

# THE LUNAR OBSERVER

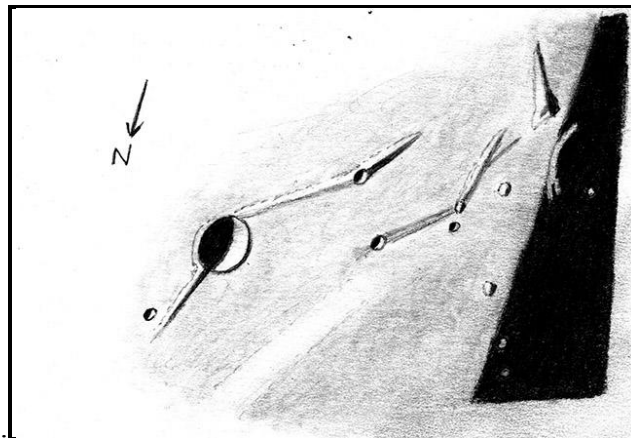
A PUBLICATION OF THE LUNAR SECTION OF THE A.L.P.O.

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 – MARCH 2016 SCHIAPARELLI



**Sketch and text by Robert H. Hays, Jr. - Worth, Illinois, USA**

**November 24, 2015 05:04-05:40 UT, 15 cm refl, 170x, seeing 8-9/10, transparency 5/6**

I sketched this crater and vicinity on the evening of Nov. 23/24, 2015 after the moon hid xi Arietis. Schiaparelli is a crisp, conspicuous crater west of Aristarchus in Oceanus Procellarum. The main crater appears symmetrical with no unusual detail. It is the surrounding features that make things interesting. The pit Schiaparelli A is west of Schiaparelli, and the similar crater to its south is Seleucus A. The smaller crater near the terminator is Seleucus E. Another crater, similar to Schiaparelli A, is northeast of the main crater; this one is not even shown on the Lunar Quadrant map. There are several wrinkles and ridges in this area, some of which change character at or near a crater. A short, low ridge extends northeastward from Schiaparelli, and peters out near the nameless crater. Another ridge reaches from the south edge of Schiaparelli to and beyond Seleucus A with a slight bend at the latter crater. Its shading is pale and gray near Schiaparelli, but is wider and darker past Seleucus A. A strip of shadow is between Schiaparelli A and a small peak just south of Seleucus E. On closer inspection, this strip appears to be double. This possible wrinkle is conspicuous west of Schiaparelli A, but there is only a hint of it east of this crater. A Y-shaped feature, probably a ridge, extends southward from the peak near Seleucus E. The straighter portion showed a sunlit slope, but the branch did not. A wider ridge begins near this branch (and the terminator), and goes southeastward from there, tapering to a point. The east rim of Seleucus was just catching the rising sun at this time. The north end of the visible arc had a split-hair appearance. A tiny dot of light became visible farther beyond the terminator during my observing. It was not visible at the start, but appeared around 4:25-30 UT. This must have been a high point on the northwest rim of Seleucus. A small peak is between Seleucus and Seleucus E, and three more peaks are farther north. Two of those peaks were beyond the terminator at this time. The features beyond the terminator may be too conspicuous on the sketch. A slightly brighter area resembling a ray was northwest of Schiaparelli, but this may have been a sunward facing slope.

# LUNAR CALENDAR

## MARCH-APRIL 2016 (UT)

2016		UT	EVENT
Mar	01	23:11	Last Quarter
	02	06:53	Moon-Saturn: 3.9° S
	03	14:19	Moon Extreme South Dec.: 18.2° S
	07	10:54	Moon-Venus: 3.5° S
	09	01:54	New Moon
	09	01:58	Total Solar Eclipse
	09	06:31	Moon Descending Node
	10	07:02	Moon Perigee: 359500 km
	14	13:44	Moon-Aldebaran: 0.3° S
	15	17:03	First Quarter
	16	05:01	Moon Extreme North Dec.: 18.2° N
	20	19:05	Moon-Regulus: 2.8° N
	22	03:57	Moon-Jupiter: 2.3° N
	22	12:58	Moon Ascending Node
	23	11:48	Pen. Lunar Eclipse
	23	12:01	Full Moon
	25	14:16	Moon Apogee: 406100 km
	28	18:45	Moon-Mars: 4.6° S
	29	14:58	Moon-Saturn: 3.8° S
	30	22:12	Moon Extreme South Dec.: 18.2° S
	31	15:17	Last Quarter
Apr	05	17:27	Moon Descending Node
	06	08:30	Moon-Venus: 0.7° S
	07	11:24	New Moon
	07	17:36	Moon Perigee: 357200 km
	10	22:05	Moon-Aldebaran: 0.4° S
	12	12:12	Moon Extreme North Dec.: 18.3° N
	14	03:59	First Quarter
	17	00:46	Moon-Regulus: 2.7° N
	18	04:42	Moon-Jupiter: 2.4° N
	18	18:04	Moon Ascending Node
	21	16:05	Moon Apogee: 406400 km
	22	05:24	Full Moon
	25	19:28	Moon-Saturn: 3.7° S
	27	04:44	Moon Extreme South Dec.: 18.4° S
	30	03:29	Last Quarter

## **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**
- 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)

**CALL FOR OBSERVATIONS:**

**FOCUS ON: Kepler**

*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 **May 2016** edition will be **Kepler**. 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](mailto:wayne.bailey@alpo-astronomy.org)**

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

**Deadline for inclusion in the Kepler article is April 20, 2016**

**FUTURE FOCUS ON ARTICLES:**

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

<b><u>Subject</u></b>	<b><u>TLO Issue</u></b>	<b><u>Deadline</u></b>
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# FOCUS ON: YOUR FAVORITE FEATURE

**By Wayne Bailey**

Coordinator: Lunar Topographical Studies

This installment of the focus on series is different than previous articles. Instead of concentrating on a particular feature, or class of feature, the emphasis here is on what you like to observe (and why). Submissions ranged from single images with commentary to multiple images and full articles. Enjoy your fellow observers' opinions.

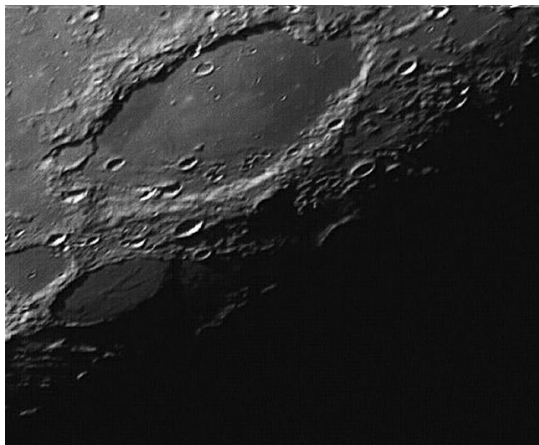
**JAY ALBERT** (Lake Worth, Florida USA) wrote:

The Aristarchus crater and neighborhood is one of the most interesting lunar areas for me for a couple of reasons. First of all is the composition of different types of features. There is the Aristarchus crater itself



with its terraced slopes and vertical bands that look like the remnants of landslides. There is the small central peak which shines like a diamond when the solar angle is right. Herodotus, in contrast, is shallower, lava-filled and smooth. Then you have the Cobra Head, looking like a volcano and Schroter's Valley all in the same eyepiece field. I also view this area frequently as part of the ALPO-BAA Lunar Transient Phenomena Program (LTP) run by Tony Cook. There have been more LTP's (obscurations, mists, colors, lighting effects) seen in and around Aristarchus than any other feature on the Moon. This image is a stack of 15 out of 382 frames (December 15, 2013, 03:26 UT. C-11, NexImage 5).

When I can catch Eratosthenes and Stadium as the Sun is rising on these features, the sight is very dramatic. The rim of Eratosthenes is very bright, while the interior is still in shadow. The rough floor of Stadium is just becoming visible and its numerous craterlets and remnant walls stand out in high relief compared with the comparatively bland view when the Sun is high. This image is a stack of 20 out of 408 frames (September 3, 2014, 01:47 UT. C-11, NexImage 5).



Schickard and Wargentín are an interesting pair also because of the extreme contrast between the two craters. Schickard is huge at just over 140 miles wide. Its floor appears to be filled with dark mare lavas with a light gray overlay in a broad diagonal stripe across a floor that is pockmarked with craterlets and surrounded by prominent walls. Wargentín, on the other hand, is a little more than 1/3 the size, but seems to stand up like a plateau with mostly negligible walls. Its floor is smooth with a "Y" shaped wrinkle ridge and almost pristine due to the lack of craterlets. This image is a stack of 10 out of 199 frames frames (August 19, 2013, 03:24 UT. C-11, NexImage 5).

**ALBERTO ANUNZIATO** (Oro Verde, Argentina) wrote:

This image belongs to an observing session for the “Lunar Geological Change Detection Program”. We were observing Mons La Hire under the same illumination conditions of a past lunar transient phenomenon. While imaging the shadow of that mountain in the Mare Imbrium, we found a curious luminous figure in the terminator. It was the crater Tobias Mayer A, located at the western end of the Montes Carpatius. I want to share this image because it is a perfect example of a known but interesting phenomenon: the moon’s pareidolia. The moon has always been a magical world built by our imagination, we had built it with the material of our desires and we see in its surface what we want to see. We should not underestimate lunar pareidolia: we still call seas their basaltic plains. In the Moon, a wonderful specular reflection of our world: “other river, lake, and rich campaign are seen (...) Here other valley, other hill and plain, with towns and cities of their own supplied (...) here spacious hold and lonely forest lay, where nymphs for ever chased the panting prey”(Orlando Furioso by Ludovico Ariosto, translated by William Stewart Rose). The sunlight illuminating the rim evokes a hatch to a subterranean world, or the sign indicating a lost entrance of the London Underground, or the lunar flower discovered by my daughter Atina.



Name and location of observer: Alberto Anunziato (Oro Verde, Argentina).

Name of feature: Tobias Mayer A.

Date and time (UT) of observation: 11-21-2015-03:24.

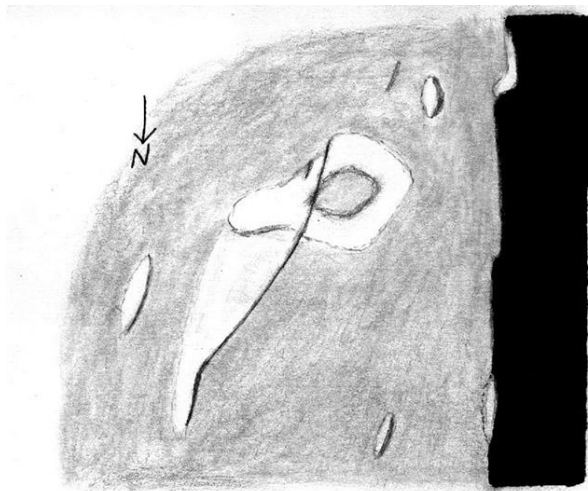
Size and type of telescope used: 250 mm. Schmidt-Cassegrain (Meade LX 200).

Filter (if used): None.

Medium employed (for photos and electronic images): Phillips SPC900NC webcam

**ROBERT H, HAYS, Jr** (Worth, Illinois USA) wrote:

(This)is a re-submission of a Reiner Gamma sketch from 2004 for the Focus On: Favorite Feature theme. I chose that feature because of its enigmatic nature and uniqueness, at least on the near side. It has had some press in the past 15 years, most recently in Selenology. This is probably my favorite of several sketches that I've made of this feature because of its proximity to the terminator. It is still conspicuous when near the terminator unlike other albedo features such as rays.



REINER GAMMA I observed this feature on the evening of June 29/30, 2004 after watching the moon hide 6th-magnitude ZC 2328. This feature was near the terminator this evening, so I decided to check it again (after having observed it before). It looked much as usual with a large, diamond-shaped area and a smaller eastern lobe. The larger portion has a dusky, oval interior patch: the edge of this patch is darker than the center. The eastern lobe has a grayish northern edge. There was a narrow, sharp strip of shadow that evening, appearing like a crack through Reiner gamma. From the south point of the diamond area, it went almost due north to the east edge of the dusky oval, then it angled northeasterly until it turned northerly again near its

end. A relatively bright area extends northward from the eastern lobe, and adjoins this shadow. It is brighter than the surrounding mare, but not as bright as Reiner gamma. I have to wonder if this brighter area is a relief feature as well as an albedo feature. (Reiner gamma itself appears to be purely an albedo feature.) A small bit of shadow is just east of the long shadow's southern end in a slightly brighter area within Reiner gamma. I had not seen this sharp, narrow shadowing previously: the terminator's proximity must have made the difference. There are a few low hills in the area, some of them causing irregularities in the terminator.

**MICHAEL SWEETMAN** (Tucson, Arizona USA) wrote:

This is my submission for the favorite lunar feature thought I don't have a favorite feature, this little crater is the object I am most interested in imaging. I just noticed it one night and didn't remember ever seeing this crater imaged and reference. I just find it so interesting and obscure to have an impact right in its center.

Timocharis

Date/Time: 11-22-2015 06h40m UT

5 inch RR APO f/22.5

DMK21 Filter: Baader Ir cut off

Seeing: 6-7/10

Trans: 3.0m

north is at the top of the image



# THE SPANISH CONNECTION

Alberto Martos, Fernando Bertrán, Eder Ugarte, Ruth Ortega, Eduardo Adarve  
Madrid Amateur Astronomical Society.

When Galileo Galilei set his primitive telescope at the Moon for first time, he discovered a new world, where seas did not look like terrestrial seas and mountains did not look like earthly mountains. The most astonishing features he saw everywhere, because of their countless number, were some what he deemed volcanoes. Hundreds of volcano round and dark craters, arranged side by side in the “continents”, cluttered his eyepiece field of view. Some of them, located where the Sun was at rise, showed a somehow weird aspect, casting elongated shadows that enhanced their contours by blackening each other their walls and floors. Some others, located in regions where the Sun was shining overhead, showed a bright and vanished aspect which prevented the details to be perceived by the observer. The whole view brought to mind a picture, being made after the painter has ended doing the left-hand scene and before he puts the finishing touches to a rough draught on the right-hand part of the painting.

Galileo did not take long to get familiar with this new realm and soon he managed to develop a technique to figure out the height of those tall mountains, as they were close to sunrise or to the sunset. As a good observer, he also noticed a peculiar “behavior” of the craters: they showed a clear trending to group in some in-line-trios. Chiefly, one trio located near the Moon’s center called his attention. Looking at this trio through his poor eyepiece, the sight of the three aligned craters recalled him three ovals in a peacock’s tail feather. And right ahead, he logged the trio as “*cauda pavonis oculis*” (peacock’s tail eyes) in his *Sidereus Nuncius* (Starry Messenger). Of course, Galileo’s main affaire is well known to everyone even slightly interested in astronomy. The epoch in which he happened to live was marked by a strong intolerance of though, exerted by narrow-minded authorities, whose main interest was to hold control against heresy by means of the inquisition court, just as a way to safeguard their own power.

Today we know with certainty that Galileo’s “*cauda pavonis*” was composed of the large craters Ptolemaeus, Alphonsus and Arzachel. They are shown in photo 1. The idea of taking advantage of “Your Favorite” target, called for by TLO, to portray some Spanish-name-bearing lunar features, no matter which religious ideas professed their eponyms (people who bore the names), brought up in our minds because the names of two features in *cauda pavonis* recall ancient astronomers born in Spain. Then, we dare to make an exchange: we have substituted the very worn out an old, lava flooded Ptolemaeus, by the much younger Alpetragius, sometimes known in English slang as “the juicer”, because of his huge central peak and his relatively small crater ramparts.

## **Alphonsus.-**

Eponym: Alfonso the Wise, a XIII century castile king who encouraged the translation of arabic, greek and chaldean science treatises, mainly of astronomical contents, to vernacular language, and published them as “Libros del saber de astrología” (Books of wisdom of astronomy), which included the “Tablas Alfonsies” (Alphonsine Tables) of positions of the Sun, Moon and planets, relative to the fixed stars. During Alphonsus’ reign christians, muslims and jews worked together without intolerance troubles for the royal team **of scholars**. This oasis of acceptance in the Spanish history is known as the three-culture-epoch.

Alphonsus (108 km / 2000 m) is an impact structure of the ring mountain class. It is located in the central *terrae* (highlands) of the Moon, East of *Mare Nubium*, in an area plenty of huge and old impact structures. It overlaps the larger Ptolemaeus (153 km / 2400 m), of the walled plain class, and its ejecta are thrown onto the rim of the smaller crater Alpetragius (40 km / 3900 m). Then, the superposition criterion of stratigraphy states that Alphonsus is younger than Ptolemaeus and Alpetragius.



Nevertheless, both Alphonsus and Alpetragius were born during the Nectarian Period (3.92 to 3.85 billion years ago). As seen in the picture, Alphonsus walls are upright, but old and show terraces all around, the floor is flat, probably covered by impact melts, and the central peaks is small, but high (1290 m). A sinuous rille system (*Rimae Alphonsus*) can be seen in the floor running in the East part. The one close to the wall (*Rima I*) runs following the wall shape, although performs some meandering. *Rima II* runs straight on.

The peak was subjected of a lot of concern in 1956, when the Soviet astronomer Nikolay Kozyrev detected an emission of red gas from the tip and obtained a spectrum showing the presence of carbon molecules (C<sub>2</sub>), as in a volcanic eruption. However, later on it was demonstrated that the gas exhausted, eventually contained C<sub>2</sub>, but at low temperature. So it was not a volcanic eruption, but a gas escape or LTP (Lunar Transient Phenomena) and Alphonsus floor had been reported as a source of LTPs since long time ago. Besides this controversial information, the outcome of a further examination did not find a vent for the gases to escape from, but a full anorthositic mountain. Then does not seem that the gas came out of a vent on the peak and rather from some small craters on the floor.

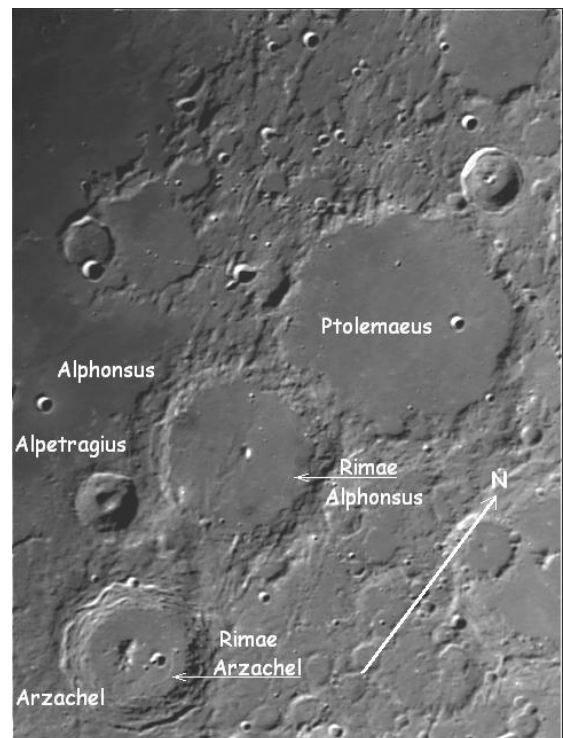
Our main concern during our visual observation of Alphonsus, were eleven dark haloed little craters existing in the floor. They were initially deemed volcanic features, but today this possibility has been ruled out in favor of impact structures lying on a magmatic cinder deposit. Actually, we needed two observations to see all the little craters, first one after the first quarter and a second one after the third quarter. But fortunately, we had a filed picture (2011-02-11) showing all aforementioned craters! Five of them have been given a name, as shown in photo 2:

- 1.- Ravi (2.5 km);
- 2.- Monira (2 km);
- 3.- José (2 km);
- 4.- Soraya (2 km);
- 5.- Chang-Ngo (3 km).

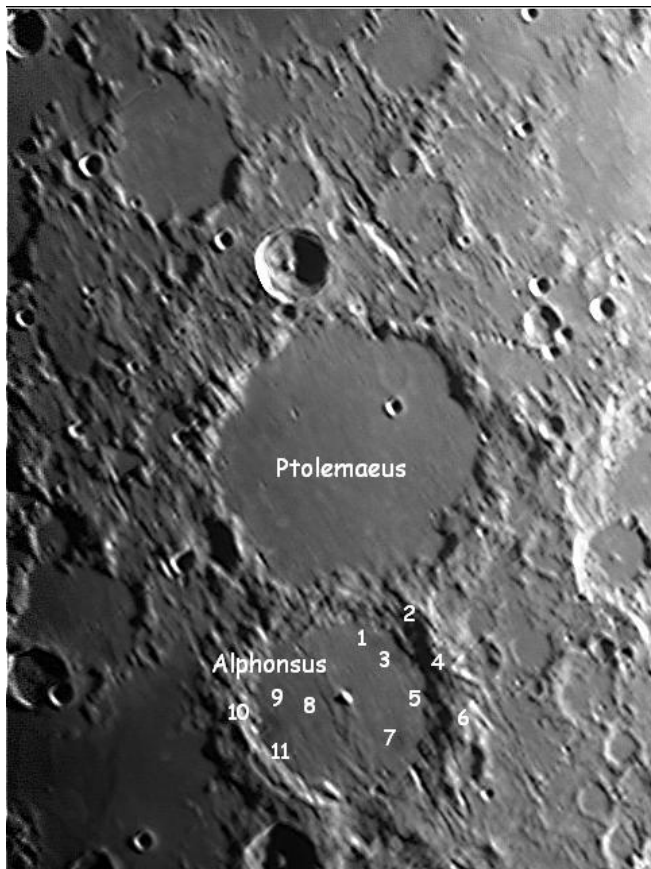
Photo 2 shows also some strokes coming from NNW: they belong to the “imbrian sculpture”, or a small part of the extensive pattern of imbrian basin radiant system.

### **Arzachel.-**

Eponym: Abu Ishaq az-Zarqallu was an astronomer and instrument builder born in Toledo (Tolaitola), of islamic religion. His main work consisted in a modification of the extant astrolabe, by changing the tympan for a stereographic projection over the colures (solstice meridians), so that the instrument could be used for any latitude, and then suitable for navigation. He lived in the XI century, that is one century before the three-culture-epoch, so when christians occupied Toledo in 1085 (without shooting a shot), Zarqallu emigrated to Seville (Ishbiliya), where he died two years later.



**Photo 1.- Ptolemaeus, Alphonsus, Arzachel and Alpetragius.**



**Photo 2.- Dark haloed craters in Alphonsus.**  
(North is at top).

occupy the whole floor extension of the crater. To observe these features, one must wait one more day after the good visibility of Alphonsus. Other ways the deep walls will cast shadow all along the peak side, preventing the observation of the depth.

To complete the quota of three-culture-epoch we have included two Spanish-born Jewish astronomers, Abenezra and Zagut.

### **Abenezra.-**

Eponym: Abraham ben Meir ibn Ezra was a versatile jewish philosopher, astronomer, mathematician, etc. born in Navarre during the 12<sup>th</sup> century. He worked with calendrical problems, astronomical tables and the astrolabe. When intransigents almohads invaded Al-Andalus (muslim Spain), jews were persecuted and Abenezra was obliged to leave the country, been converted in a landless sephardi (wanderer jew).

Crater Abenezra (42 km / 3730 m) is located in the SE region of the Moon (photo 3), characterized by highlands. Impact structures in this big area are old, flat, and lack central peak. As seen in photo 3, Abenezra is far from being round, but polygonal. It overlays Azophi and Abenezra C, a twin crater. The floor shows some ondulated ridges runing from North to South.

In our observation, we tried to find out why Azophy is younger than Abenezra, but the only answer we encountered was the polygonal shape of Abenezra, whose polynomial walls must be the result of nearby impacts.

The crater Arzachel (97 km / 3610 m) draws the observer attention because his central peak, which towers 1500 m, is not at all central, but offset towards SW. By its aspect, with massif walls, so thick that they lodge two valleys along the rim, and with terraces and peak, it looks a lot younger than Alphonsus and effectively, it was born during the lower Imbrian period, that's to say between 3.85 and 3.8 billion years ago.

During our visual observation we noticed that the main cleft of a system running in the floor, *Rimae* Arzachel, fades abruptly beyond craterlet Arzachel T (photo 1). We failed to confirm the reported (C. Wood) shadow cast onto the eastern wall.

### **Alpetragius.-**

Eponym: Nur-ad-Din al Bitruyi was an islamic astronomer born in Córdoba (Qurtuba) accordingly to his gentilic. Based on his own observation, Bitruyi rejected the Ptolemaic planetary model of deferent and epicycle spheres and set a base for the Copernican revolution.

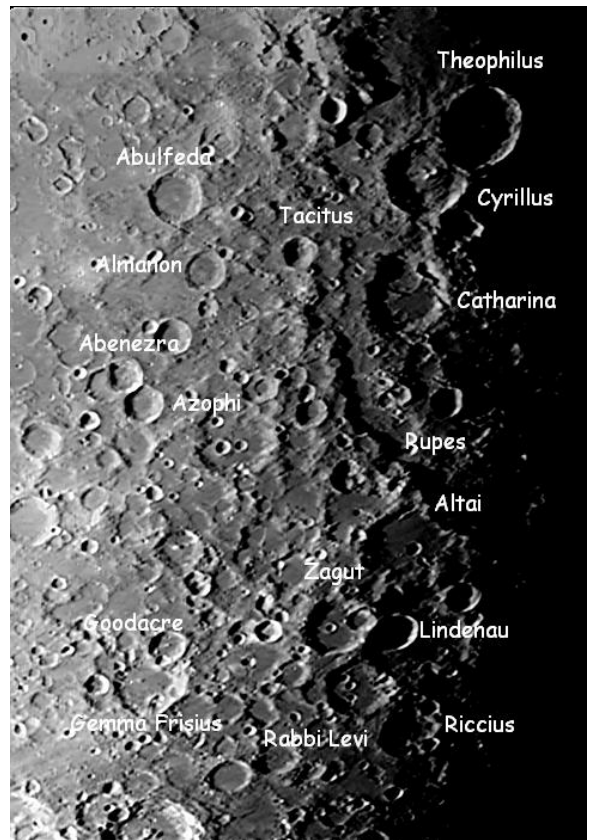
Crater Alpetragius (39 km / 3900 m) is famous because it lacks a floor. This absence is due to his big peak and a collapsed Northern wall, which

**Zagut.-**

Eponym: Abraham ben Zacuto, was born in Salamanca. He lived in the XV century and is believed to have been professor of astronomy in the University of Salamanca. He worked out astronomical tables and modified the astrolabe to determine latitude aboard a ship and wrote The Great Book of astronomy, including 68 tables for the meridian of Salamanca, based on the Alphonsine Tables. In 1492, at the same time Columbus set sail for “India”, Zacuto left Spain before a Decree of Expulsion for all Jews in the reign, signed by the Catholic Kings, took action.

Crater Zagut (84 km / 3200 m) lies also in the lunar highlands. As can be seen in photo 3, Zagut’s area is more heavily bombarded by meteorites than Abenezra’s area. The crater border has been smashed in several points, including a 35 km impact. Zagut lacks central peak, but instead of a peak it has another impact of 11 Km. As a result, the crater outline seems triangular.

Our observation was oriented to identify remnants of central peaks in this area, where central peaks are absent. Only Lindenau conserves the ruins of a peak. Some of the other craters have an impact almost at the position of the failed peak. But we should keep this activity on next opportunity.



**Photo 3.- Abenezra and Zagut.**

**VISUAL OBSERVATIONS**

Crater	Date	Time (U.T.)	Visibility	Transparency
Zagut	2016-01-15	21:00	4/5	4/5
Abenezra	2016-01-16	21:00	4/5	4/5
Cauda Pavonis	2016-01-17	22:00	2/5	4/5

**PHOTO 1**

**2011-01-12 @ 20:58:00**

Age	Colong	AS	LLat	LLon	Visibility
08,50	09° 18'	30,14'	-5° 58'	-4° 59'	4/5

**PHOTO 2**

**2011-02-11 @ 20:18:00**

Age	Colong	AS	LLat	LLon	Visibility
08,74	13° 36'	30,81'	-3° 20'	-7° 25'	3/5

**PHOTO 3**

**2008-11-18 @ 02:30:00**

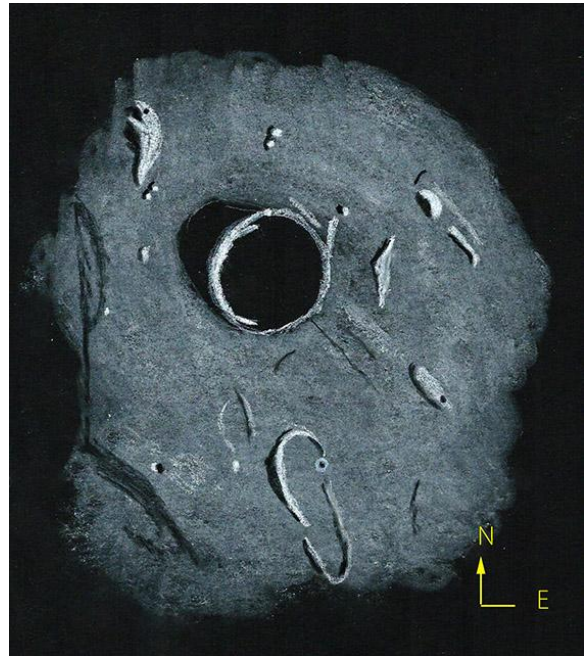
Age	Colong	AS	LLat	LLon	Visibility
20,14	150° 24'	32' 46"	-0° 49'	6° 15'	4/5

# MANILIUS

**David Teske**

I made this sketch on the early evening of 17 December 2015 (18 December 2015) using a 60 mm f/16.7 fl 1000 mm Moon Raker refractor telescope. An 8 mm Baader Planetarium Hyperion eyepiece was used with a magnification of 125. The telescope was mounted on a Losmandy GM8 mount. The observation was made between 0008 and 0051 UT. Seeing was 8/10 under clear skies. The moon was waxing crescent phase. Medium was white and black pastel with white a white pencil on black Strathmore Artagain paper. The observation was made by David Teske in Louisville, Mississippi.

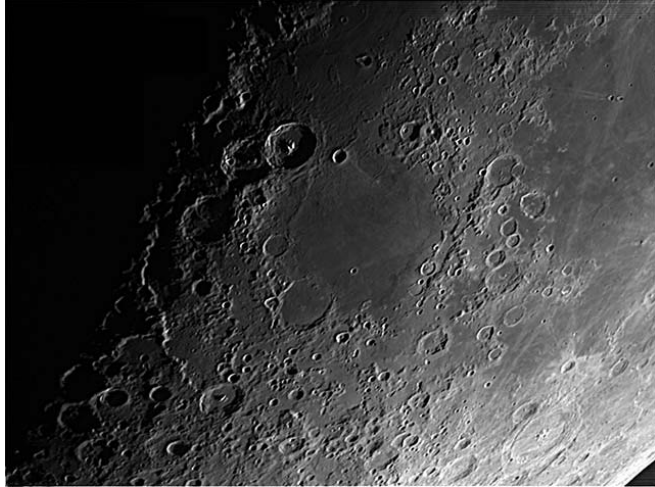
Manilius was a very prominent crater 39 km in diameter with Lacus Doloris to north, Lacus Lenitatis to the east, and Mare Vaporum to the west. The crater Manilius in this study was largely in shadow, with its western wall lit by the rising sun. It was evident that these walls were terraced. Due north of Manilius were two small hills in Lacus Doloris. Coming off of the northeast wall of Manilius is a small ridge that points to the small crater G. A ridge extends northwest of this area. East of Manilius is an isolated hill that was triangular in shape. Northeast of this hill are two isolated hills with strong shadows. A depression is just north of these hills and a light area (ridge?) to their northeast. Southeast of Manilius is a low hill with a depression on its southeastern end. Two linear shadows extend southeast of Manilius. Between the northern shadow and the triangular hill the surface is a shade brighter. South-southeast of Manilius is the most remarkable crater P. It looks like it was gouged out during the Imbrium impact. It looks like the northern and southern half of this very elongated crater does not match up. The northwestern wall is the highest; the other walls are quite low. West of Manilius is a wrinkle ridge that is in Mare Vaporum. To west the ridge has a straight and semicircular shape. Going south the ridge curves and widens as it curves southeast. The crater D is just north of this ridge. Northwest of Manilius is an isolated hill with the small crater B on its northern end and a depressed region. Two small hills are to the southeast of this hill. A low hill is south of this area.



# MARE NECTARIS

## Jerry Hubbell

Here is an image I obtained using the Mark Slade Remote Observatory (MSRO) that I and others in my club have been working on the past 4 months. This image was obtained on 2016-02-



14 00:03:56 UT. This is an image of Mare Nectaris, Theophilus, Cyrillus, and Catharina. The details are listed on the image.

***MARE NECTARIS**-Jerry Hubbell-  
Wilderness, VA. February 14, 2016  
03:56 UTC, 0.13-m refractor, f/5.7,  
ATIK 314E, North:UP, East:RIGHT,  
Colongitude: 340.1°, Transparency 5/6,  
Seeing 5/10.*

This image was obtained using the observatory remotely controlled from my home over the Internet about 5 miles from the observatory. It was a bitterly cold

evening and the wind was blowing making it that much more inhospitable. It was a pleasure operating the telescope from my warm home. The seeing was fair at best but the sky was very clear. Theophilus, Cyrillus, and Catharina are very prominent on the western edge of Mare Nectaris and there is abundant detail along the inner slopes of the lighted western portion of the crater walls. Messier and Messier A are very prominent to the northeast of Theophilus in Mare Fecunditatis. The rays from Messier A are very well presented and can be traced all the way to the western shore of Mare Fecunditatis. The mountain ridge to the east of Catharina P's western crater wall is very well presented also. This subtle detail can be further explored using Lunar Aeronautical Chart LAC96. Several small craters 5-8 km in diameter can be seen strewn across both Mare Nectaris and Mare Fecunditatis. There are hints of even smaller craters. Unfortunately the plate scale and the seeing both conspired to limit the resolution of the image. Patavius can be seen in the lower right of the image under fairly high sun. Even though the features are somewhat washed out, you can still make out the prominent rille that runs to the west from the center of the crater.

This was the first imaging done of the the moon with this system. The ATIK 314E deep sky camera was mounted on the OTA but is very usable for lunar and planetary imaging due to its very fast exposure capability of 0.001 sec. These images were obtained at 0.003 and 0.005 seconds. This image was a stack of the best 150 out of 350 images obtained over a 5 minute period. Even though the plate scale of 1 arc-sec/pixel was not the optimum for high-resolution imaging, the seeing would have limited the overall resolution anyway. I think technically, the overall image shows all that was available that night based on the conditions.

# WALTHER...not WALTER

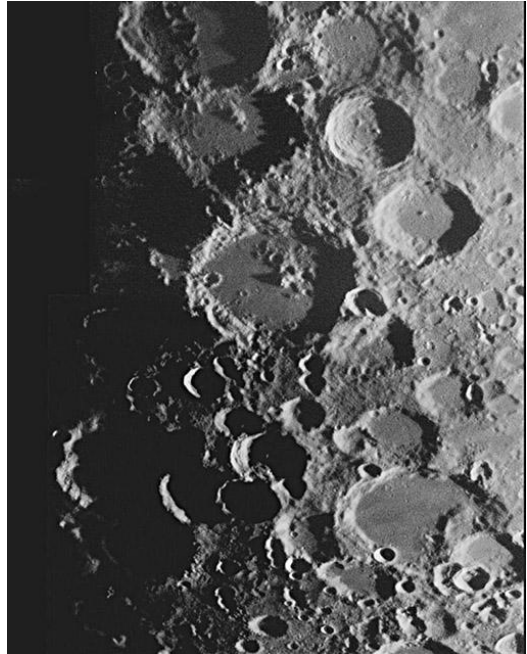
**Richard Hill**

Here we have another portion of the lunar highlands. The big crater just above center is the namesake for this image, the 145km diameter Walther. As I may have said before, but it bears repeating, both the Rukl Atlas and the Virtual Moon Atlas have the identification of this crater confused with Walter which is actually over by the crater Delisle, not far from Aristarchus. The so-called central peak of Walther is a curious mix of craters and features that for all the world look volcanic. The LROC QuickMap site does little to help clear this up. It's a very strange formation.

***WALTHER** – Richard Hill – Tucson, Arizona, USA  
February 16, 2016 02:41 UT. Seeing 710. TEC 8”  
f/20 Mak-Cass, SKYRIS 445M, 656.3 nm filter.*

Right above Walther is 129km Regimontanus with some nice shadows on its floor and a little further up, partly cut off but also showing some nice shadows, is 121km Purbach. Is it just me or does Purbach look to be the bigger of the two? Both of these craters are among oldest in this image, maybe as old as 4.5 billion years!

To the right of Walther is the 82km Aliacensis. Above this is the slightly smaller, 71km Werner and further up the less well defined but similarly sized Blanchinus. This last one, as its degradation may indicate, is also possibly 4.5 billion years old. At the bottom right corner is another ancient crater, the 129km Stofler. Note the light and dark patterns on the floor. Straight over to the left, in deep shadow on the terminator you can see one wall of another crater, Orontius. Just look at that crater wall with all the gouges and breaks. It's fun to watch such areas over a few hours as the rising sun reveals more and more of the topography.



# LUNAR TOPOGRAPHICAL STUDIES

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

## OBSERVATIONS RECEIVED

JAY ALBERT – LAKE WORTH, FLORIDA, USA. Digital images of Aristarchus, Eratosthenes & Schickard-Wargentín.

FRANCISCO ALSINA CARDINALI-ORO VERDE, ARGENTINA. Digital images of Aristarchus, Burg, Fracastorius, Gassendi, Madler, Mare Crisium(3), Messier, Plato(2), South Pole & Theophilus(2).

MAURICE COLLINS - PALMERSTON NORTH, NEW ZEALAND. Digital images of 6, 9, 13 day moon, Alexander, Alphonsus, Full Moon, Mare Imbrium, Sinus Iridum & Tycho.

CRANDALL, ED – LEWISVILLE, NORTH CAROLIA, USA. Digital images of Archimedes & Ptolemaeus.

HOWARD ESKILDSEN - OCALA, FLORIDA, USA. Digital image Kepler-Mare Insularum.

ROBERT HAYS - WORTH, ILLINOIS, USA. Drawings of Reiner gamma & Scoresby-Challis.

RICHARD HILL – TUCSON, ARIZONA, USA. Digital images of Aristarchus, Hayn, Theophilus, Tycho(2) & Walther.

JERRY HUBBELL – LOCUST GROVE, VIRGINIA, USA. Digital image of Mare Nectaris.

ALBERTO MARTOS, FERNANDO BERTRÁN, EDER UGARTE, RUTH ORTEGA & EDUARDO ADARVE– MADRID, SPAIN. Digital images of Alphonsus, Ptolemaeus-Arzachel & Zagut-Abenezra.

MICHAEL SWEETMAN – TUCSON, ARIZONA USA. Digital images of Montes Haemus, Timocharis-Lambert-Pytheas & Tycho .

DAVID TESKE - STARKVILLE, MISSISSIPPI, USA. Drawing of Manilius.

GARY VARNEY-PEMBROKE PINES, FLORIDA USA. Digital image of Archimedes.

# RECENT TOPOGRAPHICAL OBSERVATIONS

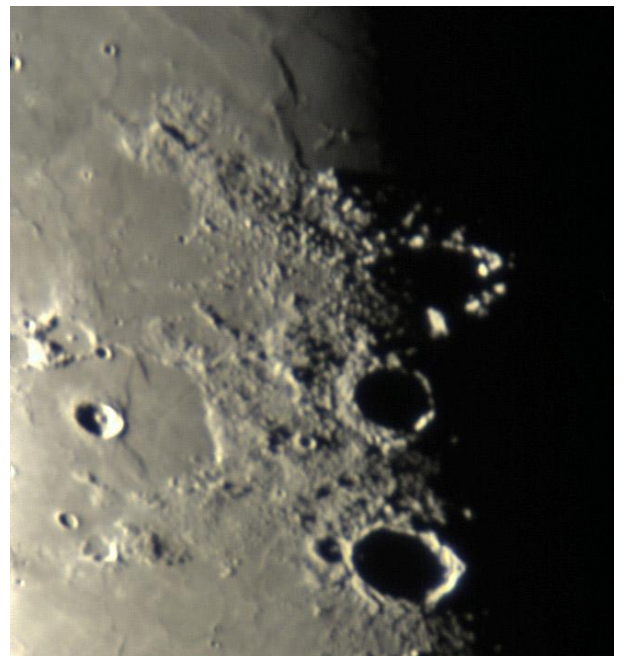
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**BURG**- Francisco Alsina Cardinali-Oro Verde, Argentina. January 16, 2016 00:45 UT. LX200 250 mm SCT, Canon EOS Digital Rebel XS.

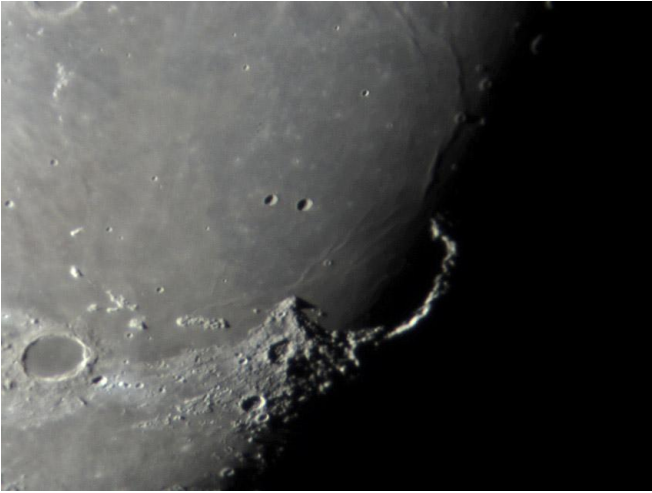


**THEOPHILUS**- Francisco Alsina Cardinali-Oro Verde, Argentina. January 15, 2016 00:10 UT. LX200 250 mm SCT, 106X with teleextender, Canon EOS Digital Rebel XS.

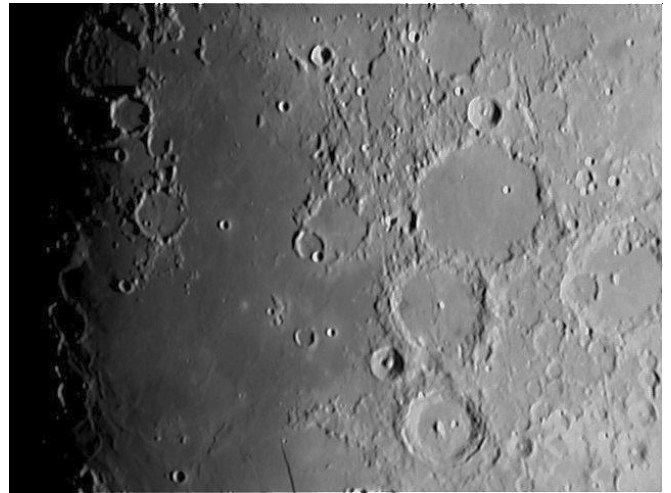
**ALEXANDER** - Maurice Collins, Palmerston North, New Zealand. February 14, 2016 08:28 UT. FLT-110, 2x barlow, seeing A-IV. (South up)







**SINUS IRIDUM** - Maurice Collins, Palmerston North, New Zealand. February 18, 2016 08:35 UT. FLT-110, f/14, seeing A-II. (South up)



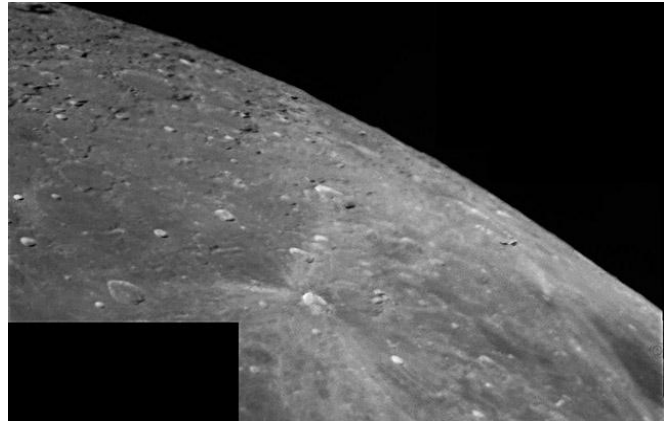
**PTOLEMAEUS** – Ed Crandall, Lewisville North Carolina, USA. December 19, 2015 23:12 UT. 110 mm, f/6.5 APO, 2X barlow. Seeing A-III. Colongitude 18.5°. ToUcam.



**KEPLER-MARE INSULARUM**- Howard Eskildsen, Ocala, Florida, USA. February 18, 2016 23:56 UT. Seeing 7/10, Transparency 5/6. 6" f/8 Refractor, 2x barlow, DMK 41AU02.AS.

**HAYN** – Richard Hill – Tucson, Arizona, USA January 21, 2016 04:47 UT. Seeing 7/10. TEC 8" f/20 Mak-Cass, SKYRIS 445M, 656.3 nm filter.

The seeing was only mediocre but the libration was about the strongest for this portion of the moon for this year. This effect allows us to see about 10% more of the moon than if it didn't wobble back and forth. This image concentrates on the 90km diameter crater Hayn shown here just below the nameplate with the sharp dark shadow against the crater wall. At the opposite libration it is over the limb and completely invisible from our nearside view but in this image the maximum libration point is right at the limb near Hayn. I had never imaged this crater before so it was on the list even if the seeing was not the best. The bright crater near the bottom with the off-center ray system is the 32km Thales. Immediately to its right, barely seen in this high sun lighting is the shallow 56km Strabo. The aforementioned ray system is quite curious. Though the crater Thales is bright the rays appear to radiate from a point just outside its north wall!



The two flat bottomed craters at the top of this image are Cusanus (56km) right, and Petermann (75km) left. Straight down from these two is a large, barely discernible 99km crater, Arnold. It has a small clear crater on its northern floor.

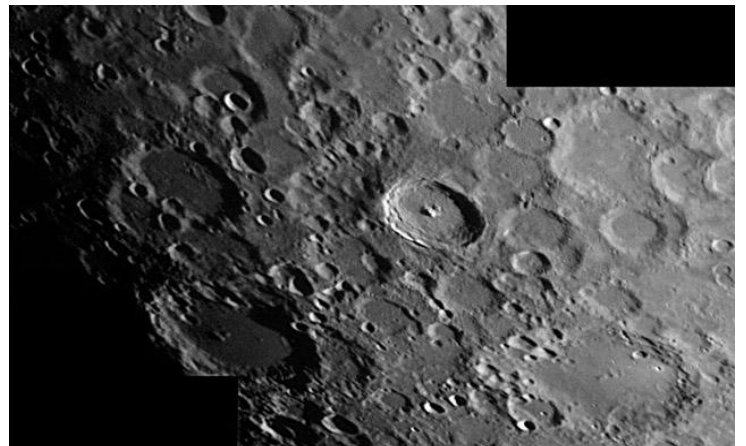


**THEOPHILUS** – Richard Hill – Tucson, Arizona, USA February 14, 2016 02:06 UT. Seeing 7/10. 3.5" Questar Mak-Cass, SKYRIS 445M, 656.3 nm filter.

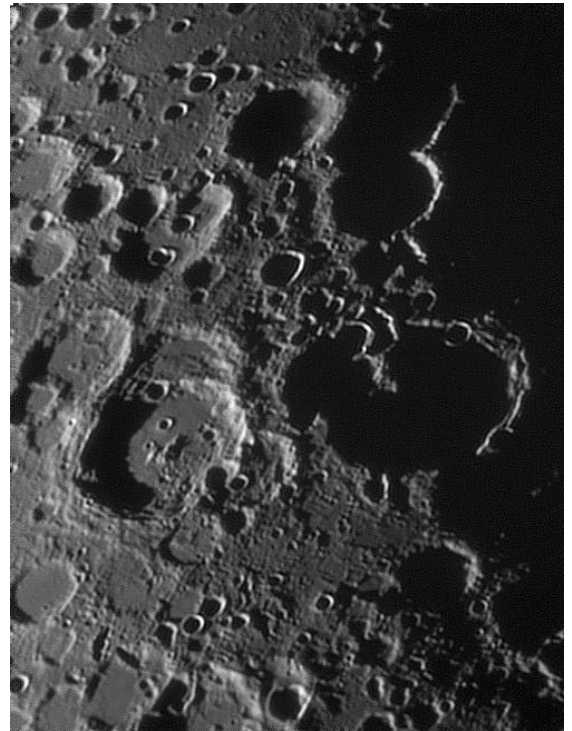
At a starparty on Sat. and people were amazed with the webcam view of the moon using my Questar 3.5". So I ripped off an AVI and showed them how to process the image. We pulled out 5km craters from the image using LROC. Not bad for a small 'scope.

**TYCHO** – Richard Hill – Tucson, Arizona, USA February 18, 2016 02:35 UT. Seeing 7/10. TEC 8" f/20 Mak-Cass, SKYRIS 445M, 656.3 nm filter.

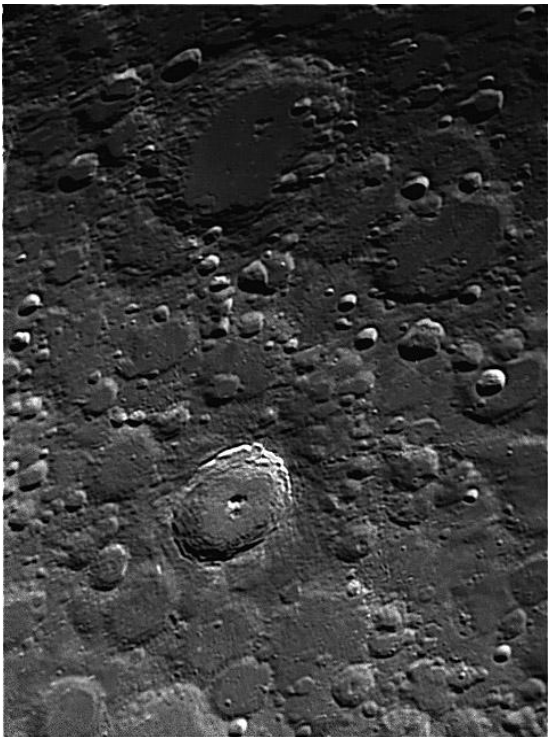
The terminator was about 1 day past revealing the 88km diameter Tycho. This is a time when the beautifully terraced walls of this crater can be seen at their best. Just above Tycho, not quite one Tycho diameter, is the 31km diameter Tycho A with a low central peak. This peak is probably a deposited block from the formation of Tycho as the whole crater is blanketed in ejecta well seen in the LROC Quick Map images. The seeing was not good enough on this night to resolve the chain of 1-2km secondary craterlets that are strung out from this crater for some 40-50km to the north or the similar chain paralleling it coming from Tycho. Between Tycho A and its namesake is the resting place of Surveyor 7, the fifth and last lander from a spectacularly successful pre-Apollo program that expanded on the quick look work of the Ranger program. This lander set down on January 10, 1968, sent images and results of laser experiments, where beams were aimed at it from Kitt Peak and the Table Mountain Observatory and detected, before finally dying on Feb.21.



Other landmarks (selenomarks?) are the 168km Maginus in the lower right corner. Just above it is a nicely preserved crater with a smooth bottom, the 56km Sassure and just above it the 126km Orontius. In the lower left corner is the large 150km diameter, flat floored Longomontanus. Towards Tycho, on the wall of this crater, is the 36km crater, Brown. Above these is the well shown 111km crater Wilhelm. It's a rich, crater saturated lunar highlands!



**MAUROLYCUS.** Michael Sweetman, Tucson, Arizona, USA, December 18, 2015 03:20 UT. Seeing 4/10, transparency 3/6. 5" f/22.5 APO. DMK21, Astronomik Pro IR742 filter.



**TYCHO.** Michael Sweetman, Tucson, Arizona, USA, December 18, 2015 06:23 UT. Seeing 6-7/10, transparency 3/6. 5" f/22.5 APO. DMK21, Baader IR cut-off filter.



**ARCHIMEDES.** Gary Varney, Pembroke Pines, Florida USA. January 2, 2016 11:47 UT. CPC800 XLT, 2x barlow, ASI120MC-S.

# LUNAR GEOLOGICAL CHANGE DETECTION PROGRAM

**Coordinator – Dr. Anthony Cook – [atc@aber.ac.uk](mailto:atc@aber.ac.uk)**

**Assistant Coordinator – David O. Darling - [DOD121252@aol.com](mailto:DOD121252@aol.com)**

**Observations/Studies for January** were received from: Jay Albert (Lake Worth, FL, USA - ALPO) observed: Aristarchus, Gassendi, Herodotus, J. Herschel, Plato, and South. Alberto Anunziato (Argentina – AEA) imaged: Copernicus, Messier, Burg, Gassendi, Madler, and Mare Crisium. Bruno Cantarella (Italy – UAI) imaged: Censorinus. Francisco Cardinalli (Argentina – AEA) imaged: Aristarchus, Copernicus, Fracastorius, Mare Crisium, Plato, the South Pole area, and Theophilus, Maurice Collins (New Zealand – ALPO) imaged: Arago, Endymion, Hercules, Hommel, Janssen, Lacus Mortis, Langrenus, Mare Crisium, Meton, Piccolomini, Plinius, Posidonius, Theophilus, and produced some whole Moon mosaics. Marie Cook (Mundesley, UK – BAA) observed: Aristarchus, Gassendi, Macrobius, Menelaus, Mons Pico, and Proclus. Tony Cook (Newtown, UK – ALPO/BAA) videoed: Earthshine, and captured webcam images of several features across the lunar disk. Valerio Fontani (Italy – UAI) imaged Censorinus and Tycho. Marcelo Gundlach (Bolivia - IACCB) imaged: several lunar features. Rik Hill (Tucson, AZ, USA – ALPO) imaged: Deslandres, Hayn, and Saussure. Bill Leatherbarrow (Sheffield, UK – BAA) imaged: Gassendi and Sinus Iridum. Aldo Tonon (Italy – UAI) imaged: Censorinus and Aristarchus. Gary Varney (Pembroke Pines, FL, USA - ALPO) imaged: Archimedes. Ivor Walton (UK - CADSAS) imaged: Menelaus and Theophilus. Derrick Ward (Swindon, UK - BAA) imaged: Aristarchus, Plato and Posidonius.

**News:** I received an email from David Darling to point out an interesting image of the Moon. David goes onto say: “I found this [picture](#) on *Spaceweather.com* taken by John Dartnell..... I know this is not an actual event but could be classic example of what observers report but is only an atmospheric event.” David is referring not just the strong atmospheric spectral dispersion effects on the limb of the Moon, and other contrasty edges, but to a strong red color on the eastern shore of Mare Crisium. David goes onto say that he is hoping to get his LTP web site up and running again soon. This used to be one of the main referenced (by Wikipedia) websites describing LTP, so it would be great if we could gain access to this again.

**LTP Reports:** No LTP reports were received in January, apart from Gary Varney’s CCD image of Alphonsus from 2016 Jan 02 UT 11:50 which turned out to be a Registax image processing artifact – this was discussed in last month’s newsletter, and is an important thing for Registax users to be aware of!

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

**Fracastorius:** On 2015 Jan 14 UT 23:20 Francisco Cardinalli (AEA) imaged this crater under the same illumination conditions (to within +/-0.5°) of a report of what was referred to as a “permanent blink” effect in this crater:

*Fracastorius 1973 Mar 09 UT ~19:57 Robinson (Devon, UK) saw a Moon Blink (color) in this crater. This crater is long suspected of giving permanent blinks due to natural color. The ALPO/BAA weight=1.*

Now the details about this 1973 report are very scant - I could find only an entry in a green diary from 1973 belonging to the BAA Lunar Section Director which states, for Mar 9th:

*“1950 – 2005*

*Proclus, Picard, Fract, - Floor blinks*  
*Messier + Pickering” } JHR”*

*“1900 Atlas RJL”*

Meaning two observers were observing that night. Ron Livesey (RJL) covered Atlas and saw nothing unusual, and J-Headley Robinson covered several craters, but used red and blue filters, and found that the floor of Fracastorius was brighter in one filter than in the other. This event is not mentioned in either of the Cameron LTP catalogs. During the 1970's, with the use of color filter wheel devices called “Moon Blinks”, visual observers could check for hints of faint red or blue (& green) tinges on the Moon by switching or “blinking”, between red and blue filters. So if there really was some tinge of red on the Moon it would look brighter in the red filter than in the blue – hence would appear to blink when filters were switched. Likewise if an area was blue it would appear brighter in the blue filter than in the red. This technique helped to eliminate false color effects due to atmospheric spectral dispersion, or chromatic aberration. After extensive use of the Moon Blink device, over several years, it was found that some areas of the Moon seemed very often to appear to blink, and these were referred to as “Permanent Blink” sites – in that they became areas to ignore. One can only presume this was because there was some natural color present on the Moon, which was always there and this was being detected. I recall that Fracastorius often gave a red blink, meaning it was supposed to have a permanent slight red tinge on some point on its floor. In Francisco's image (Fig 1 - Left) which has had its color saturation increased significantly, I can see no trace of red or blueness. So I took a look at the LROC Quick Map web site to see what color has been detected by spacecraft. This infers, after some additional color enhancement, that the southern half of the floor of Fracastorius is very slightly red, akin to the color of the surrounding highlands, but because the color is so weak, it is doubtful if this would have been detected in a Moon Blink device, else the highlands would be blinking as well! Unfortunately the details of the 1973 observation are not at all clear, so I will leave the weight at 1. However it might be worth doing repeat illumination of other permanent blink areas reported from the past to see if there is any truth in these being explainable by natural surface color.

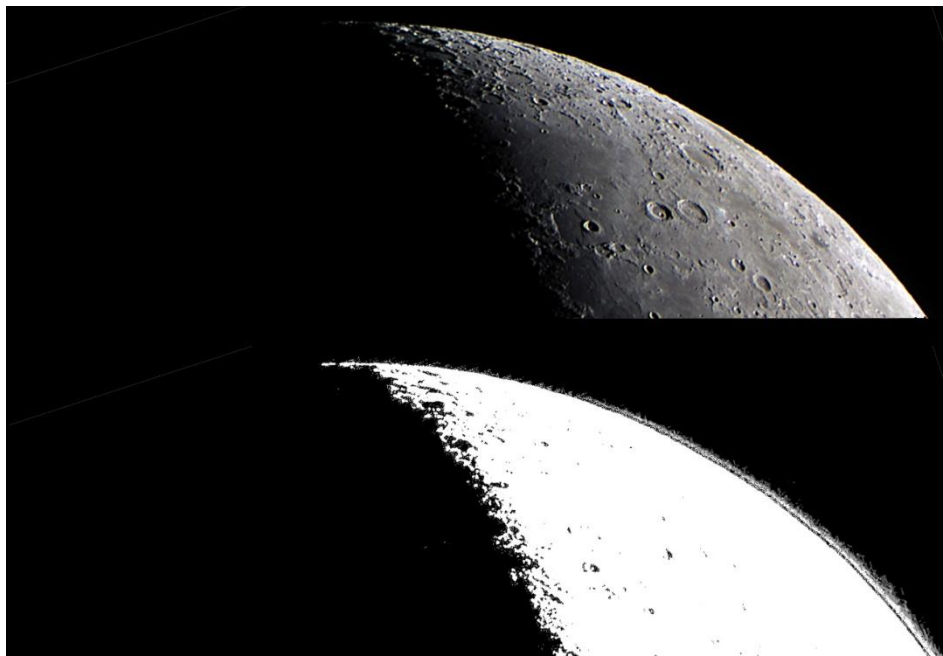


**Figure 1.** Fracastorius orientated with north towards the Top. **(Left)** Image by Francisco Cardinalli (AEA), taken on 2015 Jan 14 UT 23:20, that has been contrast stretched and had a color saturation enhancement of 80%. **(Right)** NASA LROC Quick Map WAC color mosaic – color normalized, and then had its color saturation increased to 50%.

**Plato:** On 2015 Jan 15 UT 08:34-08:39 Maurice Collins took an image of the northern part of the Moon which should have covered the Plato region under the same illumination conditions (to within +/-0.5°) to the following LTP report from Schröter:

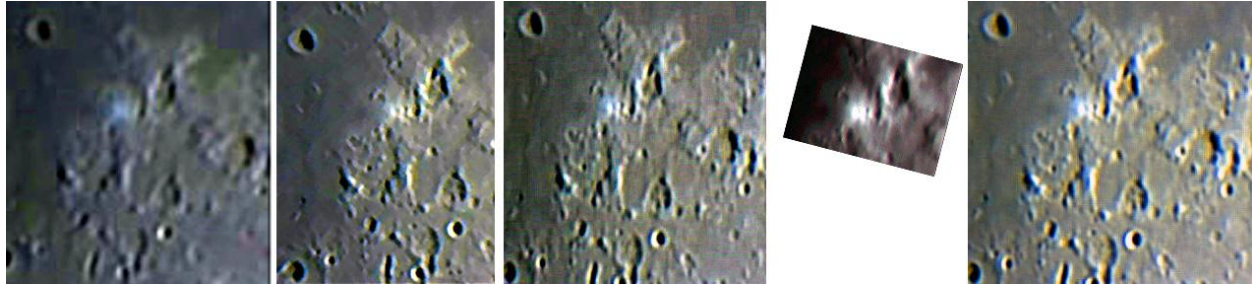
*Plato observed by Schröter on 1788-4-11 UT 20:00?-21:00? - Bright point seen near Plato. A much brighter one was near Aristarchus. Apparently seen by both Schröter and Bode. The Cameron 1978 catalog ID=43 and weight=5. The ALPO/BAA catalog weight=3.*

Maurice's image (See Fig 2 - Top) clearly shows that Plato is still on the night side of the Moon, so whatever Schröter saw must have been visible in earthshine. Just as a check, I enhanced the image (Fig 1 - Bottom) that Maurice took, but still cannot see anything in the vicinity of Plato. So what was described in the 1788 report above must have been quite bright in earthshine, in order to be visible so close to the terminator. I shall therefore leave the weight of this observation at 3, though would welcome earthshine views of the Moon during any repeat illumination events of the above in future.



**Figure 2.** The northern part of the Moon as captured by Maurice Collins on 2016 Jan 15 UT 08:34-08:39 orientated with north towards the top. **(Top)** color image. **(Bottom)** contrast stretched to reveal detail on the terminator/night side.

**Censorinus:** On 2015 Jan 15 UT Bruno Cantarella, Valerio Fontani, and Aldo Tonon (UAI) observers, attempted to detect color on Censorinus to see how early on in the lunar day this could be observed. This followed on from a chance observation in a whole disk color image by Maurice Collins from 2010 Sep 14 UT 09:33-09:44 which showed this crater as quite noticeably blue (Fig 3 –Far Left). Although none other than just natural surface color it is nevertheless interesting to find out at when in Selenographic Colongitude this becomes visible and also what is the optimal equipment needed to detect this? This formed part of something that I nicknamed the “Censorinus Color Challenge”, from a few years ago, but which we rarely had much interest in until now. In Fig 3 I have placed the observations by Bruno, Valerio, and Aldo in order of Selenographic Colongitude, alongside the image by Maurice. If anybody can capture the natural blue color earlier than these, please let me know. It is quite likely that we do not detect the blue color later because in most images Censorinus appear a saturated bright white by then.



**Figure 3.** Censorinus orientated with north towards the top. All images have been processed by increasing their color saturation, and also had some sharpening. **(Far Left)** Image by Maurice Collins from 2010 Sep 14 UT09:33-09:44 (Col=342.2°). **(Left)** Image by Aldo Tonon (UAI) from 2016 Jan 15 UT 18:04 (Col=344.1°). **(Center)** Image by Bruno Cantarella (UAI) from 2016 Jan 15 UT 18:07 (Col=344.1°). **(Right)** Image by Valerio Fontani (UAI) from 2016 Jan 15 UT 18:17 (Col=344.2°). **(Far Right)** Image by Bruno Cantarella (UAI) from 2016 Jan 15 UT 19:27 (Col=344.8°).

The images show quite some variability in color perception by the cameras involved. For example the image (Fig 3 – Right) by Valerio Fontani (using an ASI 120MC camera), was one of a sequence, but was at higher resolution than the other images. Colors were not well represented here - possibly a smaller image scale is needed to improve the image contrast sufficiently to detect them? The image (Fig 3 –Left) by Aldo Tonon (using a Phillips Toucam II Pro camera with an IR cutoff filter) shows perhaps a hint of blue color on the ejecta of Censorinus, however those images (Fig 3 – Center & Far Right) by Bruno Cantarella (using an SPC900nc camera with an IR cutoff filter) definitely show some blue in the ejecta blanket of Censorinus. The bluest appearance of all was obtained at 2° in colongitude earlier by Maurice Collins back in 2010. However image resolution was worse here and there seems to be a bit of color noise in the image, which casts a little bit of doubt on the strength of the blueness showing up in this image. So to summarize this imaging experiment, blue color can be detected in the ejecta from Censorinus, and this is not surprising because it is a geologically fresh crater and all such craters have a blueness to them. Capturing color in a reliable way is fraught with difficulty, and although we are able to detect relative redness, blueness, or indeed other colors, unlike monochrome brightness measurements, it is less easy to be quantitative over color. Many factors make quantitative color measurement difficult, firstly the colors are weak on the lunar surface, secondly Rayleigh scattering of short wave blue light will vary with the position of the Moon in the sky and atmospheric conditions, thirdly atmospheric absorption varies with wavelength and altitude, and fourthly, different cameras perceive color in different ways. I do not know what to suggest as a solution –certainly space based imaging will not suffer from these problems, so perhaps we should look into ways of calibrating our color images against spacecraft color imagery such as we find on the LROC Quick Map web site. Alternatively perhaps we should keep our exposures fixed but also image Standard Photometric stars of known color magnitudes, in order to remove atmospheric and instrumental effects. If anybody has any thoughts on this I would be pleased to hear them.

**Menelaus:** On 2016 Jan 15 UT 18:00-18:10 Marie Cook (BAA) observed this crater under the same illumination conditions (to within +/-0.5°) to a LTP report by Peter Grego from 2012:

*On 2012 Mar 28 P. Grego (Cornwall, UK, seeing II, 100mm refractor, x132) observed a patch of light just inside the NW rim of Menelaus on the shadowed wall or floor. Computer visualisations of the illumination conditions using a digital elevation model failed to produce this effect. ALPO/BAA weight=3.*

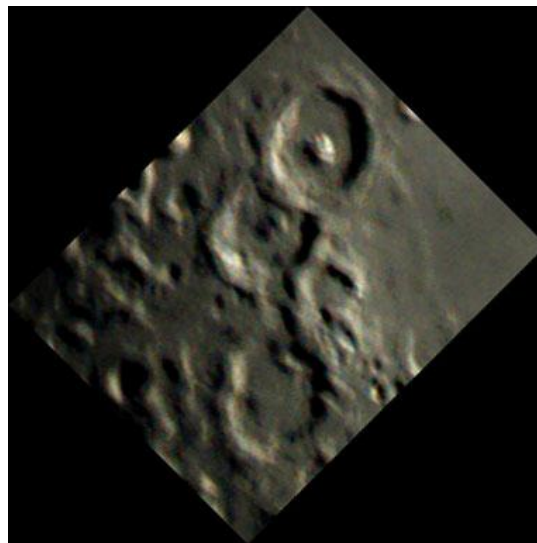
Marie was using a 90mm Questar telescope and reported seeing the usual bright patch on the western rim, but nothing unusual inside the shadow (Fig 4 – Right). A later image, by Ivor Walton (CADSAS) – not shown here, does not show anything unusual either, though the resolution is a bit too low to be sure. As the report by Peter Grego (Fig 4 – Left) is already at a weight of 3, we cannot increase this further as a weight of 4 would require confirmation by another observer at the time, and there were none.



**Figure 4** Menelaus orientated with north towards the top. **(Left)** a sketch by Peter Grego from 2012 Mar 28UT 21:40-21:51 showing a possible spot inside the shadow, which did not appear in earlier sketches. **(Right)** A sketch by Marie Cook from her note book, made on 2016 Jan 15 UT 18:00-18:10.

**Theophilus:** On 2016 Jan 15 UT 20:36 Ivor Walton (CADSAS) imaged this crater under the same illumination conditions (to within  $\pm 0.5^\circ$ ) to LTP seen back in 1984:

*On 1984 Jul 04 at UT 22:05-23:09 Richardson (Swinton, Yorkshire, UK, seeing=VE) found that a peak west of Theophilus crater had a deep blue color, and this was strange because no color was seen elsewhere on the Moon. Foley (Kent, UK, 12" reflector), once alerted, found a dome east of Kant? to be blue, and likewise no color was seen elsewhere on the Moon. Cameron 2006 catalog ID=246 and the weight=4. The ALPO/BAA weight=3.*



**Figure 5.** Theophilus orientated, with north towards the top, as imaged by Ivor Walton (CADSAS) on 2015 Jan 15 UT 20:36. Note that this image has had its atmospheric spectral dispersion removed, had its color saturation increased to 50%, and has then been sharpened.

Ivor's image (Fig 5) shows a peak just to the west of Theophilus, of similar size to the crater's central peak, but just on the edge of the rotated frame. It is the peak just to the East of Kant to which Foley was referring. This clearly shows no blue coloration in Ivor's image. Interestingly Ivor's original image had a lot of red color here and spectral dispersion elsewhere, so if observing conditions were different, perhaps blue could have been seen against this peak – though it would have been seen elsewhere too. Indeed I read the original report from E.C. Richardson (An officer from the BAA Solar Section), and although he was new to lunar observing, he did definitely look elsewhere on the Moon for similar deep blue colors, but failed to find any other examples. It seems reasonable therefore to leave this LTP report at a weight of 3, though I am tempted to raise the weight to 4 with the Foley Confirmation? However uncertainty in the positioning of the blue peak in Richardson's sketch suggests keeping the weight at 3.





**Figure 6.** An image of Mare Crisium with north towards the top as imaged by Marcelo Gundlach (IACCB) on 2016 Jan 16 UT 00:00-00:05.

**Mare Crisium:** On 2016 Jan 16 UT 00:00-00:05 Marcelo Gundlach (IACCB) imaged the Moon under similar illumination conditions (to within  $\pm 0.5^\circ$ ) to a LTP report from 1826:

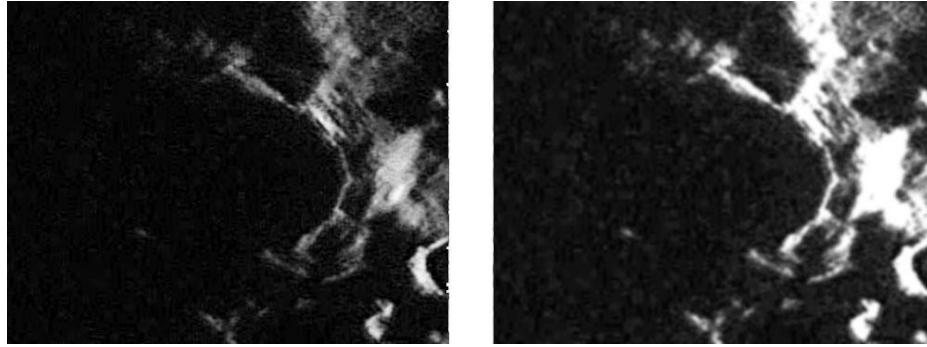
*Mare Crisium 1826 Apr 13 UT 20:00 Observed by Emmett (England?) "Black moving haze or cloud" NASA catalog weight=2. NASA catalog ID =109. ALPO/BAA weight=1.*

Moving clouds are not my most plausible type of LTP description, and are more often explained away by clouds in our own atmosphere, internal reflections in the optics, or the effects of poor atmospheric observing conditions on surface detail. However it is very good now at least to have an image (Fig 6) of the background to which Emmett reported seeing a moving haze or cloud against. This LTP event will retain a weight of 1, though I would really like to get my hands on the source material for this report to learn more about it.

**Tycho:** On 2016 Jan 18 UT 01:55 Rik Hill (ALPO) imaged this crater on the lower limit of a BAA request for lunar schedule imaging:

*BAA Request: How early can you see the central peak of this crater illuminated by scattered light off the crater's west illuminated rim? High resolution and/or long exposures needed to capture detail inside the floor shadow.*

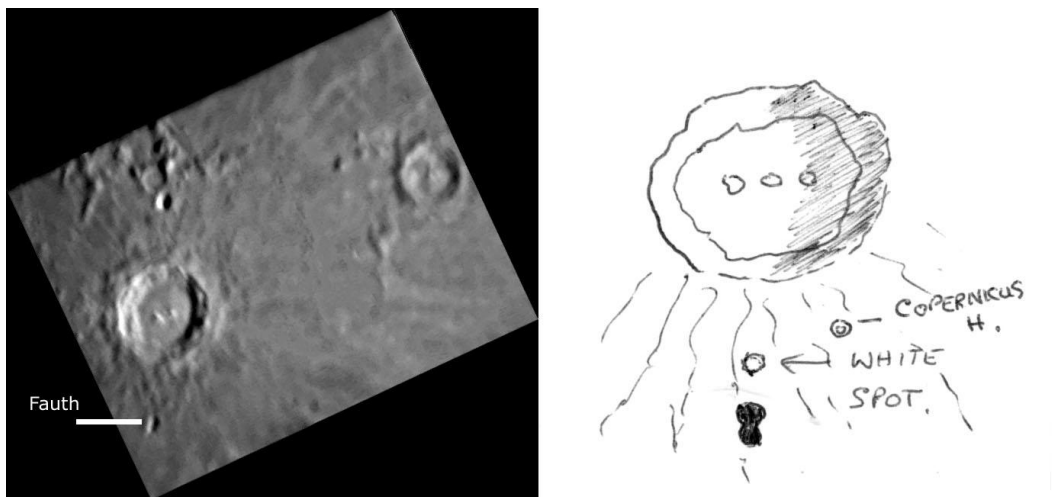
Clearly there is no sign of the central peak, as one would expect, as the best theory to explain why this is sometimes visible - despite the Sun not reaching the floor center (in early sunrise), is that it is made visible by sunlight scattered inside the crater by the illuminated western rim. The western rim is perhaps(?) faintly outlined in the brightness enhanced image, on the right of Fig7, but is clearly nowhere near bright enough to illuminate the floor. The purpose behind this BAA request is to find the earliest selenographic colongitude at which the central peak becomes visible through indirect illumination. We have had several attempts in the past, but the earliest it has been seen is at a Selenographic Colongitude of  $12.6^\circ$  back in 2003 May 09 by Brendan Shaw (BAA), and is not always seen after that until direct sunlight hits the central peak. We are interested to find out why and what kind of sky conditions, image scales, exposures are needed to optimize the visibility of the central peak prior to direct illumination.



**Figure 7.** Tycho by Rik Hill (ALPO) taken on 2016 Jan 18 UT 01:55 (Selenographic Colongitude =12.4°) orientated with north towards the top. **(Left)** The original image is from a subsection of a much larger image of the southern part of the Moon which was aimed at the crater Saussure. **(Right)** A contrast stretched version.

**Copernicus:** On 2016 Jan 19 UT 20:21 I obtained some webcam video of the Moon using an undriven 20cm Newtonian telescope – this matched the illumination conditions conditions (to within +/-0.5°) of a LTP report from Northern Ireland from 1972:

*Copernicus observed by McConnell\_J on 1972-2-24. South of Copernicus 1972 Feb 24 UT 19:30-20:00 Observed by McConnell (Northern Ireland, 6" reflector, x195, seeing=good) "White spot just S. of Cop. about same size as Copernicus H (@ 5km), (there is a bright area or mt. SW of Cop. H)." NASA catalog weight=1. NASA catalog ID 1323. ALPO/BAA weight=1. ALPO/BAA weight=1.*

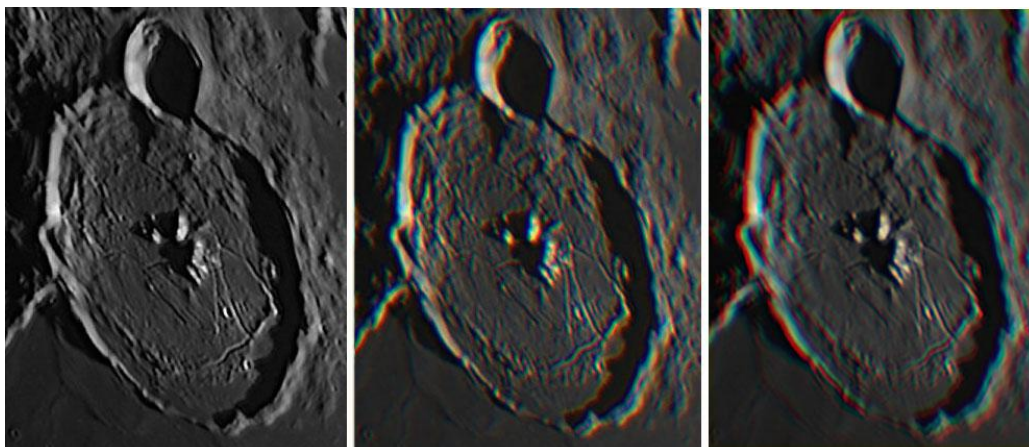


**Figure 8.** Copernicus orientated with north towards the top. **(Left)** Webcam image from 2016 Jan 19 UT 20:21 by Tony Cook (ALPO/BAA). **(Right)** A sketch made by John McConnell FRAS from 1972 Feb 24 UT 19:30-20:00 showing a white spot just north of Fauth and south of Copernicus.

The image in Fig 8 (Left), is non-optimal because the telescope being used was a non-tracking Newtonian, and the atmospheric seeing was not at its best. However you can quite clearly see that there is no white spot in the repeat illumination image, as is shown in the sketch from 1972 (Fig 8 – Right). I am therefore tempted to raise the weight from a 1 to a 3, however will stop short of this because the shadow in Fauth differs between the sketch and the image, and also what might be shadow (or shading?) in the sketch does not agree with what is in the image. Could it be that the UT in the 1972 report was wrong, or is it that the sketch is slightly inaccurate? I will therefore only raise the weight to 2. It is intriguing though what this white spot might have been, as there is absolutely no sign of at a wide range of sunrise Selenographic Colongitudes, shown in the [Hatfield Lunar Atlas – A Digitally Remastered Edition](#) (p142, Fig 5C-5F)?

**Gassendi:** On 2016 Jan 20 UT 20:57 Bill Leatherbarrow (BAA) imaged Gassendi under the same illumination conditions (to within +/-0.5°) as to the following report from 1967:

*Gassendi 1967 Jun 18 UT 22:50-23:59 Observed by Whippey Northalt, England, 6" reflector?) "Faint redness outside NE & SE wall of crater." Moore (10" Armagh refractor, x360) was observing earlier 22:10-22:40, with and without a Moon Blink but detected no redness, however his observing conditions were not very good at the time. NASA catalog ID #1039. NASA catalog weight=3. ALPO.BAA weight=2.*



**Figure 9.** Gassendi orientated with north towards the top as imaged by Bill Leatherbarrow (BAA), taken on 2016 Jan 20 UT 20:57. **(Left)** Monochrome image. **(Center)** Simulated atmospheric spectral dispersion image, where R,G,B channels have been offset in such a way so as to try to place red on the outside of the NE and SE rims. **(Right)** Simulated radial chromatic aberration, centered on the center of Gassendi crater.

Bill imaged in monochrome (Fig 9 Left), so I decided to attempt to add some artificial atmospheric spectra dispersion in eight different directions to see if I could produce red on the NE and SE outer walls. As you can see from Fig 9 (Center) it is possible to get red on the SE wall, but this is a nice contrasty feature, compared to the NE rim, where the red is hardly noticeable. In Fig 9 (Right) I have attempted to add some radial chromatic aberration, centered on the middle of the crater. Assuming Whippey used a reflector in 1967 then chromatic aberration should not have been too much of a problem unless a poor quality eyepiece was used. Both mechanisms for producing “spurious color”: atmospheric spectral dispersion, and chromatic aberration, produce the strongest colors on the most contrasty edges. Now the NE rim of the crater is just not very contrasty, so should have produced a much weaker color than on the SE – this difference is not described in the original report. Even if we combined, atmospheric spectral dispersion together with chromatic aberration, the “spurious colors” produced in the image would be so strong in several places, that most observers would notice these, mention them, and be very careful over reporting a LTP. I will leave the weight at 3 for now as we should also be looking into the possibility of natural surface color as an explanation, and need color images to test this theory out.

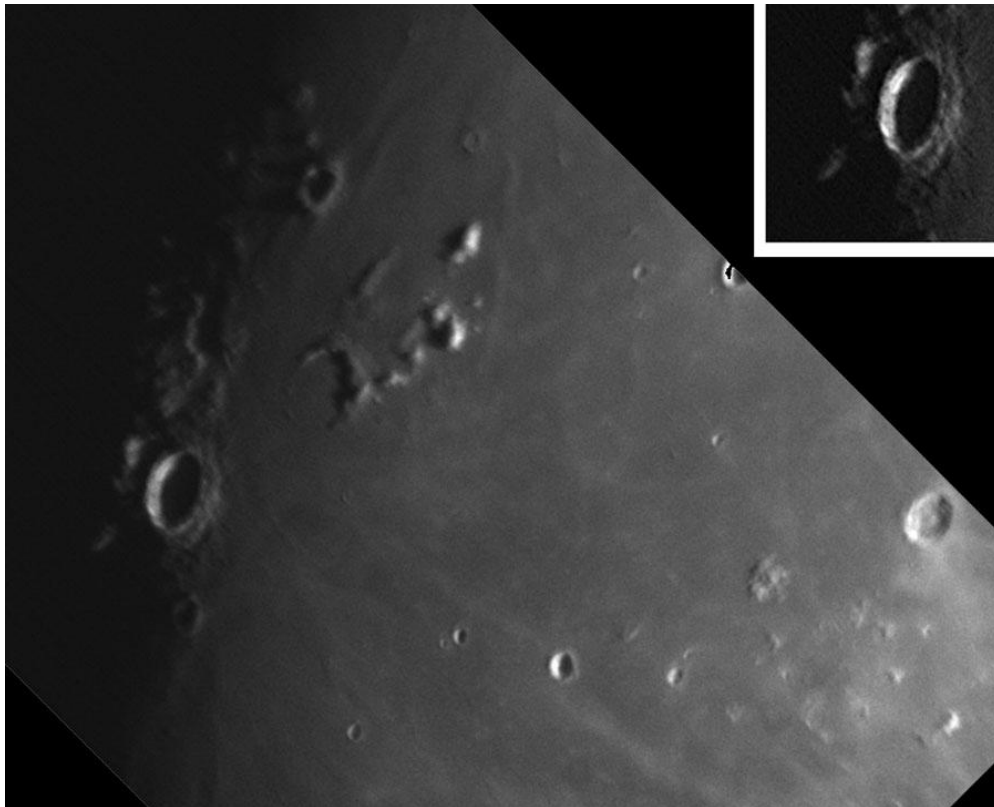
**Aristarchus:** On 2016 Jan 20 UT 23:13 Derrick Ward (BAA) imaged Aristarchus under the same illumination (to within +/-0.5°) to the following two LTP observations:

*Aristarchus 1966 Jul 29 UT 03:40 Observed by Simmons (Jacksonville, FL, USA, 6" reflector x192, S=7, T=4-5) and Corralitos Observatory (Organ Pass, NM, USA, 24" reflector + Moonblink) "Spot on S.wall vis. only in red filter, brightness 8deg. Slightly brighter than surrounding wall. No confirm. Says it might be part that reflected better. Not confirmed by Corralitos Obs. MB." NASA catalog ID #968. NASA catalog weight=1.ALPO/BAA weight=1.*

*Aristarchus 1975 Dec 14/15 UT 17:05-00:30 Observed by Foley (Dartford, England, 12" reflector,*

*S=II) and Moore (Sussex, England, 15" reflector x250 S=IV) and Argent and Brumder (Sussex, England) "In early sunrise conditions, W. wall was less brilliant than usual -- matched only by Sharp, Bianchini, & Marian. Extraordinary detail could be seen on this wall. Also noted intense & distinctly blue color entire length of W. wall. 3 others corroborated detail, but not color. Moore found things normal & saw Aris. brightest at 2030-2125h tho Argent & Brumder made it < Proclus" NASA catalog weight=4. NASA catlog ID #1422. ALPO/BAA weight=1.*

Derrick's image (Fig 10) reveals two things. Firstly there is a spot on the SW (not S) wall, but perhaps the 1966 observer could be excused from making slight direction of the compass errors. We cannot comment on the color of the spot though, but as Aristarchus has a natural blue cast, it is quite likely that the bands or non-band areas may have some slight departure from the overall blue color. Secondly concerning the 1975 observation, yes the rim does not look especially bright as we are used to seeing Aristarchus at other Selenographic Colongitudes, and yes as you can see from the inset image in Fig 10, there is quite a lot of detail on the western wall. Derrick's image shows the visual appearances of the LTP seem normal, apart from the fact that we are unable to check out the color descriptions. I will therefore leave the weights of both reports at 1.



**Figure 10.** Aristarchus orientated with north towards the top, taken by Derrick Ward on 2016 Jan 20 UT 23:13. The inset image on the top right is an enlargement of Aristarchus that has been sharpened and contrast stretched to bring out the bands and details on the western rim.

**South/J. Herschel:** On 2016 Jan 21 UT 02:10-02:30 Jay Albert observed (11" SCT Celestron scope, x255, seeing, 3-4 out of 10, Transparency variable 1<sup>st</sup>-3<sup>rd</sup> magnitude) this area under the same illumination, and topocentric libration (to within  $\pm 1^\circ$ ) to the following WWI era LTP report:

*40-54W, 54N-60N i.e. nr. South? or J.Herschel 1913 Jun 15 UT 22:00? Observer: Maw(Surrey, UK, 6" & 8" refractors) "Small distinct reddish spot which became diffused into a patch as term. advanced on the plateau NE of the crater South. When the plateau was on the term. (Goodacre says the crater was J.Herschel for same date -- 2 different spots or misident. for one?" NASA catalog weight=3. NASA catalog ID #345. ALPO/BAA weight=2.*

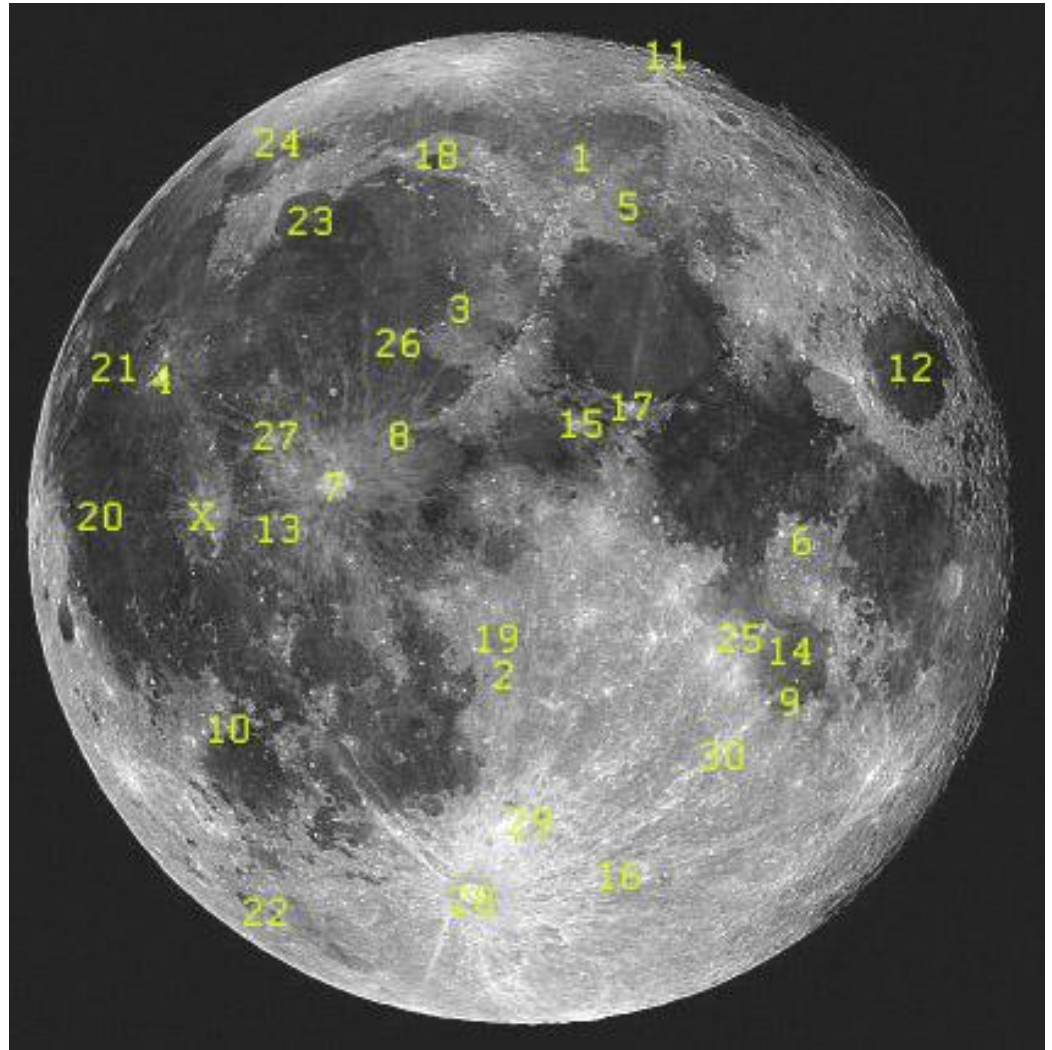
Jay commented that the terminator ran through Babbage. J. Herschel was fully lit while the Sun was low over South with much of the latter's floor in shadow, especially in the N, W and SW parts. The floor of Robinson between South and J. Herschel was in shadow. The floor of South showed a rough texture at this low solar angle. Jay saw no red spot or patch in, around or between South and J. Herschel. The Moon was almost at the zenith. So according to Jay the normal appearance is with no red spot – as one would expect. Concerning the 1913 observation, it is important to note that the “22:00” UT given in the NASA catalog is an estimate. Could it be some chromatic aberration effect from the refractor used in 1913? Possibly not as two different sized refractors are mentioned, though if the 22:00 UT is wrong then maybe it is due to atmospheric spectral dispersion which worsens as the Moon attains a lower altitude. An account of the Maw report of this 1913 LTP can be found in “Celestial Objects for Common Telescopes” (6<sup>th</sup> Edition, Esprin) where Walter Goodacre has written an appendix about the Moon: *“In my map [Goodacre] I have also shown three smaller ones [craters]; at the N.W. end a rugged plateau, on this Dr. W.H. Maw saw on 1913, June 15, when the plateau was on the terminator, a distinct reddish patch as the terminator advanced.”*. Note that N.W. here is in the classical sense of directions of the compass and in I.A.U. terms this now means N.E. So for now the weight here will be left at 2, because although the observation is intriguing, and the effect is quite prominent, there are no mentions of checks to see if red patches could be seen elsewhere on the Moon, and we have no knowledge of the Moon's altitude at the time. If anybody has access to Maw's observing log book(s), then I would be interested to find out more details about this observation.

**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/tlp/spot\\_the\\_difference.htm](http://users.aber.ac.uk/atc/tlp/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. Alexander
2. Alphonsus
3. Archimedes
4. Aristarchus
5. Burg
6. Censorinus
7. Copernicus
8. Eratosthenes
9. Fracastorius
10. Gassendi
11. Hayn
12. Mare Crisium
13. Mare Insularum
14. Mare Nectaris
15. Manilius
16. Maurolycus
17. Menelaus
18. Plato
19. Ptolemaeus
20. Reiner gamma
21. Schiaparelli
22. Schickard
23. Sinus Iridum
24. South
25. Theophilus
26. Timocharis
27. Tobias Mayer A
28. Tycho
29. Walther
30. Zagut



**FOCUS ON targets**

**X = Kepler**