ASSOCIATION OF LUNAR & PLANETARY OBSERVERS
ALPO
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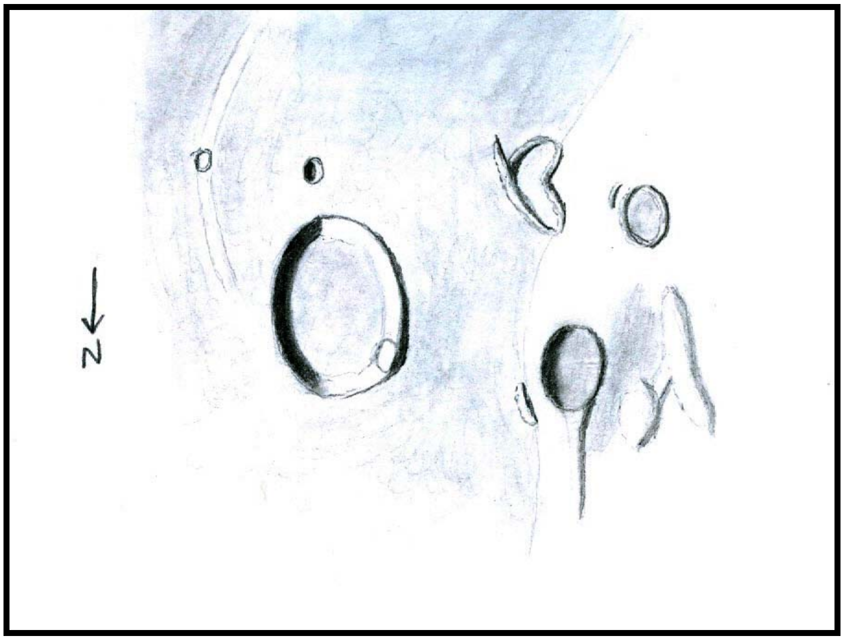
THE LUNAR OBSERVER

A PUBLICATION OF THE LUNAR SECTION OF THE A.L.P.O.
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 – APRIL 2011

RAMSDEN



Sketch and text by Robert H. Hays, Jr. - Worth, Illinois, USA
December 18, 2010 04:34-04:58 UT
15 cm refl, 170x, seeing 6-7/10

I sketched this crater and vicinity on the evening of Dec. 17/18, 2010 before the moon hid 47 Arietis. This crater is located in Palus Epidemiarum, south of Maria Nubium and Humorum. Ramsden is a relatively shallow crater whose east side is not strongly curved. This makes the crater somewhat D-shaped with points on its northeast and south ends. There is a bright patch on its northwest rim with more exterior shadow there than farther to the south. The small crater near Ramsden's south point is Ramsden A, and a shallower pit is to its east. This pit is within a narrow, bright streak which may correspond to one of the rills in this area. Lepaute is the most prominent crater west of Ramsden. A straight ridge extends northward from Lepaute and a low, curved ridge is just east of Lepaute. Lepaute K is the very shallow crater southwest of Lepaute and a shallow, boot or V-shaped crater is east of Lepaute K. A short, curved ridge is just east of Lepaute K, and a narrow, straight ridge extends southward from the point of the V-shaped crater. Palus Epidemiarum has a fairly sharp edge from southwest of the V-shaped crater, then along this feature and the ridge east of Lepaute. Both Lepaute and Lepaute K have dusky interiors, though they are not within the palus (mare) area. I couldn't detect any gaps in their rims. There are some low elevations and duskiness west of Lepaute, giving that area a lumpy appearance.

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LUNAR CALENDAR

APRIL-MAY 2011 (UT)

Apr. 01	22:00	Moon 1.6 Degrees SE of asteroid Eunomia
Apr. 02	09:01	Moon at Apogee (406,655 km – 252,684 miles)
Apr. 02	12:00	Moon 5.9 Degrees NNW of Mars
Apr. 02	15:00	Moon 5.7 Degrees NNW of Uranus
Apr. 03	14:32	New Moon (Start of Lunation 1092)
Apr. 03	20:00	Moon 5.8 Degrees NNW of Jupiter
Apr. 04	09:00	Moon 1.4 Degrees NW of Mercury
Apr. 08	22:54	Extreme North Declination
Apr. 11	12:05	First Quarter
Apr. 17	03:00	Moon 7.6 Degrees SSW of Saturn
Apr. 17	06:01	Moon at Perigee (358,087 km – 222,505 miles)
Apr. 18	02:43	Full Moon
Apr. 21	13:42	Extreme South Declination
Apr. 23	00:00	Moon 3.4 Degrees S of Pluto
Apr. 25	02:46	Last Quarter
Apr. 27	05:00	Moon 5.2 Degrees NNW of Neptune
Apr. 29	18:03	Moon at Apogee (406,042 km – 252,303 miles)
Apr. 29	23:00	Moon 5.8 Degrees NNW of Uranus
Apr. 30	18:00	Moon 6.6 Degrees NNW of Venus
May 01	00:00	Moon 7.3 Degrees NNW of Mercury
May 01	16:00	Moon 5.6 Degrees NNW of Jupiter
May 01	17:00	Moon 5.3 Degrees NNW of Mars
May 02	06:50	New Moon (Start of Lunation 1093)
May 06	03:54	Extreme North Declination
May 10	20:32	First Quarter
May 14	10:00	Moon 7.6 Degrees SSW of Saturn
May 15	11:19	Moon at Perigee (362,132 km – 225,018 miles)
May 17	11:07	Full Moon
May 18	23:24	Extreme South Declination
May 20	08:00	Moon 3.4 Degrees S of Pluto
May 24	15:00	Moon 5.4 Degrees NNW of Neptune
May 24	18:51	Last Quarter
May 27	07:00	Moon 5.9 Degrees NNW of Uranus
May 27	09:59	Moon at Apogee (405,004 km – 251,658 miles)
May 29	11:00	Moon 5.4 Degrees NNW of Jupiter
May 30	20:00	Moon 3.8 Degrees N of Mars
May 31	01:00	Moon 4.4 Degrees NNW of Venus
May 31	18:00	Moon 3.7 Degrees N of Mercury

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 non-member you are invited to join our organization for its many other advantages.

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

Our quarterly journal, **The Strolling Astronomer**, contains the results of the many observing programs which we sponsor including the drawings and images produced by individual amateurs. Additional information about the A.L.P.O. and its Journal is on-line at: **http://www.alpoastronomy.org/index.htm** 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.

Note: The published images now contain links to the original, full resolution images. Clicking on an image while connected to the internet, will download the original image, which in some cases has significantly higher resolution than the published version.

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 always be included:

Name and location of observer
Name of feature
Date and time (UT) of observation
Size and type of telescope used
Orientation of image: (North/South - East/West)
Seeing: 1 to 10 (1-Worst 10-Best)
Transparency: 1 to 6
Magnification (for sketches)
Medium employed (for photos and electronic images)

CALL FOR OBSERVATIONS:
FOCUS ON: Alphonsus

Focus on is a bi-monthly series of articles, which includes observations received for a specific feature or class of features. The subject for the **May 2011** edition will be Alphonsus. 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 crater to your observing list and send your favorites to:

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

Deadline for inclusion in the Alphonsus article is April 20, 2011

FUTURE FOCUS ON ARTICLES:

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

Plato	**TLO Issue: July 2011**	**Deadline: June 20, 2011**
Posidonius	**TLO Issue: September 2011**	**Deadline: August 20, 2011**

ALPO 2011 CONFERENCE

The annual ALPO Conference is being held in Las Cruces, New Mexico this year. I encourage you to attend, if possible, and to consider presenting a paper. Information, including deadlines, from the conference web-site follows, with links to more information.

ALPO 2011 CONFERENCE

The 2011 Annual Conference of the Association of Lunar and Planetary Observers will be held at New Mexico State University, Guthrie Hall Room 201, in Las Cruces, New Mexico, Friday, July 22, 2011 and Saturday, July 23, 2011. For the latest information visit: www.morning-twilight.com/alpo

REGISTRATION:

	Before July 1:	After July 1:
Individual:	$65.00	$80.00
Individual plus family member:	$75.00	$95.00

Banquet: $30 per person (Held at NMSU Golf Course Clubhouse)

LODGING:

Conference Hotel:	Sleep Inn University	2121 S. Triviz, Las Cruces, NM 88001 (575) 522-1700
Reservations:	(877) 424-6423	Single queen bed: $70+tax single or double occupancy (Call after April 1, 2011- Mention the Association of Lunar and Planetary Observers Conference)

NMSU Dorm Rooms		Bedding Included*	Bedding not included**
Residence Halls	Single Occupancy	$25.00	$19.00
	Double Occupancy	$21.50	$16.00
Apartments	Chamisa Village	N/A	$39.00
	Vista Del Monte or Cervantes Village	N/A	$28.50

DORM RATES PER PERSON PER NIGHT
*Bedding includes 2 flat sheets, 1 pillowcase, 1 pillow, and 1 blanket. Towels are not provided.
**Apartments include kitchens. Guests must bring their own cooking equipment and dining utensils.
If you would like to stay in the dorms, you can download the NMSU Housing Request Form here (PDF).

SPECIAL TOURS: July 21 and July 22

Very Large Array — Apache Point Observatories
National Solar Observatory — White Sands Missile Range

(All venues may not be available, dates to be determined. See website for current details)

REGISTRATION/QUESTIONS: alpoconference@morning-twilight.com

Registrar: ALPO 2011 Conference Robert Williams, 308 N. Mesquite St. #3, Las Cruces, NM 88001

CONTRIBUTED PAPERS:

Deadline for four or five sentence abstract/proposal for papers/workshops/posters is June 15, 2011.
For submission details see JALPO 53, #2, Spring 2011, pg. 4

Contact:
Dr. Richard Schmude
Professor of Chemistry, Gordon College
Barnesville, GA 30204
(770) 358-0728 schmude@gdn.edu

FOCUS ON: Central Peaks with Craters

By Wayne Bailey

Coordinator: Lunar Topographical Studies

An interesting, but difficult to observe class of lunar features is craters whose central peaks have craters superimposed on them. The observational difficulty arises from the fact that a crater superimposed on a peak is necessarily small, and small nooks and crannies can be difficult to distinguish from a crater.

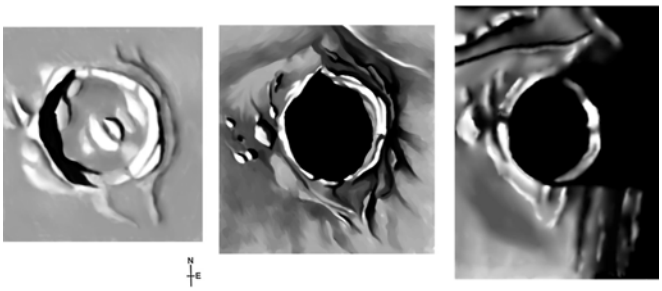


FIGURE 1. ***PLINIUS****-Peter Grego, St. Dennis, Cornwall, UK 200 mm SCT,* ***Left****: November 21, 2005 04:47-05:17 UT. 200X, binoviewer. Colongitude 1467.6 -147.9º.* ***Middle:*** *July 23, 2008 02:15-03:00 UT. 200X. Colongitude 151.4-151.8º. Seeing AII-AIII.* ***Right:*** *May 4, 2010 03:50-04:20 UT. 250x. Colongitude 153.7-154.0º.*

Several possible interpretations come to mind: 1. Random impact crater postdating the central peak. 2. Volcanic vent that is associated with, or possibly the source of, the central peak. 3. Illusion resulting from the central peak topography. Rik Hill mentioned the three examples (Plinius, Regiomontanus, & Walter) that may be the easiest to observe. To me, these three also look (based only on appearance) like possible examples of each of the three interpretations above.

FIGURE 2**.** ***PLINIUS AREA****- Howard Eskildsen-Ocala, Florida, USA. January 11, 2011 23:28 UT. Seeing 7/10, Transparency 4/6. 6" f/8 Explore Scientific lens refractor, 2x barlow, DMK 41AU02 AS, no filter.*

PLINIUS

North (2000) describes Plinius as "The central mountains are very peculiar and can give the impression of being a crater under some illuminations…". The Rukl Atlas shows what appears to be a crater on the central peak. Peter Grego's drawing of Plinius (Fig. 1) shows a groove crossing the peak, while Howard Eskildsen's image (Fig. 2), with opposite lighting, appears to be a cone with a central crater. In the Lunar Reconnaissance Orbiter image (Fig. 3) with overhead lighting, the peak appears to be a highly structured ring. Theseimages may be consistent with a collapsed dome-like feature, but it seems most likely that it is simply a rugged peak.

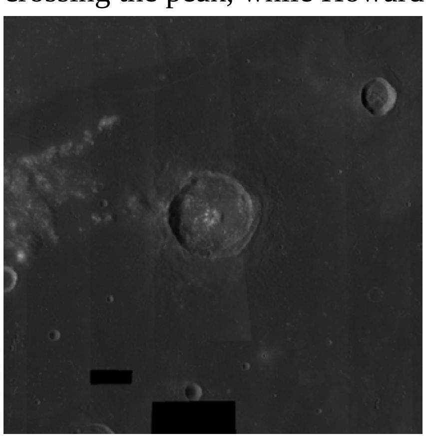


FIGURE 3. ***PLINIUS.*** *Lunar Reconnaissance Orbiter Camera.* http://wms.lroc.asu.edu/lroc

WALTER

The floor of Walter contains a large number of craters of various sizes (Figs. 4-6). The "crater" atop the main peak looks to me more like a cliff. The crater on the southern extension of the peak is a little more convincing as a volcanic feature, but the density of similar craters on the floors makes it difficult to exclude a random impact.

REGIOMONTANUS

The central peak of Regiomontanus has a well preserved crater, Regiomontanus A, nicely centered on its peak (Fig. 4 & 6). The peak has been described as a ridge extending to the northwest rim. To me, it looks like a symmetrical dome or cone, with rougher, slightly elevated terrain between it and the NW rim.

(Fig. 7), possibly a result of the encroachment by Purbach to the north. Wood (2003) points out that, based on its size, a central peak is expected in Regiomontanus, and A looks like an impact feature. Also, Regiomontanus itself appears old and battered, with its rim well worn. But A appears fresh, arguing for a later, impact, origin. Rukl (2004) gives the depth

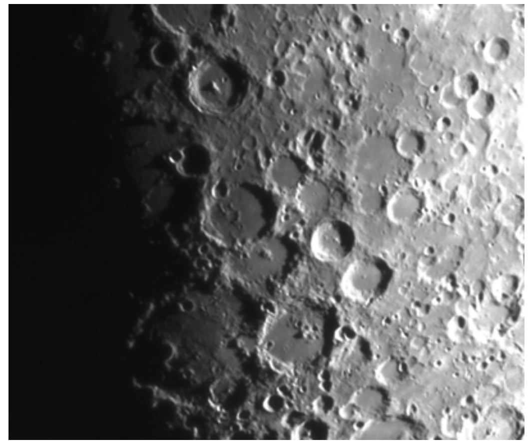
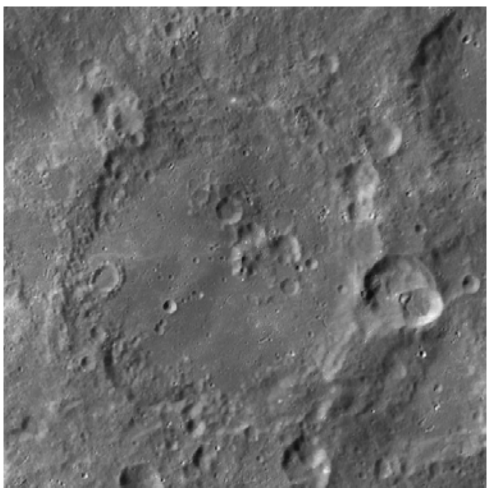


FIGURE 4. ***REGIOMONTANUS & WALTER****- Jerry Hubbell, Locust Grove, Virginia, USA. March 13, 2011 02:00 UT. Colongitude 9.2º, Seeing 7/10, Transparency 4.5/6. Sky-Watcher Equinox 120 ED APO. ATIK 314e TEC CCD.*

of Regiomontanus as 1730 m, which is shallow for its diameter (126x110 km), which could be accounted for by rim erosion, but also opens the possibility that the true central peak is buried. Overall, an interesting crater whose true nature may not be determined until it is visited by a geologist.



OTHER FEATURES

Additional examples of central peaks with craters include are additional examples of central peaks with craters. Although interesting to observe, craters on central peaks are most likely just a mixture of impacts that happened to land on a peak and jumbled rock formations that happen to look like pits.

FIGURE 5. ***WALTER****- Lunar Reconnaissance Orbiter Camera.* http://wms.lroc.asu.edu/lroc

Schultz (1976) raised the question of whether summit pits, annular central peaks and concentric craters are related. This could be the case, for instance, if they areall formed by collapse or rebound, rather than impact. Well known examples of craters with arcuate central peaks include Gassendi, Kunowsky, Philolaus, and Posidonius. Some of these do look like enlarged versions of summit pits that are not impact craters. Dembowski (2006) discusses concentric craters, including a version of Charles Wood's original list.

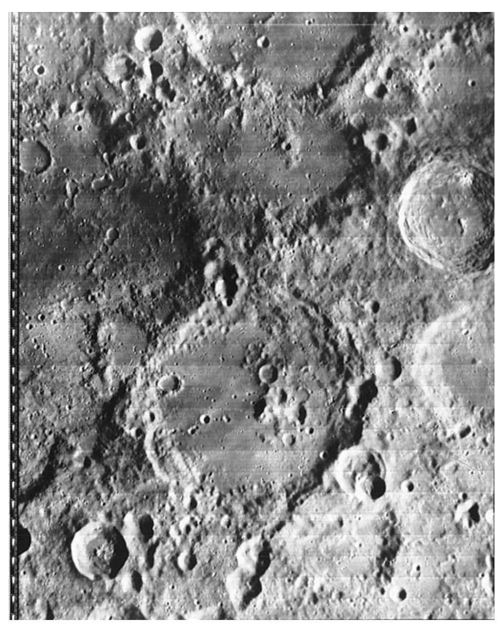


FIGURE 6. ***REGIOMONTANUS & WALTER****-Gillis (2004)-Lunar Orbiter 4 107H3.*

FIGURE 7. ***REGIOMONTANUS-*** *Lunar Reconnaissance Orbiter Camera.* http://wms.lroc.asu.edu/lroc

ADDITIONAL READING

Bussey, Ben & Paul Spudis. 2004. The Clementine Atlas of the Moon. Cambridge University Press, New York.
Byrne, Charles. 2005. Lunar Orbiter Photographic Atlas of the Near Side of the Moon. Springer-Verlag, London.
Dembowski, William. 2006. JALPO, 48, #4, 27. "Enigmatic Lunar Craters". (http://www.alpo-astronomy.org)
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Rukl, Antonin. 2004. Atlas of the Moon, revised updated edition, ed. Gary Seronik, Sky Publishing Corp., Cambridge.
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Wood, Charles. 2003. The Moon: A Personal View. Sky Publishing Corp. Cambridge.

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A TIDE POOL ON THE MOON

Fred Corno

Sinus Iridum is positioned at the NNW on the rim of the Mare Imbrium, as a wide flooded circus, approximately 260 km in diameter. The rim is discernible for almost 270°, but a large gap opens in it towards the SE, where the circus merges in the vast expanse of the Mare Imbrium. A series of ridges completes the missing section of the rim, where it probably was emplaced at a lower level since protruding over the Imbrium Basin.

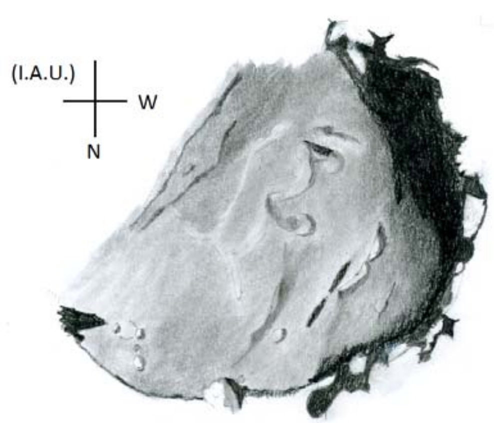
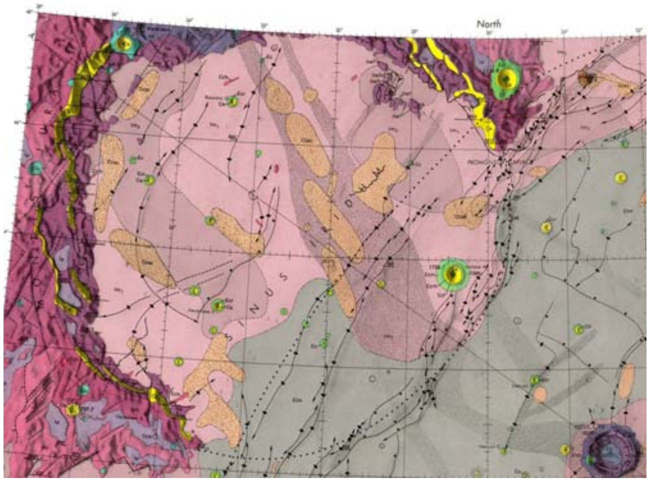


Figure 1: ***Sinus Iridum floor.*** *Drawing by the author, 27th of June 2004, 20.40 UT at 216x (200 mm catadioptric).*

Its position and structure, as well as the lava filling, continuous with that of the adjacent mare, clearly date Sinus Iridum basin between the Imbrium-forming impact and the late basaltic eruption filling the basin.



The floor of the Sinus Iridum is hostile to the lunar drawer, although fascinating: its fine albedo

Figure 2: ***Crop from Lunar Geologcal Map I 602:*** *different hues of pink indicate lava flooding from Imbrian period. Grey indicates lava flows from early Erathostenian. Purple stands for Imbrian ejecta and ray materials, while violet is related to transformed pre-Imbrian crust transformed by Imbrian impact mixed with ejects of the same impact. Ochre and dotted zones delimitate the ray material from late impacts. Yellow indicates latest rim rampart modification due to slumping in Copernican period (high albedo features).*

variations and articulate low contrast ridges are in fact most difficult to transfer to paper when sitting in the dark peering into the eyepiece (Figure 1). Actually they reflect the complex formation history of the district: after the original impact, occurred right after the formation of the Imbrium basin, subsequent lava flows filled the cavity formed, as it also happened in the larger basin. Lava extrusion continued in three main separate events across the upper Imbrian period into the early Erathostenian (approximately 3 billion years ago): material belonging to different flows is recognizable by difference in albedo (generally around or less then 0.1)

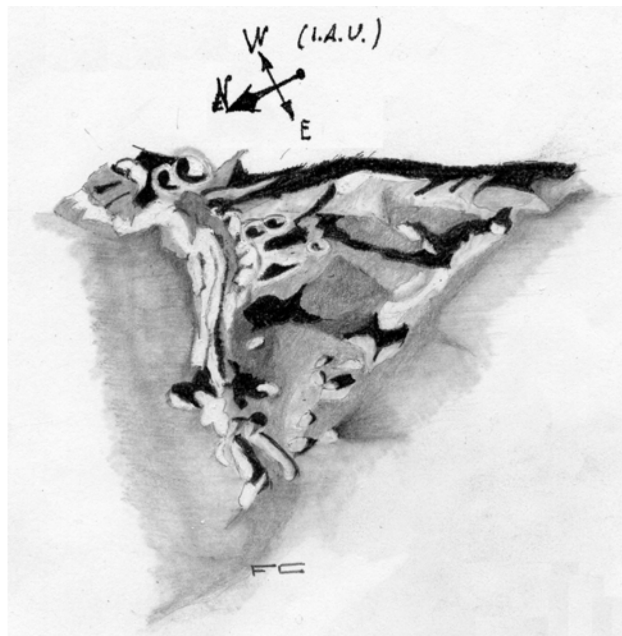


Figure 3: ***Promontory Heraclites.*** *Drawing by the author, 18th of October 2010, 19.00 UT at 208x (5" apo refractor).*

and crater count. Patches of ray material and ejecta from recent large impacts (Copernicus, Aristillus and Aristarchus) crisscross the surface as higher (larger than 0.1) albedo features. The complexity of the district is finely described in Figure ***2***.

Two promontories visually separate the Sinus from the Mare as gate pillars: Heraclides is the westernmost, while Laplace is positioned to the East. Both of them are a part of the rim of the Sinus, then belonging to the lower Imbrian system. Rocks forming them derive from the rim constituents of the Imbrium basin, and are a mixture of reworked pre-imbrian crustal rocks and imbrian ejecta. Both of them, to the inner side, present high albedo patches because of slumping of rim ramparts occurred recently, in the Copernican period (less than 1.2 billion years ago, see Figure 3 and Figure ***4***).

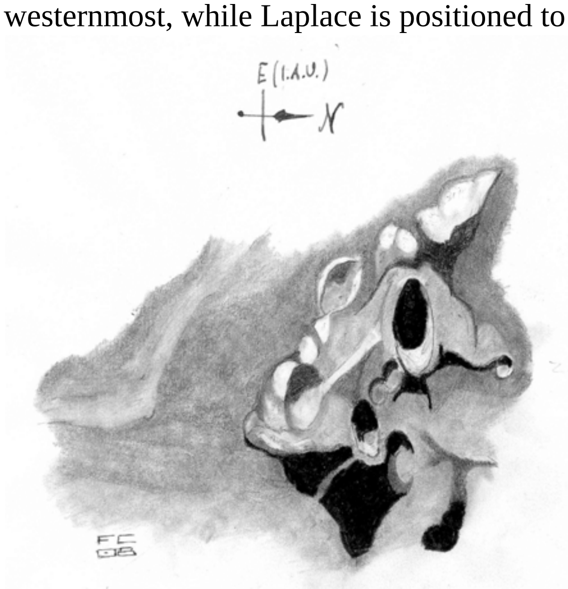


Figure 4: ***Promontory Laplace.*** *Drawing by the author, 10th of October 2008, 21.30 UT at 346x (5" apo refractor).*

This portion of the Moon is not only most attractive because of its complex geologic history, but also for the romance that lays in it: Gian Domenico Cassini had Jean Baptiste Patigny represent Promontory Heraclides with the semblance of a young lady in his celebrated 1679 lunar map. When created, such a map was intended as a tool to support longitude determination by an Earth-based observer: even if not definitively accurate at a close inspection, still today Cassini's map strikes for the wealth of topographical details. Cassini himself is remembered as a lunar scientist for the three laws of Lunar motion he worked out from studies of lunar revolution and rotation, meant to determine a lunar reference coordinate system to support terrestrial longitude calculation. Nevertheless he allowed two main scientific deviations creep in his lunar map, the lady's face and the heart-shaped albedo feature in Mare Serenitatis, to the point that last September, W. Sheenan and F. Launay, in their Sky and Telescope article, speculate that they may constitute a love tribute to the astronomer's wife.

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The Western Shore of the Mare Humorum and the Liebig Scarp

Phil Morgan.

At 19:30 hrs UT on the 14th of February, 2011 the western (IAU) shore of the Mare Humorum was well presented and so I decided to attempt a sketch of the region, the results being shown in the south up observation reproduced here (Figure 1). Seeing was (as usual of late) not particularly favourable, and so I was unable to pick out some of the finer rilles that I have recorded in the past. The most striking feature at this colongitude is the great Liebig Scarp, a fault similar to the Straight Wall, and running northwards for some 80 kilometres from the crater Liebig G. This fault has a much greater curvature than the Straight Wall, and may have formed slightly differently since there is an absence of any relay ramps on its open eastern face. The relay ramps of the Straight Wall could indicate a gradual formation of the fault over a period of time, but the Liebig Scarp would appear to have had a much more sudden genesis. Although I have suggested elsewhere that the Straight Wall could possibly have started out as a normal looking rille, I would say that the evidence is much stronger here with definite rille segments still visible at both the north and south ends of the fault. The LROC WAC image in Figure 3 shows clearly (arrowed) that the Liebig Scarp is still a normal rille as it enters the northern rampart of the crater Liebig G. Most likely we are looking at what once was a normal curving peripheral rille that had formed as a consequence of tension in the surface because of outpourings of magma filling the basin centre. Later lava flows nearer to the eastern edge of the rille brought about a sudden slumping of the eastern side of the rille. The resulting scarp face was of great interest to lunar geologist Gilbert Fielder, and in particular the odd D shaped crater that is situated at the mid point of the fault face on the upthrown side. (figure 2)

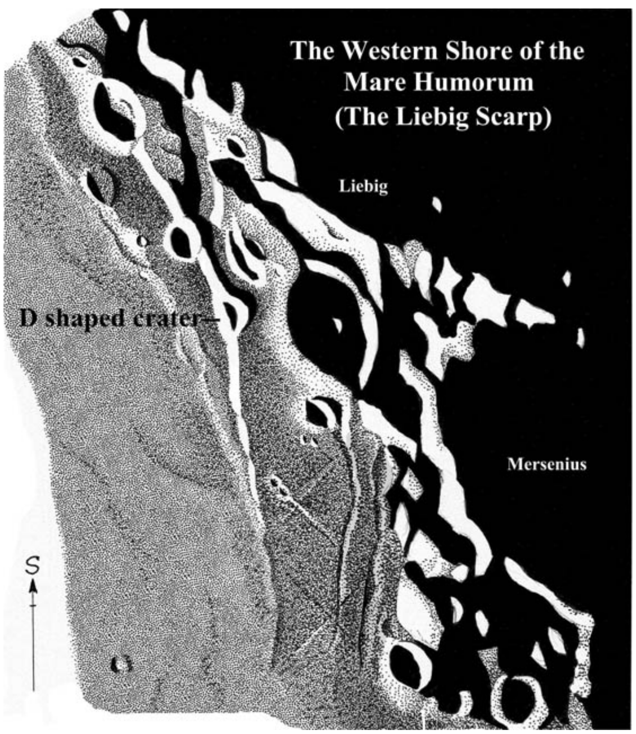

*__Figure 1.__ **Liebig Scarp.** Phillip Morgan- Lower Harthall-Tenbury Wells, Worcestershire, England. February 14, 2011. 19:30-20:00 UT, Colongitude 49.5°-49.8°. Seeing 6/10, Transparency 4/5. 305mm, f/5, Newtonian, 400x.*

Writing in 'Lunar Geology' (July 1965, page 57) and dealing with "Craters on Faults", Fielder felt that this peculiar half crater was of special interest because, situated as it is on the upthrown block of a fault, it indicated a quiescent process of growth for this particular crater. Going on to say "If the crater formed by an explosion after the fault, the fault would not bend around the crater, and the wall at W (Classical) would have blown away. This circumstance still has to be explained even if the crater formed before the fault; and one would then expect to find some trace of the wall W on the downthrow, yet nothing of the kind is observed. Clearly the crater did not form explosively; rather it grew slowly along with the fault itself."

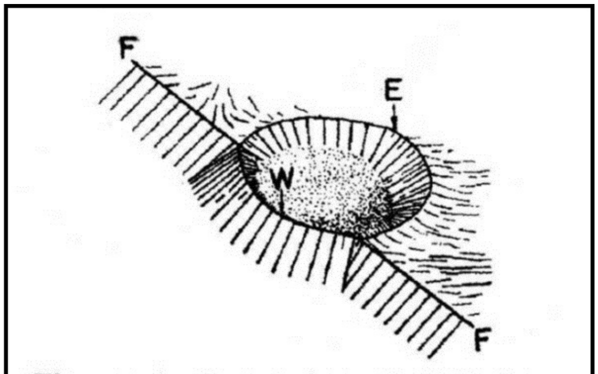

Fig. 4-2-1 A crater on a fault in the east of Mare Humorum

Figure 2. ***Fielder's (Classical) sketch of the D shaped crater***

Unfortunately for Fielder the images that he had to hand back at the time of his writing were limited to Earth based telescopic photographs, the best probably being those made at Mount Wilson. As such these did not really show him the true nature of this strange crater until the Lunar Orbiter missions, and today of course, we have the marvelous LROC WAC highly detailed views. The south up LROC image in Figure 3 shows us clearly that this odd D shaped little feature is in fact a very ancient crater that had formed before the emplacement of the Liebig Scarp, and was cut almost neatly in half when the eastern side of the fault dropped away. There are remnants of a once grand central peak still visible on the floor, close to the very edge of the fault, but no evidence at all of any remains of the missing half of the crater at the foot of the slope. So we can only assume that they were eroded away by the erosive action of later lava flows that once swept up to the base of the scarp face. Just to the south of the D crater is the bright crater Liebig F. This little crater is completely unaffected by the dipping of the fault face, and so is a newer feature.

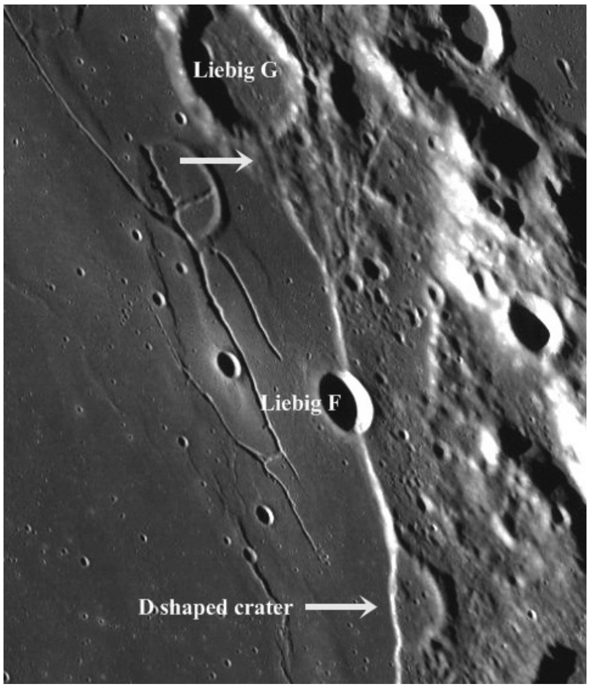

***Figure 3*. LROC WAC image of the western Mare Humorum and the Liebig Scarp**

LUNAR TOPOGRAPHICAL STUDIES

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

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

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

OBSERVATIONS RECEIVED

JAY ALBERT – LAKE WORTH, FLORIDA, USA. Digital image full moon.

MAURICE COLLINS - PALMERSTON NORTH, NEW ZEALAND. Digital images of Aristarchus & full moon.

FRED CORNO - SETTIMO TORINESE, ITALY. Drawings of Promontory Heraclites & Sinus Iridum.

HOWARD ESKILDSEN - OCALA, FLORIDA, USA. Digital images of 1st Qtr, 3rd Qtr, & Full Moon.

CHARLES GALDIES – NAXXAR, MALTA. Drawing of Theophilus' central peak.

MARK HARDIES – NEW PORT RICHEY, FLORIDA, USA. Digital images of Alphonsus, Montes Apenninus & Plato (2).

RICHARD HILL – TUCSON, ARIZONA, USA Digital images of Aristarchus & Reiner Gamma.

JERRY HUBBELL – LOCUST GROVE, VIRGINIA, USA. Digital images of 1st Qtr moon, Archimedes, Deslandres-Stoffler, Maginus, Ptolemaeus-Alphonsus & Purbach-Walter.

PHILLIP MORGAN –LOWER HARTHALL-TENBURY WELLS, WORCESTERSHIRE, ENGLAND. Drawing of Western Mare Humorum.

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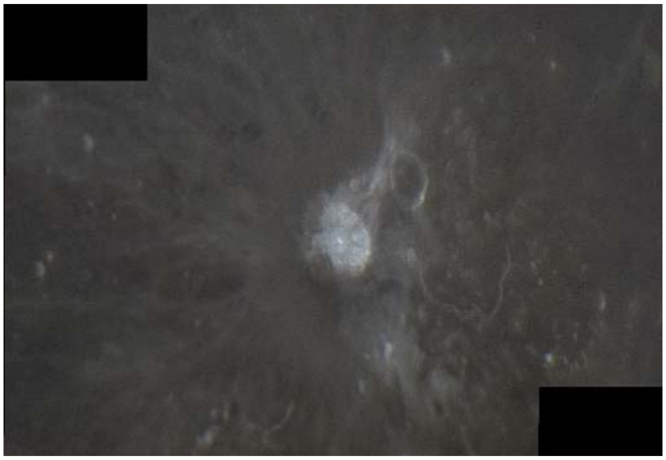
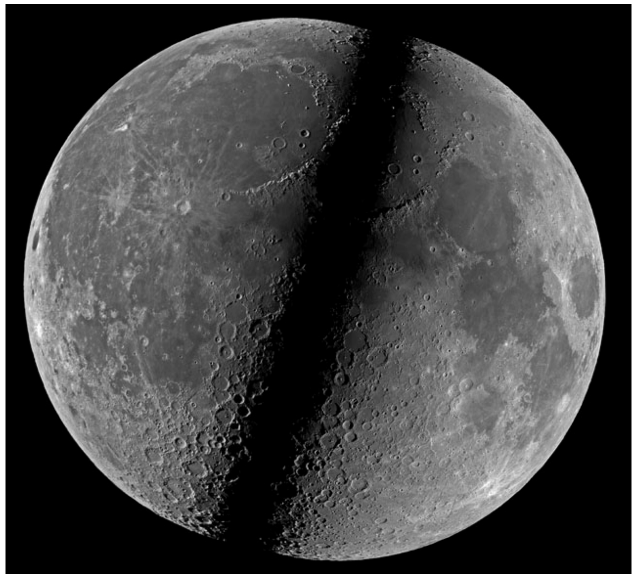
RECENT TOPOGRAPHICAL OBSERVATIONS

FULL MOON – Jay Albert-Lake Worth, Florida, USA. March 19, 2011. Olympus digital camera (10 Mpix), max zoom, ISO 200, f/7, 1/800 sec, handheld.



ARISTARCHUS - Maurice Collins-Palmerston North, New Zealand. March 19, 2011 09:20-09:22 UT. Seeing A-IV. C8, 3x Barlow.



1st & 3rd QUARTER MOON (Extreme Libration) - Howard Eskildsen-Ocala, Florida, USA. Orion ED 80, 600 mm f.l., 2X Barlow, DMK 41AU02.AS, No Filter.

1st Quarter March 13, 2011 00:54 UT. Seeing 7/10, Transparency 4/6**.** Libration: Latitude -00° 36', Longitude -08° 17'.

3rd Quarter March 26, 2011, 10:17 UT. Seeing 9/10, Transparency 5/6**.** Libration: Latitude -00° 04', Longitude +07° 37'

Note: The total libration difference between the two images was nearly 16 degrees!

Central feature of Theophilus
Charles Galdies
http://znith-observatory.blogspot.com

THEOPHILUS CENTRAL PEAK - Charles Galdies-Naxxar, Malta. February 9, 2011 20:00 UT. Seeing good. 8" SCT f/10, 333x.

On February 9th I spent around an hour examining the central detail of Theophilus. This circular crater is around 100 km in diameter and forms a remarkable trio with Cyrillus and Catharina.

The most striking feature of this crater is the magnificent bright central mountain which I sketched to show its proportion as well as the level of detail observed.

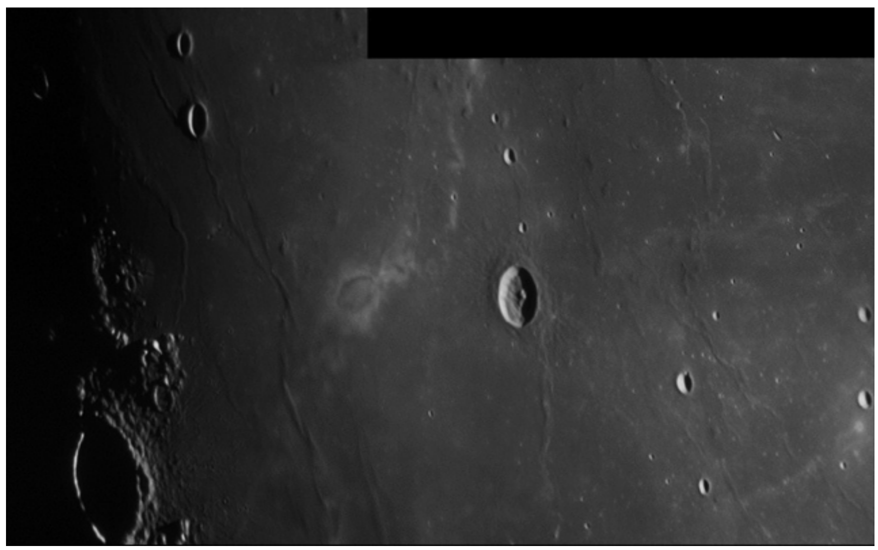
This mountainous feature was seen to be composed of distinct masses (around 4) surmounted by lofty peaks, one of which is documented to be around 6,000 feet above the floor, and covers an area of at least 300 square miles.

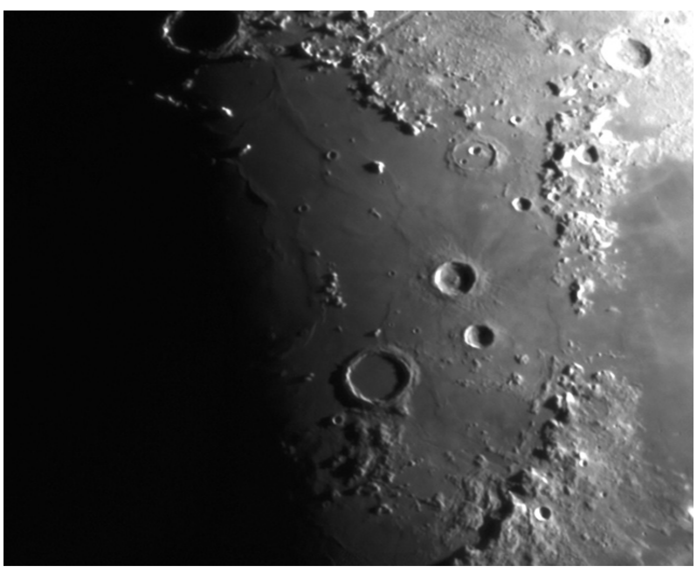
I have annotated the four peaks of this mountain: The reflected light from **Region (a)** was strong and translucent except for a small part at the edge, which suggests a slightly sloping feature. **Region (z)** reflected less light. High power magnification suggests this area as sloping into a valley-like feature, making this region decreasing in brightness as one goes away from peak (z). **Region (x)** showed a very interesting texture under high power, which originated from one of the four summit peaks and gradually sloped down ending into an area of extensive mountain debris. This effect gradually increased the reflected light starting from the shadowed summit peak to a maximum at the crater floor. **Region (y)** was seen as the resultant shadow of a fourth peak which was seen extending outwards.

Except for a distinct crater on the S.E. quarter, this mountainous feature was the only object of interest within Theophilus.

<u>M</u>ONTES APENNINUS – Mark Hardies-New Port Richey, Florida, USA. March 13, 2011 01:35 UT. Seeing 6/10, Transparency 5/6. Colongitude 8.7º. C-8 SCT f/10, DMK 41AU02.

<u>REINER GAMMA</u> – Richard Hill – Tucson, Arizona, USA February 16, 2010 04:49 UT. Seeing 7/10. C14, 2x barlow, f/22, SCT. DMK21AU04. UV/IR blocking filter.





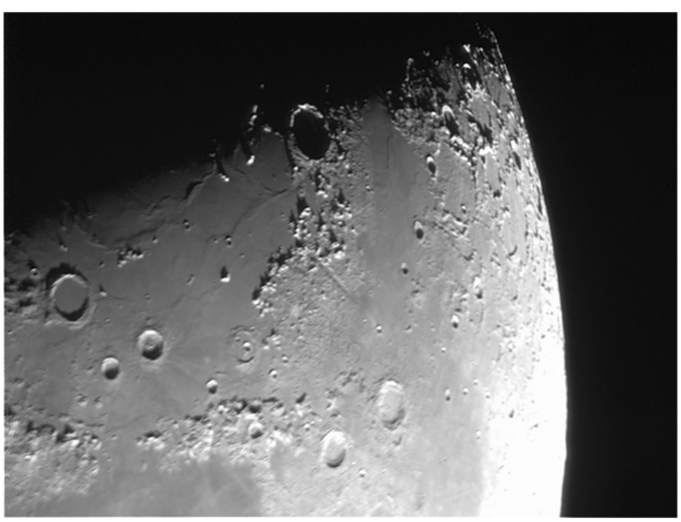
<u>ARCHIMEDES-CASSINI</u>– Jerry Hubbell, Locust Grove, Virginia, USA. March 13, 2011 02:37 UT. Colongitude 9.5º, Seeing 7/10, Transparency 4.5/6. Sky-watcher 120 ED APO, 2x Barlow, ATIK 314e TEC CCD.

Archimedes, Cassini, and Aristillus In the Mare Imbrium provided a very good view, with several ridges covering the mare. Of more interest were the numerous mountain peaks in the region, all with very long shadows ripe for measurement using LTVT, the Lunar Terminator Visualization Tool. Mons Piton was particularly well lit, being so early in the morning there. There are several peaks East Southeast of Plato, Northwest of Cassini in the Montes Alpes range that have very long shadows. Amongst the mountains, crater Piazzi Smyth stands out adjacent to a ridge that runs parallel to the Montes Alpes. There is detail in the Aristillus ejecta blanket, particularly to the North and East. Aristillus A is also discernible, even though it is only 3 Km in diameter. There are several other features worthy of extended study, which my images afford me the luxury of doing.

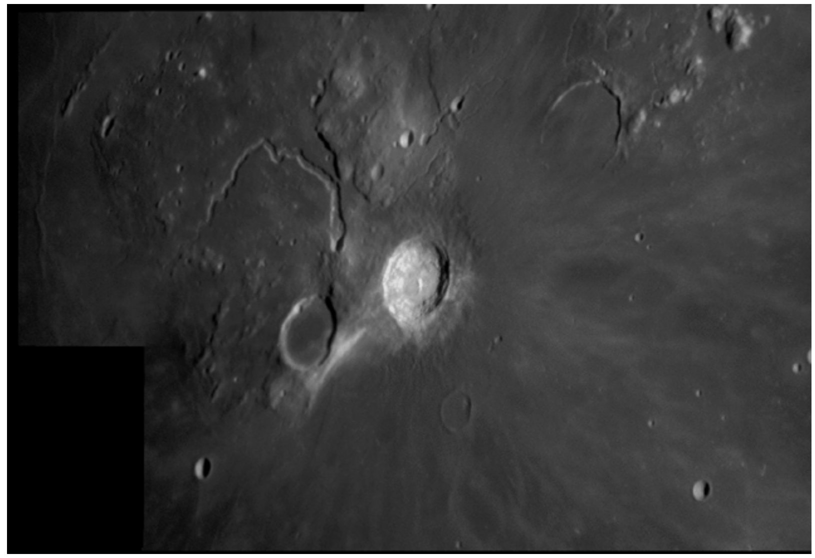
ADDITIONAL TOPOGRAPHICAL OBSERVATIONS

FULL MOON - Maurice Collins-Palmerston North, New Zealand. March 19, 2011 07:16-08:37 UT. C8, LPI.

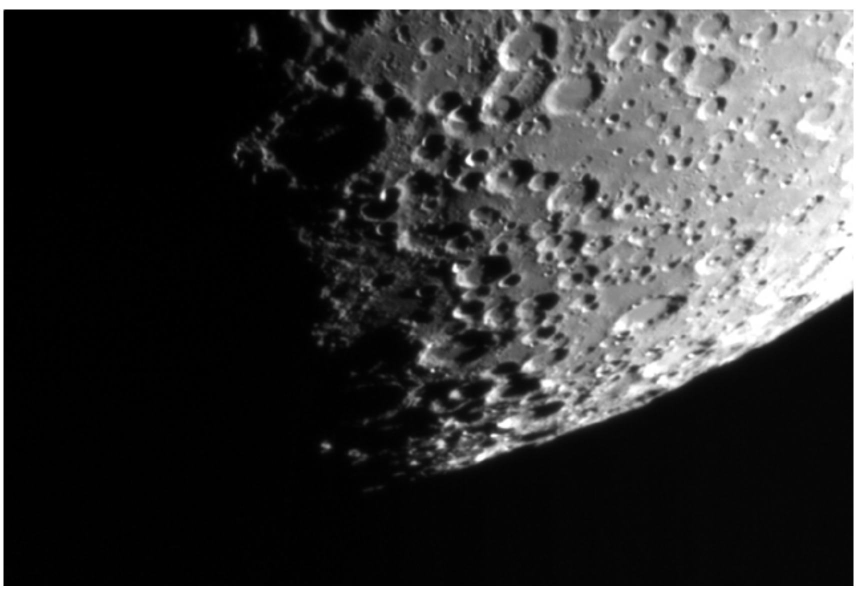
FULL MOON - Howard Eskildsen-Ocala, Florida, USA. March 20, 2011 02:29 UT. Orion ED 80, 600 mm f.l., DMK 41AU02.AS, No Filter.



PLATO – Mark Hardies-New Port Richey, Florida, USA. March 13, 2011 01:37 UT. Seeing 6/10, Transparency 5/6. Colongitude 8.7º. C-8 SCT f/10, DMK 41AU02.



<u>ARISTARCHUS</u> – Richard Hill – Tucson, Arizona, USA February 16, 2010 04:45 UT. Seeing 8/10. C14, 2x barlow, f/22, SCT. DMK21AU04.



<u>MAGINUS</u>– Jerry Hubbell, Locust Grove, Virginia, USA. March 13, 2011 02:13 UT. Colongitude 9.3º, Seeing 7/10, Transparency 4.5/6. Sky-watcher 120 ED APO, 2x Barlow, ATIK 314e TEC CCD.

Maginus provided a very interesting view. The floor of the crater was completely in shadow, except for the central peak(s), but the Western flank of the crater immediately adjacent to the Western rim, was bathed in light showing several smaller craters in high relief. Those craters included: Maginus C, G, M, N, and NB. Of note, the Western Rim of crater Maginus C is showing first light, which for me is one of the finer sights at the terminator. Also Maginus H is totally in shadow being on the South Western rim of Maginus C.

LUNAR TRANSIENT PHENOMENA

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

LTP NEWSLETTER – APRIL 2011

Dr. Anthony Cook - Coordinator

Observations for Feb 2011 were received from the following observers: Jay Albert (Lakeworth, FL, USA) observed: Agrippa, Aristarchus, Bessel, Burg, Earthshine, Picard, Proclus, Rabbi Levi, and several other features. Maurice Collins (New Zealand) observed Aristarchus, and took whole Moon images. Marie Cook (Mundesley, UK) observed Alpetragius, Aristarchus, Bullialdus, Gassendi A & C, Manilius, Picard, Plato, and Yerkes. Myself (Newtown, UK) observed several features on the illuminated disk with a color webcam, Stave Lang (New Zealand) took whole Moon images. Bob O'Connell (Keystone Heights, FL) observed Aristarchus. Brendan Shaw contacted me to let me know that he would have observed, but for the fact that his CCD camera stopped working and he had to return it to the manufacturer!

News: Of relevance to LTP studies, at this year's Lunar and Planetary Science Conference (Houston TX), a poster (http://www.lpi.usra.edu/meetings/lpsc2011/pdf/2811.pdf) was shown that proved that a theory, that Aristarchus has more LTPs during low and high vertical tides, was wrong. This theory was proposed, based upon an analysis of observational evidence between 1963-1965 by Chapman, and later for the period 1963-1968 by Middlehurst. The vertical tide from the Earth causes a change in the surface gravitational force of 0.08% at extremes and Middlehurst thought that this might be sufficient to cause pores in subsurface rocks to expand and contract and release gas. However with hindsight, now that we have an extra 40 years of LTP data, as well as routine observations to act as a control, we can quite clearly see that this is not the case. This does not disprove the theory that tides, or indeed the closeness of the Moon to the Earth do not affect lunar quakes, indeed they do; it is that for Aristarchus at least, that the vertical tide from the Earth is not a big player in the cause of LTPs. Interestingly enough, the Apollo seismometers did not find many quakes coming from the vicinity of Aristarchus anyway.

Another LTP related poster presentation (http://www.lpi.usra.edu/meetings/lpsc2011/pdf/2600.pdf) was by Professor Crotts of Columbia University, NY, USA. Although still processing/analyzing the results of his continuing white light whole nearside survey for LTPs with robotic telescopes, he has since been looking for smaller changes on the Moon by comparing high resolution Lunar Orbiter images from the 1960's with modern LRO images of similar metre scale resolution. Two examples were shown, firstly a crater had a bright halo in one image the LRO image, but four decades earlier it did not have the halo in the Lunar Orbiter image – in truth there was a 50° illumination angle difference between the images, but none of the other craters showed this effect. Secondly a large boulder appears to have moved slightly between images taken four decades apart. So far he has examined relatively few images, but potentially upto ten thousand square kilometers of the lunar surface could be checked this way.

Thirdly the outcome of the LCROSS impact at the south pole was discussed. It was revealed that amount of volatiles (according to my hand written notes made at the conference) released in the vapor plume of the impact included 11 kg of Mercury, 15 kg of Calcium, 3 kg of Magnesium, 103 kg of Hydrogen, 45 kg of carbon monoxide, from a total of 3300 kg of ejected regolith. There was a great deal of speculation where some of these came from e.g. brought in by meteorite/cometary impacts and frozen out at the poles. Also water on the Moon was thought to come from two main sources OH solar wind implantation at lower latitudes and water from comets. Some of these water deposits were transient in nature, vaporizing at sunrise at high latitudes and freezing out on the night side or more poleward in nearly fully nocturnal shadowed craters.

Figure 1. *From left to right: Tony Cook, Arlin Crotts, and Chuck Wood at the Lunar and Planetary Science Conference, Houston, TX, USA in March 2011. Photo taken by ALPO member Bob O'Connell.*

Theories as to the origin of lunar swirls, such as Reiner Gamma are still under discussion, and appear to be no closer as to solving the riddle. All swirls though have magnetic fields and are dark in the UV.

The Ina formation is still thought to be geologically very young and is a result of some out-gassing that has blown material away. Another Ina like formation was announced – on the floor of Hyginus crater, this has previously been mentioned in MoonZoo http://users.aber.ac.uk/atc/tlp/moonzoo.pdf .

An interesting theory was revealed concerning lava tube skylights (lunar pits or "sub-lunar voids"). Three clear cut cases of these have been found in: Mare Tranquilitatis (86-96 m across and 92-105 m deep), Marius Hills (60x47 m across by 41 m deep), and Mare Ingenni (66x103 m across by 42 m deep). The Marius Hills pit exists in a 3.5 billion year old area of the surface, and calculations show that temperatures inside the lava tube underneath are relatively stable at between -20 C° and +3° C. The pit opening allows solar wind in and the implantation of OH on the surface of dust grains. These grains are slowly covered by other dust grains falling in from the sides, and so the floor of these skylights might become a rich source of trapped volatiles. Alas none of these sky lights appear in any LTP areas.

Whilst talking to some planetary geologists, I discovered that one of my long held assumptions about where outgassing might occur in craters was probably wrong. I had previously assumed that any gas release from underneath craters was more likely to escape inside the floors of craters, simply because they were nearer the source level, than the tops of crater rims were. However it was pointed out to me that crater terraces are where the rock strata has been folded over, and so if gases were seeping out from beneath the

Moon, they could find their way out between rock strata layers here, assuming that these had not been covered by scree down the sides of the inner crater rim. However there are still quite differing views, depending upon who you talk to, over whether outgassing, or indeed LTPs are indeed possible on the Moon (See figure 1).

Finally it should be said that ALPO contributing observers had a good turn out at this years's LPSC meeting as I had the pleasure of meeting: Dr John Westfall, Bob O'Connell, Dr Brian Cudnik, and the furthest afield of them all: Maurice Collins from New Zealand!

Routine Reports: On 2010 Feb 10 at UT 01:45-01:55 Jay Albert (Lakeworth, FL, USA) observed Bessel under the identical illumination to an 1877 Jun 17 UT 22:30 LTP report by Dennett. Here is the original description:

Bessel observed by Dennett_F on 1877-6-17 Bessel 1877 Jun 17 UT 22:30 Observed by Denett (England?, 2.75" reflector) "Tho't he could detect a minute pt. of light shining out of dark crater. (no high peaks in Bessel to catch light.)" NASA catalog weight=3 (average). NASA catalog ID #194. ALPO/BAA weight=3.

Jay reports: "*I could not see a minute point of light shining in the shadow on the crater floor. I did sometimes see a minute brighter point on the interior of the SW wall. It seemed to flicker slightly in the increasingly unsteady seeing. Used 311x with a W8 yellow filter to try to steady the seeing. Observed till 01:55 UT*" So has Jay at last solved this mystery? Unfortunately I do not have the English Mechanic article (25-432 according to Cameron) that the original LTP report appeared in, so we cannot to be 100% sure that this LTP has been cracked yet!

On 2011 Feb 15, between 01:13 and 02:44 UT repeat illumination recurred for the following famous Greenacre and Barr Aristarchus LTP event from 1963 Nov 28th (although not as famous as the 1963 Oct 30th event). Here are the heavily summarized details from Cameron's NASA catalog:

On 1963 Nov 28 at UT 00:30-02:45 "Greenacre, Barr, Hall and Dungan (Flagstaff, AZ, USA, 24" refractor and 69" reflector), Tombaugh (New Mexico, USA, 16" reflector x524) and Olivarez (New Jersey, USA, 17" reflector) observed a reddish-orange and sparkle on the rim and central peak, west (IAU?) side and blue on the floor of Aristarchus later. However Cyrus did not see anything from 02:25-02:30UT". The Cameron 1978 catalog ID=785 and weight=5. The ALPO/BAA weight=4.

I observed the area from the UK with a color webcam, but at only moderate resolution, as I was using a non-tracking Dobsonian, and the robotic scopes at Aberystwyth operate at lower resolution still as they are intended to image in narrow spectral wavebands. I attempted to raise other observers in the UK, but all were clouded out! However Bob O'Connell in Florida did manage to observe and I show some experiments on his image in Figure 2. One of the criticisms leveled (unfairly) at the Greenacre and Barr observations was that the observation may have suffered from atmospheric spectral dispersion or chromatic aberration in the Flagstaff refractor, and this is what the observers had seen! According to Bob, who has managed to obtain archive material from Lowell observatory, and has interviewed many of the people involved, or their families (alas Greenacre passed away), the Flagstaff team were well aware of false color issues, and did a number of checks on other craters – further more they saw the color originally through a Wratten 15 filter, which was a standard filter used at the time to minimize chromatic aberration. Bob would probably be the first to say that the Cameron catalog description above, does not do the Flagstaff observers justice, but I think we should wait until he has written up his article rather than for me to give away too many of his archival research secrets. Anyway – just supposing spectral dispersion in our atmosphere, or radial chromatic aberration in the telescope optics were to blame, where would colors appear? First order spectra dispersion has been added to Bob's image (taken on 2011 Feb 15 at 01:41UT and is shown in figure 2 at potential 45° offset angles. Perhaps the bottom left image is the closest to the description given from 1963 – however prominent color is seen elsewhere and this simply was not reported. Back in the Sep 2005 LSC I simulated a spectral dispersion image for the 1963 Oct 30 LTP and came to a similar conclusion. Experiments also have taken place to simulate radial chromatic aberration, and again no luck there either as the colors get stronger the further away from the centre, and again this was not seen.

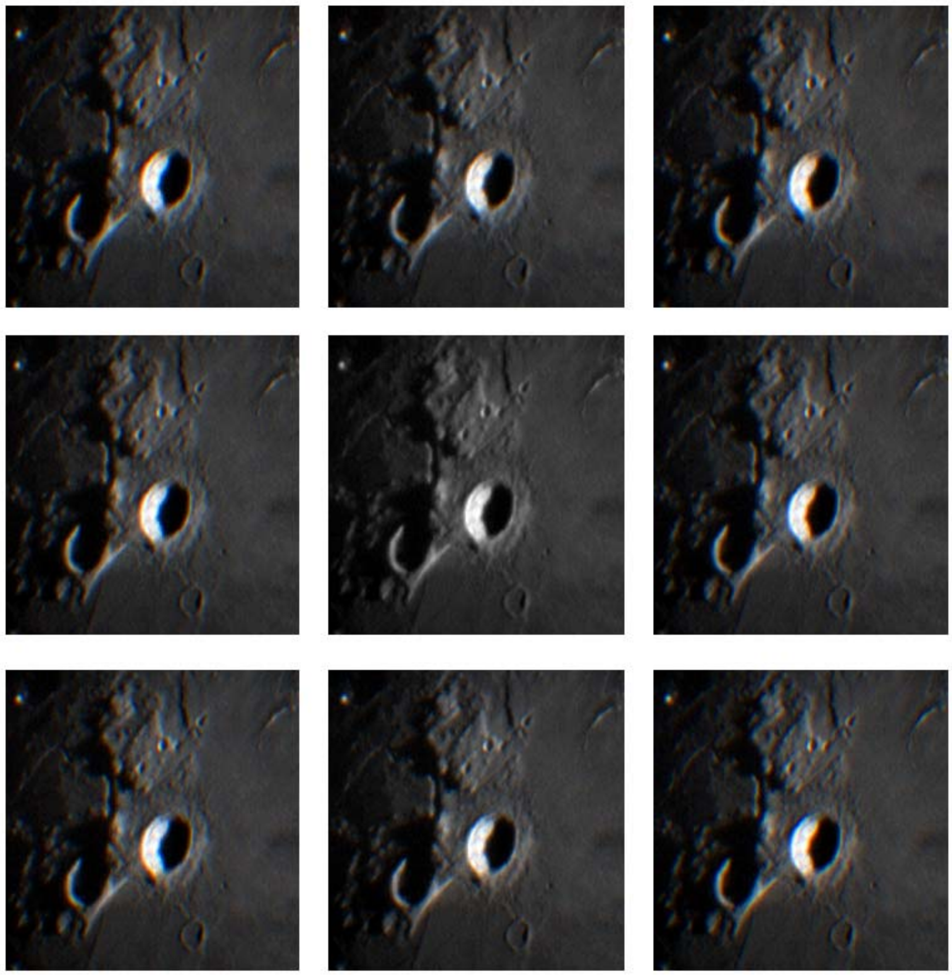
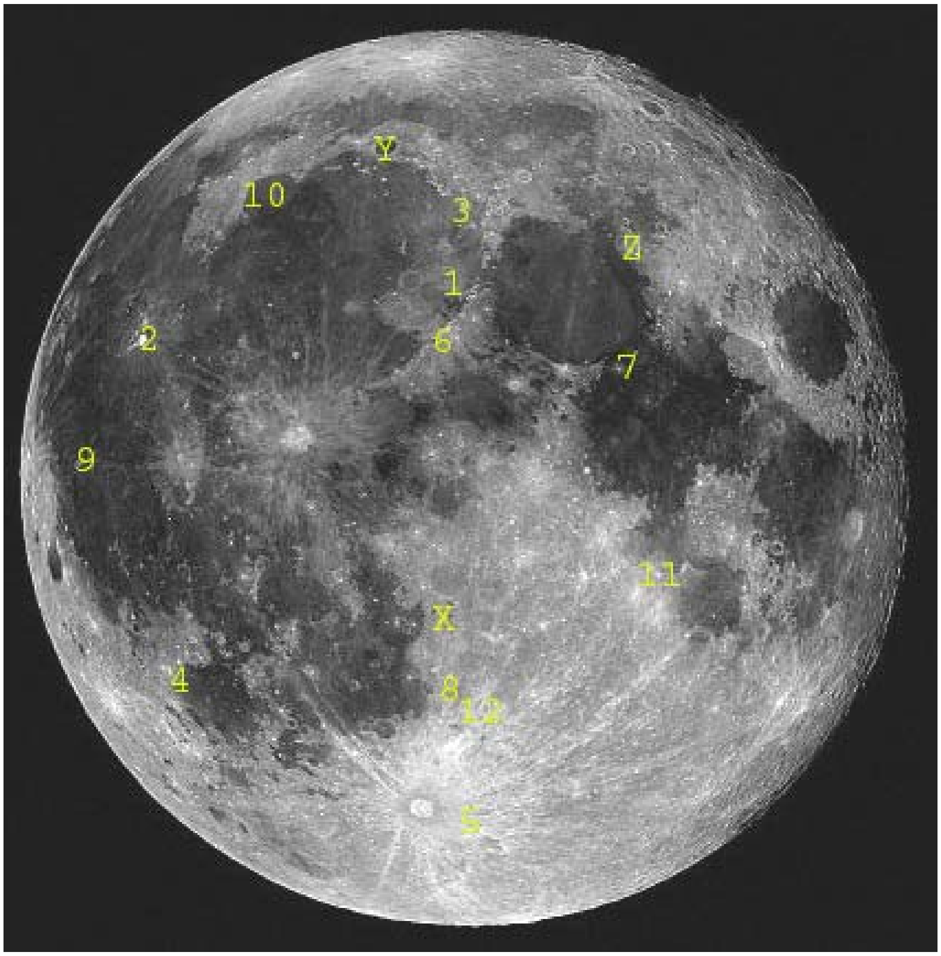


Figure 2. *Centre image is a monochrome image taken by Bob O'Connell to match the same illumination as the 1963 Nov 28 Greenacre and Barr LTP. The surrounding eight images have had artificial spectral dispersion added to simulate what might have been seen through the telescope if this had been the cause of the LTP. North is at the top.*

Suggested Features to observe in April: For repeat illumination (only) TLP predictions for the coming month, these can be found on the following web site: http://users.aber.ac.uk/atc/tlp/tlp.htm .For members who do not have access to the internet, please drop me a line and I will post predictions to you. If you would like to join the TLP telephone alert team, please let me know your phone No. and how late you wish to be contacted. If in the unlikely event you see a TLP, 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 TLP alerts can be accessed on http://twitter.com/lunarnaut.

Dr Anthony Cook, Institute of Mathematical and Physical Sciences, University of Wales Aberystwyth, Penglais, Aberystwyth, Ceredigion, SY23 3BZ, WALES, UNITED KINGDOM. Email: atc @ aber.ac.uk.

KEY TO IMAGES IN THIS ISSUE



1. **Archimedes**
2. **Aristarchus**
3. **Cassini**
4. **Liebig Scarp**
5. **Maginus**
6. **Montes Apenninus**
7. **Plinius**
8. **Regiomontanus**
9. **Reiner Gamma**
10. **Sinus Iridum**
11. **Theophilus**
12. **Walter**

FOCUS ON targets

X = Alphonsus (May)
Y = Plato (July)
Z = Posidonius (September)