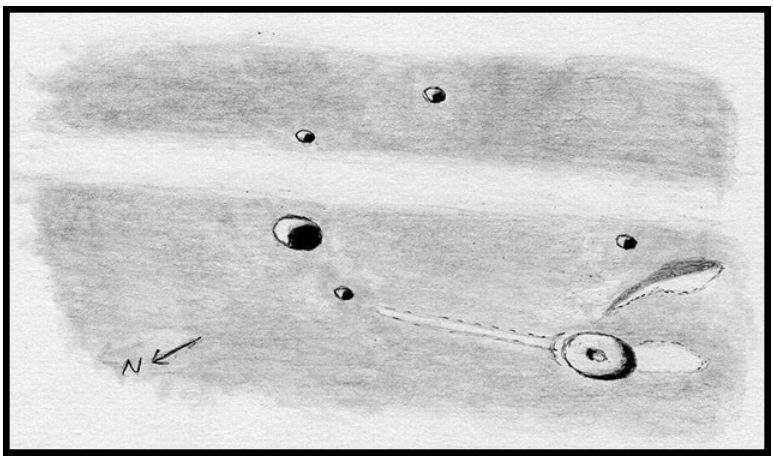
ASSOCIATION OF LUNAR & PLANETARY OBSERVERS
ALPO
Founded in 1947

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 – FEBRUARY 2018
DECHEN & HARDING



Sketch and text by Robert H. Hays, Jr. - Worth, Illinois, USA
November 10, 2005 23:25-23:39, 23:46-23:58 UT, 15 cm refl, 170x, seeing 7-8/10.

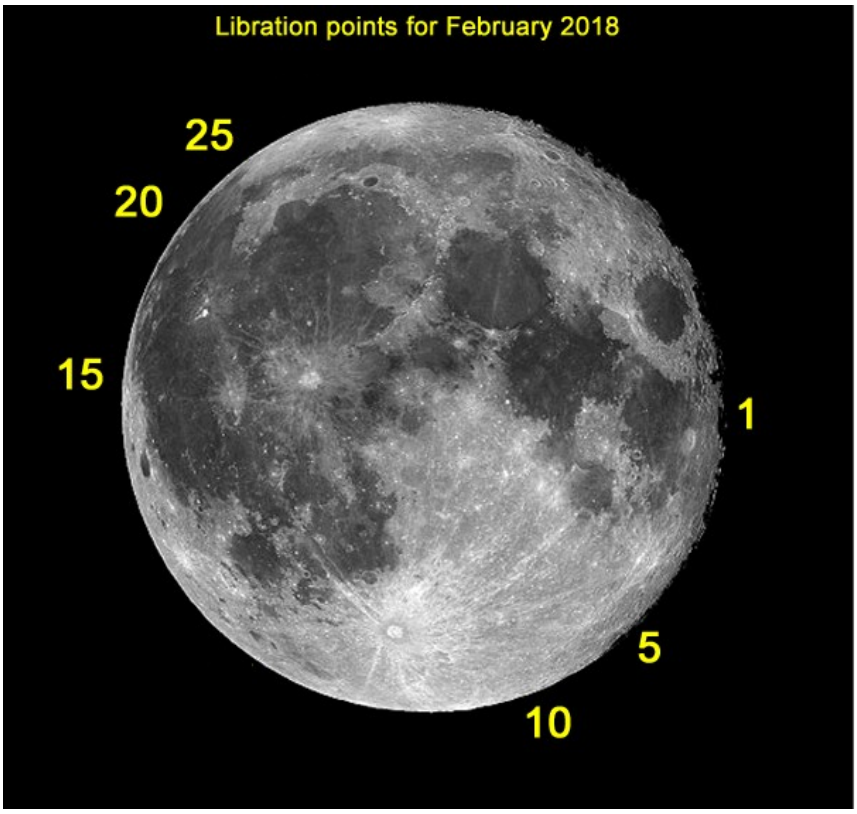
I sketched these craters and vicinity on the morning of July 18, 2017. This area is where Sinus Roris merges with Oceanus Procellarum, and had favorable lunar librations that morning. Harding is the largest crater in this sketch. It is a fairly shallow crater with a conspicuous central peak. A bright shadowless patch abuts the south rim of Harding, and a low ridge with weak shadowing is to its east. This ridge widens near its southern end. Harding D is the small pit east of the ridge. A narrow curved bit of shadow is concentric with the northeast rim of Harding, and a straight narrow ray extends outward from there. Dechen is the smaller but deeper crater northeast of Harding. This crater is flanked by the pits Dechen A to the east and Dechen C to the west. The latter is near the end of the narrow ray that extends outward from Harding. Dechen B is the small crater south of Dechen. The lettered Dechen craters and Harding D are all similar to each other. A wide diffuse ray passes between Dechen and Dechen A and goes just east of Harding D. This ray is not parallel to the narrow ray northeast of Harding. The two rays are also quite dissimilar in appearance.

LUNAR CALENDAR

2018	U.T.	EVENT
Feb 07	15:54	Last Quarter
07	1947	Moon-Jupiter: 4.7° S
09	05:12	Moon-Mars: 4.8° S
11	14:16	Moon Apogee: 405700 km
11	14:46	Moon-Saturn: 2.7° S
11	23:21	Moon Extreme South Dec.: 20° S
14	21:11	Moon Descending Node
15	20:52	Partial Solar Eclipse
15	21:05	New Moon
23	08:09	First Quarter
25	20:07	Moon Extreme North Dec.: 20.1° N
27	14:48	Moon Perigee: 363900 km
28	05:03	Moon Ascending Node
Mar 02	00:51	Full Moon
07	06:57	Moon-Jupiter: 4.4° S
09	11:20	Last Quarter
10	00:37	Moon-Mars: 4.2° S
11	02:37	Moon-Saturn: 2.5° S
11	06:39	Moon Extreme South Dec.: 20.1° S
11	10:13	Moon Apogee: 404700 km
14	10:48	Moon Descending Node
17	15:12	New Moon
18	21:07	Moon-Venus: 3.9° N
24	17:35	First Quarter
25	04:04	Moon Extreme North Dec.: 20.2° N
26	19:17	Moon Perigee: 369100 km
27	12:56	Moon Ascending Node
31	14:37	Full Moon

LUNAR LIBRATION

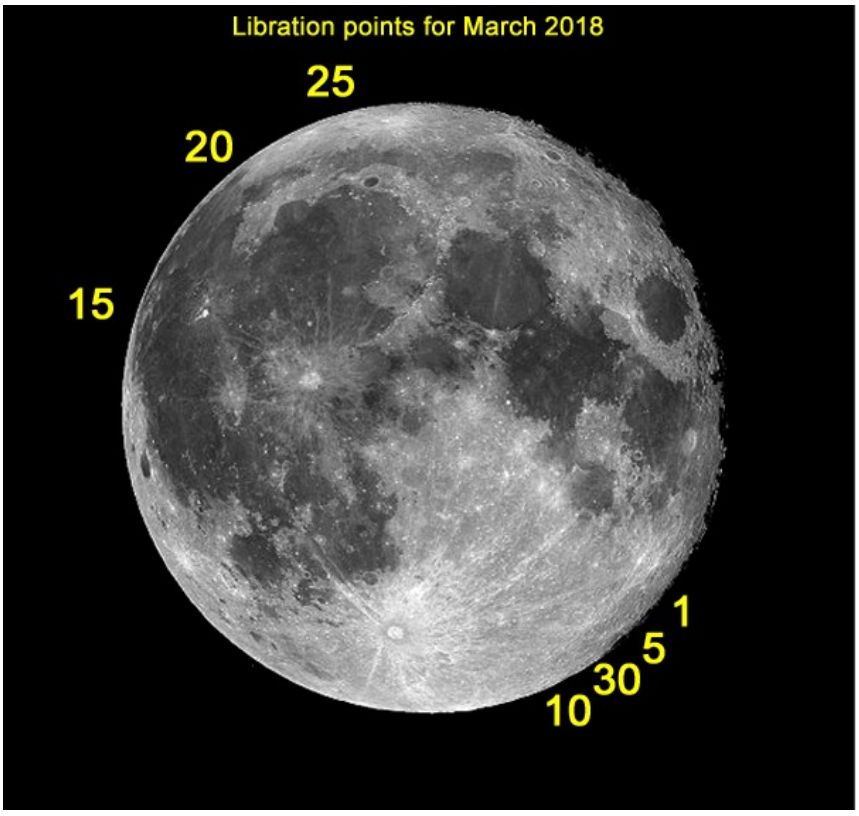
FEBRUARY-MARCH 2018



Size of Libration

02/01	Lat	-00°22'	Long	+02°54'
02/05	Lat	-05°55'	Long	+06°45'
02/10	Lat	-05°48'	Long	+03°14'
02/15	Lat	+00°10'	Long	-03°19'
02/20	Lat	+06°09'	Long	-06°16'
02/25	Lat	+04°57'	Long	-03°16'

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



Size of Libration

03/01	Lat	-01°23'	Long	+02°09'
03/05	Lat	-06°17'	Long	+05°39'
03/10	Lat	-05°07'	Long	+02°25'
03/15	Lat	+01°14'	Long	-03°56'
03/20	Lat	+06°28'	Long	-05°13'
03/25	Lat	+03°48'	Long	-01°28'
03/30	Lat	-03°56'	Long	+03°15'

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

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

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

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

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

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

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

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

Name and location of observer
Name of feature
Date and time (UT) of observation (use month name or specify mm/dd/yyyy, dd/mm/yyyy)
Size and type of telescope used Magnification (for sketches)
Filter (if used)
Medium employed (for photos and electronic images)
Orientation of image: (North/South - East/West)
Seeing: 0 to 10 (0-Worst 10-Best)
Transparency: 1 to 6

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

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

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

CALL FOR OBSERVATIONS:
FOCUS ON: Rima-Rilles

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 **March 2018** edition will be **Rima-Rilles** Observations at all phases and of all kinds (electronic or film based images, drawings, etc.) are welcomed and invited. Keep in mind that observations do not have to be recent ones, so search your files and/or add these features to your observing list and send your favorites to (both):

Jerry Hubbell –jerry.hubbell@alpo-astronomy.org
Wayne Bailey - wayne.bailey@alpo-astronomy.org

Deadline for inclusion in the Rima-Rilles article is February 20, 2018

FUTURE FOCUS ON ARTICLES:

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

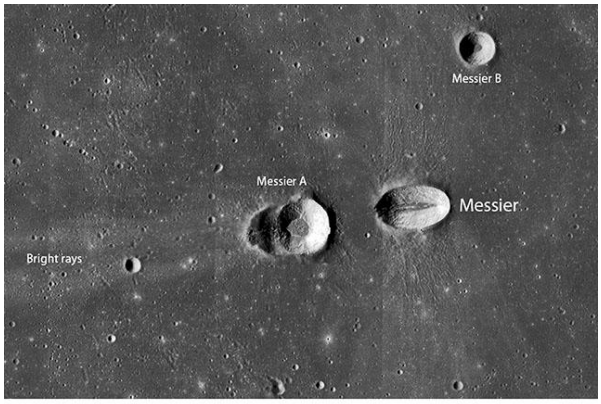
Subject	TLO Issue	Deadline
Craters – Latest and Greatest	**May 2018**	**Apr. 20, 2018**

MESSIER A AND ITS RAYS

Bill Dembowski - ALPO Assistant Coordinator
Lunar Topographical Studies

The picturesque pair (fig. 1) of Messier and Messier A (formerly known as Pickering) lies in the western reaches of Mare Fecunditatis. Although intimately linked, only Messier A is responsible for the unique, comet-like ray system associated with the pair. The odd appearance of the crater pair and double ray contributed to several interesting theories. Walter Goodacre detected five ghost craters lying between the two rays. V. A. Firsoff explained their presence by theorizing that Messier A was gradually creeping eastward, with the ghost craters marking its previous locations. Franz von Gruithuisen even proposed that the rays were artificial in nature.

Messier is about 1,250 m deep and of an elongated form, measuring about 11 km in length and 8 km in width. Messier A lies about 20km west of Messier. It is a double crater, measuring 11x13 km. The smaller, older crater was superimposed by a newer, a bit larger crater. Major rays extend north and south from Messier and west from Messier A. A well-developed ray-excluded zone occurs east of Messier.

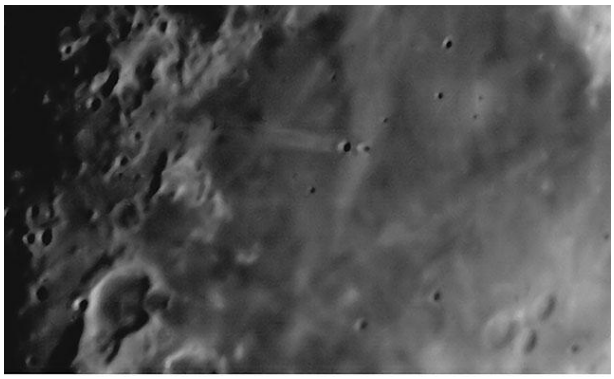


NASA - Lunar Reconnaissance Orbiter

FIGURE 1. Messier, MessierA and rays.

We now believe that both craters, and associated rays, were created by a single body (or a very close double body) whose angle of impact was too shallow for the ejecta to disperse radially. Non-radial dispersion occurs when the impact angle is less than 45^{O}. The extreme nature of the Messier A rays suggests that the angle was probably less than 15^{O} and, quite possibly, as little as 1^{O} to 5^{O}.

The odd shape of Messier A, especially under changing light, prompted Harvey Nininger to suggest that a meteorite had crashed through a ridge leaving a hole on either side connected by a tunnel. The rays themselves extend from Messier A to the vicinity of Lubbock H on the edge of the highlands to the west (fig. 2), a distance of about 105 km (65 miles). Rays, particularly at their greatest distance from the parent crater, are notoriously difficult to trace across highland areas and so their total length is probably slightly greater. Of relatively equal size, both rays are approximately 6 km (3.7 miles) across at their widest point.



Mare Fecunditatis
William M. Dembowski, FRAS - Elton Moonshine Observatory
20 June 2007 - 01:52 UT - Colong: 339.3 - Seeing: 4/10
8 inch f/10 SCT - 2x Barlow - Orion StarShoot II Camera

FIGURE 2. Mare Fecunditatis.

The northern ray begins to break apart in the last 40 km (25 miles) of its length. This appearance could also be caused by the ray overlapping, or being overlapped by, another ray pattern. If the separation of the northern ray is not the result of an overlap one also has to wonder if it occurred in "mid-air" or as the ray material struck the lunar surface.

Other rays on the Mare Fecunditatis also enter the picture. A broad fan-shaped ray, narrowest to the south, covers the area from the eastern rim of Messier to the eastern rim of Messier A, a distance of about 16 km (10 miles). It then fans out to several times that width as it travels north.

In addition, a slender and gently curving ray, originating from the vicinity of Taruntius B, crosses the Messier A ray at its midpoint and proceeds to the area just east of Lubbock. It does not intersect the Messier A ray at the point where the previously mentioned separation occurs.

REFERENCES:

Antonin Rukl, "Atlas of the Moon", Paul Hamlyn Publishing, London, 1991

Peter H. Schultz, "Moon Morphology", University of Texas Press, Austin, 1976

V. A. Firsoff, "Strange World of the Moon", Basic Books, N.Y., 1959

Charles A. Wood,"Messier on the Moon", Sky & Telescope Magazine, Nov. 2000

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ANORTHOSITE RAYS ON ANAXAGORAS WALL

Alberto Anunziato

At colongitude 84.1º (99.4% illumination), the bright rays are the spectacle par excellence of the lunar surface. Anaxagoras (fig. 1) has often been compared to Tycho for its system of bright rays, extensive and symmetrical, although in the case of Anaxagoras we are content to imagine the rays that extend through the dark side, since being close to the north pole are not visible from our planet.

On the left below Anaxagoras stands Timaeus, that seems to have the form of a bright ray crater whose rays are confused with those of Anaxagoras but its ejection mantle is distinguished. But Timaeus it is not in the ALPO list of bright ray craters, so it must be a full moon delusion.

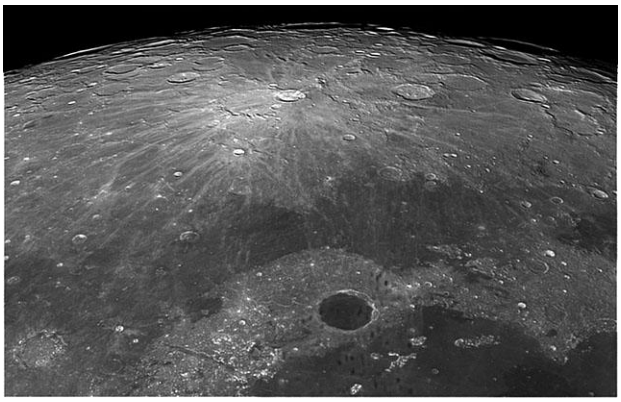

FIGURE 1. ***Anaxagoras.*** *Alberto Anunziato, Oro Verde, Argentina.*

Despite the magnificence of the Anaxagoras ejecta, the most interesting aspect of the image was initially raised as an enigma. Two bright rays arise from the center of the crater and extend outwards. The first thing I thought was that they were an artifact of the image, but in the video used to make the stacking (with AutoStakker) they were visible, albeit weakly. I searched and searched my few lunar books (those of us approaching 50 search first in the books) ... nothing. So I took the step of Google ... nothing. Until I tried to look for images of Anaxagoras online and found the Lunar Picture of the Day (LPOD) of May 28, 2012 (https://lpod.wikispaces.com/May+28%2C+2012), in which can be seen "Two broad zones of material on the western wall and continued beyond the rim crest down the outer wall", in the words of Chuck Wood, "it seems most likely that the wall zones are bright (hence anorthosite) material ejected during formation of the crater". The bright material that I considered a consequence of being pulverized ejecta, was bright per se, being the most ancient type of moon rocks, the material that formed the lunar crust and that is preserved on the surface of the highlands. Perhaps the brightness of these strange rays is due to two reasons: 1) intrinsic bright material, anorthosite ejected from the crust by a Copernican, and therefore recent, impact (that Wood considers oblique), 2) material that has not yet been obscured by space weather, as all the bright rays. That is why both inner rays appear brighter than the central peak, which we also know is pure anorthosite. NASA had selected the central peak of Anaxagoras as a Region of

Interest for the canceled Constellation program, since sampling the central peak area would be an opportunity to access the original lunar crust.

These two strange interior rays point towards the area between Philolaus and Mouchez in which the twin probes GRAIL impacted on December 17, 2012.

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MONS GRUITHUISEN

David Teske

This series of lunar domes is located at the junction of Mare Imbrium and Oceanus Procellarum. In this area, there is a peninsula-like piece of highland terrain that extends southwest of Sinus Iridum. At the end of this peninsula is Mons Gruithuisen, the moon's second largest dome (fig. 1). The westernmost dome, Mons Gruithuisen Gamma, has a base 18 km by 24 km and a height of 1,200 m. It lays between the craters Gruithuisen and Mairan. This dome has a summit crater about 1 km in diameter. Mons Gruithuisen Delta to the

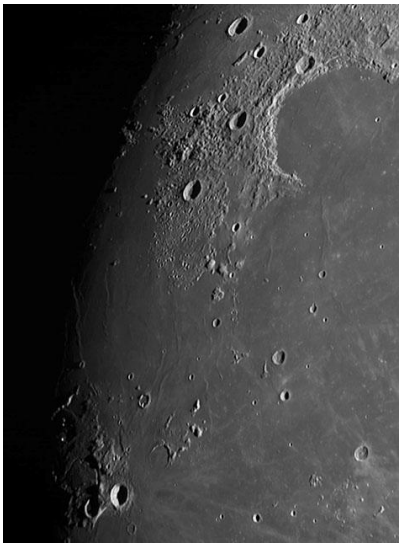
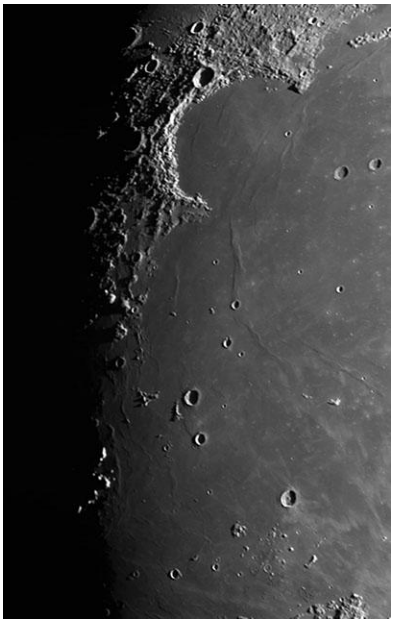


***FIGURE 1*. Mons Gruithuissen Domes.** *David Teske, December 30, 2017 02:20 UT. Colongitude 50.3 º, seeing 5/10. 102 mm f/7 APO refractor, 2.5 x Power mate, ZWO ASI 120mms camera.*

southeast is similar to Gamma, with a more irregular shape (fig. 2). It has a base 14 km by 33 km and a height of 1,500 m. Delta does not have a summit crater. These domes are bright, rounded mounds sitting at the edge of the Imbrium mare lavas.



The Gruithuisen domes are extrusive piles of silicic volcanic rocks like similarly shaped features on Earth. This silica-rich lava seems to be rare in lunar samples. These domes are much steeper than most mare domes, which typically have a slope of one or two degrees. These

***FIGURE 2*. Mons Gruithuissen Domes.** *David Teske, December 29, 2017 03:12UT. Colongitude 38.6 º, seeing 7/10. 102 mm f/7 APO refractor, 2.5 x Power mate, ZWO ASI 120mms camera.*

domes are not only bright inappearance, but are also brighter in the red part of the spectrum than normal lunar lavas. These characteristics suggest the Mons Gruithuisen domes have a different chemical composition than other lunar domes and that their lavas were very viscous and did not flow far from their vents. To the south is Mons Gruithuisen Zeta that is a small plateau perhaps similar to Rümker.

A YOUNG PORTION OF THE MOON

Rik Hill

When we first landed on the moon, NASA chose the safest places as landing sites. As our exploration of the moon went on in subsequent missions, science took more of a priority as we wanted to learn about the origins and history of the moon. To this end, Apollo 16 was the first mission to ever go to the lunar highlands just west (lunar) of the well known crater Theophilus (not seen in fig. 1). For orientation we see at the bottom of the image the crater Albulfeda (65km diameter), near the top center is Delambre (54km) and below it the interesting non-round crater Taylor (43km).

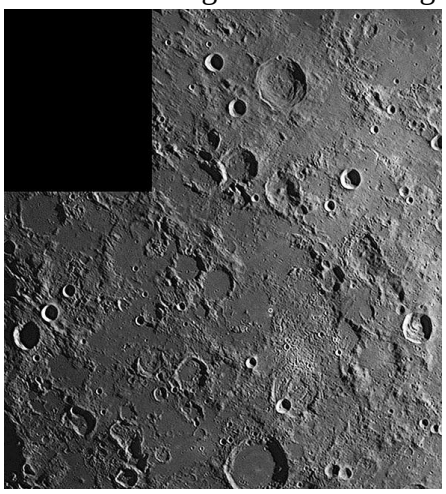


FIGURE 1. Apollo 16 *- Richard Hill – Tucson, Arizona, USA July 12, 2016 02:50 UT. Seeing 9/10. 8" Mak-Cass, f20, 665 nm filter, SKYRIS 445M.*

The Commander of Apollo 16 and the 9th person to walk on the moon, was John Young, who passed away on January 5th at the age of 87. He had also "flown" on Gemini 3 1965 and then Gemini 10 a year later and orbited the moon in Apollo 10. But on Apollo 16 he and astronaut Charles Duke spent 71 hours on the lunar surface, 20 hours of which were EVAs to collect 211 lbs of surface samples, the second largest amount surpassed only by Apollo 17. The landing site of Apollo 16 is shown here just below center marked with a small "o". The little white spot below the marker was named "South Ray Crater" about a kilometer across with the rays being about 2-3 km across. Above the marker are a few mountains dubbed "Smokey Mountains". Below and slightly to the right is some lighter colored material on rumpled terrain overlaying the north wall of a ruined crater. The crater is Descartes (49km). Note the concentric structures of this crater. The lighter colored material is a magnetic anomaly like Reiner Gamma and is the strongest such on the side of the moon we can see. This is fascinating region to be sure and while John Young and many of his fellow astronauts are gone now, their footprints will outlive all of us!

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THE PRINTER'S CRATER

Rik Hill

Set along the northeastern shore of Mare Nectaris (seen here in the lower left of fig. 1) is the odd shaped 77km diameter crater Gutenberg. This keyhole shaped formation is very complicated. It was formed between 3.9-4.5 billion years ago, about the same time as Mare Fecunditatis in the upper right of this image but undoubtedly highly modified by the more recent Nectaris impact of 3.85-3.95 billion years ago. The floor was flooded and instead of a central peakthere is a unusual grouping of mountains on its floor. On the east or right rim is another ancient crater that is almost a ghost crater, Gutenberg E (28km) and to the south

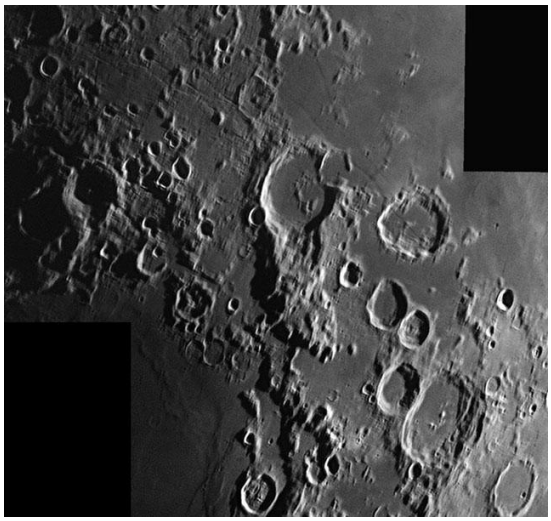

FIGURE 1. Gutenberg *- Richard Hill – Tucson, Arizona, USA May 2, 2017 01:56 UT. Seeing 7/10. 8" Mak-Cass, f20, 665 nm filter, SKYRIS 445M.*

is another feature, Gutenberg C (45km) that may have been a crater at one time but is now filled in with ejecta. Further east is the crater Goclenius (56km) that is an elongate crater with Rimae Goclenius crossing the floor and extending off to the north of Gutenberg until it mingles with the Rimae Gutenberg to the upper left of the Gutenberg crater. Notice there is another graben extending from the vicinity of Gutenberg E northwards.

Due west of Gutenberg is a largely shadow filled crater, Capella (51km) with a valley going through it from the lower left to the upper right. Then at the bottom of the image is the large crater Colombo (51km) and the Montes Pyrenaeus to its left. North of these mountains is another strange crater, Gaudibert. Give this one a look the next time you're in the area. It defies a simple explantion!

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A LOAD OF BULLIALDUS

Rik Hill

There are many gems hidden away in Mare Nubium. The obvious anchor feature is Bullialdus the 63km diameter crater just above left of center (fig. 1) with its radial feathery ejecta splash pattern. It is quickly identifiable at the telescope because of the three similar sized craters below it, Bullialdus A (26km) just south of the namesake crater, Bullialdus B (21km) a little further out and Konig (24km) to the lower left (lunar west). South of these craters is the ring of a ghost crater with a little mountain hanging off the bottom. This is Kies (46km). It has an interesting dome just to the west with a central pit called Dome Kies Pi. This is one of the easier domes to find on the moon. To the east of Bullialdus is the curious feature Wolf (26km). It changes its appearance dramatically with changes in lighting and is worth watching the whole lunation. In the lower right corner of this image is the large crater Pitatus (100km) with its nice system of Rimae Pitatus just inside the walls of the crater. Adjacent to the west is the crater Hesiodus with a central crater Hesiodus D and below it is Hesiodus A (15km), one of the best examples on the moon, of a double walled crater. From Hesiodus to the bottom of this image is a nice graben, Rima Hesiodus over 300km long but only 3-4km wide. The two shadow filled craters lie just beyond that to the west, Mercator (49km) on the right and Campanus (also 49km) to the left.

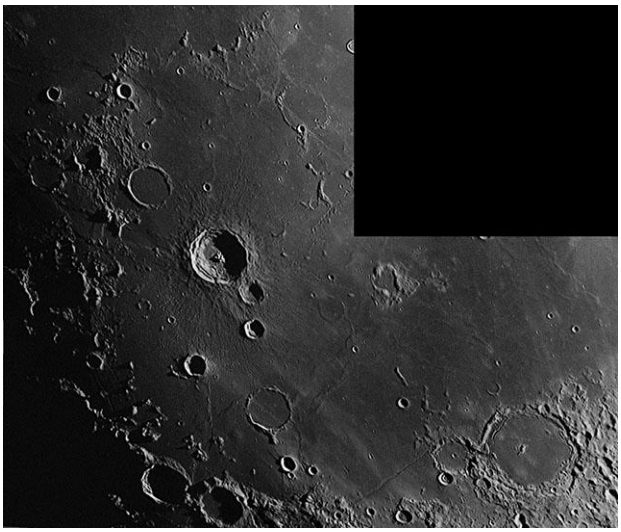

***FIGURE 1*. Bullialdus** *- Richard Hill – Tucson, Arizona, USA June 15, 2016 02:28 UT. Seeing 8/10. 8" Mak-Cass, f20, 665 nm filter, SKYRIS 445M.*

Above Wolf, just off the edge of the nameplate you may notice a nice line of 2-4km diameter secondary craters. These run through the ruins of the crater Gould (36km). North of this is the remnants of a crater, now just a ghost, called Opelt (51km) and north of Bullialdus is a similar sized ghost crater, Lubiniezky (46km). Note the shadows of the mountains and crater walls in this region.

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

ALBERTO ANUNZIATO - ORO VERDE, ARGENTINA. Digital image of Anaxagoras.

MAURICE COLLINS - PALMERSTON NORTH, NEW ZEALAND. Digital images of 9 & 12 day moon.

WALTER ELIAS - ORO VERDE, ARGENTINA. Digital image of Alphonsus, Aristarchus(2), Grimaldi & Montes Apenninus.

HOWARD ESKILDSEN - OCALA, FLORIDA, USA. Digital images of Aristillus & Proclus.

RICHARD HILL – TUCSON, ARIZONA, USA. Digital images of Bullialdus, Delanbre, Endymion, Gutenberg, Montes Caucasus, Ptolemaeus, Rupes Recta & Rimae and Rilles(65).

DAVID TESKE - LOUISVILLE, MISSISSIPPI, USA. Digital images of Mons Gruithuisen domes(5).

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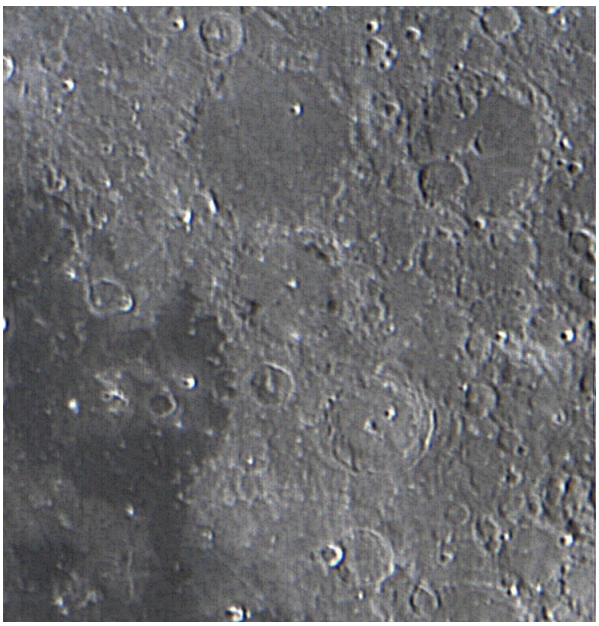
RECENT TOPOGRAPHICAL OBSERVATIONS

9 DAY MOON- Maurice Collins,- Palmerston North, New Zealand. December 27, 2017 10:12-10:16 UT. FLT-110, ASI120M. North down.

RECENT TOPOGRAPHICAL OBSERVATIONS

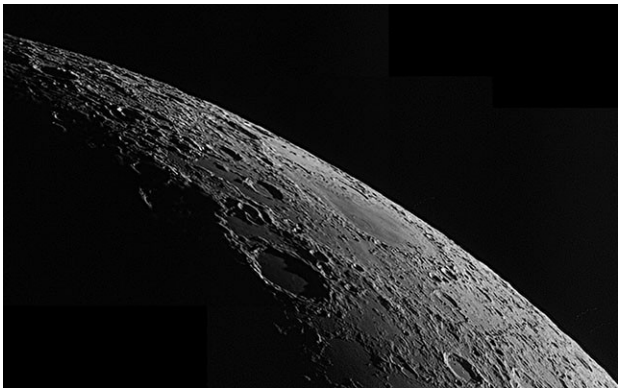
12 DAY MOON- Maurice Collins,- Palmerston North, New Zealand. December 30, 2017 09:45-08:55 UT. FLT-110, ASI120M. North down.



ALPHONSUS- Walter Elias, Oro Verde, Argentina. December 7, 2017 05:36 UT. 289 mm Celestron, Canon EOS Digital Rebel XS.

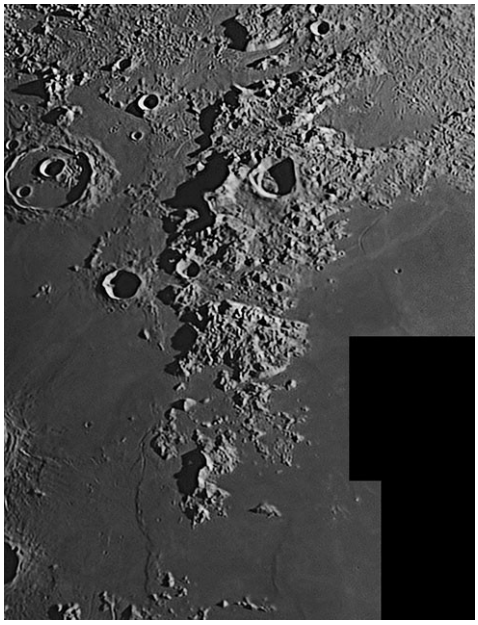
MONTES APENNINUS- Walter Elias, Oro Verde, Argentina. December 10, 2017 06:22 UT. 289 mm Celestron, Canon EOS Digital Rebel XS.

RECENT TOPOGRAPHICAL OBSERVATIONS



ENDYMION - Richard Hill – Tucson, Arizona, USA May 29, 2017 02:37 UT. Seeing 8/10. Celestron 5" SCT, 665 nm filter, SKYRIS 445M.

As often happens during this time of the year, I have bronchitis and cannot go out in the night air. This gives me time to take a look at some images from earlier in the year. After all, New Years is a time for looking back and taking stock. Here we have a view of the moon 3.5 days into the lunation when the 129km diameter crater Endymion is seen just coming into the light with the wonderful play of shadows on its floor. This is a favorable libration for this crater and between it and the limb is the large flat mare, Mare Humboldtianum. Adjacent to the upper left of the mare is a very foreshortened shallow crater that is not often seen, Belkovich (204km) and further on a better seen crater Hayn (90km). In the upper left corner is a shadow filled crater, Cusanus (65km). Then at the lower edge of this image is a nicely defined crater Mercurius (70km). Before leaving, notice how smooth the limb is here. We don't see big mountains or the profiles of large craters standing off the edge.



MONTES CAUCASUS - Richard Hill – Tucson, Arizona, USA May 3, 2017 02:12 UT. Seeing 8/10. TEC 8" f/20 Mak-Cass, 665 nm filter, SKYRIS 445M.

Like an inverted spearpoint the Montes Caucasus acts as an isthmus between eastern Mare Imbrium and western Mare Serenitatis. It juts down from Aristoteles and Eudoxus and points towards the Montes Apenninine to the south. The peaks rise to heights of 3600-3700m above the plain below but once, before the great Serenitatis and Imbrium impacts that flooded the mountain passes, they must have been grand summits indeed! On the left edge of the image we see Cassini (60km diameter) with all its interior wrinkles and rimae and nicely defined ejecta blanket. In the middle of the upper peaks of the Caucasus is the crater Calippus (34km) and between these craters to the south is Theaetetus (26km). Directly between Cassini and Calippus is a nice unnamed rille system. Then off the left side of the spectacular mountain in the southern tip of this range, is another rille, Rima Theaetetus. Rima Calippus can be seen off the right flanks of these mountains up by Calippus. Above and to the right of Calippus is a broad flat region. This is the "crater" Alexander. Virtual Moon Atlas gives it an 85km diameter though there's nothing very round about it. In the description they call it "triangular" though it's not much of a triangle either. LROC gives it a larger diameter of 94km and Wiki only 81km. To me it looks squarish, about 70km on a side giving a diagonal close to the larger listed "diameter". Spend and evening in the passes and peaks of this range, crank up the magnification and enjoy!

BANDED CRATERS PROGRAM

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

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

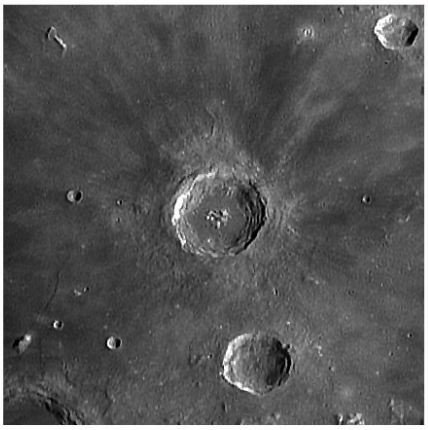
Assistant Coordinator – William Dembowski – dembowski@zone-vx.com

Banded Crater Program Website: http://moon.scopesandscapes.com/alpo-bcp.html

A.L.P.O. Lunar Section: Selected Areas Program Banded Craters Observing Form

Crater Observed: Artistillus
Observer: Howard Eskildsen Observing Station: Ocala, Florida
Mailing Address: P.O. Box 830415, Ocala, Florida, 34483
Telescope: Meade Refractor 15.2 cm f/8
Imaging: DMK 41AU02.AS, 2X Barlow, Filters: Orion V-block
Seeing: 9/10 Transparency: 5/6
Date (UT): 2017/02/07 Time (UT): 00:45
Colongitude: 37°
Position of crater: Selen. Long. Selen. Lat.
1.2° East 33.9° North
Lunar Atlas Used as Reference: Virtual Moon Atlas Expert Version 2.1 2004-11-07

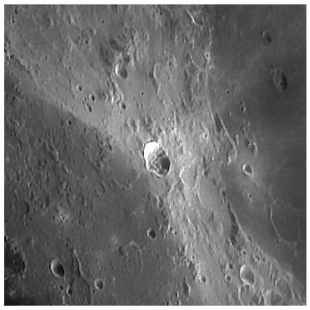
Image (north up): Comments:



Archimedes, Aristillus, Autolycus 2017/02/07, 00:45 UT,
Seeing 9/10, Transparency 5/6
6" f/8 Refractor, Explore Scientific Lens, 2X Barlow
DMK 41AU02.AS, Orion V-block Filter
Howard Eskildsen, Ocala, Florida, USA

Crater Observed: Proclus
Observer: Howard Eskildsen Observing Station: Ocala, Florida
Mailing Address: P.O. Box 830415, Ocala, Florida, 34483
Telescope: Refractor, Explore Scientific lens, 15.2 cm f/8
Imaging: DMK 41AU02.AS, 2X Barlow, Filters: W-8 Yellow
Seeing: 8/10 Transparency: 6/6
Date (UT): 2017/10/26 Time (UT): 23:53
Colongitude: 353.3°
Position of crater: Selen. Long. Selen. Lat.
46.8° East 16.1° North
Lunar Atlas Used as Reference: Virtual Moon Atlas Expert Version 2.1 2004-11-07

Image (north up):



LUNAR GEOLOGICAL CHANGE DETECTION PROGRAM

Coordinator – Dr. Anthony Cook – atc@aber.ac.uk

Assistant Coordinator – David O. Darling - DOD121252@aol.com

Observations received so far, for December, have come from: Jay Albert (Lake Worth, FL, USA – ALPO) who observed Aristarchus, Censorinus, earthshine, Grimaldi, Herodotus, Hipparchus, Picard, Torricelli B, and Vallis Schroteri. Alberto Anunziato (Argentina, AEA) observed Aristarchus and Plato. Francisco Alsina Cardinalli (Argentina, AEA) imaged Plato. Maurice Collins (New Zealand, ALPO/BAA/RASNZ) who imaged Aristarchus, earthshine, and took some whole lunar disk images. Anthony Cook (Aberystwyth/Newtown/Mundesley, UK – Abeystwyth University/ALPO/BAA) imaged several features and videoed earthshine. Rob Davies (UK – NAS) imaged Aristarchus, David Durate and Romualdo Caldas (Brazil, EXOSS) videoed earthshine. Walter Elias (Argentina –AEA) imaged Aristarchus, Alphonsus, and Grimaldi. Valerio Fontani (Italy – UAI) imaged Bullialdus. Les Fry (NAS) imaged Copernicus and several features. Nick James (UK – BAA) videoed earthshine. Tim Haymes (UK - BAA) videoed earthshine. Tom Moran (UK – BAA) videoed earthshine. Stefan Sposetti (Switzerland – GLR) videoed earthshine. Derrick Ward (BAA) imaged Mons La Hire and Plato. Luigi Zanatta (Italy, UAI) imaged the lunar south pole area. Marcello Zurita videoed earthshine (Brazil, EXOSS).

News: I continue in my analysis of the Brazil (EXOSS) observations of an impact flash, that we mentioned in the last newsletter. On another note a paper has been accepted for publication in Astronomy and Astrophysics on the ESA funded NEOLITA observatory work in Greece. Authored by: A.Z. Bonanos *et al.*, it describes 10 impact flashes with temperatures of between 1,600-3,100 K.

LTP Reports: There were two reports for December, both of which we can probably say were not LTP.

Firstly I received an email from an observer in Port Washington, NY, USA to say that on 2017 Dec 26 UT 22:45 they saw something odd about the Moon. At that time the Moon was 56% illuminated and 48° above the observer's local horizon. As far as I can make out it was a naked eye observation, however as the observer failed to respond to an email request for additional information, I would rather not go into further detail, but shall assign a weight of 0 to the ALPO/BAA LTP database. However if you were observing on that date and time, then please do get in touch.

Secondly Maurice Collins took some video of Aristarchus on 2017 Dec 30 UT 09:40, and the Registax'ed image picked up some blue on the outer western rim which he had not detected visually. You can see from Fig 1 (Top) why it raised his interest - initially. However a careful re-examination of the video frames from that night, an example of which is in Fig 1 (Bottom), we can quite clearly see that there is plenty of atmospheric spectral dispersion present. The saturation on the western interior rim, in the top version of figure 1, hides some of the corresponding red color. This report will therefore be given a LTP weight of 0 and could explain some past color photographic LTP reports, where only one color was seen, were thought of as LTP. So in itself, although not a LTP, this observation has its value in teaching us to be careful when interpreting colors in images that are over exposed contrast-wise.

Figure 1. Aristarchus on 2017 Dec 30 UT 09:40, taken by Maurice Collins (ALPO/BAA/RASNZ), orientated with north towards the top. **(Top)** The image has undergone sharpening and had its color saturation increased to 50%. Color on the western rim is explained away in the text below. **(Bottom)** This is one of the original images that went into the Registax program, but is less contrast stretched, though color saturation was set at 80%.

Routine Reports: Below is a selection of reports received for December that can help us to re-assess unusual past lunar observations. Due to teaching work I have not had much time to go into these in depth though.

Censorinus and Torricelli B: On 2017 Dec 02 UT 01:35-01:45 & 01:45-01:55 respectively, Jay Albert checked out these features under similar illumination, to within ±0.5° to the following to reports:

On 2002 Sep 20 at UT05:30-07:20 R. Gray (Winnemucca, NV, USA) found that Censorinus to be more difficult to see through a blue Wratten 38A filter than through a red Wratten 25 filter. This effect though might have had more to do with respective filter densities rather than an actual LTP. The ALPO/BAA weight=1.

On 2002 Sep 20 at UT05:30-07:20 R. Gray (Winnemucca, NV, USA) found Torricelli B to be more difficult to see through a blue Wratten 38A filter than through a red Wratten 25 filter. This effect though might have had more to do with respective filter densities rather than an actual LTP. The ALPO/BAA weight=1.

Jay, found that Censorinus was obviously extremely bright in integrated light and when viewed in the Kodak Wratten 25 red and blue 44A filters seemed about equally bright. However when viewed through a Wratten 38A blue filter it was significantly dimmer. Jay comments that this was because the Wratten 38 filter has greater density (less transmission) than the Wratten 44a blue filter. Likewise for the Torricelli B observation he found a similar effect i.e. the red Wratten 25 and blue Wratten 38 filters were of different densities and can therefore probably explain the effect that Robin Gray described. I should point out that Robin Gray often commented upon the issues with the Wratten 38A being darker than the red filter, but we kept the observations on the database just in case, and so it is now appropriate, with the help of Jay's observations, to remove them by assigning weights of 0.

Plato: On 2017 Dec 03 UT 03:47, 04:00 and 04:09-04:10 Francisco Alsina Cardanalli (AEA) imaged the crater under the same illumination conditions to the following report:

Plato 1966 Aug 01 UT 06:14 Observed by Kelsey (Riverside, CA, USA, 8" reflector x300) The wall from the S to the NNE wouldn't focus well though at least 4 craterlets on the floor were clearly seen (Ricker uncertain if real LTP. Cameron thinks it probably was -- similar to Bartlett's experience on Aris. NASA catalog weight=2. NASA catalog ID #961. ALPO/BAA weight=1.

Francisco took four images, but they all pretty much looked the same as shown in Fig 2. Here you can

clearly see the central craterlet on the floor of Plato, one to the NW and another to the SW of this, with a hint of a 4th one to the west. So therefore the image is sharp. Concerning the NNE rim, this is that blurry, though perhaps the N to E section of the rim could be said to be of lower contrast than the rest of the rim. The fact that Kelsey saw 4 craterlets on the floor, and we can see these in Fig 2, and that the NNE rim is now clearly seen, suggests that there may be some credence to Kelsey's assertion the NNE rim should not be difficult to focus on, as he described for 1966. I shall therefore leave the ALPO/BAA weight of this report as it is at 1.

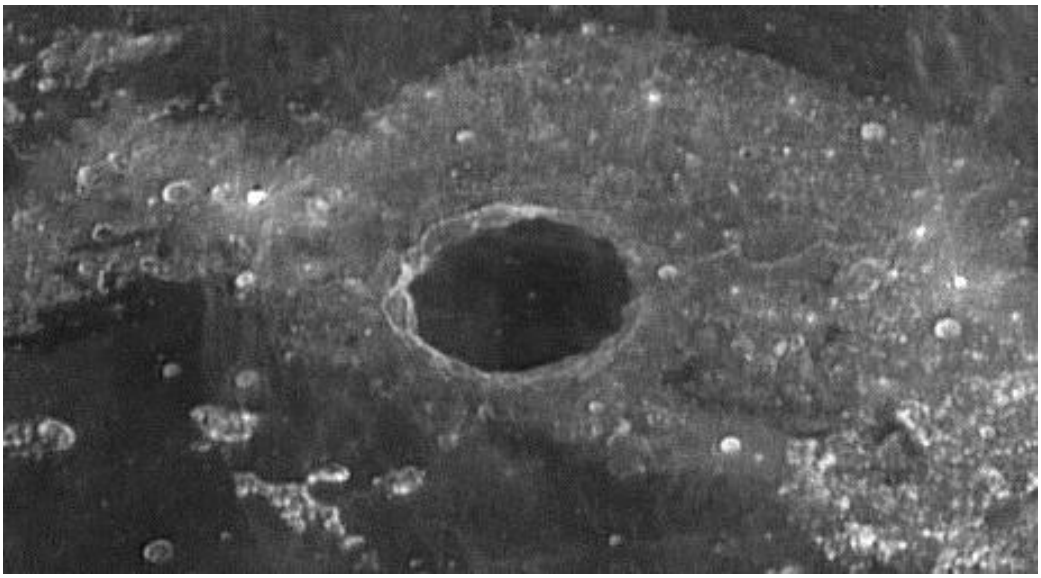


Figure 2. A monochrome image of Plato by Francisco Alsina Cardanalli (AEA) on 201 Dec 03 UT 04:00 and orientated with north towards the top.

Aristarchus: On 2017 Dec 02 UT 08:57-09:00 Maurice Collins (ALPO/BAA/RASNZ) imaged the Moon under similar illumination, to within ±0.5°, to a photographic observation by Alter from 1959:

Aristarchus 1959 Jan 23 UT 06:20 - Observer: Alter (Mt Wilson, CA, 60" reflector x700) "Brilliant blue in interior later turning white. Photos obtained. (MBMW has this entry twice for diff. dates because source gave UT date as 23rd.)" NASA catalog weight=5. NASA catalog ID = #712. ALPO/BAA weight=4.

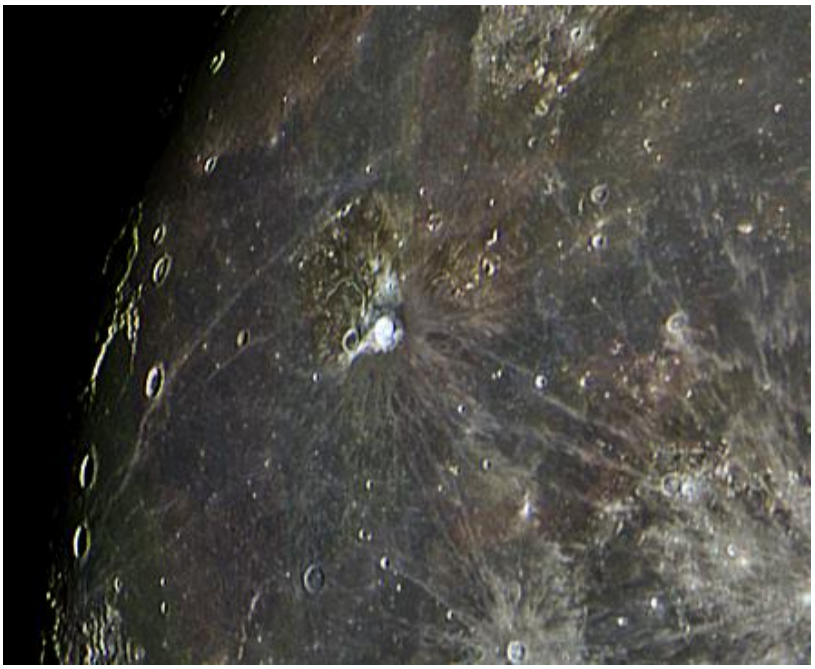


Figure 3. Aristarchus as imaged by Maurice Collins on 2017 Dec 02 UT08:57-09:00. The image has had its color saturation enhanced to 80% and is orientated with north towards the top.

Alter's photograph was taken with a 60" scope, somewhat larger than Maurice had access to, and quite

likely the photographic material was more sensitive to the UV and short wavelength end of the spectrum that the CCD that Maurice used. Aristarchus is naturally blue, and probably even stronger in color at shorter wavelengths, so it is not surprising that although Aristarchus has a slight blue cast in Fig 3, we are not seeing what Alter recorded. Also Aristarchus in Fig 3 is slightly saturated. We shall leave the weight at 4 for now,

Grimaldi: On 2017 Dec 07 IT 04:17 Walter Elias (AEA) imaged this crater under the same illumination conditions to the following report:

Grimaldi 1938 Mar 28 UT 09:30 Observer: Firsoff (Glastonbury, UK - 6" reflector) - Slight greenish color - {Note the UT given in the NASA catalog is 09:30 which is in daylight here in the UK - possibly the catalog is wrong, else the observer was observing in daylight, but worth checking out just in case}. NASA catalog ID No. #433 and NASA weight=4. ALPO/BAA weight=3.

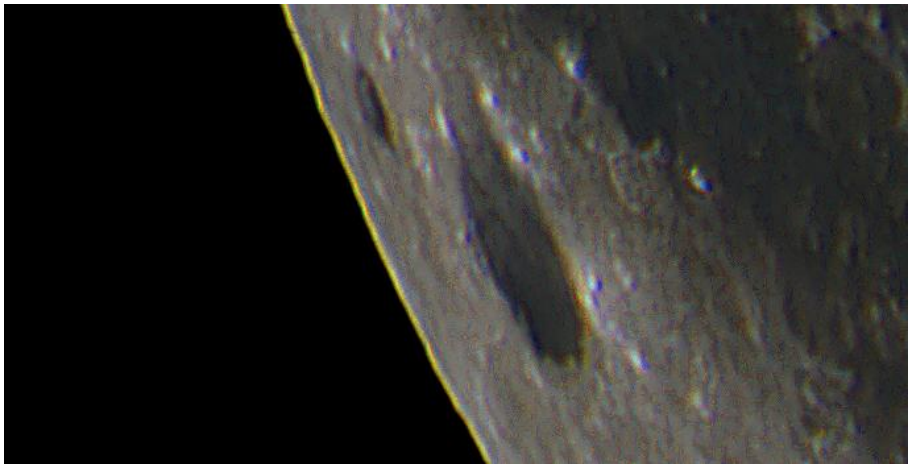


Figure 4. A color image of Grimaldi taken by Walter Elias on 2017 Dec 07 UT 04:17, and orientated with north towards the top. The image has had its color saturation increased to 85% to try to bring out natural surface color.

Walter's image (Fig 4) shows no color to the mare filling in Grimaldi, indeed the tint is no different to nearby Oceanus Procellarum on the east, so natural surface color cannot explain what Firsoff described back in 1938. However as you can see from the LTP description above, the 1938 observation was made in daylight, unless the UT is wrong, so perhaps it was a color contrast effect with the sky, though of course that would also make other mare areas a similar color. We shall leave the weight of this report at 3.

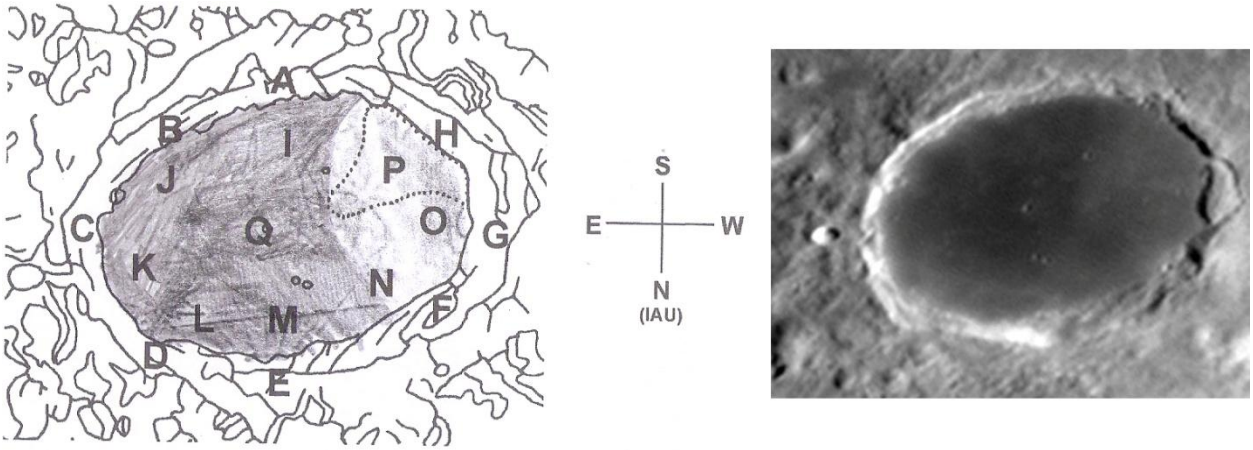


Figure 5. (Left) An ALPO chart of Plato with floor shadings added in by Alberto Anunziato (AEA), from 2018 Dec 08 UT 05:15-05:30. **(Centre)** Directions of compass. **(Right)** An image by Brendan Shaw (BAA) Taken on 2004 Sep 04 UT 01:27 under similar illumination.

Plato: On 2017 Dec 08 UT 05:15-05:30 Alberto Anunziato observed this crater under similar illumination to the following report:

Plato 1825 Apr 08 UT 01:00 Observed by Gruithuisen (Munich, Germany) "West part of crater brighter than east part". NASA catalog weight=4. NASA catalog ID #106. ALPO/BAA weight=2.

Alberto was using a Meade EX 105 at a magnification of x154, under 5/10 seeing, and found that the western part of the floor of Plato was brighter than the sketch, as indicated in Fig 5 (Left). Although I have no further information about the Gruithuisen observation and whether he was referring to the floor or the rim, I did find a reference to a repeat illumination observation by Brendan Shaw, which was mentioned in p14 of the 2004 Nov TLO, and can be seen in Fig 5 (Right). This is very similar to Alberto's sketch. Until we can find out about what Gruithuisen actually meant in his 1825 observation, I think we should lower the weight to 1.

Tycho: On 2017 Dec 11 UT 08:42 Les Fry (NAS) imaged the southern hemisphere of the Moon, just 10 minutes before an observing widow for the following report came into effect:

On 1996 Feb 12 at UT 07:30-08:27 J.Sandel (Caycee, SC, USA) noted a contrast effect inside Tycho at sunset. At 07:30UT there was a slight, but definite illumination of small areas of the crater floor west of the central; peak. Also seen by T. Ferrel (Lawrenceville, GA, USA, SCT C8). This was oval in shape and gray in color - Ferrel noted some diffuseness. It brightened over 30 minutes. At 08:11UT a definite brightness fade noted in Tycho's central peak. The crater floor had increased illumination of entire crater floor. ALPO/BAA weight=3.

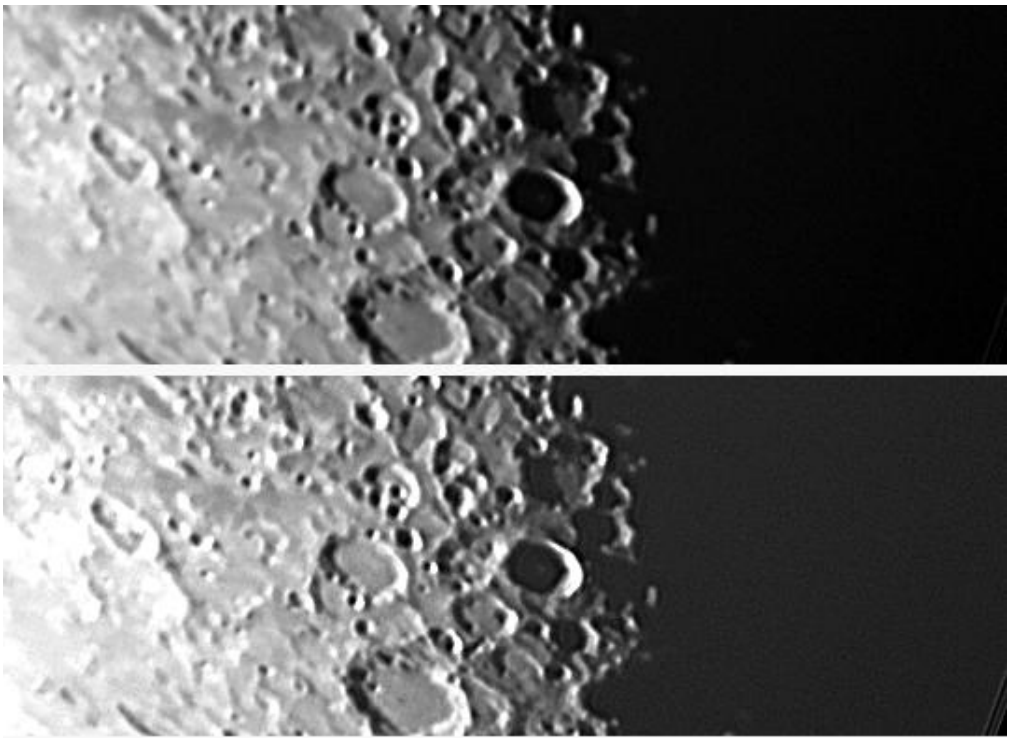


Figure 6. Tycho crater, from a much larger image, taken by Les Fry on 2017 Dec 11 UT 08:42. Orientated with north towards the top, **(Top)** Original image. **(Bottom)** Image with contrast enhancement and some sharpening to reveal the central peak area.

The image that Les took, certainly seems to show the presence of the central peak in Tycho, but we cannot push the processing further to investigate the region of darkness west of the peak. We shall therefore leave the weight at 3 and continue monitoring this crater at this illumination stage.

South Pole: On 2017 Dec 23 UT 16:13 Luigi Zanatta (UAI) imaged this area under similar illumination to the following report:

South Pole 2011 Apr 08 UT 19:30-20:00 A.Kemp (Mold, Flintshire, UK) observed that the Leibnitz peaks at the southern pole stood out sharply. However one of the peaks was "shining like a spot light. So bright that I couldn't make out its shape". – image clear and steady with excellent transparency and seeing in the 70mm f/13 refractor (25mm and 10mm eyepieces). Inspections during the above time period revealed no changes in brightness. Previous observations of this area had never shown such an unusual brightness, and Arthur likened the brightness to "a maximum brightness of Venus shining amongst 2nd magnitude stars". The observer was an experienced observer. ALPO/BAA weight=2.

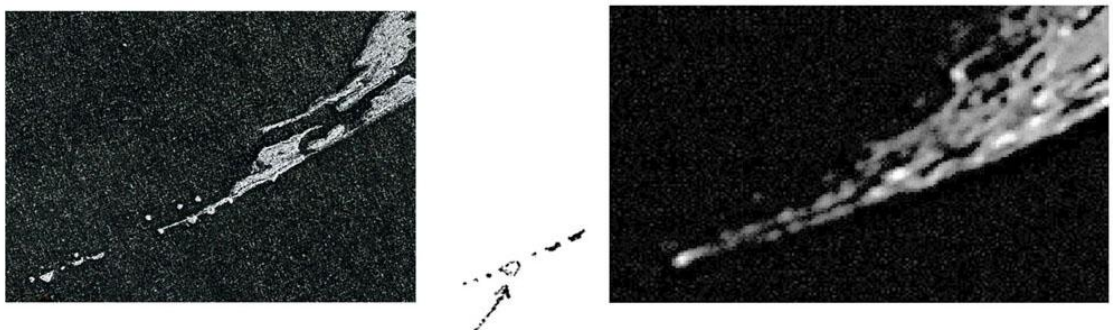


Figure 7. The South Pole area orientated with north towards the top. **(Left)** A sketch by Arthur Kemp from 1977 Mar 24 UT 20:30-20:50. **(Centre)** A sketch by Arthur Kemp from 2011 Apr 08 UT 19:30-20:00 showing an incredibly brilliant peak. **(Right)** An image by Luigi Zanatta (UAI) taken on 2018 Dec 23 UT 16:13.

Luigi's image certainly shows the peak in question in both the 1977 and 2011 sketches, though I would not say that it could be described as shining as bright as Venus. This is maybe a viewing angle issue, so perhaps we will have to wait until the topcentric libration is very similar in order to see if the description is unusual or not. It may also depend upon the magnification used, as peaks in low power eyepieces appear more point-like and concentrated in appearance. We shall leave the weight at 2 for now.

Plato: On 2017 Dec 28 UT 19:45-20:00 and 19:58, respectively Marie Cook observed, and Derrick Ward imaged, this crater under similar illumination conditions to the following report:

On 1983 Jul 20 at UT 18:50-22:40 P.W. Foley (Kent, UK, 12"reflector, seeing II-III) noted that the south wall of Plato at the 11 o'clock position, at the location of a cleft, was fuzzy on either side of the cleft. There was also a deep red color along the cleft and the outside wall. The color had gone by 22:40 though. All other parts of the rim of Plato were clear and distinct. M. Cook (Frimley, UK, seeing III) sketched some obscurations at 22:03UT. At 22:08UT the red color reduced to a red line and vanished by 22:37. The south wall obscuration varied in size and there was a possible obscuration at the 7 o'clock position. J. Cook (Frimley, UK, seeing II-III) confirmed Foley's and M.Cook's observations. Detail inside the crater was sharp, but color opposite to what is usual. Price (Camberley, UK, seeing IV-V) a few km away had atmospheric ripples affecting his observations. At 21:36UT G. North described the south wall as odd in appearance and the terrain south of this was lacking in detail - this was odd because elsewhere Plato was nice and sharp. At 21:45UT though the north section of the crater was a hazy red. The Cameron 206 catalog ID=224 and the weight=5. The ALPO/BAA weight=3.

Marie comments that the crater detail was sharp and that definitely no color was seen. Derrick's image was in monochrome (Fig 8A), but also shows a sharp appearance. Some of the sketches from the 1983 event are included in Fig 8. Re-reading the reports, it is interesting that none of the observers appeared to use filters to check whether the colors were real and not atmospheric spectral dispersion, and so the color mentioned in Fig 8 C & D could easily have this origin although it seems to vary with time. With regard to the obscurations mentioned, yes both the southern and NNE rim which were mentioned as indistinct in Fig 8 B & C do appear to be of lower contrast in Fig 8A. Also Gerald North's description of the area to the south of the southern rim as lacking in detail seems reasonable in context with Fig 8A. Alas we do not have a copy of the Foley report. It is probably worth lowering the weight from 3 to 2.

Bullialdus: On 2017 Dec 29 UT 21:02 Valerio Fontani (UAI) imaged this crater under similar illumination conditions (±0.5°) to the following report, and ~30 min prior (21:57UT) to the similar illumination to the second report at:

On 1990 Apr 05 at UT 00:43-01:46 D. Darling (Sun Praire, WI, USA, 3" refractor, x90) observed that Bullialdus (the crater was in shadow) was pink in color on the edge of its wall. The effect lasted from 01:15-01:44UT and he could discern the terrace on the western wall. Comparisons were made to Tycho and Copernicus - all of which were normal. The Cameron 2006 catalog ID=399 and the weight=3. The ALPO/BAA weight=3. Bullialdus 1980 Oct 18 UT 20:15-20:25 Observed by Amery (Reading, England, 10" reflector) "Color blink reaction in English Moon Blink Device" BAA Lunar Section report. Cameron suggests that this might be a permanent colored blink area. Cameron 2006 catalog ID=115 and weight=3. ALPO/BAA weight=3.

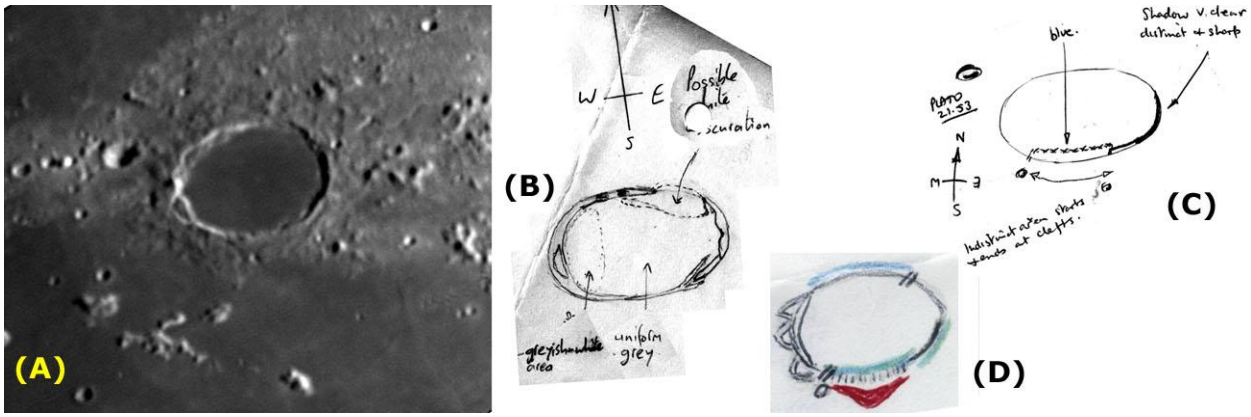


Figure 8. Plato orientated with north towards the top. **(A)** A monochrome image by Derrick Ward (BAA) taken on 2017 Dec 29 UT 1958. **(B)** A sketch by Marcus Price (BAA) from 1983 Jul 20 UT 21:28-21:46 – words have been rotated so that they can be read in this orientation, (V) A sketch by Jeremy Cook (BAA) From 1983 Mar 20 UT 21:53-21:59. **(D)** A sketch by Marie Cook (BAA) from 1983 Jul 20 UT 22:03.

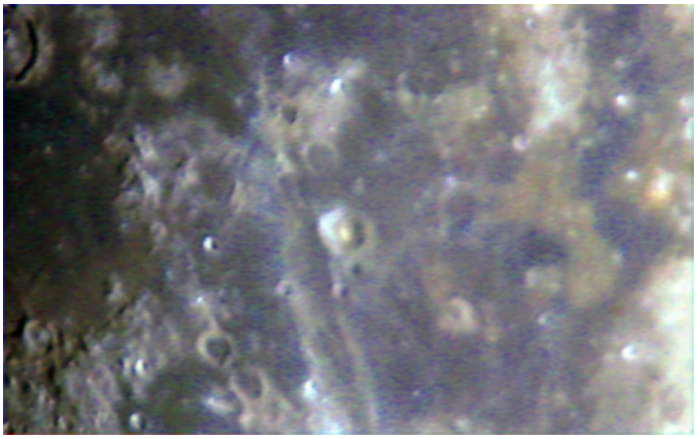


Figure 9. A colour image of Bullialdus and its surrounds by Valerio Fontani (UAI) on 2017 Dec 29 UT 21:02 and orientated with north towards the top. The image has undergone auto-color correction.

It is quite clear from Fig 9 that despite what the description says, that the Bullialdus was not in shadow on Dec 28th, so maybe the 1990 report was from 1990 Apr 04 rather than 1990 Apr 05?. Also there is no sign of any pink, though one could argue that there is some orange on the eastern rim and floor, however there is orange/yellow on other features in the surrounds. I will lower the weight to 2 as I am not convinced that the 1990 date was correct?

General Information: For repeat illumination (and a few repeat libration) observations for the coming month - these can be found on the following web site: http://users.aber.ac.uk/atc/lunar_schedule.htm . By re-observing and submitting your observations, only this way can we fully resolve past observational puzzles. 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 . If in the unlikely event you do ever see a TLP, 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 .

Dr Anthony Cook, Department of Physics, Aberystwyth University, Penglais, Aberystwyth, Ceredigion, SY23 3BZ, WALES, UNITED KINGDOM. Email: atc @ aber.ac.uk. .

KEY TO IMAGES IN THIS ISSUE

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4. **Aristillus**
5. **Bullialdus**
6. **Dechen**
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8. **Endymion**
9. **Gutenberg**
10. **Grimaldi**
11. **Messier**
12. **Mons Gruithuisen**
13. **Montes Apenninus**
14. **Montes Caucasus**
15. **Plato**
16. **Proclus**
17. **Tycho**