
	19	02:08	Last Quarter
	22	11:56	Moon-Aldebaran: 2° S
	23	15:36	Moon North Dec.: 18.9° N
	24	18:16	Moon-Venus: 4.9° N
	26	22:42	New Moon
	28	03:27	Moon Apogee: 406600 km
Aug	02	11:26	Moon Ascending Node
	02	13:27	Moon-Spica: 2.5° S
	03	10:02	Moon-Mars: 2.4° S
	04	00:50	First Quarter
	04	10:54	Moon-Saturn: 0.1° N
	07	04:26	Moon South Dec.: 18.8° S
	10	17:43	Moon Perigee: 356900 km
	10	18:09	Full Moon
	15	00:18	Moon Descending Node
	17	12:26	Last Quarter
	18	17:46	Moon-Aldebaran: 1.7° S
	19	22:12	Moon North Dec.: 18.8° N
	24	05:48	Moon-Venus: 6.3° N
	24	06:09	Moon Apogee: 406500 km
	25	14:13	New Moon
	29	13:14	Moon Ascending Node
	29	19:08	Moon-Spica: 2.7° S
	31	19:21	Moon-Saturn: 0.4° S
	31	23:43	Moon-Mars: 4.4° S

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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 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
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: ALTAI SCARP

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 2014** edition will be the **Altai Scarp.** 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 Altai Scarp article is August 20, 2014

FUTURE FOCUS ON ARTICLES:

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

Subject	TLO Issue	Deadline
Ghost Craters	**November 2014**	**October 20, 2014**

FOCUS ON: BANDED CRATERS

By Wayne Bailey

Coordinator: Lunar Topographical Studies

Banded craters are seldom noticed by the casual observer of the moon, although they are actually fairly common among the moderate and smaller sized craters. The most obvious example of a banded crater is Aristarchus (fig. 1), although Anaxagorus, Aristillus and Burg are equal or larger in size. Despite the prominence of the radial bands on its interior walls, their earliest mention occurs in 1868. Earlier lunar observers, such as Schroter, Beer, Madler, Lohrmann and Schmidt make no mention of bands in their descriptions. A list of 22 large banded craters is available on the ALPO Banded Craters Program (BCP) website and as Table 1. A more extensive list of nearly 200 examples that are observable with amateur telescopes is also included on the website. Many of the craters on the latter list are small and difficult to observe, or even identify. The smaller lettered craters are often not identified on the common lunar atlases, such as Rukl (2004). In these cases, the IAU Working Group on Planetary Nomenclature's Gazetteer of Planetary Nomenclature can produce labeled images including every name accepted by the IAU. Finding charts with (almost) every banded crater on the ALPO longlist labeled are also available on the ALPO BCP website. Spacecraft images show that banding is common among the smaller craters.

***Figure 1*. ARISTARCHUS.** *Jay Albert, Lake Worth, Florida USA. December 15, 2013 03:26 UT. Seeing 7-8/10 Transparency 3/6. C-11 SCT, NexImage 5.*

Bands are, by definition, albedo features. Most are visible under a wide range of illumination angles, although their contrast is greatest, therefore they are most obvious, around full moon. Bands exhibit several different forms, probably indicating that there are several mechanisms that create them. A classification system exists based on the appearance of the bands. It's described in more detail on the ALPO BCP website and in Dembowski (2007). Here, I'll simply describe some banded craters, without including classifications.

Aristarchus is an example of a crater with bands radiating from the center of the floor. Its bands are obvious on the interior walls. The bright bands have a bluish tint, indicating that they have been exposed relatively recently. Some of the bright and dark bands appear to continue beyond the rim as features in

Table 1: 22 Large Banded Craters

CRATER NAME	DIAMETER (km)	LONGITUDE	LATITUDE
Agatharchides A	10	28.4 W	23
Anaxagoras	51	10.1 W	73.4 N
Aristarchus	40	47.4 W	23.7 N
Aristillus	55	01.2 E	33.9 N
Bessarion	10	37.3 W	14.9 N
Birt	17	08.5 W	22
Bode	19	02.4 W	06.7 N
Brayley	14	36.9 W	20.9 N
Burg	40	28.2 E	45.0 N
Conon	22	02.0E	2
Dawes	18	26.4 E	17.2 N
Kepler	32	38.0 W	08.1 N
Maury	18	39.6 E	37.1 N
Menelaus	27	16.0 E	16.3 N
Messier	10	47.6 E	01
Milichus	13	30.2 W	10.0 N
Nicollet	15	12.5 W	21
Proclus	28	46.8 E	16.1 N
Pytheas	20	20.6 W	20.5 N
Rosse	12	35.0 E	17
Silberschlag	13	12.5 E	06.2 N
Theaetetus	25	06.0 E	37.0 N

the ray structure surrounding the crater (fig. 2). The banded crater Brayley is also visible on this image.

While not as spectacular as Aristarchus, Pytheas exhibits short radial bands, mostly on the upper portion of the inner wall. Notice, though, that one dark band on the northwest wall

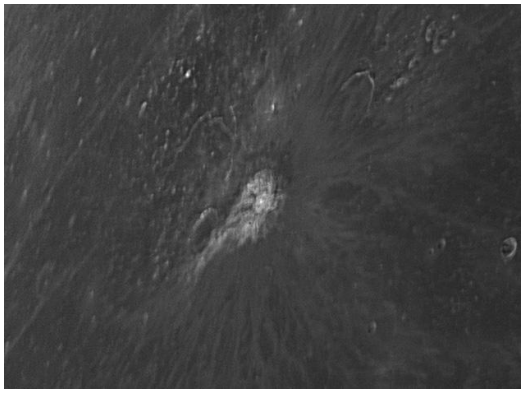
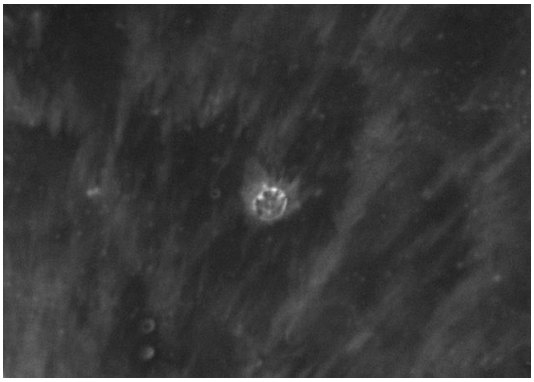


Figure 2. ***Aristarchus Bands & Rays.*** *Wayne Bailey, Sewell, NJ USA. October 31, 2007 07:27 UT. Seeing 4/10, Transparency 5/6, colongitude 153º. C-11 SCT f/20, Skynyx 2-1M, Schuler IR72 filter.*

becomes a short, bright feature outside the rim (fig. 3). Conon (fig. 4) is another example of a crater with short radial bands on its inner wall, but the bands are more difficult to see in this case.



The region near the straight wall (fig. 5) contains three examples of banded craters, Birt, Thebit A and Nicollet. The bands in Nicollet are difficult to discern. Thebit A, perched on the rim of Thebit,

Figure 3. ***Pytheas.*** *Wayne Bailey, Sewell, NJ USA. September 29, 2007 07:27 UT. Seeing 3/10, Transparency 4/6, colongitude 123º. C-11 SCT f/20, Skynyx 2-1M, Schuler IR72 filter.*

shows somewhat more contrast. However, Birt is the star of this region. Almost half of the floor is dark, with a short dark band extending eastward across the floor to a dark arc on the east. Menelaus, on the southern edge of Mare Serenitatis, is another nice example (fig. 6).

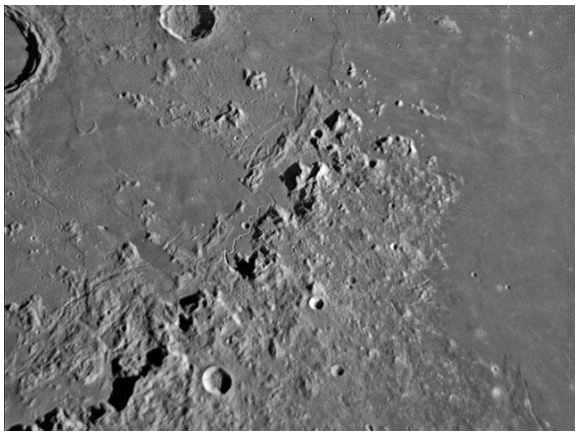


Figure 4. ***Conon.*** *Howard Eskildsen-Ocala, Florida, USA. June 7, 2014 00:05 UT. Seeing 8/10, Transparency 4/6. Mewlon 250, 1.4x Barlow, DMK 41AU02.AS.*

Agatharchides A (fig. 7) is an example bands that radiate from an off-center point. Kies A (fig. 8) has a single band oriented east-west.

What creates bands? Probably more than one process. The association of the band structure with rays in Aristarchus seems to indicate that that they are a result of ray system formation. Most of the radial bands on crater walls can be interpreted as landslides that exposed fresher, brighter material. Debris that slid down the wall and onto the crater floor may account for some of the floor bands. Possibly, small lava flows created some dark features. Whatever their origin, banded craters are an interesting, and somewhat elusive, target for lunar observers and imagers.

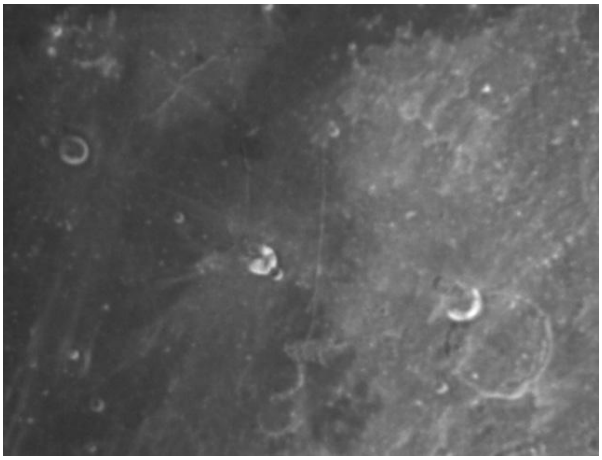


Figure 5. ***Birt, Thebit A & Nicollet.*** *Wayne Bailey, Sewell, NJ USA. September 29, 2007 07:27 UT. Seeing 3/10, Transparency 4/6, colongitude 123º. C-11 SCT f/20, Skynyx 2-1M, Schuler IR72 filter.*

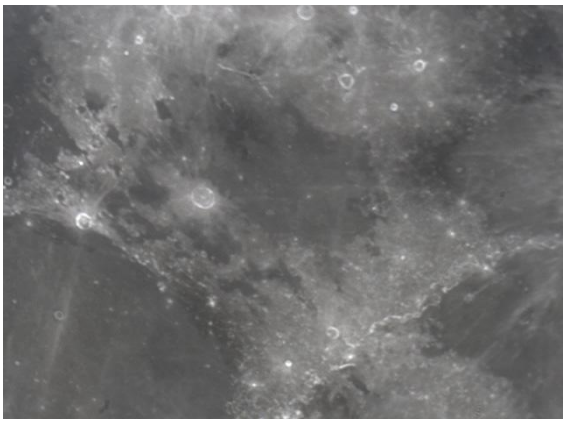


***Figure 6*. Menelaus.** *Maurice Collins-Palmerston North, New Zealand. June 12, 2014 09:58 UT. C-8. North down.*

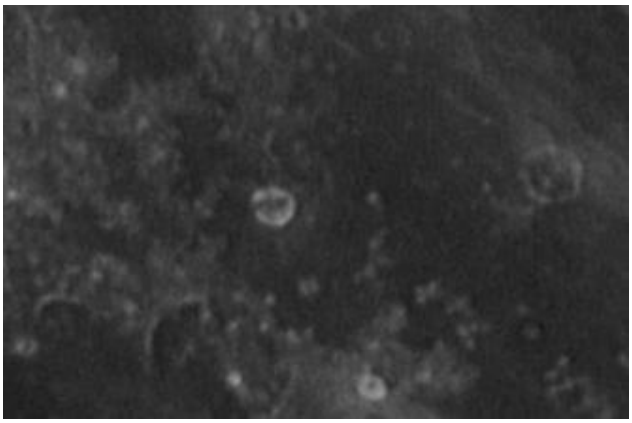


***Figure 7*. Agatharchides A.** *Wayne Bailey, Sewell, NJ USA. February 15, 2006 05:22 UT. Seeing 3/10, Transparency 4/6, colongitude 114º. C-11 SCT f/10, Toucam, Schuler IR72 filter.*

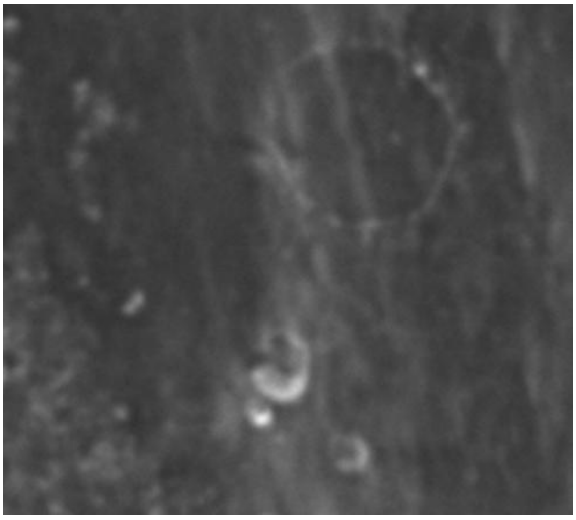


***Figure 8*. Kies A.** *Wayne Bailey, Sewell, NJ USA. August 19, 2008 05:42 UT. Seeing 4/10, Transparency 4/6, colongitude 123º. C-11 SCT f/20, Skynyx 2-1M, Schuler IR72 filter.*

ADDITIONAL READING

ALPO Banded Craters Program website. http://moon.scopesandscapes.com/alpo-bcp.htm.

Bussey, Ben & Paul Spudis. 2004. The Clementine Atlas of the Moon. Cambridge University Press, New York.

Byrne, Charles. 2005. Lunar Orbiter Photographic Atlas of the Near Side of the Moon. Springer-Verlag, London.

Chong, S.M., Albert C.H. Lim, & P.S. Ang. 2002. Photographic Atlas of the Moon. Cambridge University Press, New York.

Chu, Alan, Wolfgang Paech, Mario Wigand & Storm Dunlop. 2012. The Cambridge Photographic Moon Atlas. Cambridge University Press, New York.

Gillis, Jeffrey J. ed. 2004. Digital Lunar Orbiter Photographic Atlas of the Moon.. Lunar & Planetary Institute, Houston. Contribution #1205 (DVD). (http://www.lpi.usra.edu/resources/lunar_orbiter/).

Grego, Peter. 2005. The Moon and How to Observe It. Springer-Verlag, London.

IAU/USGS/NASA. Gazetteer of Planetary Nomenclature. (http://planetarynames.wr.usgs.gov/Page/MOON/target).

North, Gerald. 2000. Observing the Moon, Cambridge University Press, Cambridge.

Rukl, Antonin. 2004. Atlas of the Moon, revised updated edition, ed. Gary Seronik, Sky Publishing Corp., Cambridge.

Schultz, Peter. 1972. Moon Morphology. University of Texas Press, Austin.

Wlasuk, Peter. 2000. Observing the Moon. Springer-Verlag, London.

Wood, Charles. 2003. The Moon: A Personal View. Sky Publishing Corp. Cambridge.

Wood, Charles & Maurice Collins. 2012. 21st Century Atlas of the Moon. Lunar Publishing, UIAI Inc., Wheeling.

The-Moon Wiki. http://the-moon.wikispaces.com/Introduction

PITATUS & HESIODIUS SHADOWS

Howard Eskildsen

Got the telescope out yesterday before sunset just to play with it a little. Clouds were moving in and prospects did not look good for imaging. However, seeing was much better than expected and when I saw Pitatus and the shadows on the floor of Hesiodus, I just had to try. I got about 6 images of various regions before the cirrus thickened to the point that it was time to quit as the sun was just touching the horizon. I was surprised by the results in spite of the conditions. Also I have found the best magnification combination for the Mewlon by using a 2X Barlow in the diagonal and a 0.72X focal reducer on the imager. I assume the combination is around 1.4X and I like the results.

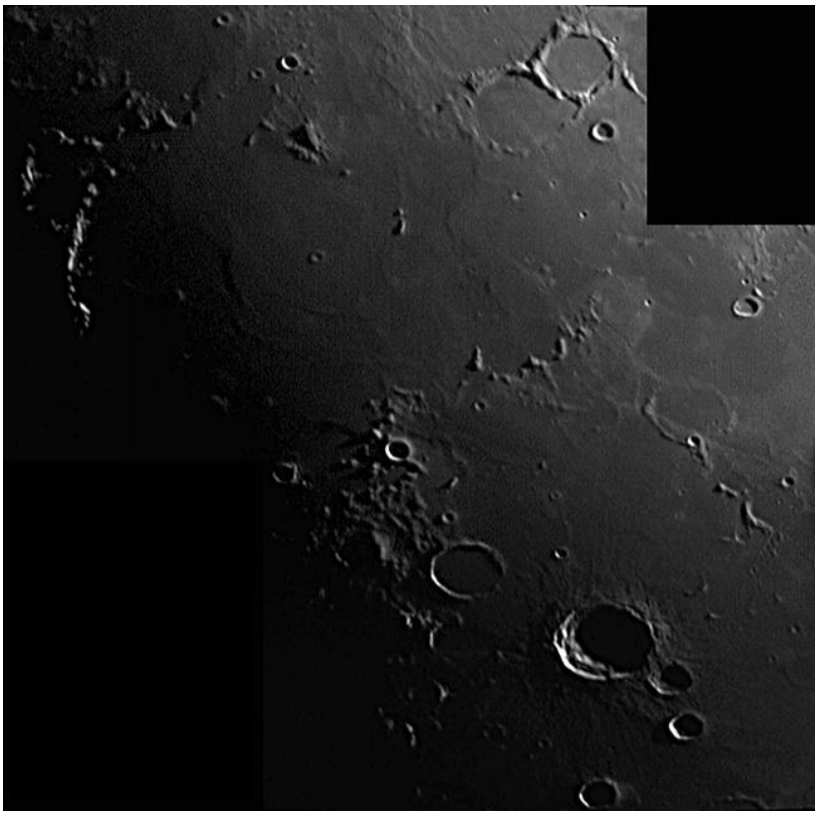
I was first drawn to Pitatus and Hesiodus by the late Jose Olivares. One evening as we were winding down an observing session at his place, he told me that there was just one more thing that I needed to see before I left. Through his folded 10" refractor the curious "V" cone of light traced its way across the floor or Hesiodus, pointed towards the rising sun. We discussed possible reasons for this phenomenon, but he concluded that it was not fully explained.

On this image it appears as a gap between shadows from a breach in the western wall of Pitatus, with two small craters within the light-V and two peaks of rubble emerging from the shadows east of the apex of the "V." But why would there be a breach in the western wall of Pitatus in the first place. On this image there does not appear to be a crater chain or single impact to explain it.

I have often wondered about floor-fractured craters. Obviously their floors were elevated, but most likely their rims were also elevated from their original position by magma intrusion below. They were just not elevated as much as the floor due to isostatic differences caused by the mass of the rims. Could this gap in the western wall of Pitatus be a graben created by asymmetric uplift of the crater rim? After looking at detailed images on LROC QuickMap, I think it is very possible. I just wish I could discuss it with Jose.

GOOD MORNING BULLIALDUS!

Richard Hill



Here that beautifully formed crater is catching the first rays of sunlight. But don't let that fabulous crater with its great ejecta features surrounding it draw too much of your attention. There are many other things to notice.

Spend a moment with the Montes Riphaeus in the upper left corner, sparkling in the early sunlight. At roughly the focus of the curve formed by these mountains sits the crater Kuiper in Mare Cognitum. Further to the right is the "ghost crater" Bonpland and adjacent to that Parry. Notice the wonderful linear Rimae Parry crossing the walls of that crater.

Above Bullialdus is another "ghost crater" Lubiniezky. Further to the right are two more of the selenographic apparitions, Opelt and below Gould. The Rimae Opelt can be seen to the upper left of the crater.

Three images made up this montage. Each was a stack of 300 from 1500 frames done with Registax6 and final processing done with GIMP and IrfanView.

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

JAY ALBERT – LAKE WORTH, FLORIDA, USA. Digital image of Aristarchus.

MAURICE COLLINS - PALMERSTON NORTH, NEW ZEALAND. Digital images of 14, 15 & 16 day Moon, Aristarchus(3), Drygalski, Hausen, Humboldt, Mare Orientale, Mare Vaporum, Petavius, & Yangel.

HOWARD ESKILDSEN - OCALA, FLORIDA, USA. Digital images of Arzachel, Conon, Hadley Rille, Pitatus & Alpine Valley.

FILOTHODORUS, ALEXANDROS.- SAMOS, GREECE. Digital image of Eratosthenes.

ROBERT HAYS - WORTH, ILLINOIS, USA. Drawings of J. Herschel F & Plato H.

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

PAOLO LAZZAROTTI – MASSA, ITALY. Digital image of Sinus Iridum.

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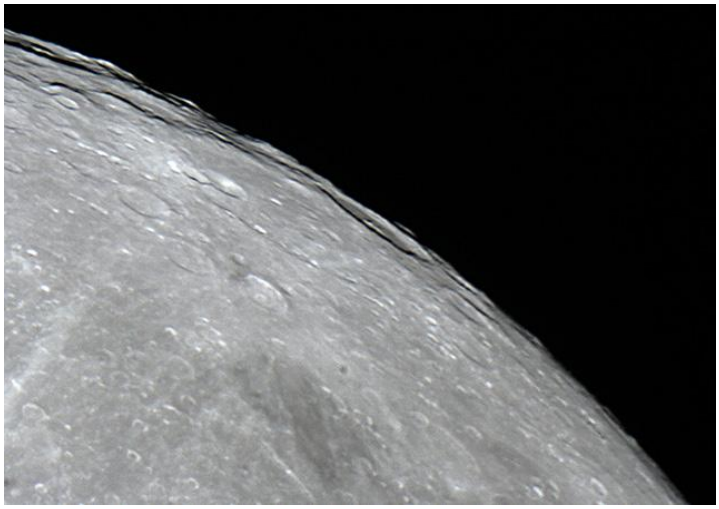
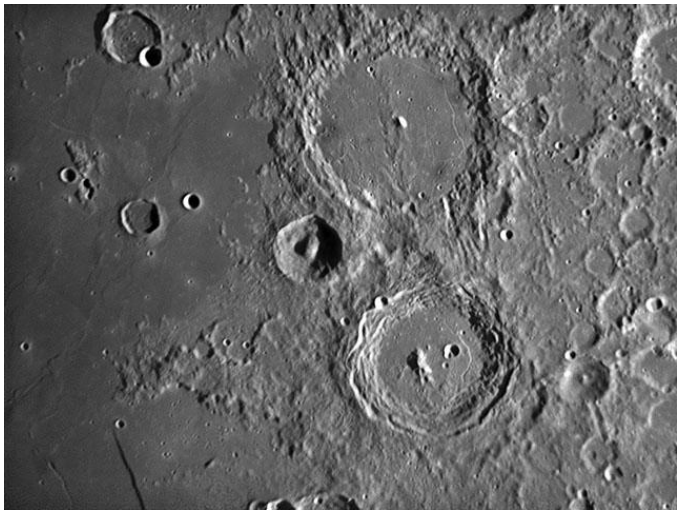
RECENT TOPOGRAPHICAL OBSERVATIONS



HAUSEN - Maurice Collins-Palmerston North, New Zealand. June 13, 2014 08:11 UT. C-8. North down.

RECENT TOPOGRAPHICAL OBSERVATIONS

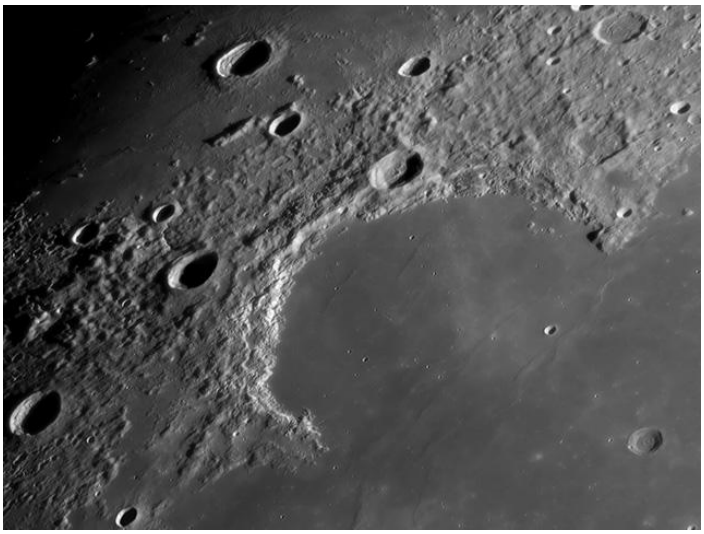


ARZACHEL - Howard Eskildsen-Ocala, Florida, USA. June 6, 2014 23:59 UT. Seeing 7/10, Transparency 4/6. Mewlon 250, 1.4x Barlow, DMK 41AU02.AS.

In this image Alphonsus (upper large crater) and Arzachel (lower large crater) dominate the right center of the frame, and smaller Alpetragius lies between and to the left of the two larger craters. While Alphonsus and Arzachel are notable for many features including rilles, craterlets and pyroclastics (dark areas in Alphonsus), what really stands out is the proportionally huge central peak of Alpetragius. If central peaks were instead called noses, Alpetragius would be the Jimmy Durante of the lunar craters while Alphonsus and Arzachel would each be shamed by their sniveling schnozzolas.

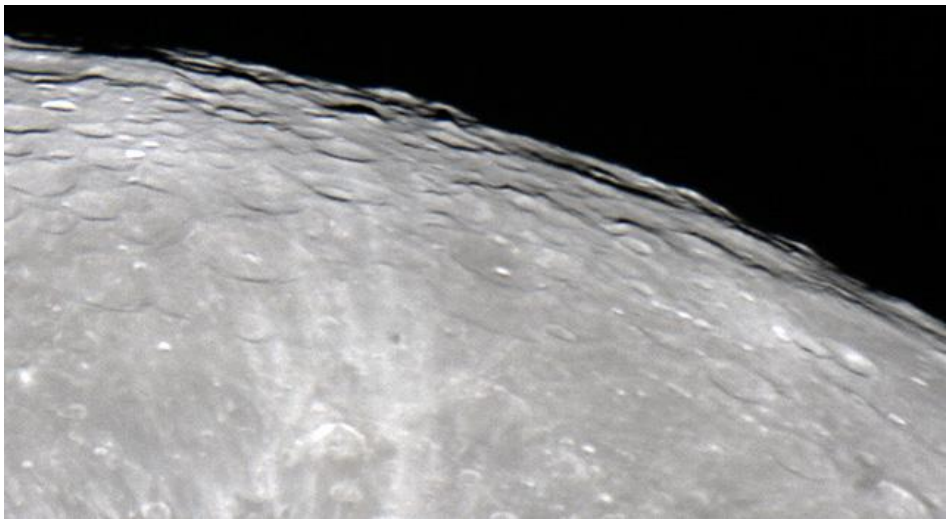
Why the difference? I don't know. I have a few ideas, but so far none of them rise to the level of a hypothesis, so I will keep those ideas to myself--for now...a-dink, a-dink, a-dinka-doo.

ERATOSTHENES – Alexandros Filothodoros-Samos, Greece. June 6, 2014 19:55 UT. 14" SCT, f/10, DMK21AU618, IR cut filter.

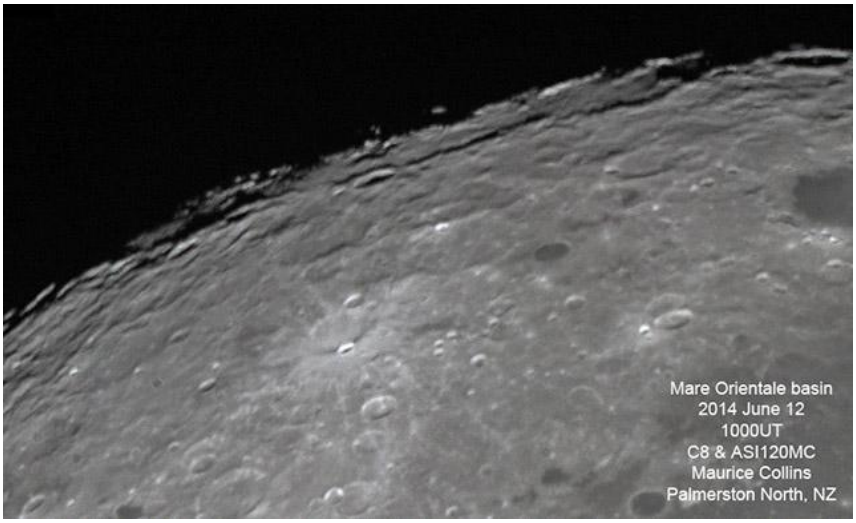


SINUS IRIDUM– Paolo Lazzarotti – Maaciano (GR), Tuscany, Italy. February 14, 2011 20:06-20:16 UT. Seeing 5-7/10, Transparency 4/6. Gladius XLI 400mm Cassegrain, 2x barlow. Experimental Sony ICX285 camera, Baader R filter.
http://www.lazzarotti-hires.com/2014/05/maestoso-sinus-iridum.html?lan=english

ADDITIONAL TOPOGRAPHICAL OBSERVATIONS



DRYGALSKI- Maurice Collins-Palmerston North, New Zealand. June 13, 2014 08:26 UT. See A-III. C-8 SCT. North down.



MARE ORIENTALE - Maurice Collins-Palmerston North, New Zealand.June 12, 2014 10:00 UT. C-8 SCT. ASI120MC. North down.

CONON - Howard Eskildsen-Ocala, Florida, USA. June 7, 2014 00:02 UT. Seeing 8/10, Transparency 4/6. Mewlon 250, 1.4x Barlow, DMK 41AU02.AS.

LUNAR TRANSIENT PHENOMENA

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

LTP NEWSLETTER – JULY 2014

Dr. Anthony Cook - Coordinator

Observations for May were received directly, or indirectly (forwarded onto me), from the following observers: Jay Albert (Lake Worth, FL, USA - ALPO) observed: Aristarchus, Aristillus, Linne, Manillius, Mons Pico, Plato, Proclus, Ross D, and Torricelli B. Alexandra Amorim (REA, Brazil) videoed Earthshine. Gary Beal (NZ Astronomers, New Zealand) imaged several features. Maurice Collins (New Zealand) imaged Aristarchus, Copernicus, Langrenus, Mare Crisium, Petavius, Plato and several other features. Marie Cook (Mundesley, UK - BAA) observed Alphonsus and Plato. Tony Cook (Aberystwyth University, UK) videoed Earthshine. Rik Hill (Tucson, AZ – ALPO) imaged Alphonsus, Hainzel, and Rimae Hippalus. Robert Reeves (San Antonio, TX, USA - ALPO) imaged several features. Franco Taccogna (Italy - UAI) imaged Alphonsus, Aristarchus, Copernicus, Gassendi, Hyginus, Peirce, Plato, Proclus, and Swift. Can I please request that everyone who submits observations, includes not just the date but also the UT. Most of our observers do this, but a very few are failing to do this, which makes the observations very difficult to use.

News: I was contacted by Thomas Bianchini, the new LTP coordinator of the Lunar Section of UAI – we will be sending them news of any LTP alerts, and sharing observations.

A couple of my 3rd year BSc project students for 2014/2015, Rachael King and Gavin Tulley, have started their project early, namely analysis of multiple observations of impact flashes. They are organizing a new temporary observing group within the BAA Lunar Section with the intention of running for about a year. If British observers (or anybody on a similar longitude to the British Isles say +/-30°), with low light sensitive CCTV/web cameras capable of recording down to magnitude 9 or 10 in real time, then please get in contact with Rachael as soon as possible. This is a fascinating project and I hope those of you taking part will find it as exciting as I did when I observed my first impact flash back in 2001. You can also do occultation observing at the same time and support the BAA Occultation group too.

Many of the highest weight LTP reports in the catalogs, are spectroscopic observations where the astronomers concerned have found the depth of solar absorption bands in the reflected spectra have sometimes become shallower than expected. Several refereed journal papers have been published implying that some form of luminescence on the Moon was present, hence shallowing out these absorption bands. For example in 1967 McCord found that presumed luminescence in absorption bands varied by as much as 2% with time and place on the lunar surface. A study done by Chanin in 1982, using late 1960's era observations, implied luminescence of up to 40%, mostly at lunar dawn, and weakening towards lunar sunset. However studies of lunar rocks returned by Apollo showed that luminescence efficiencies were significantly a lot less than 1%. I was therefore very interested to come across, by chance, a paper by Potter and Medell, published in 1984 in the Journal of Geophysical Research Vol. 89, Supplement, pp C240-C244, where they deduce that the amount of shallowing of solar absorption lines seems to be related to the inverse of the line width – so the thinner the absorption line, the more infilling. They suggest inelastic scattering of sunlight, perhaps due to photon-phonon scattering which cause the wavelengths of the scattered photons to shift slightly, thus shallowing out absorption lines in the reflected solar spectra. A later paper by Clarke and Basurah, published in Icarus, Vol 88, p396-406, describes their own spectropolarimetry observations – but leaves some questions unanswered over whether measurable luminescence has been detected on the Moon, or whether they are detecting some kind of Rayleigh-Broullin scattering at the surface.

LTP Reports: May has been an exceedingly quiet month with no LTP reported. There is nothing unusual in this – we have plenty of routine observations coming in – it's just in the nature of LTP that they are almost certainly exceedingly rare!

However I am grateful to Christopher Garrison for telling me of two previously uncataloged LTPs seen from Madras in India in 1837:

> 1837 Mar 10 UT 13:46 (19:07 local Madras time) T.G. Taylor (Madras Observatory, India) whilst observing a 9th magnitude star being occulted, noticed a 6th magnitude nebulous spot where Aristarchus should be. He had never seen anything quite as bright as this on previous occasions. However he did see something similar the next day on 1837 Mar 11 UT 15:27 (20:48 local Madras time). ALPO/BAA weight=2 for both observations.

I am assigning a weight of 2 to these for now as separate LTP – though it may be the continuation of the same event. A possible explanation is that this is simply exceedingly bright Earthshine on these two days, and Aristarchus, which was perhaps not normally visible through his refractor, brightened enough to be seen above his detection threshold. Though he makes no mention of other features being seen, which makes it an interesting observation. If anybody is familiar with other observations of Earthshine from around these dates, then please let me know.

Routine Reports: Here are a selection of reports received for May that can help to re-assess some past LTP observations. Again I would like especially to thank Franco Taccogna (UAI) for sending observations in of many lunar features in the form of image sequences. As space is limited I can publish only one of these.

Linne: On 2014 May 6 UT 02:00 Jay Albert (ALPO) observed this crater under repeat illumination conditions to within +/-0.5° to the report described below.

> *Linne 1867 Aug 06 UT 21:00? Observed by Buckingham (England?) "Crater in darkness, he saw a "rising oval spot". Other obs. saw it as a triang. Bold black spot pointing to Earth, slowly diffused white & drift of white on slope of pyramid. (indep. confirmation?)" NASA catalog weight=5. NASA catalog ID #155. ALPO/BAA weight=3*

Jay was using a Celestron 11" with seeing 8 of 10 and transparency permitting 3rd magnitude stars to be seen. He comments that: *Linne appeared as a bright, white spot in a clearing surrounded by wrinkle ridges at the edge of the terminator. I did not see a "rising oval spot" or a "bold black spot pointing to Earth". I did see a somewhat triangular shadow, possibly a depression, just 5 to 10 kilometers S of Linne' which may relate to one of the features described in the LTP. I used 400x from 02:00 to 02:30UT, after which I attempted to image some features on the Moon. Unfortunately, by the time I got my Neximage 5 camera and my wife's laptop set up, the seeing was becoming degraded.* Please note that the time given in the Cameron catalog for the Buckingham observation is estimated. Although Linne is notorious for being mistaken as an area for change due to earlier map errors, the 1867 description differs significantly from Jay's observation, so I shall keep its weight at 3 – though the *"triang. Bold black spot"* has some similarities as Jay points out. If any of our readers can lay their hands on details of sketches from the original observers, I would be interested to see these.

Pytheas: On 2014 May 09 UT 06:26 Maurice Collins produced a Copernicus area mosaic, and this just happened to contain the crater Pytheas (see Fig 1) at a similar illumination to the following LTP report from 1982:

> *On 1982 Jul 01 at UT 02:23-02:58 Robotham (Springfield, ON, Canada, seeing=II) found that the west rim of Pytheas crater was a very bright yellow-white, indeed brighter than Proclus. At lower magnifications, Pytheas was one of the brightest spots on the Moon. The Cameron 2006 catalog ID=173 and weight=2. ALPO/BAA weight=2.*

Whilst it is not possible to check the color of bright rim of Pytheas, because it is nearly saturated in this image, it is possible to get an idea of how bright the crater is, by doing a brightness threshold on the

mosaic from which Fig 1. is from (not shown here). In doing so, it is obvious that there are several other bright features on the Moon, possibly rivaling Pytheas in brightness. Having found a copy of the original report though, it is noted that Rob Robotham regarded themselves as a beginner and was also using a relatively small 8.3 cm refractor. Therefore I shall leave the ALPO/BAA weight at 2 for now.

Figure 1. The Copernicus area as imaged by Maurice Collins on 2014 May 09 UT 06:26. The crater Pytheas is just left of centre, near the top edge. The image has been color saturation enhanced. North is towards the top.

Plato: On 2014 May 9 UT two observers, Marie Cook (BAA) and Franco Taccogna (UAI) recorded the appearance of the Moon under the same illumination conditions to a LTP alert instigated by Patrick Moore in 1981 Jun 12. This is a particularly important LTP as it ranks at a weight of 5 in the 2006 Cameron catalog, and at a weight of 4 in the ALPO/BAA database – in other words alleged confirmation by two or more observers. What follows below, in italics, is a minute by minute account of what was reported back in 1981, but this has been interspersed with non-italic text descriptions, or digital images from the present day era for comparison. The colongitudes, and altitudes of the Moon above the horizon, have been included in brackets.

(Col. = 35.09°-35.20°, Alt_{moon} = 35°-34°) : 2014 May 09 UT 21:17-21:30 Marie Cook was using a 9 cm Questar telescope, the seeing was III and transparency moderate-good. She comments that concerning the LTP seen by Patrick Moore (see immediately below): that the southern wall and floor were clear and sharp. No vertical streaks were seen crossing the floor in white, red or blue light. No translucent haze seen on the floor. No milky/misty area seen either. No floor detail (craterlets seen) but by 21:30UT the Moon was getting close to tree branches, so observations ceased.

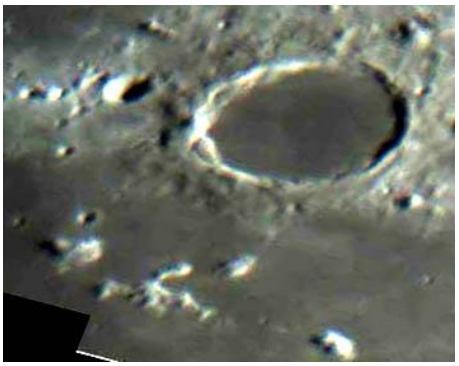


Figure 2. *(Col. = 35.26°, Alt_{moon} = 36°)* :2014 May 09 UT 21:36 taken by Franco Taccogna (UAI).

(Col. = 35.26°, Alt$_{moon}$ = 32°) *: 1981 Jun 12 UT 21:10 Patrick Moore finds S. Wall and the S. Wall exterior to be indistinct. Also the floor showed no detail – not even the central craterlet. Everywhere else was sharp. 38cm reflector, x360, Seeing III. Plato would have resembled Fig 2 at the start of this session.*

(Col. = 35.26°-35.38°, Alt$_{moon}$ = 32°) *: 1981 Jun 12 UT 21:10-21:25 Hedley Robinson observed Plato at some point during this time span, amongst other features. He found the SW floor patch clearer in red light than in blue, but nothing else unusual. 26cm reflector, x200, seeing II-III, moderate haze. He learnt about Patrick Moore's LTP, later.*

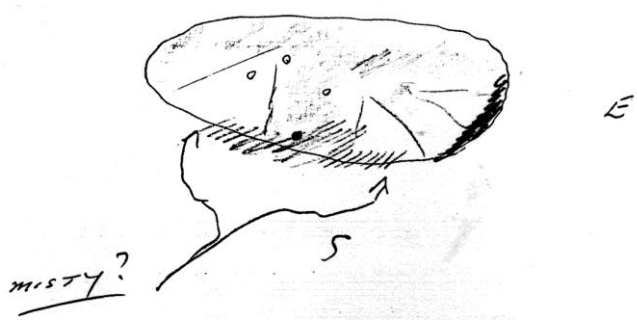


Figure 3. 1981 Jun 12 A sketch from 1981 Jun 12 made, sometime between 21:15-21:51UT, by Peter Foley.

(Col. = 35.30°, Alt$_{moon}$ = 31°) *: 1981 Jun 12 UT 21:15 Peter Foley sees an obscuration across part of the S. Rim, and "in-roading" onto the floor – it was almost like looking at the S. Wall through mist. 28cm reflector, seeing II initially.* Note that if you look carefully in Fig 4, you can see the two triangular lighter patches on the S. floor of Plato, coming off the southern rim, as shown in Peter Foley's sketch in Fig. 3, though the craterlets and hazy misty S. rim are not so evident.

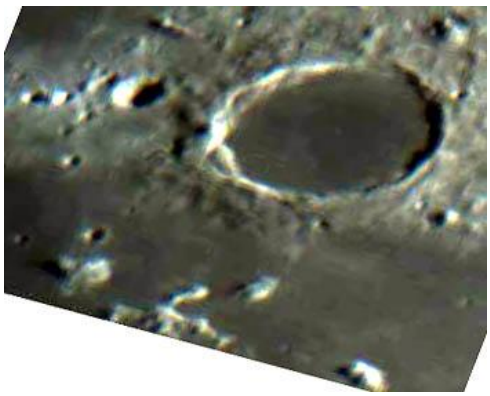


Figure 4. ***(Col. = 35.31°, Alt$_{moon}$ = 35°)*** *:* 2014 May 09 UT 21:42 taken by Franco Taccogna (UAI).

(Col. = 35.34°, Alt$_{moon}$ = 30°) *: 1981 Jun 12 UT 21:20 Martin Mobberley (14" reflector, seeing II-III) only saw one white spot, almost dead central on the floor, whereas he was expecting to see other craterlets too. The floor shading appeared less distinct than normal. Did not consider either of these as LTP due to the Moon's low altitude, and only "reasonable grade" transparency he was experiencing.*

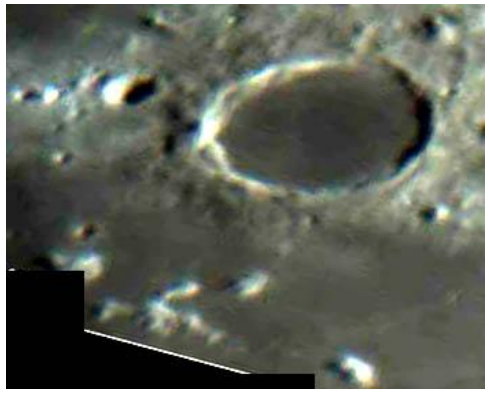


Figure 5. ***(Col. = 35.37°, Alt$_{moon}$ = 34)*** **:** 2014 May 09 UT 21:49 taken by Franco Taccogna (UAI).

(Col. = 35.34°, Alt$_{moon}$ = 30°) *: 1981 Jun 12 UT 21:20 M. Mobberley, after receiving a telephone alert, undertook photography of the area on color film.*

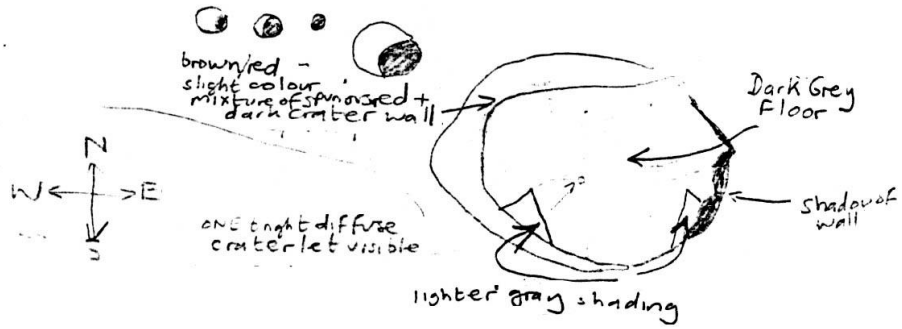


Figure 6. ***(Col. = 35.43°, Alt$_{moon}$ = 29°)*** : 1981 Jun 12 UT 21:30 Sketch by Martin Mobberley – re-orientated with labels rotated so that north was towards the top.

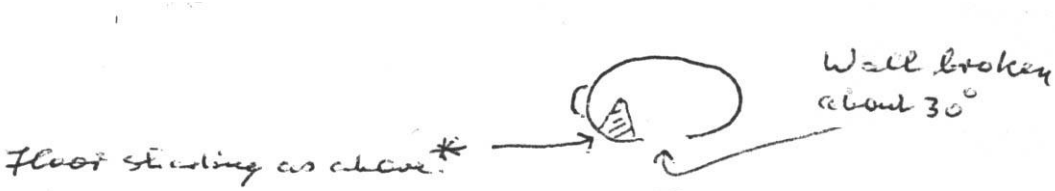


Figure 7. Hedley Robinson's sketch made on 1981 Jun 12 UT 21:41. This has been re-orientated with north towards the top,

(Col. = 35.52°, Alt$_{moon}$ = 31°) *: 1981 Jun 12 UT 21:41 Hedley Robinson (following a LTP alert) re-examined Plato and found that there was no difference between red and blue filters in appearance. However the southern rim was indistinct and apparently broken in white, yellow and green light. His sketch can be seen in Fig 7.*

(Col. = 35.53°, Alt$_{moon}$ = 30°) *: 1981 Jun 12 UT 21:42 Patrick Moore still saw an obscuration, but it was less marked. Seeing still III, but some snatches of II. Moon blink revealed no color.*

(Col. = 35.54°, Alt$_{moon}$ = 30°) *: 1981 Jun 12 UT 21:44 Patrick Moore reports only a trace of obscuration left, and he could see detail through it.*

(Col. = 35.58°, Alt$_{moon}$ = 30°) *: 1981 Jun 12 UT 21:48 Patrick Moore notes seeing still at III, but had an impression (not 100% certain) of vertical streaks*

across floor of Plato, coming from the obscuration area. These were perhaps easier to see in the red, rather than blue filter. Also the floor of Plato had some patchiness to it.

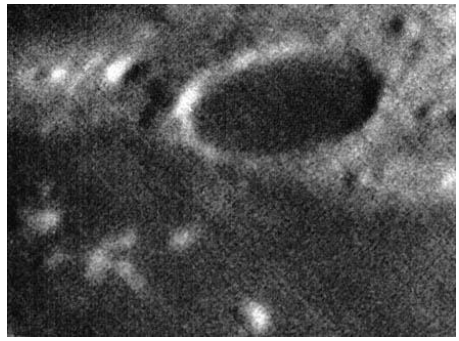


Figure 8. 1981 Jun 12 UT 21:50 Photograph by Martin Mobberley with north towards the top.

(Col. = 35.60, Alt$_{moon}$ = 28°) *: 1981 Jun 12 UT 21:50 Martin Mobberley took some color photography – see poor quality monochrome merge of 4 photocopies of the original photos that remain in the BAA Lunar Section Archive in Fig 8. Patrick Moore (Alt$_{moon}$ = 30°) reported that the crater was almost back to normal, but the vertical linear streaks were still suspected and there was still some patchiness to the floor. Gerald North (Alt$_{moon}$ = 30°) observed that the whole of the NW wall was reddish, more so than from atmospheric spectral dispersion elsewhere. The floor was quite dark. 46cm reflector, X86, seeing IV, Transparency fair. Peter Foley (Alt$_{moon}$ = 29°) resumed observing after issuing a telephone alert. The obscuration had diminished in effect.*

(Col. = 35.60°, Alt$_{moon}$ = 29°) *: 1981 Jun 12 UT 21:51 Peter Foley commented that there was variability apparent over much of the floor with 4 major craterlets popping in and out of visibility with seeing, and the craterlet lying to the west was not seen at any time. This visibility of floor detail variability continued until observing ceased at 23:10.*

(Col. = 35.62°, Alt$_{moon}$ = 30°) *: 1981 Jun 12 UT 21:53 Patrick Moore notes that the S. Wall was still slightly obscure, but hardly noticeable in the seeing, which had deteriorated.*

(Col. = 35.63, Alt$_{moon}$ = 30°) *: 1981 Jun 12 UT 21:54 Gerald North, now using x144 noted that the NW section of the wall was a very strong red/orange as well as a loss of sharpness in wall detail. Indeed an orange transparent (translucent) haze extended across nearly half of the floor of the crater from the NW ridge. He could see 4 craterlets on the floor of Plato, though they varied in visibility over time, possibly due to the seeing.*

(Col. = 35.68°, Alt$_{moon}$ = 29°) *: 1981 Jun 12 UT 22:00 Gerald North used x207 but could not see much color at this power, but the NW wall was still hazy, but elsewhere was sharp e.g. Mons Piton/Pico. Floor close to the NW rim was milky in appearance. Hedley Robinson (Alt$_{moon}$ = 30°) sees the break in the southern rim to be less distinct.*

(Col. = 35.71°, Alt$_{moon}$ = 29°) *: 1981 Jun 12 UT 22:03 Gerald North noted that the effect was less well seen now, but the whole of the floor of Plato was a green-brown color with some mistiness on the floor nearest to the NW rim. Only atmospheric spectral dispersion seen at this x207 power.*

(Col. = 35.76°-36.42°, Alt$_{moon}$ = 27°-20°) *: 1981 Jun 12 UT 22:10-23:27 Martin Mobberley, photographed the area. Seeing IV-V. All his photographs reveal shading on the crater floor, and the southern rim to be more out-of focus than the rest of the crater walls.*

(Col. = 35.79°, Alt$_{moon}$ = 28°) *: 1981 Jun 12 UT 22:13 Gerald North, again still using x207, but now with a green filter, noted that the crater floor was surprisingly dark compared to exterior mare areas. Also with this filter the NW was again looking blurred, but so too was the N wall. Elsewhere the crater rim was*

sharp. Occasionally the floor craterlets could be seen. Hedley Robinson (Alt$_{moon}$ = 29°) noted that the southern rim break comes and goes with variable seeing.

(Col. = 35.82°, Alt$_{moon}$ = 29°) *: 1981 Jun 12 UT 22:17 Hedley Robinson reported that Plato looked normal in green light, and with the apodizing screen to steady the image.*

(Col. = 35.82°, Alt$_{moon}$ = 28°) *: 1981 Jun 12 UT 22:18 Gerald North noted that the NW wall was more sharper, but the N wall was still blurred. Again floor craterlets were intermittently seen. Hedley Robinson (Alt 29°) noted that Plato looked normal in white, yellow, green and red light, but still looked slightly hazy in blue.*

(Col. = 35.85°, Alt$_{moon}$ = 27°) *: 1981 Jun 12 UT 22:20 Gerald North, still at x207, but switching to a yellow filter – now the floor of Plato was as bright as Mare Imbrium – a clear color difference between yellow and green light. The NW rim was similarly blurred as through the green filter, and particularly the B wall. A large ~20km diameter light patch was visible just south of the centre of Plato.*

(Col. = 35.87° Alt$_{moon}$ = 29°) *: 1981 Jun 12 UT 22:22 Hedley Robinson noted that Plato looked normal in all filters now, without the apodizing screen.*

(Col. = 35.91°, Alt$_{moon}$ = 27°) *: 1981 Jun 12 UT 22:27 Gerald North – still at x207 and using a yellow filter, noted that the floor craterlets were becoming easier to see and there was generally less blurring elsewhere in the crater, despite a worsening in the seeing. Plato's floor was looking normal and was now dark in the yellow filter compared to Mare Imbrium.*

(Col. = 35.94°, Alt$_{moon}$ = 27°) *: 1981 Jun 12 UT 22:31 Gerald North – now using white light, but still at x207 – the crater now looked perfectly normal. However there was significant atmospheric spectral dispersion present: strong red to the North of Plato and pale blue to the South – but less in extent than the color seen earlier in the evening and different in nature. Only slight atmospheric spectral dispersion seen elsewhere e.g. the Montes Jura (near the terminator).*

(Col. = 36.04°, Alt$_{moon}$ = 26°) *: 1981 Jun 12 UT 22:42 Gerald North – x144 all appeared normal in Plato, despite an increase in turbulence. Strong atmospheric spectral dispersion in Plato – but little noticed elsewhere.*

(Col. 36.13°, Alt$_{moon}$ = 25°) *: 1981 Jun 12 UT 22:53 Patrick Moore, after being clouded out, noted that the crater looked completely normal. Then he was clouded out again.*

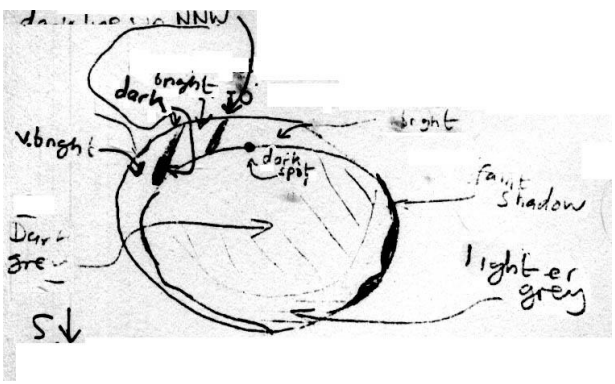


Figure 9. 1981 Jun 12 UT 23:35 sketch by M. Mobberley with labels re-orientated and with north towards the top.

(Col. = 36.42°-36.71°, Alt 20°-16°) *: 1981 Jun 12 UT 23:27-00:02 Martin Mobberley (seeing IV-V, x280) resumed visual observing. He detected atmospheric spectral dispersion in small bright craters, especially on the eastern half of the Moon e.g. blue to the north and yellow to the south. The shading inside Plato appeared different, and there was no sign of the central white spot, however transparency and seeing were now poor. He made a sketch at 23:35 (Col. 36.48° Alt$_{moon}$ = 19°) as can be seen in Fig 9.*

OK to sum up, we have four observers overlapping during this 1981 LTP, and two repeat illumination observations from May 2014, albeit at a different libration. The original LTP description by Patrick Moore refers to the southern rim being indistinct, but Gerald North, Martin Mobberley, and Hedley Robinson, fail to pick this effect up initially, though, Hedley does see it from 21:41UT onwards, after being told that there is a LTP somewhere in Plato. Peter Foley does see the effect though. There is a strong likelihood that the obscured southern rim effect could be a combination of the natural appearance of this areas (See Figs 2, 4, and 5) and seeing effects, though it is slightly odd that Patrick Moore noticed the effect fading as the Moon attained a lower altitude and the seeing worsened. Also Peter Foley must have had sufficiently good seeing to see 4 craterlets, but also noted the S. rim to be obscure. Earlier 2014 repeat illumination images of Plato by Franco Taccogna (not shown here) are sharper than in Figs. 2, 4, & 5, and were taken at a higher altitude, thus showing that altitude and possibly seeing may indeed affect the sharpness of the S. rim, and indeed the visibility of the 4 craterlets. Color is another aspect of what was reported, with Gerald seeing orange color on the NW rim, and inside, Martin seeing slight brown/red on the NW rim (he considered this to be atmospheric spectral dispersion or "spurious color" – see Fig 6), Hedley seeing a SW floor patch, brighter in red light than in blue (but the effect disappeared by 21:41UT), and Patrick Moore seeing tentative vertical streaks across the floor in red light as the S. rim obscuration effect was fading. The third aspect was the visibility of craters on the floor. Peter Foley and Gerald North appeared to be able to see four craterlets at times (confirmed in some of the 2014 repeat illumination images), Martin Mobberley was only able to make out the central one at times, and Patrick Moore saw none. The final aspect of this LTP is the floor darkness. Gerald North noted some variability over time, in particular the floor being lighter than Mare Imbrium at 22:20UT, but darker at the other times – no other observers comment on the floor being brighter, just darker.

This is a very confusing set of evidence for a Cameron 2006 catalog LTP of weight 5, and an ALPO/BAA weight of 4, both of which imply significant confirmation of what was seen. I am sure that these observers were just reporting what they were seeing, but even allowing for different seeing conditions experienced by the observers, and different color sensitivity, I fail to see why there was not more corroboration of the reported effects. As many of these largely non-confirmed effects changed over time, this still merits being a LTP, but the weight must be reduced from confirmation level of 4 to a more realistic 3.

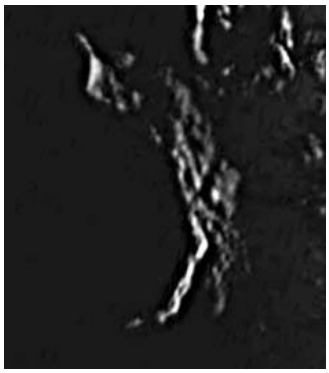


Figure 10. 2014 May 10 UT 02:14 Section of an image mosaic, taken by Rik Hill, showing the crater Gassendi emerging at local sunrise. Orientated with north towards the top.

Gassendi: On 2014 May 10 UT02:09 Rik Hill (ALPO) imaged the Rimae Hippalus area (subsection shown in Fig 10) within just the outer limit (+/-0.5°) to the same illumination to a LTP observed in Gassendi back in 1966:

Gassendi 1966 Apr 30 UT 21:30-23:28 Observed by Sartory, Ringsdore (England, 8.5" reflector, S=E), Moore, Moseley (Armagh, Northern Ireland, 10" refractor, S=VG), Coralitos Observatory (Organ Pass, NM, USA, 24" reflector, Moon Blink) "English moon blink system detected red spots with vis. confirm. Ringsdore says no color but saw obscuration. (LRL 60-in photos showed nothing unusual by my casual inspection).

Indep. confirm. (even E. wall was in dark). Corralitos did not confirm by MB." The BAA Lunar Section Circular (from May 1966) goes into a bit more detail: Sartory detected red (using a Moon Blink device - so supposedly impervious to the effects of atmospheric spectral dispersion) on the SE outer wall, where a ridge runs into this section of the crater, between 21:30 and 21:55 UT - he then left the scope to telephone an alert. There was also an obscuration of detail here, especially on the ridge - at its strongest at the intersection with the wall. An additional blink was seen at two places in the flat rectangular enclosure to the north. Patrick Moore and Terrence Moseley started observing the area and at 22:18 saw the reddish patch on the outer SE wall of Gassendi, though it became difficult to see by 22:25, and was gone by 22:31 - though may have re-appeared faintly at 22:32 and was gone completely by 22:34. Sartory overlapped observing slightly and saw the patch faintly at 22:27, but had lost it completely by 22:29UT. Moore and Moseley failed to detect the other red patch to the north, but it may have faded by that time, though they did both see a red patch here much later over the E wall from 23:21-23:27. Phil Ringsdore was able to observe the crater from 22:30 onwards, but was unable to detect any color, though he suspected obscuration on the SE rim - though this had gone by 22:50. He did detect later though a misty patch further to the south on the rim from 23:20-23:28UT, but nothing else was seen and he finished observing at 23:50. Note that only Sartory was equipped with a Moon Blink device, the other UK observers studied the Moon in white light. NASA catalog weight=5. NASA catalog ID #931. ALPO/BAA weight=3.

The original observation in 1966 spanned about two hours, and Rik's image corresponds to what the crater would have looked like at approximately 22:30 UT on 1966 Apr 30. Although Rik's image was not in color, I have added simulated atmospheric spectral dispersion (not shown here), and can get red on the SE outer edge of Gassendi – however this will not have shown up in the Red/Blue Moon Blink device used at the time. Also the altitude of the Moon from Sartory's observing site was quite high: 46°-36°, so effects from our atmosphere should not have contributed much to the color anyway. Incidentally the reason why the Corralitos team failed to detect a blink here was simply because the Moon did not rise until 22:00 from New Mexico, and it was daylight anyway – they obviously did check the Gassendi area, but it must have been well after LTP had finished. Incidentally this LTP is covered quite favourably in Martin Mobberley's book: *"It Came from Outer Space Wearing an RAF Blazer!"* – in the sense that it is one of the few LTPs that is not criticised in this book - though Martin does say that many years later Patrick would comment that the color he saw was very subtle. In view of the good seeing conditions, and high altitude of the Moon, and better agreement between observers of what was seen (albeit on the tail end of the event) I am increasing the weight of this LTP from a 3 to a 4. If anybody else knows about this event from the 1960's then please let me know.

Suggested Features to observe in July: For repeat illumination (and a few repeat libration) LTP predictions for the coming month, these can be found on the following web site: http://users.aber.ac.uk/atc/tlp/tlp.htm. By re-observing and submitting your observations, we will get a clear understanding of what the feature ought to have looked like at the time. Only this way can we really fully analyze past LTP reports.

If you would like to join the LTP telephone alert team, please let me know your phone No. and how late you wish to be contacted. If in the unlikely event you see a LTP, advice on tests to carry out can be found on: http://users.aber.ac.uk/atc/alpo/ltp.htm . If you are still convinced it is a LTP then please give me a call on my cell phone: +44 798 505 5681 and I will alert other observers. Twitter LTP alerts can also be accessed on http://twitter.com/lunarnaut.

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KEY TO IMAGES IN THIS ISSUE

1. **Agatharchides A**
2. **Aristarchus**
3. **Arzachel**
4. **Birt**
5. **Bullialdus**
6. **Conon**
7. **Drygalski**
8. **Eratosthenes**
9. **Hausen**
10. **Hercules A**
11. **Kies A**
12. **Linne**
13. **Mare Orientale**
14. **Menelaus**
15. **Pitatus**
16. **Plato**
17. **Pytheas**
18. **Sinus Iridum**

FOCUS ON targets

X = Altai Scarp (September)
Ghost Craters (November)