ASSOCIATION OF LUNAR & PLANETARY OBSERVERS
ALPO
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THE LUNAR OBSERVER

A PUBLICATION OF THE LUNAR SECTION OF THE A.L.P.O.
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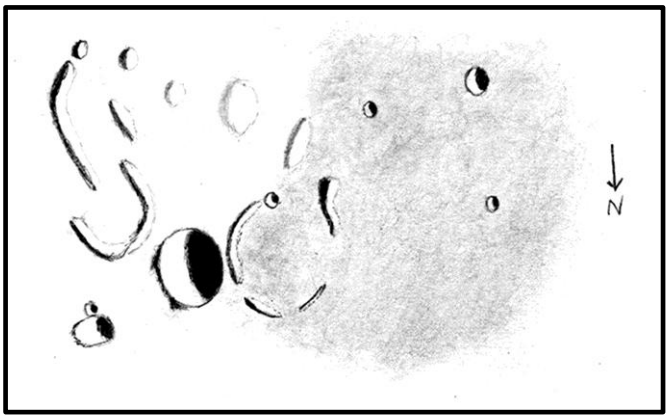
17 Autumn Lane, Sewell, NJ 08080
RECENT BACK ISSUES: http://moon.scopesandscapes.com/tlo_back.html

FEATURE OF THE MONTH – FEBRUARY 2016

MAURY



Sketch and text by Robert H. Hays, Jr. - Worth, Illinois, USA
October 30, 2015 08:38-09:16 UT, 15 cm refl, 170x, seeing 8/10

I drew this crater and vicinity on the morning of Oct. 30, 2015 after the moon uncovered ZC 741. Maury is near the extreme eastern end of Lacus Somniorum. The main crater is a crisp, conspicuous, apparently symmetric feature, but it showed irregular exterior shadow at this time. Maury C is the larger, broken ring just west of Maury. This ring has a fairly substantial east rim with one break, a narrow detached northwest rim and nothing of a west or southwest rim. There is an irregular ridge in that area, but it does not look like a crater rim. A small pit is just west of the largest ring segment of Maury C. A low ridge is just south of this pit. Maury C has a gray interior as though it was flooded by Lacus Somniorum. Three small but easily seen craters are farther west within the lacus, all associated with Hall, farther south (not drawn). Hall J is the largest of this trio, and forms nearly a right angle with Hall X to its east and Hall Y to its north. All three are smaller versions of Maury. Maury E is east of Maury, and is quite elongated east-west. A tiny craterlet is on the south rim of Maury E. A half circle is south of Maury and Maury E. This is probably an old ring with the south-southeast rim missing. A long ridge extends southeastward from this ring's gap, then angles to the south with a detached peak just off its southern end. There is a short ridge just south of the broken ring's west end, and an isolated peak to its south. Two circular elevations with pale shadowing are south of Maury and Maury C, and have the appearance of domes.

LUNAR CALENDAR

FEBRUARY-MARCH 2016 (UT)

2016		UT	EVENT
Feb	01	03:28	Last Quarter
	01	08:48	Moon-Mars: 3° S
	03	19:05	Moon-Saturn: 3.8° S
	05	04:34	Moon Extreme South Dec.: 18.3° S
	06	07:32	Moon-Venus: 4.5° S
	06	16:47	Moon-Mercury: 3.9° S
	08	14:39	New Moon
	10	20:46	Moon Descending Node
	11	02:42	Moon Perigee: 364400 km
	15	07:46	First Quarter
	16	07:41	Moon-Aldebaran: 0.4° S
	17	23:18	Moon Extreme North Dec.: 18.3° N
	22	12:48	Moon-Regulus: 2.7° N
	22	18:20	Full Moon
	24	03:58	Moon-Jupiter: 1.9° N
	24	06:10	Moon Ascending Node
	27	03:28	Moon Apogee: 405400 km
	29	18:16	Moon-Mars: 3.9° S
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

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

CALL FOR OBSERVATIONS:

FOCUS ON: Your Favorite Feature

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 2016** edition will be **Your Favorite Feature. This is your opportunity to show your favorite images and tell us why you like them.** Observations at all phases and of all kinds (electronic or film based images, drawings, etc.) are welcomed and invited. Keep in mind that observations do not have to be recent ones, so search your files and/or add this to your observing list and send your favorites to (both):

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

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

Deadline for inclusion in the Your Favorite Feature article is February 20, 2016

FUTURE FOCUS ON ARTICLES:

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

Subject	TLO Issue	Deadline
Kepler	May 2016	April 20, 2016

ARZACHEL CRATER NEAR TERMINATOR

Stephen Tzikas

Arzachel crater is remarkably crisp in its structure and a favorite telescopic target for many amateur astronomers. Arzachel is very distinct during the first and last quarters of the Moon when it is near the terminator. Even small telescopes show a rich captivating structure. The rim of Arzachel is detailed, and there is nice terrace structure on the interior walls. The walls tower about 4.5 km above the immediate surroundings in the east, and about 3.4 km above surroundings in the west. There is a rough outer rampart that joins a ridge running from the north rim to southern rim of Alphonsus. The crater floor lies nearly 1 km below the level outside the formation. The rugged central peak of Arzachel is prominent, rising 1.5 km above the floor. The floor looks relatively smooth, but not without features. There is a rille system named the Rimae Arzachel that runs from the northern wall to the southeast rim. A small crater lies prominently in the floor to the east of the central peak, with a pair of smaller craterlets located nearby, and is sketched in the drawings I provide.

The grouping of craters Ptolemaeus, Alphonsus and Arzachel, tend to form a visual set. A couple superimposed craters have given the appearance of a linkage between both Alphonsus and Arzachel craters. The NW end Arzachel's crater and the portion connecting to Alphonsus are fairly devoid of detail. Arzachel, at 97 km in diameter, is the younger of the two craters and has taller crater walls.

Presented here are seven observational sketches of Arzachel during phases near the terminator. My observations were completed with either a 8” Meade Starfinder or a Meade 12” Lightbridge. A 9 mm eyepiece was usually used for a magnification of 133x with the Starfinder. Occasionally a 6 mm eyepiece was used to extract additional details. My observing location was Reston, VA of coordinates: 38.95 degrees North; and 77.35 degrees West. Dates (UT) and calculated colongitudes are:

- October 1, 2014, 23:05-23:25, Colongitude 7.18
- August 4, 2014, 1:17, Colongitude 7.97
- November 30, 2014, 23:13-23:59, Colongitude 17.97
- August 5, 2014, 1:35, Colongitude 20.34
- December 13, 2014, 8:15-9:35, Colongitude 168.33

Arzachel has a number of satellite craters. By convention these features are identified on lunar maps by placing the letter on the side of the crater midpoint that is closest to Arzachel. Arzachel’s satellite craters range in size from 3 to 10 km. These satellites craters include those designated by the letters A, B, C, D, H, K, L, M, N, T, and Y. The USGS Digital Atlas of the Moon contains charts that are part of the Lunar Astronautical Chart (LAC) series. Chart (LAC 95) identifies the satellite crater locations around Arzachel. The LAC charts are available online without cost.

Table 1: Arzachel Crater Sketches

Basic direction: Left (Western sky), Right (Eastern sky), Top (South), Bottom (North)

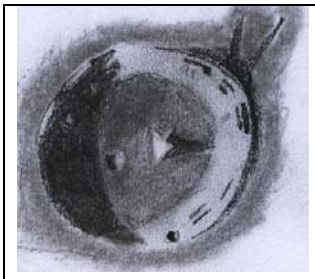
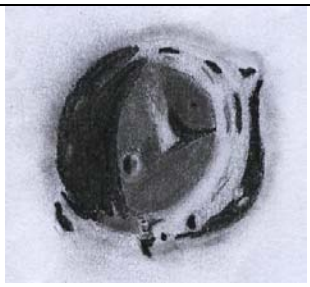
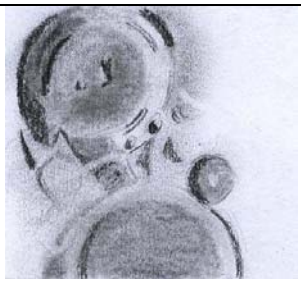
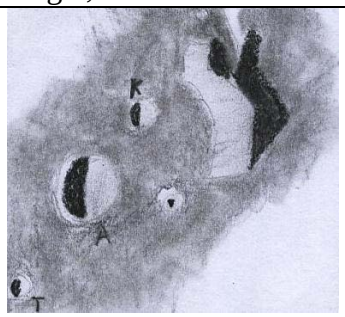
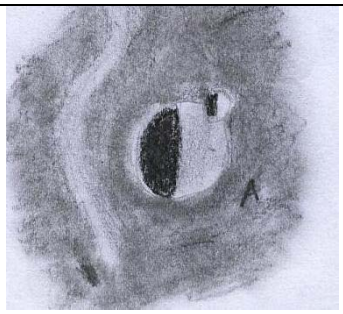
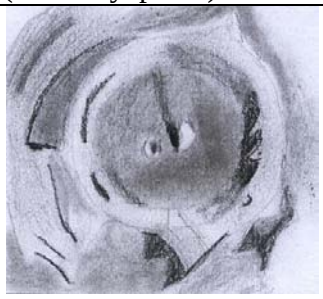
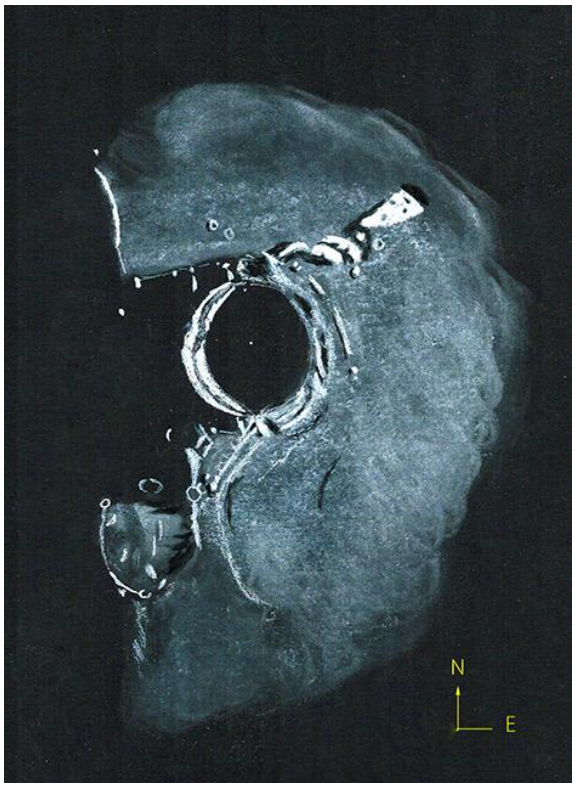
 Oct 1, 2014 CoL 7.18	 Aug 4, 2014 CoLl 7.97	 Nov 30, 2014 CoL 17.97
 Aug 5, 2014 CoL 20.34	 Aug 5, 2014 CoL 20.34 (6 mm eyepiece)	 Aug 5, 2014 CoL 20.34 (2.3 mm eyepiece)
	 Dec 13, 2014 CoL168.33	

Table 2: Arzachel Crater Observational Notes

Date (UT)	CoL.	Observational Notes
10/1/2014 23:05-23:25	7.18	Focus of detail for this sketch was the southeast quadrant. Notice the subtle perpendicular tones to the main crater wall layering. The 6mm eyepiece helped the visibility of these features. 8” Starfinder
8/4/2014 1:17	7.97	A 50-minute observation session of Arzachel lasted until clouds set in. Arzachel is a detailed rich crater. 12” Meade Lightbridge: (169x, 9mm eyepiece)
11/30/2014 23:13-23:59	17.97	Daily changes in Arzachel’s appearance are always significant. A complex plateau structure seems to exist between craters Arzachel and Alphonsus. A complex sloping elevation seems to exist between Arzachel and Alpetragius. 8” Starfinder
8/5/2014 1:35	20.34	Even more detail observed in Arzachel compared to yesterday’s observation. Session lasted for 1 hour, 20 minutes. Amazing detail in the southwest and western half of the crater wall (shadowed part). Southwest quadrant of wall is dotted with two regions of shadowed points. Hard to resolve but I estimate about 10 shadow points seen in each of the two areas. My intensity diagram was overcrowded. 12” Meade Lightbridge (169x , 9mm eyepiece)
8/5/2014 1:35	20.34	Close-up of central features using a 6mm eyepiece. 12” Meade Lightbridge (254x, 6mm eyepiece)
8/5/2014 1:35	20.34	Close-up of central crater “A” and features using a 2.3 mm eyepiece. Amazing what a 12” telescope and a 2.3 mm eyepiece can see. Rille and crater closeup. 12” Meade Lightbridge (663x, 2.3 mm eyepiece)
12/13/2014 8:15-9:35	168.33	Early morning observation. This is my first early morning sketch of Arzachel. Tones are now mostly “opposite” of the prior early evening sketches when Arzachel was in the early stages of “waxing.” 8” Starfinder.

ERATHOSTHENES

David Teske



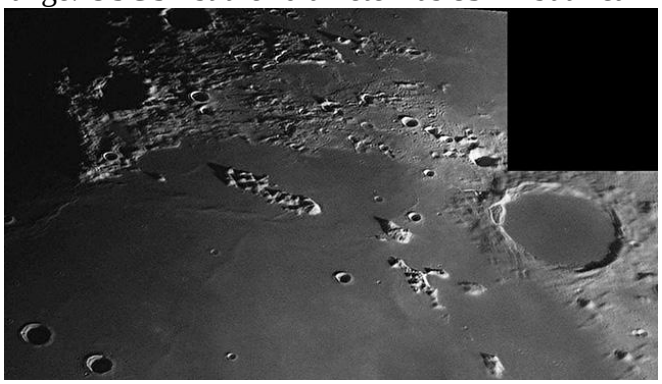
I made this sketch on the early evening of 19 November 2015 using a 60 mm f/16.7 fl 1000 mm Moon Raker refractor telescope. An 8 mm Baader Planetarium Hyperion eyepiece was used with a magnification of 125. The telescope was mounted on a Losmandy GM8 mount. The observation was made between 2328 and 0028 UT 20 September 2015. Seeing was 8/10 under clear skies. The moon was waxing gibbous phase. Medium was white and black pastel and pencil on black Strathmore Artagain paper. The observation was made by David Teske in Starkville, Mississippi.

Eratosthenes is a wonderful, 58 km diameter crater at the southwest tip of the Apenninus Mountains. In this study, Eratosthenes is just emerging from the lunar night. The western wall of Eratosthenes is in sunlight and shows terraces. The light changed noticeably during this observation. The central peak just came into view as a pinpoint near the end of the session. The outer eastern and southern walls of Eratosthenes are terraced with a play of shadow and light. To the northeast of Eratosthenes is the beginning of Montes Apenninus. Some hills are seen to the northeast. The farthest is triangular in shape and has at least four depressions on its surface. To the west of Eratosthenes are some scattered foothills of Montes Apenninus. Just north of Eratosthenes is the fresh crater Cwith a diameter of 5 km. A faint, similar sized crater is just to the southeast of C. To the northwest of Eratosthenes is a wrinkle ridge that marks the terminator. Just to its north of this is a small hill. East of Eratosthenes is some small, linear hills that look concentric to the crater; they are probably ejecta. Directly south of Eratosthenes are two low parallel ridges that point southwest. The northern ridge appears to end at a complicated area near a small crater. This crater is on ridge that marks part of the terminator. To this ridge's northern end are two small ridges that point towards Eratosthenes. West of this in the shadow appears to be a small crater rim. The ridge on which this small crater lies goes further to the south. This ridge then turns into the wall of the ghost crater Stadius. There were shadows in Stadius that were quickly changing. The western wall of Stadius marked the terminator. The northern part of Stadius was is shadow; however, the rim of a small crater was above the shadow. The floor of Stadius had both light and dark regions marking ridges and shallow depressions.

MONTES RECTI

Richard Hill

Nestled between Plato and Sinus Iridum is a largely forgotten but exquisite range of mountains, Montes Recti. The name means straight mountains and it's apt for this 70x10km range. USGS list the "diameter" as 83km but I cannot get that for the length when measuring on the LROC Quick Map. They are undoubtely the remnants (along with Montes Teneriffe and Mons Pico below and to the right of Montes Recti) of a once great wall of a monster crater that was infilled and is now Mare Imbrium. Notice the ridge on the right end of these mountains that crossed them from right to left and turns into a dorsum on the mare. The very polygonal layout of the mountains is well seen on the left end of the range.



MONTES RECTI *– Richard Hill – Tucson, Arizona, USA November 21, 2015 03:14 UT. Seeing 8/10. TEC 8" f/20 Mak-Cass, SKYRIS 445M, 656.3 nm filter.*

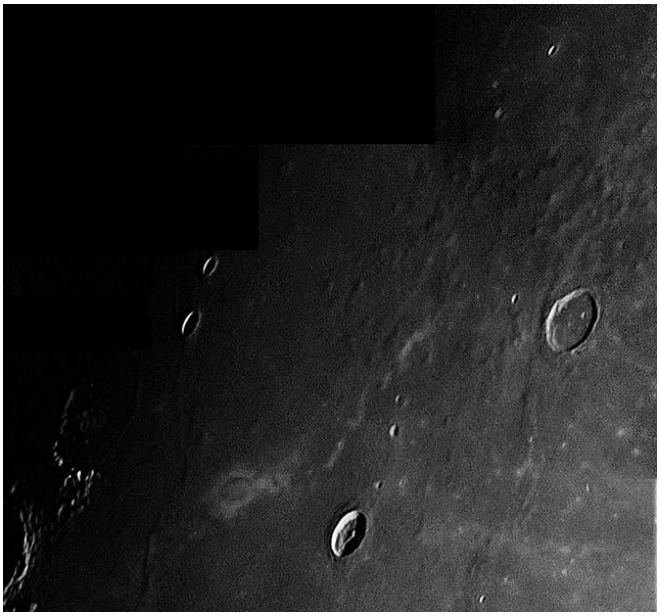
Left of the range is a well lit mountain peak. This is Promontorium Laplace with the nice 11km crater Laplace D. This is one of the gateways to the great Sinus Iridum, the home of the Chinese lander Chang'e-3 and its rover, Yutu. The two craters at the bottom left corner of the image are the 2km Helicon (left) and the 20km Le Verrier.

Plato is the elephant in the living room on the right side of the image. It is of distinctly poorer quality as the image it was on was taken as seeing was rapidly deteriorating owing to cold air that was sliding off the mountains to my east. I left it on as a landmark. Only one craterlet is visible on its floor. Before leaving note Plato A just above its namesake crater. It has odd walls and nice interior detail.

This montage of 2 images was made from 2 stacked images each 600 frames from 3000 frame AVIs stacked with Registax6. Further processing was done with GIMP, IrfanView with the final assembly by AutoStitch.

A MAGNETIC ANOMALY

Richard Hill



REINER gamma *– Richard Hill – Tucson, Arizona, USA September 26, 2015 04:24 UT. Seeing 7/10. TEC 8" f/20 Mak-Cass, SKYRIS 445M, 656.3 nm filter.*

A ghostly wraith winds its way through Oceanus Procellarum between the craters Marius. Galilaei and Reiner. It has no relief but once you have seen it, you will notice it all the more. This is the enigmatic Reiner Gamma. Some astronomers have pointed out that the oval head of this snake resembles iron filings sprinkled on a sheet of paper over a bar magnet. Several spacecraft have measured a fairly strong magnetic field over these albedo markings. And that's another oddity about this feature, there are no surface structures, no relief, just a light colored marking, a brighter albedo or reflectivity. Even so in this image I had to pump up the contrast to show it well but under the right lighting conditions it can be traced for twice the length shown here.

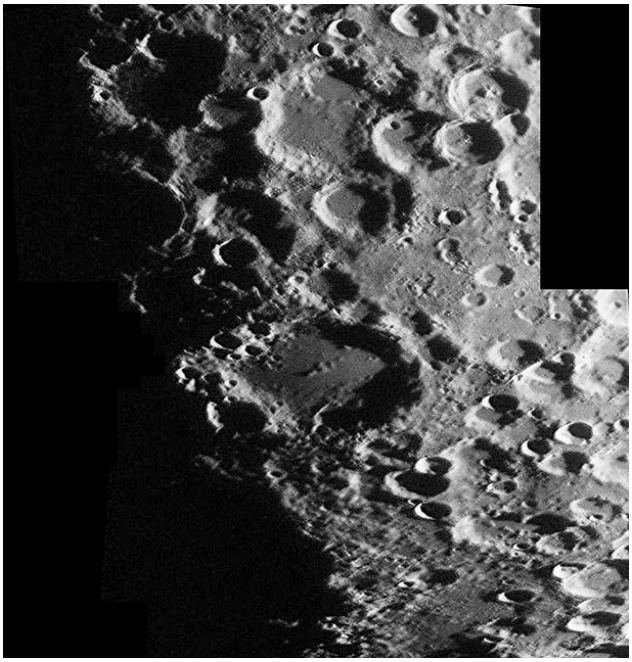
The large crater near the right edge is the 43km diameter Marius with the "Marius Hills" or Domes Marius, well shown above and to the left mingled with the tail (if you will) of Reiner Gamma. Below Reiner G. is the 31km crater, Reiner, its namesake and to the left are two distinct craters. The lower crater of the pair is the Galilaei and the upper the slightly smaller Galilaei A.

Each of the two frames that makes up this montage were a 500 frame stack from 3000 frame AVIs using Registax. Further processing and assembly was done with GIMP, IrfanView and AutoStitch

SAUSSURE REGION

Richard Hill

Again we are looking at the lunar highlands where we see "saturated" selenoscape of crater upon crater, lots of detail. The largest crater near center is the ancient (4 billion years old) 168km diameter Maginus. Note the 'V' shaped shadow on the floor of this crater that points back to a flat topped gap in the crater wall. The large pool of shadow to the lower left of Maginus is Clavius, not yet catching the morning light. Just above Maginus is a flat bottomed crater about 56km in diameter, half in shadow. This is Saussure, the namesake for this image. Above and to the left is the 126km Orontius, also 4 billion years old, with younger craters impinging on both sides. The southern wall of this crater is fascinating having been peppered with secondary cratering. Moving away from Orontius on the right side are three craters, Huggins (66km), Nasireddin (54km) and Miller (77km) with a nice central peak.



SAUSSURE *– Richard Hill – Tucson, Arizona, USA January 18, 2016 01:55 UT. Seeing 7/10. TEC 8" f/20 Mak-Cass, SKYRIS 445M, 656.3 nm filter.*

But the most interesting feature is to the right of Orontius halfway to the image edge. Here you find the 43km Lilius A, a crater looking like a small version of Saussure with a shadow of the same shape on its floor. Below this are two overlapped craters Lilius E and below Lilius D. Notice the wall between these two and Lilius A. It is very straight even on the LROC images. There are several other such examples of this in the highlands.

The two images that make up this montage were each made from 500 frames of a 3000 frame AVI. Further processing was done with GIMP and IrfanView and final assembly was done with AutoStitch.

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 Tobias Mayer A.

FRANCISCO ALSINA CARDINALI-ORO VERDE, ARGENTINA. Digital images of Archimedes, Clavius, Copernicus, Eratosthenes, Messier, Montes Apennines, Plato, Proclus & Tycho.

MAURICE COLLINS - PALMERSTON NORTH, NEW ZEALAND. Digital images of 5 day moon, Arago domes, Atlas-Hercules, Endymium, Hommel, Janssen, Lacus Mortis, Langrenus, Mare Crisium, Meton, Piccolomini, Plinius, Posidonius, Southern region & Theophilus.

CRANDALL, ED – LEWISVILLE, NORTH CAROLIA, USA. Digital images of Clavius & Straight Wall.

ROBERT HAYS - WORTH, ILLINOIS, USA. Drawings of Le Verrier D, Maury & Schiaparelli.

RICHARD HILL – TUCSON, ARIZONA, USA. Digital images of Deslandres, Maurolycus, Plato-Sinus Iridum, Reiner gamma & Saussure.

DAVID JACKSON - REYNOLDSBURG, OHIO, USA. Drawing of Ptolemaus area..

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

STEVE TZIKAS - RESTON, VIRGINIA, USA. Drawings of Arzachel (7).

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RECENT TOPOGRAPHICAL OBSERVATIONS

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CLAVIUS- Francisco Alsina Cardinali-Oro Verde, Argentina. December 20, 2015 01:56 UT. LX200 250 mm SCT, 168X, Canon EOS Digital Rebel XS.

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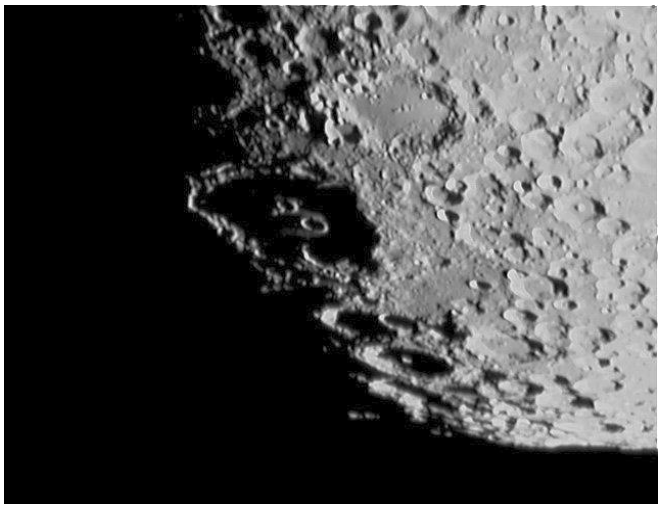
ERATOSTHENES- Francisco Alsina Cardinali-Oro Verde, Argentina. December 20, 2015 00:36 UT. LX200 250 mm SCT, 168X, Canon EOS Digital Rebel XS.

PLATO- Francisco Alsina Cardinali-Oro Verde, Argentina. December 20, 2015 00:53 UT. LX200 250 mm SCT, 168X, Canon EOS Digital Rebel XS.

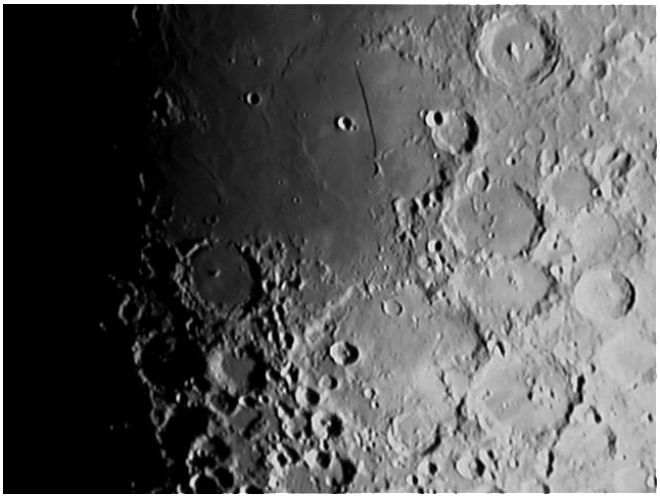
ARAGO Domes - Maurice Collins, Palmerston North, New Zealand. January 15, 2016 08:40 UT. FLT-110, f/14, seeing A-IV. (South up)

POSIDONIUS - Maurice Collins, Palmerston North, New Zealand. January 15, 2016 08:41 UT. FLT-110, f/14, seeing A-IV. (South up)

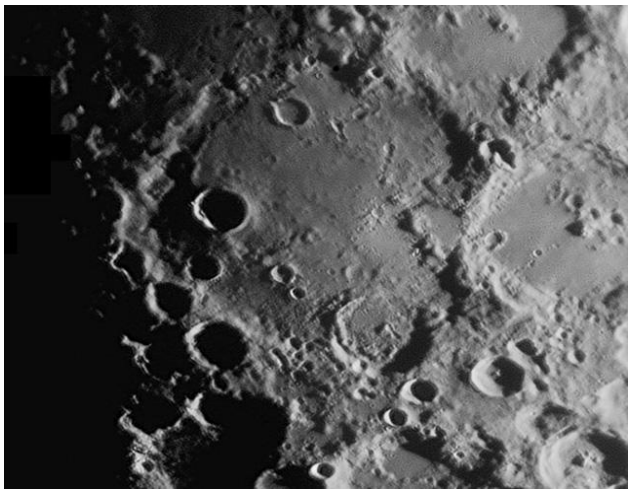
THEOPHILUS - Maurice Collins, Palmerston North, New Zealand. January 15, 2016 08:39 UT. FLT-110, f/14, seeing A-IV. (South up)



CLAVIUS – Ed Crandall, Lewisville North Carolina, USA. December 19, 2015 23:18 UT. 110 mm, f/6.5 APO, 2X barlow. Seeing A-III. Colongitude 18.5º. ToUcam.



STRAIGHT WALL – Ed Crandall, Lewisville North Carolina, USA. December 19, 2015 23:20 UT. 110 mm, f/6.5 APO, 2X barlow. Seeing A-III. Colongitude 18.5º. ToUcam.



DESLANDRES – Richard Hill – Tucson, Arizona, USA January 18, 2016 01:49 UT. Seeing 8/10. TEC 8” f/20 Mak-Cass, SKYRIS 445M, 656.3 nm filter.

The crater taking up the majority of this image is the great 241km diameter Deslandres. Over 4 billion years old is has been wrecked by subsequent impacts. If you learn nothing else you'll at least know where Hell is. I's the 34km crater filled with shadow on the left side of Deslandres. Look to the left of this for the odd crater perched on the top of the crater wall of Deslandres. It is the merger of a number of smaller craters dominated by Gauricus S, also filled with shadow just like the 43km crater Ball directly below Hell on the Deslandres wall.

At the bottom of Deslandres, also on the crater wall, is the largely ruined 65km crater Lexell. Over to the right of Deslandres is the 134km Walther, mislabeled as "Walter" on both the Virtual Moon Atlas and the Rukl Atlas.

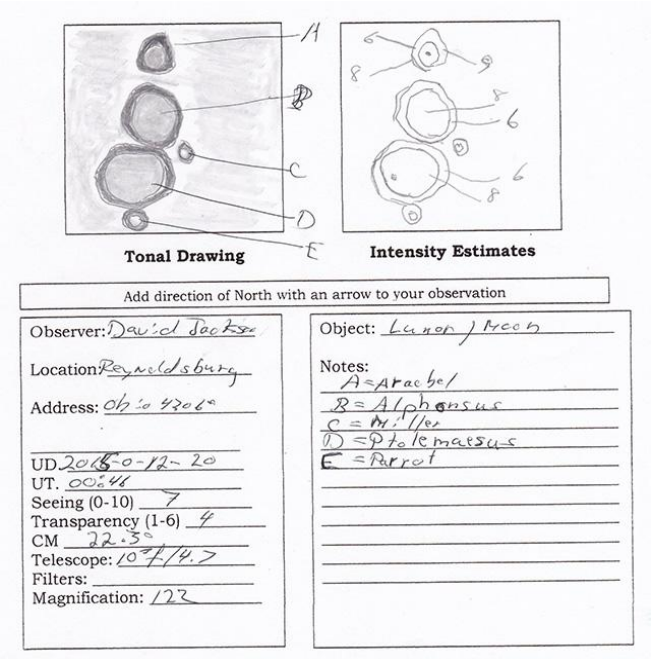
I like the north-south chain of craterlets in the north part of Deslandres. The bottom or south most crater is Deslandres H. There's much more to enjoy in this region and it pays to study it.

MAUROLYCUS – Richard Hill – Tucson, Arizona, USA October 20, 2015 01:02 UT. Seeing 9/10. TEC 8” f/20 Mak-Cass, SKYRIS 445M, 656.3 nm filter.

It was a great night and this little region on the moon had a lot to offer. The namesake of the image, the 117km diameter Maurolycus, is the dominant feature in the upper right quadrant of this image. Notice its double central peak and how it sits in the merged remnants of a much older crater. Just below this is the 50km crater Barocius. To the left, still deep in shadow, is the 69km crater Faraday and further to its left is the 129km Stofler. Below this is the 77km Licetus, also filled with shadow, and at bottom the same sized Cuvier. Note all the secondary cratering in this area, seen here to about 2km resolution.

Between Cuvier and Barocius is the crater Clairaut listed also as 77km diameter but it is anything but round, formed from the merger of two or more craters. On its floor is a peculiar crater, Clairaut D. While officially listed as a 12km diameter crater it is anything but. It's dimensions are more like 8x12 km. It is also likely two craters that were made simultaneously or merged in some fashion erasing the shared wall.

Before leaving I would call your attention to the large pool of darkness to the left of Cuvier. This is the unusual crater Heraclitus, also formed from the merging of several craters such that it has a quasi-linear central peak that runs the length of the feature. Here it is in shadow but you can see the faintest trace of the first light catching the highest portions of this central peak.



PTOLEMAUS Area – David Jackson – Reynoldsburg, Ohio USA December 20, 2015 00:46 UT. Seeing 7/10. Transparency 4.1/6, colongitude 22.3º , 10”, f/4.7, 122x.

BRIGHT LUNAR RAYS PROJECT

Coordinator – Wayne Bailey – wayne.bailey@alpo-astronomy.org
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Bright Lunar Rays Website: http://moon.scopesandscapes.com/alpo-rays.html

RECENT RAY OBSERVATIONS

COPERNICUS- Francisco Alsina Cardinali-Oro Verde, Argentina. January 2, 2016 00:22 UT. LX200 250 mm SCT, QHY6.

PROCLUS- Francisco Alsina Cardinali-Oro Verde, Argentina. December 20, 2015 00:39 UT. LX200 250 mm SCT, 106X, Canon EOS Digital Rebel XS.

PETAVIUS B - Maurice Collins, Palmerston North, New Zealand. January 15, 2016 08:45 UT. FLT-110, f/14, seeing A-IV. (South up)

LUNAR GEOLOGICAL CHANGE DETECTION PROGRAM

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

Observations for December were received from: Jay Albert (Lake Worth, FL, USA - ALPO) observed: Aristarchus, Briggs, Censorinus, Mare Crisium, Menelaus, Plato, Proclus, Promontorium Agarum, Schickard, the Western Limb, and imaged the whole disk. Alberto Anunziato (Argentina – AEA) imaged: Albategnius, Archimedes, Censorinus, Clavius, Eratosthenes, Linne, Messier, Montes Appenninus, Pico B, Plato, Proclus, and Tycho. Maurice Collins (New Zealand – ALPO) imaged: Aristarchus, Clavius, Copernicus, Langrenus, Mare Crisium, Mare Humorum, Mare Nectaris, Plato, Schickard, Tycho, and captured whole disk images of the Moon. Marie Cook (Mundesley, UK) observed Endymion and Plato. Valerio Fontani (Italy – UAI) imaged Eratosthenes and Mare Nubium. Rik Hill (Tucson, AZ – ALPO) imaged Atlas and Hercules. Carlo Muccini (Italy – UAI) imaged Mare Nubium. Aldo. Tonon (Italy – UAI) imaged Mare Nubium. Gary Varney (Pembroke Pines, FL, USA – ALPO) imaged Alphonsus.

News: I was very sorry to learn of the passing of Prof Arlin Crotts of the Department of Astronomy, Columbia University, USA. Arlin wrote several convincing papers in the Astrophysical Journal (See his papers on his web site: http://user.astro.columbia.edu/~arlin/TLP/), on the subject of LTP. I met him, as well as LPOD founder Chuck Wood, at a Lunar and Planetary Science Conference in Houston back in 2011 (See http://www.baalunarsection.org.uk/2011-04-lsc.pdf on page 11). Arlin wrote a book, "The Moon: Water, Exploration, and the Future Habitation", which describes the latest findings from spacecraft, the possibility of mining the Moon, and discusses his statistical analysis of LTP. He was also interviewed in a Japanese NHK TV program, the Cosmic Front, about LTP, which was broadcast in April 2015 – I featured in this too. Arlin was running a couple of automated telescopes to look for LTP in white light over many years, one at the Cerro Tololo observatory in Chile, and another at Columbia University, NY. The idea was that if both scopes detected a change in surface reflectivity (to a sensitivity of a percentage level), then these could possibly be a LTP. However his system was running in white light, and could not operate near the terminator, nor in color. Whereas visual observers, although seeing white light events, more frequently report colored LTP, or LTP near the terminator – nevertheless this was one of the best chances of coming up with concrete proof for LTP. He told me that he had detected some anomalies, but was in the process of checking these. Even running two telescopes, geographically separated, if you wait long enough, random image noise, or atmospheric seeing, can cause coincident detections in the same place on lunar images. I had only once seen some example images taken by his system, when I was trying to check out a 2015 Jul 18 TLP in Maginus crater. Arlin's system had been taking images at regular intervals, and overlapped with the amateur astronomer who reported that 2015 Jul 18 LTP. Although Arlon's system had not imaged the Moon at precisely the same time of the said LTP, it was quite clear that no geological process could have affected such a large area of Maginus crater in such a short space of time, and not appeared in Arlin's images too. So we were able to eliminate the Maginus LTP as probable lens flare effect inside the zoom Barlow used by the amateur astronomer concerned. At present it is unclear what will happen to the data collected by Arlin's lunar monitoring system – one would hope that some of his co-workers will be able to finish the analysis and publish this in some peer reviewed journal in the near future?

Onto more pleasant news - I have heard from several amateur astronomers in the last month. Jill Scambler is continuing her statistical study of LTP. Marcelo Mojica Gundlach, President of the Icarus Astronomy Club (Cochabamba, Bolivia), has expressed an interest in taking part in repeat illumination prediction observations, and we will start to see some of his images in next month's newsletter. Gary Varney (South Florida Astronomical Association) has joined ALPO and is hoping to contribute to our repeat

illumination program. Gary runs a face book page which is similar to the Lunar Picture of the Day (LPOD). If some of you have wondered what has happened to LPOD, which has been frozen since 2015, this now seems to have restarted on: http://www2.lpod.org . Alexandre Amorim (REA) has also told me that there is a Spanish version of LPOD that has appeared on: https://blpod.wikispaces.com/ . Alexandre has also produced a definitive catalog of all LTP observed from Brazil: http://www.geocities.ws/costeira1/cbfl2015.pdf .

Lastly on the subject of lunar impact flashes, it appears that the Chinese will launch Chang'e 4, mission to the lunar farside, with an orbiter and a lander. The orbiter will contain an impact flash camera to monitor impact flashes from a Lagrangian halo orbit. This mission is based upon a past ESA Lunar Farside proposal, which was not selected on the last proposal round, but will be put into the next round of ESA planetary proposals.

LTP Reports: No LTP reports were received in December. Though one interesting image was obtained of Alphonsus on 2016 Jan 02 UT 11:50 by Gary Varney, and this seemed to show a 2nd peak on the floor of Alphonsus (See Fig 1- Left). However careful analysis of the raw video frames video that went into this, by Gary, Maurice Collins, myself, and others, seem to suggest that it was a processing artifact of Registax, which occasionally happens in dark shadowed area of the Moon, especially when the image is jumping around a lot in atmospheric seeing. A similar artifact was recorded on the shadow filled floor of Aristarchus, by Simon Kidd back in 2009 (see Fig 1 – right). Again a careful analysis of the video frames, and reprocessing revealed that to be an artifact too. So the moral here is not to trust everything that Registax shows, and always consider reprocessing or examining individual frames to see if it is real or not.

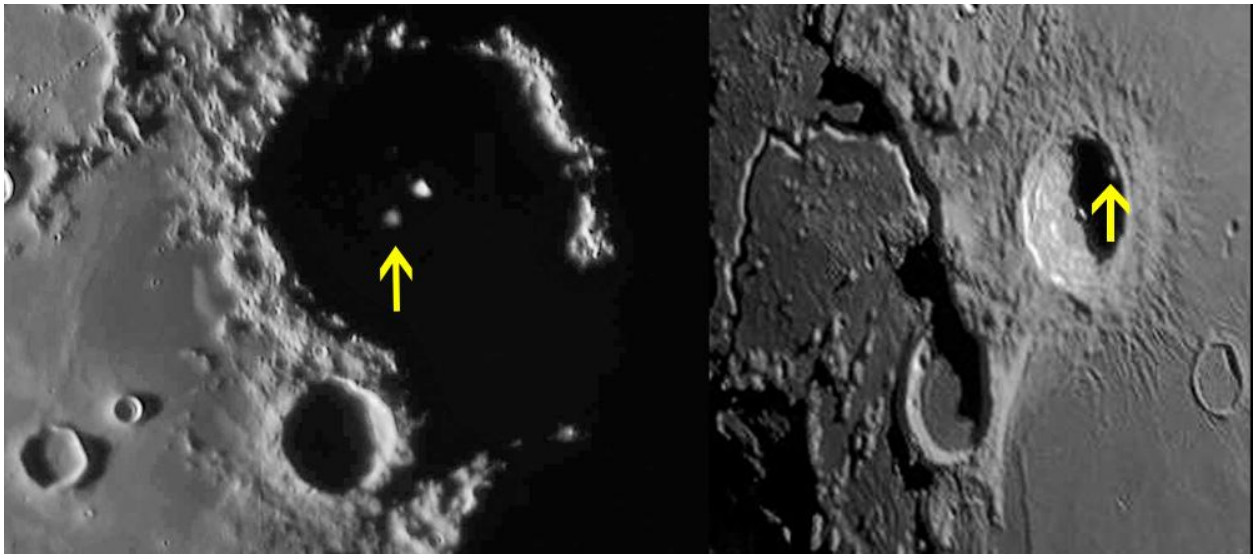

Figure 1. *Examples of Registax image processing "artifacts" as indicated by yellow arrows.* ***(Left)*** *Alphonsus 2016 Jan 02 UT 11:55-11:58 by Gary Varney (ALPO).* ***(Right)*** *Aristarchus 2009 Dec 28 UT 17:35 by Simon Kidd (BAA).*

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

Eratosthenes: On 2015 Dec 19 UT 17:10-17:23 Valerio Fontani (UAI) imaged this crater under the same illumination conditions to the following LTP reports:

Firstly on 2009 Nov 25 Paul Abel and others detected some color on the inner west illuminated slopes of this crater. No similar color existed elsewhere. On 2012 Aug 25 Charles Galdies imaged this crater and detected a similar color, approximately in the same location, though he also imaged color elsewhere. It is important to replicate this observation to see if it was natural surface color, atmospheric spectral dispersion, or some effect in the camera that Charles was using, namely a Philips SPC 900NC camera. The minimum sized telescope to be used would ideally be a 8" reflector.

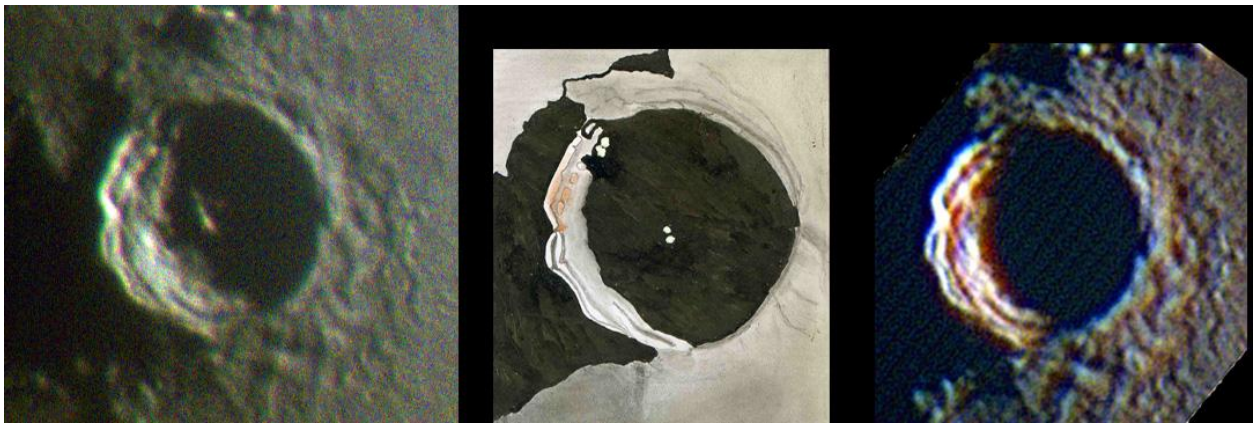

Figure 2 *Eratosthenes with north towards the top – note color saturation has been increased here to bring out colors more. Left color image by Valerio Fontani (UAI) on 2015 Dec 19 UT 17:13.* ***(Centre)*** *Sketch by Dr Paul Abel, made during 2009 Nov 25.* ***(Right)*** *Image by Charles Galdies from 2012 Aug 25 UT 19:44-19:52– note that the over processing here is entirely on my doing.*

Valerio's image is closer to Dr Paul Abel's sketch in terms of illumination than to Charles Galdies' image. You can quite clearly see the three bright facets on the terrace in Valerio's image which Dr Paul Abel sketched as a faint brown tinge. At the time of Paul's observation, others suggested atmospheric spectral dispersion as a cause-but Paul and his colleagues who were using Patrick Moore's 15" reflector checked for this. You can see some slight hint of atmospheric spectral dispersion in Valerio's image, in particular on the central peak. The important point to remember with atmospheric spectral dispersion though is that it is strongest on contrasty features e.g. sunlit peaks versus dark shadows, or on bright crater rim edges. It should be less visible on less contrasty areas. I would like to see a few more similar illumination color images of Eratosthenes at this illumination stage in order to be able to come to conclusion over what was seen back in 2009. The color in the Charles Galdies image is most probably due to calibration issues with the camera being used but there may be some atmospheric spectral dispersion factor too contributing to the effect here – not to mention my over processing of the image?

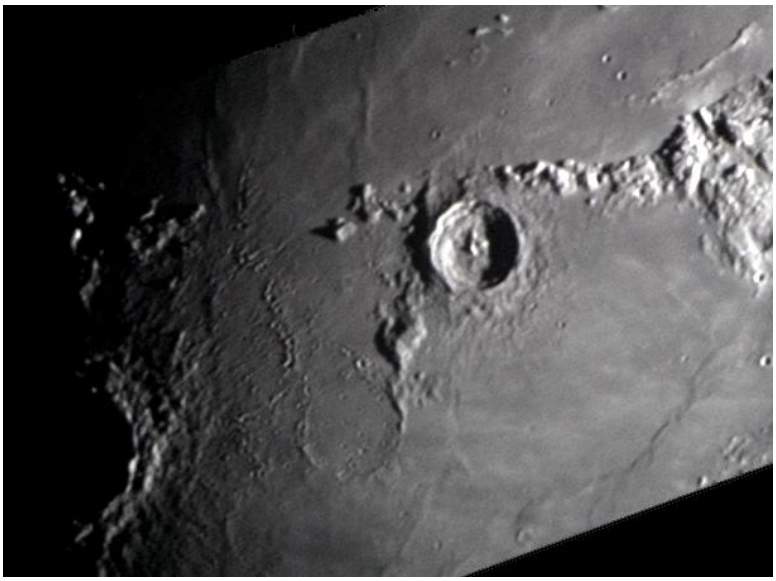

Figure 3. *Eratosthenes by Alberto Anunziato (AEA), orientated with northtowards the top, taken on 2015 Dec 20 UT 00:36.*

Eratosthenes: On 2015 Dec 20 UT 00:36 Alberto Anunziato (AEA) imaged this crater about 30 min after the end of the ±0.5˚ similar illumination window for the following LTP report by Dr Peter Catermole:

Eratosthenes 1954 May 11 UT 20:00 Observer: Catermole (UK, 3" refractor) "Central peak invis. tho surroundings were sharp". NASA catalog ID #563, NASA weight=4. ALPO/BAA weight=2.

As you can see from Alberto's image in Fig 3, the central peak region should have clearly been visible, even allowing for observing slightly outside the similar illumination window that we normally employ. I am therefore raising the weight of this 1954 observation up to 3.

Plato: On 2015 Dec 21 UT 09:23 Maurice Collins (ALPO) imaged Plato, just 14 minutes outside the ±0.5˚ similar illumination window for the following LTP:

Plato 1969 May 26 UT 20:30-21:05 Observed by Farrant (Cambridge, England, 8" reflector, x160, S=G) "Had misty portion of SW(ast.?) floor from 2030-2105h at which time it was gone. Clearly seen, had ill-defined boundaries & was an easy obj. to see. Alt.=33 deg. (Apollo 10 watch)." NASA catalog weight=3. NASA catalog ID No. 1148. ALPO/BAA weight=2.

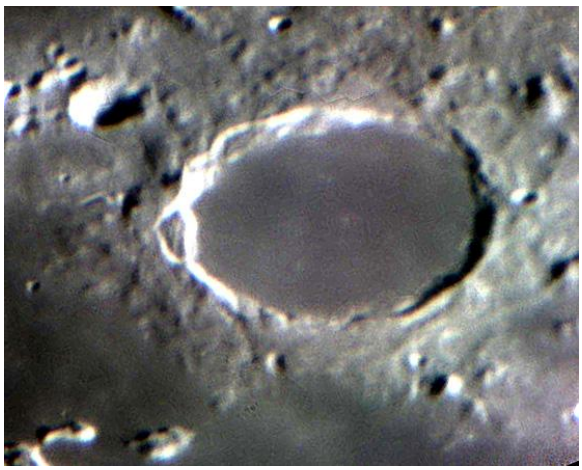

Figure 4. *Plato as imaged by Maurice Collins on 2015 Dec 21 UT 09:23, oriented with north towards the top. This image has been sharpened and had its color saturation increased to 50%.*

Maurice's image (Fig 4) also perhaps shows a slightly lighter diffuse area on the SW floor, though in general there is not much detail on much of the floor anyway – but you can just about make out the central craterlet, and perhaps the resemblance of some other faint spots. Was the variability of Farrant's fuzzy SW floor patch seeing related? I would be happier to judge this if we had some additional detailed views of the floor of this crater under similar illumination. For now I will leave the weight of this1969 observation at 2.

Briggs: On 2015 Dec 24 UT 01:25-01:45 Jay Albert observed this area under the same illumination conditions (to within ±0.5˚) to the following LTP report:

On 2010 Apr 27 at UT 00:10-00:30 and 01:45-02:00 P. Grego (St Dennis, UK, 20 and 30cm reflectors) noticed a craterlet just to the east of Briggs and an E-W trending lineament or wrinkle ridge that did not show on NASA LAC charts. Further checks did not reveal it on Lunar Orbiter mosaics, or on very recent LROC images of the area. Possibly these are very low relief features that show only under very shallow illumination conditions. The ALPO/BAA weight=1 until we get confirmation at repeat illumination.

Jay was using a 6" SCT (x214) and saw the craterlet east of Briggs and north of Briggs C. He also saw an even smaller craterlet between the aforementioned craterlet and Briggs (closer to the latter). Both were on Rukl chart 17, but neither was named. Briggs was on the terminator. Its exterior east wall and interior west rim were brightly lit while the floor was in full shadow. He saw a low wrinkle ridge running N-S, but not E-W as in the LTP description. The transparency was 2nd magnitude, and the seeing was 7 out of 10. In view of the lack of

sighting of the E-W wrinkle ridge, we shall keep the weight of Peter Grego's 2010 observation at 1, but consider raising it to a 2 or a 3 if another repeat illumination observation fails to show this E-W ridge again.

Promontorium Agarum: On 2015 Dec 27 UT 03:14-03:40 Jay Albert & Ashley observed this area under the same illumination conditions (to within ±0.5˚) to the following LTP report:

> *On 1990 May 09 at UT08:24-08:28 D. Louderback (South Bend, WA, USA, 3" reflector, x150, Clears sky) noticed in Promontorium Agarum (Cape Agarum), that at 08:24UT the west point (C) dimmed to a brightness of 6.5 before regaining its normal brightness at 7. Cameron comments that these are wedge measurements equivalent to 0.5 steps in Elger's brightness scale. No other effects noticed elsewhere. The Cameron 2006 catalog ID=404 and the weight=3. The ALPO/BAA weight=2.*

They reported that there was no sign of a "slight blue tinge" or indeed any other color at or near the promontory. They had a beautiful view of the entire Crisium region though. A Celestron Nexstar 6" scope was used at 214x. The transparency was 3rd magnitude, and seeing was 3 to 5 out of 10. Observing was broken from 03:17 to 03:19 and 03:20 to 03:24UT due to cloud. In view of the lack of color seen this time around, the weight of this 1990 LTP will remain at 2.

Plato: On 2015 Dec 29 UT 23:35-23:45 Marie Cook observed this crater under the same illumination conditions (to within ±0.5˚) to the following LTP report:

> *On 1975 Mar 02 at UT05:00-06:18 P.W.Foley (Wilmington, Dartford, Kent, UK, 12" reflector) observed blueness along the southern wall of Plato. This is a BAA observation. A Moon Blink device was used. Note that it is assumed that this is the same as Cameron's catalog 1975 Mar 02 UT 01:00 or 23:00 report by an Unknown English Observer who apparently observed color in Plato (Red or violet). The Cameron 1978 catalog ID=1402 and weight=1. The ALPO/BAA weight=1.*

Marie, using a 90mm Questar telescope at x80 (seeing III, transparency moderate) noted that detail was sharp, but no blueness was seen along the south wall of the crater. No color was seen in general. Everything appeared normal. Observations ceased due to cloud cover. I will keep the weight of the 1975 LTP at 1 because color should not be seen here and colored filters were used in 1975, which reduces the risk of the cause being due to atmospheric spectral dispersion.

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 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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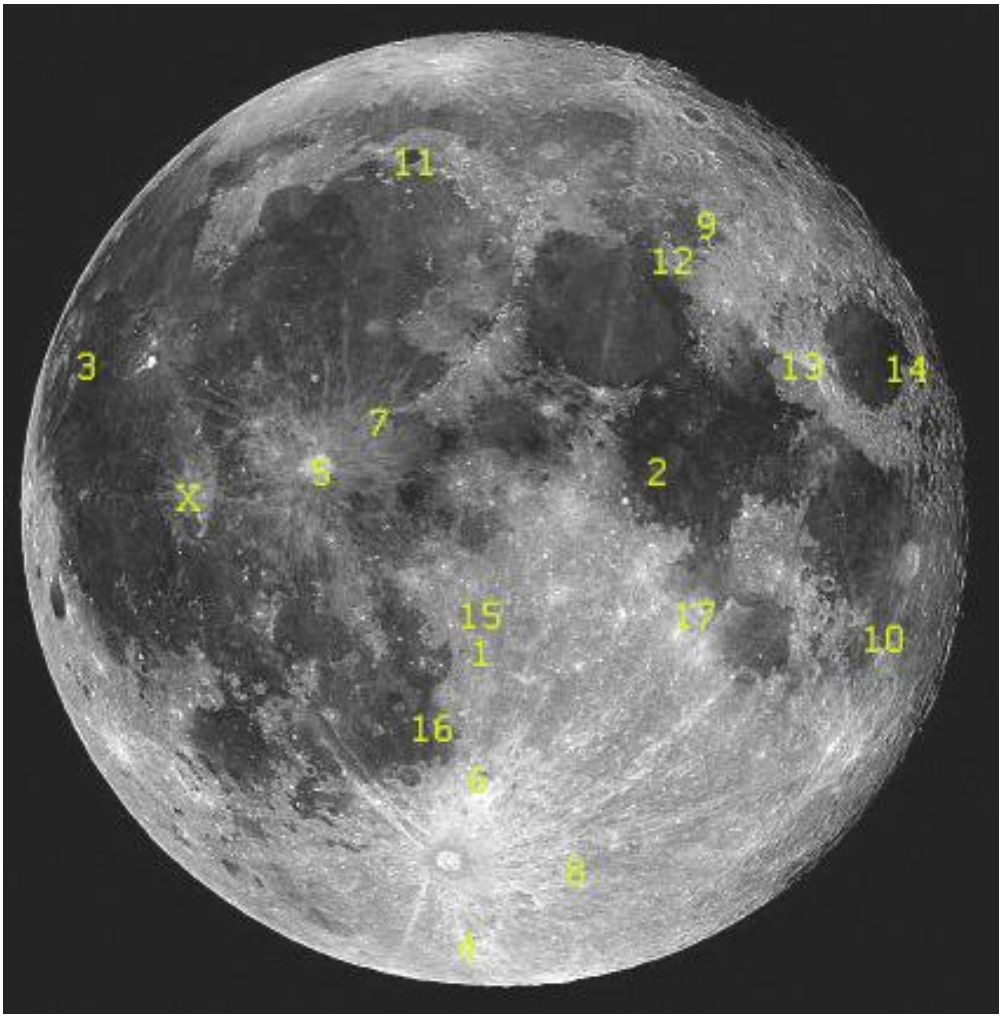
KEY TO IMAGES IN THIS ISSUE

1. **Alphonsus**
2. **Arago**
3. **Briggs**
4. **Clavius**
5. **Copernicus**
6. **Deslandres**
7. **Eratosthenes**
8. **Maurolycus**
9. **Maury**
10. **Petavius B**
11. **Plato**
12. **Posidonius**
13. **Proclus**
14. **Promontorium Agarum**
15. **Ptolemaus**
16. **Straight Wall**
17. **Theophilus**



FOCUS ON targets

X = Kepler