THE LUNAR OBSERVER

ASSOCIATION OF LUNAR & PLANETARY OBSERVERS — ALPO — Founded in 1947

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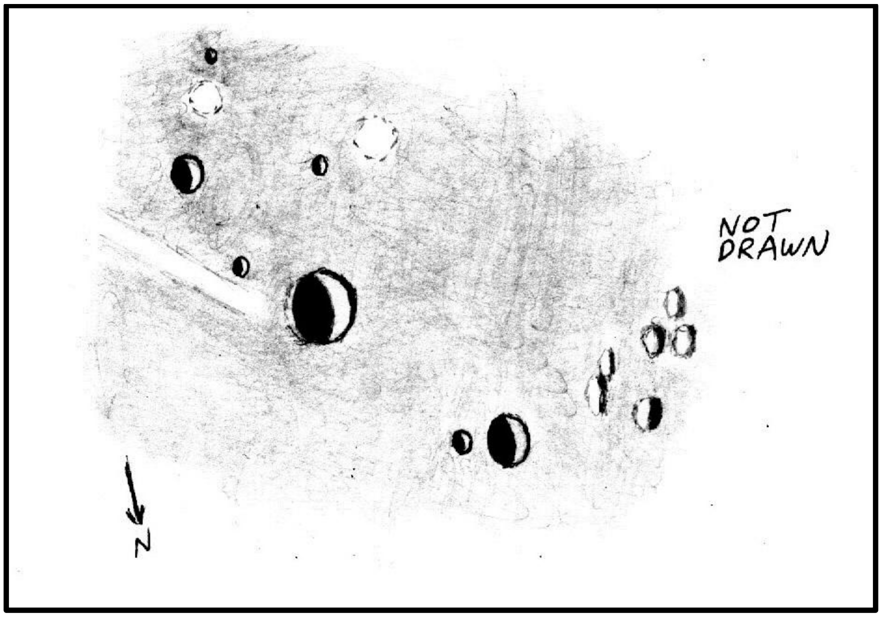
17 Autumn Lane, Sewell, NJ 08080
RECENT BACK ISSUES: http://moon.scopesandscapes.com/tlo_back.html

FEATURE OF THE MONTH – SEPTEMBER 2015

MARIUS A,C,D



Sketch and text by Robert H. Hays, Jr. - Worth, Illinois, USA
May 1, 2015 02:40-03:04 UT, 15 cm refl, 170x, seeing 8/10

I sketched these craters and vicinity on the night of April 30/ May 1, 2015 before the moon hid ZC 1795. This area is northeast of Marius itself in Oceanus Procellarum. Marius A is the largest crater in this sketch, and is the central feature. Marius D is the largest of a group of four craters south and southeast of Marius A. Marius F is between A and D, and Marius DB makes nearly a right angle west of D and south of A. Marius DA is south of D and is the smallest crater shown here. A vaguely defined bright patch is just north of Marius DA, and a similar patch is west of Marius DB. A short, crisp ray segment, possibly from Kepler, is east of Marius A and just north of F. Marius C is the larger of two craters northwest of Marius A; its companion is Marius CB. All of the craters on this sketch are neat, crisp features, differing only in size. I drew six hills west of Marius C. The one farthest to the northwest had the darkest shadowing, and is probably Marius μ, according to the Lunar Quadrant map. This group of peaks is the northeast edge of a complex of hills, mostly west of Marius, that must number 100 or more. Sketching them would be a herculean task. By contrast, the area south of Marius C and west of Marius A appears very smooth.

LUNAR CALENDAR

SEPTEMBER-OCTOBER 2015 (UT)

2015		UT	
Sep	05	05:09	Moon-Aldebaran: 0.6° S
	05	09:54	Last Quarter
	06	17:06	Moon North Dec.: 18.2° N
	10	05:53	Moon-Venus: 2.9° S
	13	06:41	New Moon
	13	06:55	Partial Solar Eclipse
	14	04:38	Moon Ascending Node
	14	11:28	Moon Apogee: 406500 km
	19	02:54	Moon-Saturn: 3.1° S
	21	08:59	First Quarter
	21	12:02	Moon South Dec.: 18.1° S
	27	21:04	Moon Descending Node
	28	01:46	Moon Perigee: 356900 km
	28	02:48	Total Lunar Eclipse
	28	02:50	Full Moon
Oct	02	12:51	Moon-Aldebaran: 0.5° S
	03	23:55	Moon North Dec.: 18.1° N
	04	21:06	Last Quarter
	08	20:32	Moon-Venus: 0.8° N
	09	16:51	Moon-Mars: 3.8° N
	09	23:30	Moon-Jupiter: 3° N
	11	10:54	Moon Ascending Node
	11	13:17	Moon Apogee: 406400 km
	13	00:06	New Moon
	16	13:20	Moon-Saturn: 3.2° S
	18	18:31	Moon South Dec.: 18.2° S
	20	20:31	First Quarter
	25	07:36	Moon Descending Node
	26	12:59	Moon Perigee: 358500 km
	27	12:05	Full Moon
	29	22:45	Moon-Aldebaran: 0.6° S
	31	09:02	Moon North Dec.: 18.2° N

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.

INTERNATIONAL OBSERVE THE MOON NIGHT SEPTEMBER 19, 2015

International Observe the Moon Night (InOMN) is an annual worldwide celebration of lunar science and exploration. One day each year, everyone on Earth is invited to unite and observe and learn about the Moon and its connection to planetary science, and share personal and community connections we all have to the Moon. InOMN 2015 is just over a month away: September 19, 2015.

Check out the InOMN website for a map of registered events, to register a new event, and for InOMN resources, including a guide that walks you through planning an InOMN event of any size, advertising materials, suggested activities, and InOMN Moon map, evaluation materials, and more.

http://observethemoonnight.org

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: Deslandres

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 **November 2015** edition will be the crater **Deslandres** and surroundings**.** 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 Deslandres article is October 20, 2015

FUTURE FOCUS ON ARTICLES:

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

Subject	**TLO Issue**	**Deadline**

AT THE BOTTOM OF THE MOON

Richard Hill

If you can ignore the grand sight of Clavius at the top of this image (fig. 1), there is another remarkable and well defined crater in the center of this image, the 117 km diameter Moretus. It is fairly recently formed on a lunar timescale, only 1-3 billion years old. Just above Moretus is the 97 km ancient crater Gruemberger with a small more recent 20 km crater on its floor. Adjacent to the right of this is the 51 km Cysatus. Immediately adjacent to the southern wall of Moretus itself is another well defined, also 51 km crater, Short.

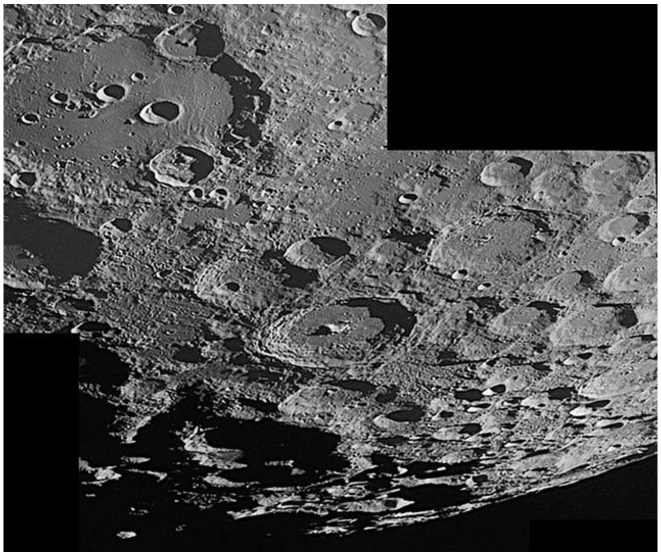


***Figure 1*. Moretus** – *Richard Hill – Tucson, Arizona, USA July 26, 2015 02:37 UT. Seeing 9/10. TEC 8" f/20 Mak-Cass, SKYRIS 445M, 656.3 nm filter.*

Below and to the left of Moretus (southwest), past Short, is a large group of craters mostly in shadow. The largest one closest to Moretus is the famous 82 km crater Newton. Two more craters overlap it to the south. There is so much that is interesting and historic here but not with all this shadow.

Below Clavius is the well defined Blancanus, half in shadow and partially cut off by the edge of the image. Also below and to the right of Moretus is similarly sized but much more shallow crater Curtius.

At the bottom of this image is a large dark cirque where the terminator meets the limb. This is 100km crater Cabeus where the upper stage LCROSS and shortly there after the LCROSS craft itself impacted the moon at the end of their mission. To the right of that is another pool of shadow up against the limb is the crater Malapert very near the point where Lunar Prospector was crashed into the wall of a crater to see if we could detect water in the splash. I was on the 61-inch Kuiper telescope observing with an Echelle spectrograph and, sadly, we detected none.

FOCUS ON: DIONYSIUS

By Wayne Bailey

Coordinator: Lunar Topographical Studies

Dionysius is a moderate sized (18 km diameter) crater at the edge of Mare Tranquilitatis (fig. 1), west of the Ranger 8 and Apollo 11 landing sites. It is named for St. Dionysius the Areopagite, who Riccioli classed as an astronomer because he supposedly saw the darkness of Jesus crucifixation while in Syria, realized that it wasn't a solar eclipse, and was later converted to Chrisianity by Paul at the Areopagus in Athens.

***FIGURE 1*. DIONYSIUS** *- Maurice Collins, Palmerston North, New Zealand. August 26, 2015 07:26-07:31UT. FLT-110.*

When the terminator is near, Dionysius is easily located, but unremarkable (fig. 2). Near full moon Dionysius is very bright, but otherwise appears, at first glance, to be just another small, ray crater (fig. 3). Attention easily switches to the Ariadaeus Rille to the north, or to locating the three small craters named for the Apollo 11 astronauts to the east on the Mare. On closer examination though, something is different. Where other ray craters are surrounded by radial streaks of bright material, possibly overlaying a darker inner halo (such as Tycho), Dionysius is surrounded by a bright halo, and its rays are actually dark material overlaying the bright.background. This isn't obvious to the casual observer, since a radial pattern is present, the contrast is fairly low, and the expectation is to see bright rays. But carefully observing the details of the light and dark patterns shows that the dark material, not the light, forms the typical starburst pattern. Increasing the contrast of an image makes this easier to see (fig. 4). For comparison, Godin to the west of Dionysius, is a typical bright ray crater. This is the only dark-ray crater on the near side that I know of. I don't know whether there are any on the far side.

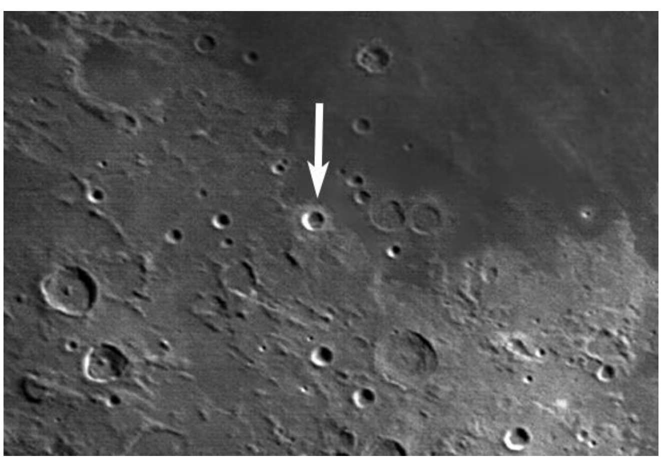


***FIGURE 2*. LOW SUN DIONYSIUS - Jay Albert, Lake Worth, Florida USA. June 2.52, 2015 03:10 UT. Seeing 7-8/10. Nexstar 6" SCt, Neximage 5 camera.**

Although a dark-ray crater may seem exotic, the explanation is really quite simple. Dionysius is located on the west shore of Mare Tranquilitatis. Here, the bright shore is actually a thin veneer covering the relatively thin mare basalt. The impact that formed the crater penetrated the overlying veneer, excavating mare basalt which formed the rays. Since basalt is darker than the highland material, the resulting rays are dark. Moreover, the impact penetrated the underlying mare basalt to excavate lighter colored material from the mare basin. This material formed the inner bright halo.

Dionysius is simply an unusually large example of a dark halo crater (DHC). DHC are not rare, but are usually small and inconspicuous. They formed in two fundamentally different ways. One type is the result of an impact that penetrates a thin overlying layer to excavate underlying basalt. These have been used to map cryptomaria, buried mare material. The second type is volcanoes that formed deposits of dark material around the vent. The dark spots in Alphonsus are a well known example of this type of DHC.

The dark rays of Dionysius apparently escaped notice until 1965 (Smalley, 1965). How many more subtle features have gone unnoticed?

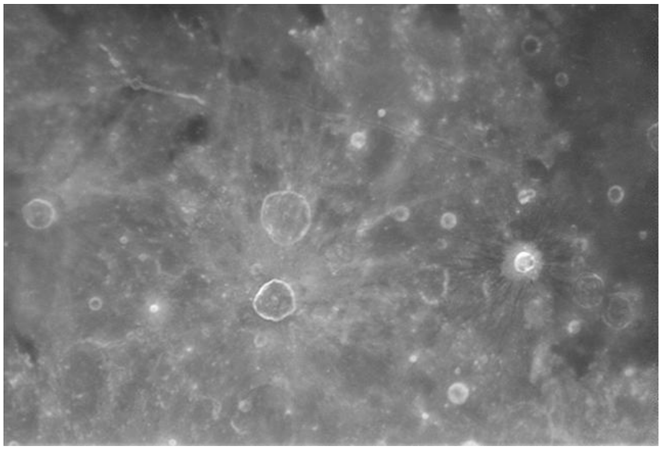


***FIGURE 3*. HIGH SUN DIONYSIUS.** *Howard Eskildsen, Ocala, Florida USA. January 26, 2013 02:06 UT. Seeing 4/10, Transparency 5/6. 6" f/8 refractor, 2X barlow, DMK41AU02.AS, IR & V-block filters*

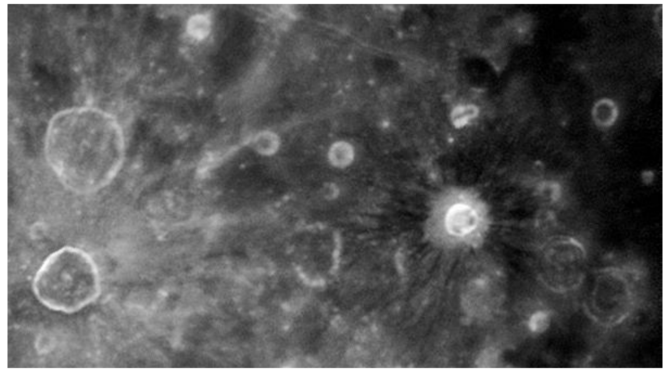


***FIGURE 4*. Cropped and contrast increased from fig. 3.**

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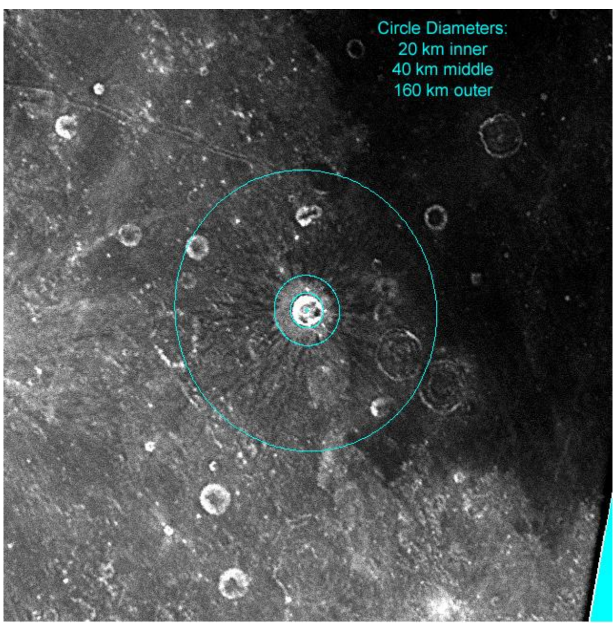
Wood, Charles & Maurice Collins. 2012. 21st Century Atlas of the Moon. Lunar Publishing, UIAI Inc., Wheeling.

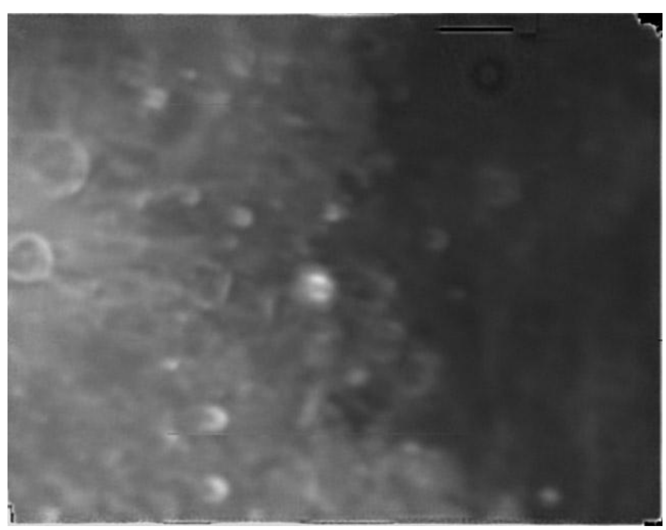
ADDITIONAL DIONYSIUS IMAGES

Francisco AlsinaCardinali, Oro Verde, Argentina. July 5, 2015 07:20 UT. 250mm LX-200 SCT. EOS Digital Rebel XS.

Howard Eskildsen, Ocala, Florida USA. October 26, 2009 00:09 UT. Seeing 6/10, Transparency 5/6. 6” f/8 refractor, 2X barlow, DMK41AU02.AS, W-15 yellow & IR block filters.



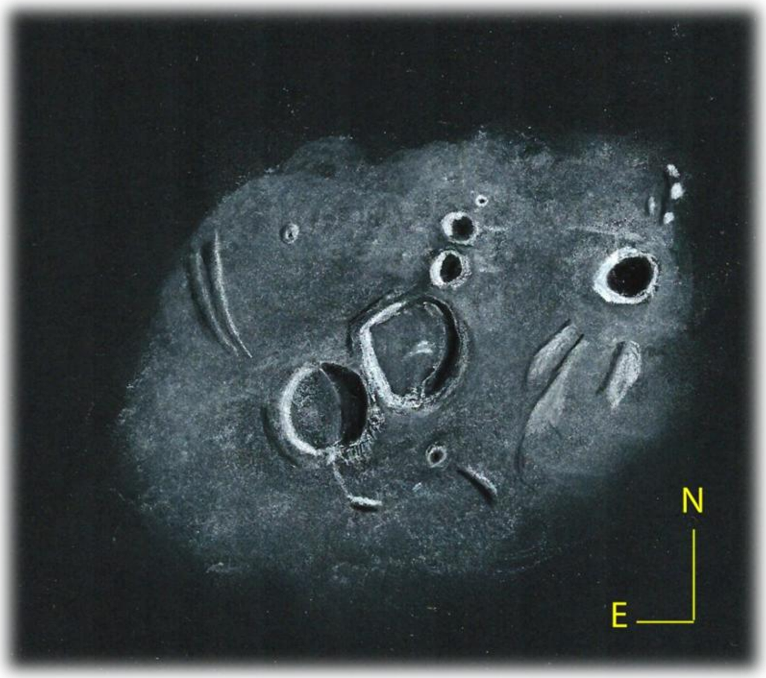
Howard Eskildsen, Ocala, Florida USA. January 28, 2010 01:02 UT. Seeing 8/10, Transparency 5/6. 6” f/8 refractor, 2X barlow, DMK41AU02.AS, no filter.



Thierry Speth –Metz-Lorraine, France. July 2,, 2015 20:18 UT. 200 mm, f/5, Newtonian. Afocal.

Lunar Craters Sabine, Ritter, and Dionysius

David Teske



I made this sketch on the early morning of 05 August 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 0843 and 1014 UT. Seeing was 7/10 under mostly clear skies. The moon was waning gibbous phase. Medium was white and black pastel on black cardstock. The observation was made by David Teske in Starkville, Mississippi.

Sabine was the southernmost crater depicted. It has a diameter of 30 km. It's floor was flat with a brightening on the east center of the floor, perhaps hummocks or a small crater. Shadow covers the western third of the crater's floor. Sabine's eastern wall is was fairly bright in evening sun. Extending from the southern wall of Sabine is a ridge that turns southwest. This southwest extension seems to have the greatest elevation, judging from the shadow. Just about touch Sabine to its northwest is the crater Ritter. Ritter's southeast wall seems more flattened than circular towards Sabine. Ritter has a diameter of 31 km, just slightly larger than Sabine. The floor of Ritter is relatively flat with some hummock areas near its center. North of Ritter and looking fresher is C with a diameter of 13 km. Just north of this is D with a diameter of 14 km. North oh this is B with a diameter of 6.5 km. South of Ritter is Schmidt, a fresh crater 11 km in diameter. Southwest of Schmidt is a small hill casting a shadow. On the western edge of the sketch is Dionysius, with a diameter of 17 km. Dionysius' eastern well is very bright with a slightly pointed shape. Most of its floor was in shadow. North of Dionysius was a series of three small hills with a small hill to the east of these. To the southeast of Dionysius are three large hills. The hill just south of Dionysius was had the most elevation based on shadows. North of Sabine is Arago B, with a diameter of 7 km. Northeast of Sabine is mare ridges associated with Lamont.

DIONYSIUS

Eduardo Adarve, Alberto Martos, Carlos de Luis.
The Lunar Group of Madrid Amateur Astronomy Society (AAM).

Dionysius is a very special crater located in the western edge of Mare Tranquillitatis. It appeared as a Feature of the Moon on The Lunar Observer issue of June 2004, just at North West of Ritter. The coordinates of Dionysius are Lat 2,77º N and Long 17,29º E and its diameter is 17,25 km (13 miles) (1). This crater is a Copernican age crater (2). Dionysius was named by St. Dionysus, died in 120 AD, because according to Riccioli (3), he observed a solar eclipse when Christ was crucified.

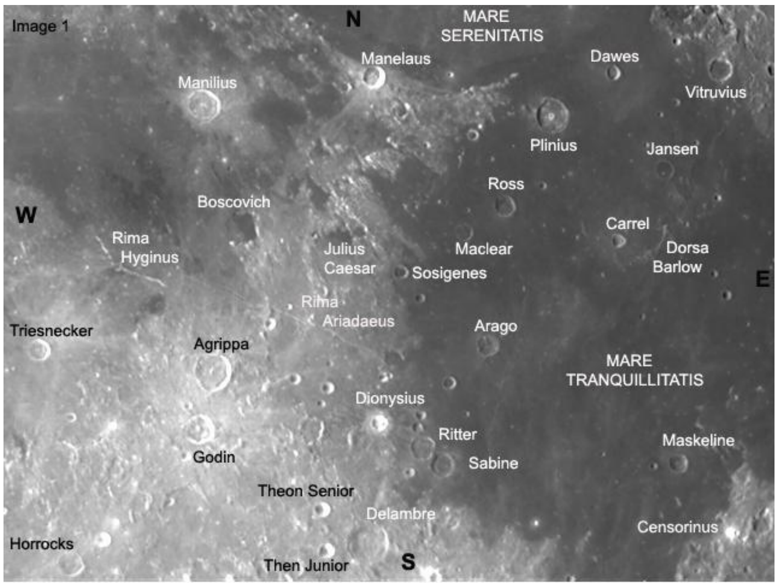


***Figure 1** obtained by Alberto Martos at full Moon. We can observe the general area of Mare Tranquillitatis where crater Dionysius is located (North is upwards).*

Dionysius is unique on Near Side of the Moon as it is surrounded by a bright halo close to the outer rim, and radial dark rays beyond the bright halo (4). Wikipedia indicates that the radius of this ray system is over 130 km (5), but more in detail, the radius of the continuous bright halo is about 40 km, most dark rays appear to reach less than 80 Km from the crater center, but some rays are longer spreading out to 160 km distance (6). The presence of this pattern of dark stripes on bright halo "was apparently discovered by U.S. Air Force scientist Vern Smalley in 1965" (7), and it was photographed by UV-VIS cameras of Clementine lunar probe in 1994 (8).

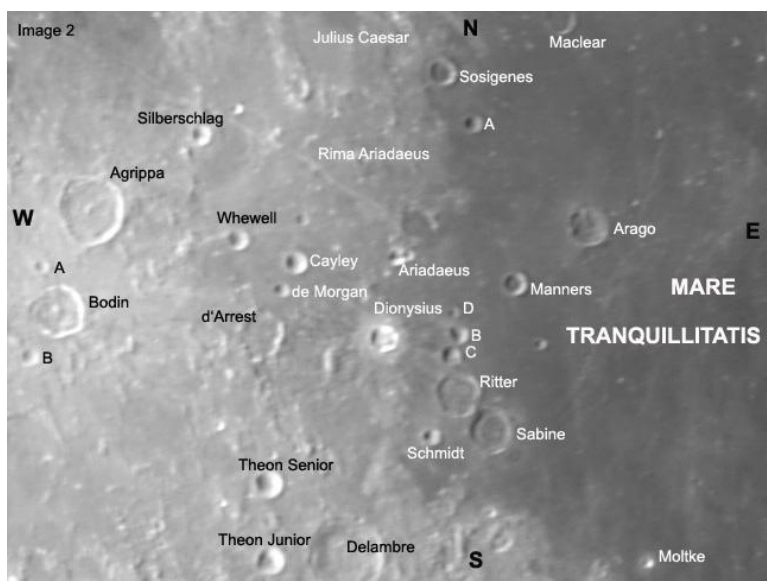


***Figure 2** obtained by Alberto Martos at full Moon. It has a bigger detail, we found Dionysius at the center of the image and it is well noticed its bright halo and dark rays (North is upwards).*

Initially the proposed origin of these dark rays included impact melt deposits and dark primary ejecta, but detailed studies carried out with Clementine multispectral images and other spacecraft photography, seem point toward that the dark rays are composed of mare debris contaminated with minor amounts of highland material, not glassy impact melts. The bright halo and bright rays consist of anorthositic bed rock with small amounts of iron and titanium dioxide (FeO, TiO_2) brought to surface by the impact. In addition, OMAT (Optical Maturity) values indicate that bright ray surfaces are not fully mature." The mafic debris ejected by Dionysius were derived from a dark, iron-rich unit exposed high on the inner wall of the crater. This layer probably represents a mare deposit that was present at the surface of the preimpact target site" (9)(10).

Visual observation 1 performed by Eduardo Adarve on July 22nd 2015. Observation at magnification 266X with SCT 8" allowed to observe the flat floor of Ritter and Sabine but not the floor of Dionysius close to them at Northwest, which indicates that Dionysius has a deeper floor than these two craters.

A conspicuous bright halo around Dionysius rim was very visible, and also it was visible a blurred dark area around the bright halo. It was not possible to identify individual dark rays in the dark area, which seemed to be homogeneous all around the bright halo.

The atmosphere stability allowed to increase the magnification to 333X, then it was possible to make out a few individual dark rays between Dionysius and Ritter during some moments of careful observation.

Visual observation 2 performed by Eduardo Adarve on July 26th 2015. Night was very calm with no wind nor atmosphere turbulence, which allowed to achieve a high magnification (257X and 360X) with a refractor 120ED. Because the high Sun illumination it was noticed a very clear image, with high contrast, showing many details of Dionysius.

Image at 360X showed that the bright halo was not symmetrical around Dionysius, it appeared wider toward Northwest than Southeast. Beyond it, the dark area (dark rays) seems to have double diameter that the bright halo, except toward Northwest and Southeast where rays are even longer. In addition, it seemed that a few rays extended more to the Southeast, crossing Ritter from end to end.

In the inner Southeast wall of Dionysius a dark area was present, close to it, in the South wall, it was observed a small structure parallel to the rim of crater, like a terrace caused by a fall down of this internal wall.

Ephemeris

	Date/Time	Lunation	Colong.	Angular size	Libration Lat/Long	Equipment
Fig. 1	Jan. 8, 2015 01:00 UT	16.98 days	120.5º	29,94’	5º 51’/1º 18’	**Newtonian 8" f 7.2 Camera QHY5**
Fig. 2	Aug. 17, 2011 01:53 UT	17.30 days	126.0º	29.93’	-5º 55’/0º 48’	**Newtonian 8" f 7.2 Camera QHY5 + Barlow 2X**
Vis. 1	July 22, 2015 21:15 UT	6.83 days	349.1º	29.69’	-0º 34’/-3º 19’	**SCT 8" f 10, EP 15, 7.5 & 6 mm. Seeing A II**
Vis. 2	July 26, 2015 21:30 UT	10.84 days	38.1º	30.98'	-4º 58’/-6º 53'’	**Refractor 120mm ED, f 7.5, EP 3.5 & 2.5 mm. Seeing A I**

References.

(1) John Moore. Craters of the Near Side Moon *(John Moore Ed., 2014, page 189)*

(2) Don E. Wilhelms. The Geologic History of the Moon (*U.S. Geological Survey Professional Paper 1348, United States Government Printing Office, Washington, 1987. Chapter 13, Copernican system, pages 265-273*)

(3) Antonín Rükl. Atlas of the Moon (*Gary Seronik Ed., Sky Publishing Corp. / Cambridge, Massachusetts, 2004, page 96*)

(4) Charles A. Wood and Maurice J. S. Collins. 21st Atlas of the Moon (*West Virginia University Press, 2013, page 36*)

(5) Wikipedia, URL *https://en.wikipedia.org/wiki/Dionysius_(crater)*

(6) Howard Eskildsen. Dionysius (*Selenology, Fall 2010, pages 15-18*)

(7) Charles A. Wood. The Modern Moon. A personal view (*Sky Publishing Corp., 2003, page 86*)

(8) Alan Chu, Wolfgang Paech and Mario Weigand. The Cambridge Photographic Moon Atlas (*Cambridge University Press 2012, Chapter 18 Statio Tranquillitatis*)

(9) Giguere, T.A, et al. Remote Sensing Studies of the Dionysius Region of the Moon (*Lunar and Planetary Science XXXVI, 2005, Abstract #1092*).

(10) Giguere, T.A, et al. Remote Sensing Studies of the Dionysius Region of the Moon (*Journal of Geophysical Research, Vol. 111, E06009, 2006*).

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

EDUARDO ADARVE & ALBERTO MARTOS – MADRID, SPAIN Digital images of Dionysius (2) & Visual descriptions(2) of Dionysius..

MAURICE COLLINS - PALMERSTON NORTH, NEW ZEALAND. Digital images of 2.6, 11, 12, 13 day moon, Aristarchus(2), Bailly, Copernicus, Gassendi, Grimaldi, Mare Crisium, Mare Humorum(2), NW moon, Petavius, Schickard, Schiller-Zucchius Basin, Sinus Iridum & SW moon.

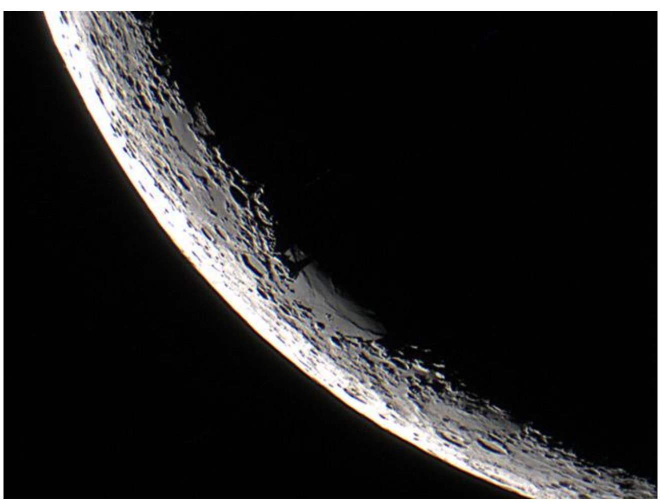
HOWARD ESKILDSEN - OCALA, FLORIDA, USA. Digital images of Agrippa-Dionysius, Aristarchus, Dionysius(3), Milichius & Mare Insularum.

RICHARD HILL – TUCSON, ARIZONA, USA. Digital images of Gassendi, Montes Alpes, Moretus & Schiller.

MICHAEL SWEETMAN – TUCSON, ARIZONA USA. Digital images of Deslandres, Herschel-Regiomontanus & Mare Nectaris.

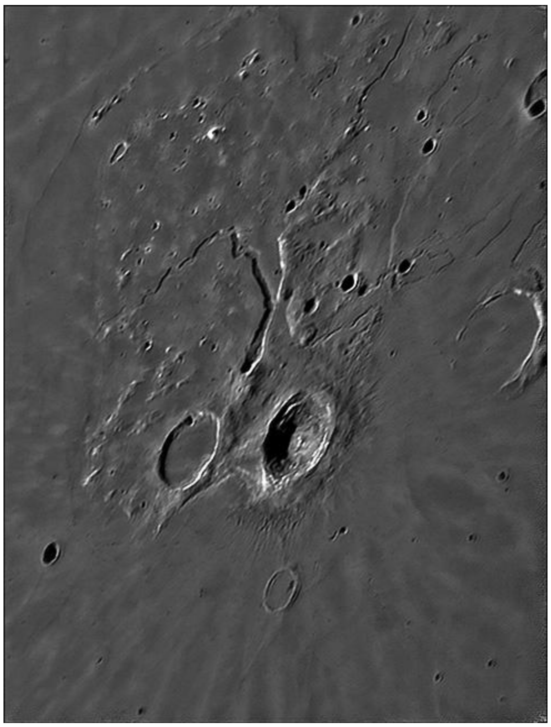
DAVID TESKE-STARKVILLE, MISSISSIPPI, USA. Drawing of Dionysius.

RECENT TOPOGRAPHICAL OBSERVATIONS



MARE CRISIUM - Maurice Collins, Palmerston North, New Zealand. August 17, 2015 06:19 UT. Seeing A-II. ETX-90.

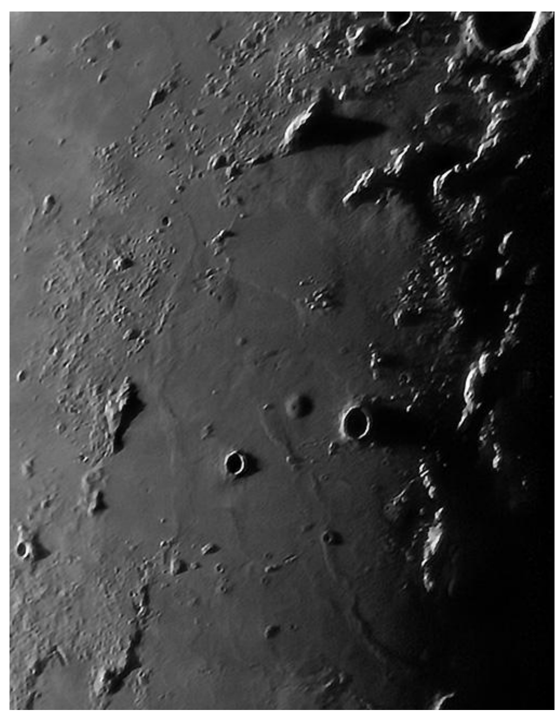
PETAVIUS - Maurice Collins, Palmerston North, New Zealand. August 17, 2015 06:19 UT. Seeing A-II. ETX-90.

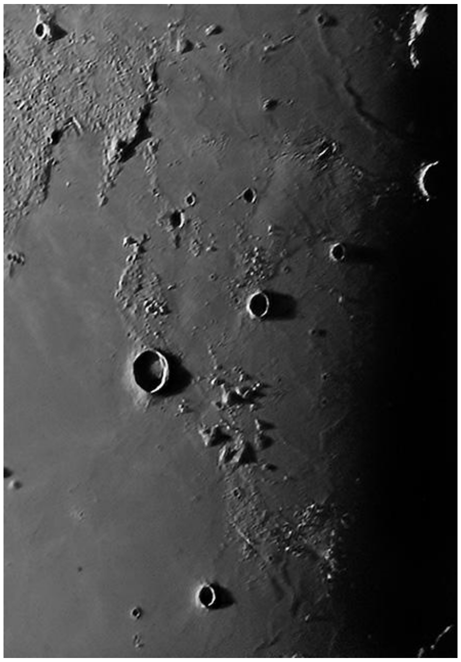


ARISTARCHUS- Howard Eskildsen, Ocala, Florida, USA. July 11, 2015 10:23 UT. Seeing 8/10, Transparency 5/6. Mewlon 250, 1.5 barlow, DMK 41AU02.AS.

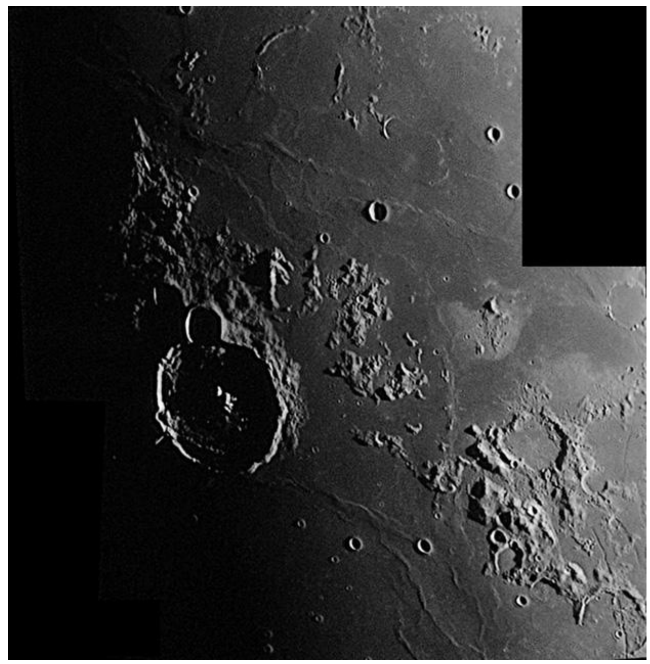
MILICHIUS- Howard Eskildsen, Ocala, Florida, USA. July 11, 2015 10:11 UT. Seeing 8/10, Transparency 5/6. Mewlon 250, 1.5 barlow, DMK 41AU02.AS.

.The craters Milichius and Milichius A show dark interiors and angle across the image just below the center of the image. Near the center of the image Milichius Dome rises with an obvious central pit, the remnants of a caldera in an ancient shield volcano on the moon. Two other lower domes with pits are visible upward and to the left of Milichius Dome. Other volcanic domes are visible in the upper portion of the image. A few have visible caldera pits, while others do not. These represent the last gasps of volcanic activity in this curious region on the western central moon.





MARE INSULARUM- Howard Eskildsen, Ocala, Florida, USA. July 11, 2015 10:15 UT. Seeing 8/10, Transparency 5/6. Mewlon 250, 1.5 barlow, DMK 41AU02.AS.

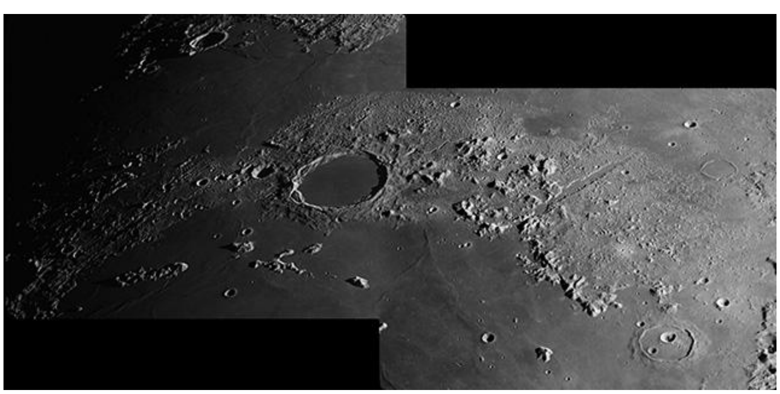


GASSENDI – Richard Hill – Tucson, Arizona, USA July 27, 2015 02:56 UT. Seeing 8/10. TEC 8" f/20 Mak-Cass, SKYRIS 445M, 656.3 nm filter.

One of those "Oh man!" moments the other night when I looked on the moon a couple days after 1st Quarter and there was this large ring on the terminator. It was an old friend, Gassendi, but it never fails to get a rise out of me when it's 114km diameter walls are just coming into the light. The seeing was pretty good so it became and instant target.

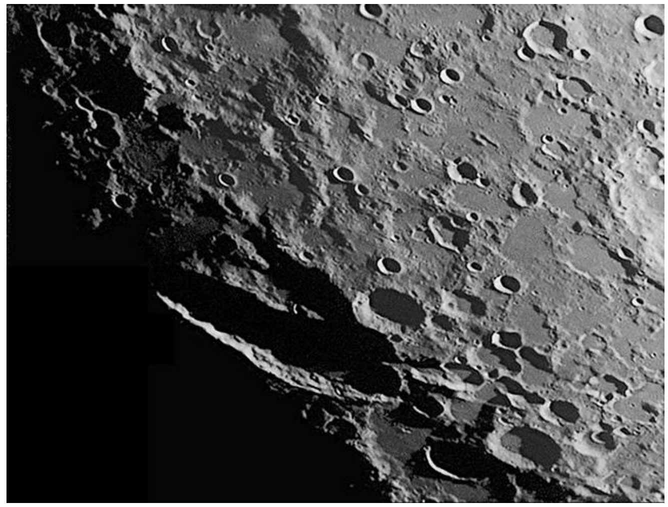
The first thing that caught my eye, and has before, are the two notches in Gassendi's wall at about the 11 o'clock position. On LROC Quick Map they appear to be to impacts through the mountains giving the appearance at this lighting of being parallel rimae. Below Gassendi is Mare Humorum with its wonderful dorsa, peppered with the Gassendi satellite craters through the letter "Y". Notice in the lower right corner the Rimae Hippalus and above them the ruined 51km crater, Agatharchides. Rima Agatharchides can be seen crossing the ghost crater Agatharchides P just to the right of its namesake crater.

Above and to the right of Gassendi, sitting in the shallows of Oceanus Procellarum is the relatively fresh 15km crater Herigonius just south or below the 330km long Dorsa Ewing. Between Agatharchides (I couldn't stand not using that name again) and Herigonius is and island of light colored material with a couple mountains, some craterlets and a rima in it. The whole island, its mountains, craterlets and rima are unnamed! Also unnamed is the large broken ring remnant of a ghost crater at the top of the image.



MONTES ALPES – Richard Hill – Tucson, Arizona, USA July 26, 2015 02:43 UT. Seeing 8/10. TEC 8" f/20 Mak-Cass, SKYRIS 445M, 656.3 nm filter.

<u>SCHILLER</u> – Richard Hill – Tucson, Arizona, USA July 27, 2015 02:47 UT. Seeing 8/10. TEC 8" f/20 Mak-Cass, SKYRIS 445M, 656.3 nm filter.

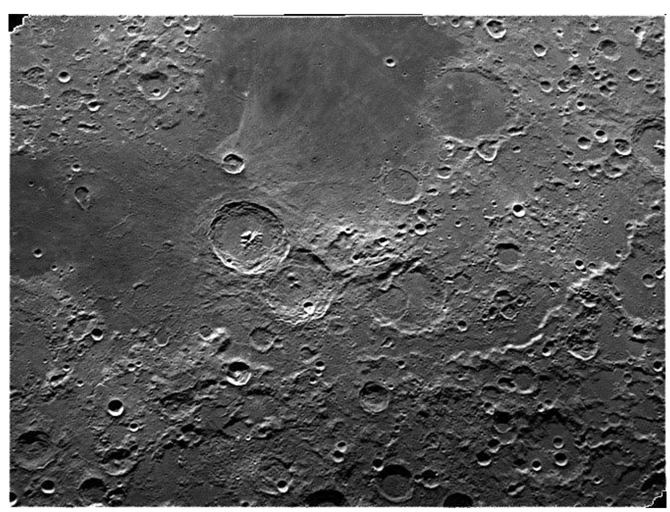


This is an unusual view of this big unusual, footprint shaped crater, but it was quite eye catching on the terminator. The big one I'm talking about is Schiller, just below center in this image, usually known for its broad flat floor, in shadow here. Note the craggy slumped walls of this 179x71 km crater, catching the first rays of morning sunlight. It is thought to be the overlap of two craters formed about the same time from low angle impacts, 3.8-4 billion years ago. To the right (east) of Schiller is the 49km Bayer also formed about the same time. The long axis of the bigger crater points down to another well seen crater, the 51km Rost. Above Schiller, partly cut off by the edge of this image is the old ruined crater Mee. This 136km crater is about half a billion years older than the previously mentioned craters. Let's put that in perspective. The very first shelly creatures (brachiopods, trilobites, snails etc.) are in the fossil record just a little over the time period between these features! "Half a billion years" rolls off the tongue quickly and easily but encompasses all the time for larger, hard bodied creatures on earth (megafauna) and 100,000 more time than all our written histories!!

Before leaving this image look in the upper right corner (northeast) at the interesting keyhole shaped crater, Lagalla F some 29km in diameter. This one is so distinctive that it should have a name of its own, don't you think?

HERSCHEL-REGIOMONTANUS. *Michael Sweetman, Tucson, Arizona, USA,November 22, 2012 06:30 UT. Seeing 5/10, transparency 3/6. 6" f/12 Mak. DMK21, Astronomik Pro IR742 filter.*

MARE NECTARIS. *Michael Sweetman, Tucson, Arizona, USA, January 19, 2013 04:41 UT. Seeing 3-4/10, transparency 3/6. 6" f/12 Mak. DMK21, Astronomik Pro IR742 filter.*



LUNAR GEOLOGICAL CHANGE DETECTION PROGRAM

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

Observations/Studies for July were received from: Jay Albert (Lake Worth, FL, USA - ALPO) observed: Alhazen Alpha, Aristarchus, Copernicus, Fracastorius, Gassendi, Promontorium Agarum, Tycho, and Vallis Schroteri. Maurice Collins (New Zealand, ALPO) imaged: Alphonsus, Archimedes, Aristotles, Clavius, Eratosthenes, Mare Serenitatis, Plato, and also made some whole/part Moon image mosaics. Marie Cook (Mundesley, UK – BAA) observed: Aristarchus. Rik Hill (Tucson, AZ, USA) imaged Atlas, Clavius, Gassendi, Moretus, Vallis Rheita, and imaged several other features. Thierry Speth (France, BAA) imaged: Aristarchus, Dionysius, and Menelaus.

News: I would like to thank Mike Thomas (Ebbw Vale, UK), who belongs to the Usk and also the Heads of the Valley Astronomical Societies, for sending me digital copies of his lunar observational archive from 1998 till the present day. Apart from using this to help calibrate LTP statistics by having a database of where people are looking on the Moon and not seeing LTP, these can also be used to tell us the normal appearance of surface features, when comparing against LTP reports under similar illumination. I will also make sure that Mike's observations get into the archives of the BAA and ALPO Lunar Sections for more general use. On another note, many thank ALPO member Darryl Davies (Albany, OR, USA) for querying the mention of the use of a 12" reflector by Walter Haas as described in the Cameron report for the 1937 Jul 22 Plato LTP. Darryl comments that Walter used a 6 inch scope from around 1937 to 1948, and thereafter began using a 12" telescope. – though this does not preclude him from having used other larger instruments, at other localities, when he visited other astronomers. Darryl is building up a database of where ALPO observers were located, and what instruments they were using over their membership years with ALPO. If you would like your own observational details added to his database, please get in contact with me and I will put you in touch with him.

LTP Reports: No LTP reports were received for July.

Spot the Difference: Jay Albert has been in contact to say that he has not found any changes in last month's Aristarchus temporal image pair from NASA's LROC camera. I will let this run on the web site a little while longer in case anybody else wants to try to see if they can spot any boulders that have rolled down hill, or can spot any new meteorite craters. Jay comments that it was a difficult image pair because the resolution of the second image was different to that of the first, and the stereo parallax effect made the scene jump around a lot when he was blinking between images. I will see if I can solve the parallax jumping issue if I can coax an old JPL stereo matcher program back into life on my laptop in the future.

In the previous Spot the Difference of Picard crater, we also found no new craters or boulder trails (despite three of us looking), but I did mention though that I thought I had found a crater where the ejecta blanket had changed in brightness slightly, and the location of this crater can be seen in Fig 1. Now the effect is very subtle, at around 3% in terms of brightness, and you might take some convincing, but here goes….

Fig. 2 (Left and Centre) shows the same crater, but taken almost two years apart. The two images have similar brightness and contrast, but if you look carefully at the central crater, it has an ejecta blanket that is slightly brighter in the Left (2012) image than in the Centre (2014) image. To be sure I have attempted a difference image (Fig 2 (Right)) and you can see the ejecta blanket appears to have changed brightness? Could this be due to changing Sun angle? The difference in Selenographic Colongitude between both images is just 1.2° or about 2.5 hours in terms of lunar phase and the Sun was just over 40° above the horizon – so there should be little shadow effect to explain what was detected. Three possibilities to explain this apparent anomaly are: (1) there has been some physical change on the lunar surface e.g. a fresh small crater (perhaps too small to see) but which has kicked up some dust over the existing ejecta blanket. Or (b) there is some specular and/or refractive material e.g. glass beads present in some small percentage of the ejecta blanket, and this is just making a fraction of the scattered light from the lunar surface more directional than other nearby regions? Or (c)

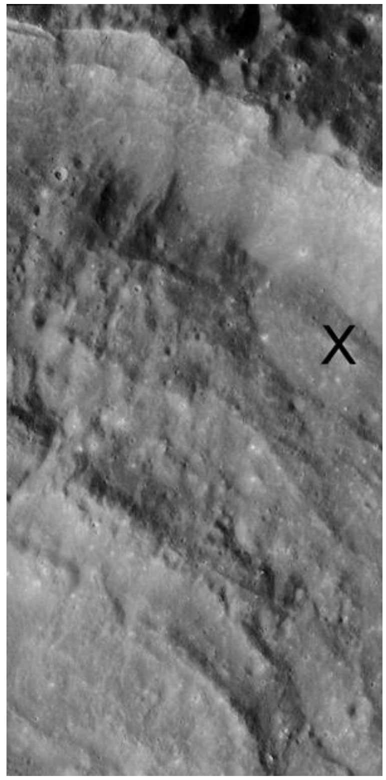


Figure 1. *"X" marks the spot of a crater that may have changed in brightness in this subsection of NASA LROC image of a 50m diameter (54.8870°W, 14.8351°N), located on the NW inner rim of Picard. For more information, see the full resolution version of this crater in Fig. 2.*

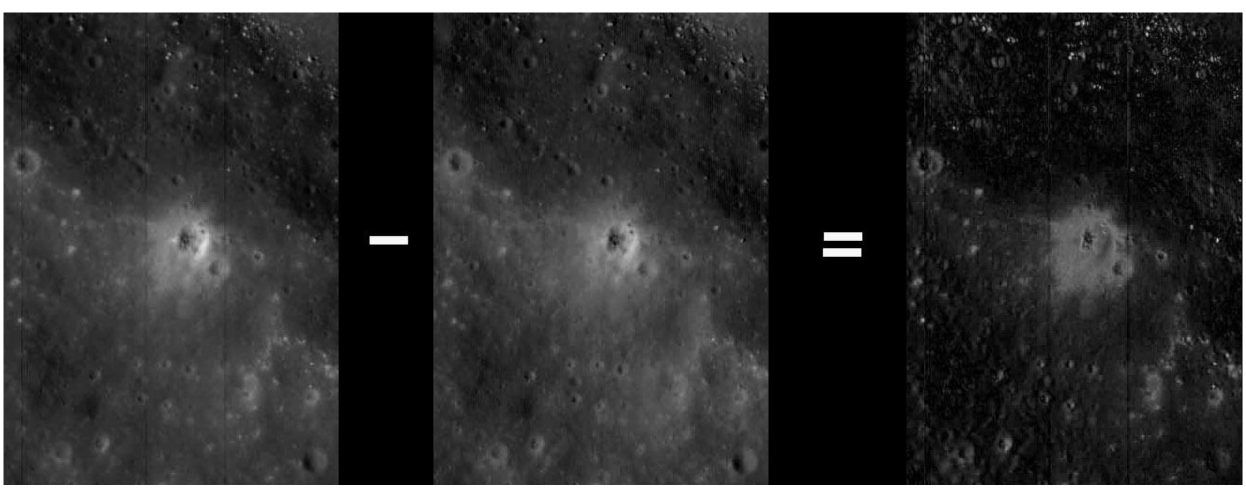


Figure 2. (Left) *Sub-section of NASA LROC image: M1098494476LE taken on 2012 Aug 01 UT 20:07 – $Alt_{\odot}$ = 41.0°, $Az_{\odot}$ = 254.9°.* ***(Centre)*** *Sub-section of NASA LROC image: M1159742485RE taken on 2014 Jul 11 UT 18:27 – $Alt_{\odot}$ = 39.9°, $Az_{\odot}$ = 255.4°.* ***(Right)*** *Contrast stretched difference image – centred on the crater. Note that due to stereo parallax effects, some of the background fine scale detail remains visible.*

there is a radiometric calibration error – I must admit I did not do a full LROC style calibration of the images, other than normalize their brightness to each other based upon using image standard deviation to define the image contrast stretch and offset. The latter two theories seems more likely explanations, but just inspecting the images, I am more inclined to option (b). So with this in mind, when attempting "Spot the Difference" we should not be just on the lookout for new craters, displaced boulders, but should be looking for more diffuse/subtle changes when comparing old and new spacecraft images of the Moon.

Routine Reports: Below is a selection of reports received for July that can help us to re-assess unusual past lunar observations. You may have gotten the impression from past newsletters, that we are always disproving past LTPs through these repeat illumination studies, however there are a couple of examples in this month's analysis that remain a puzzle, at least until we obtain some repeat illumination/topocentric libration observations – which would help to rule out directional optical effects.

Aristarchus: On 2015 Jul 02 UT 20:23 & 20:36 Thierry Speth (BAA) observed Aristarchus under the same illumination and topocentric libration conditions (to within ±1°) to what Grainger and Ring reported from Cambridge University in 1961:

961 May 30/31 UT 23:00-01:00 Enhancement of spectrum in UV and CaI recorded on photoelectric spectrometer scans by Grainger and Ring in England. Effect seen on Aristarchus and a ray near Bessel (approx 17E, 22N). Cameron 1978 catalog ID=740 and weight=5. ALPO/BAA weight=5.

Although Thierry Speth had no access to spectroscopic equipment, we can at least see what Aristarchus should have looked like to these observers (See Fig 3). I decided to read a little deeper, beyond the above Cameron catalog abbreviated description. As it turns out, Grainger and Ring, although from Manchester University, England, were in fact using a 50" reflector from the University of Padua, at the observatory in Asiago, Italy. They appear to have been looking for evidence of lunar luminescence, by searching for reflected solar absorption line shallowing effects - we discussed this in last month's article where it was suggested natural Brillouin Scattering, was the most likely cause rather than lunar luminescence. Grainger and Ring published their results in the Monthly Notices of the Royal Astronomical Society (1963 Vol 125, No. 2, p93-104) but do not mention of any effort to check for similar effects in other regions of the Moon. I shall therefore lower the ALPO/BAA weight from 5 to 3, and have updated their observing location in the database of observers. Of course line shallowing could be caused by lunar spectral emission from an ionized gas, but for now, based upon what I read in the 1963 paper, Brillouin scattering seems really the most probable cause.

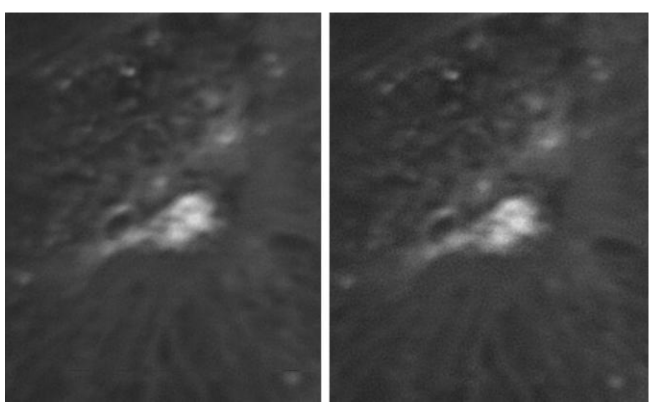


***Figure 3.** Two images of Aristarchus, taken by Thierry Speth, orientated with north towards the top. **(Left)** Taken at 20:23UT. **(Right)** Taken at 20:36UT.*

Lambert: On 2015 Jul 25 UT 07:45-07:48 Maurice Collins (ALPO) imaged the Moon under the same illumination conditions, to within +/-0.5 to a LTP seen way back in 1902:

On 1902 Aug 13 at UT 00:50 Jones (Philadelphia, Penn, USA, 6" reflector, x250) observed a brilliant star-like point near Lambert (21W, 25N) on the dark side of the terminator. It was a magnitude 3-4 round spurious *disk and had an interference or diffraction ring. Resolved into a very brilliant spot as the terminator neared it. Cameron says that this was too far from the terminator to be a sunlit peak? The report is given as Aug 12 in Middlehurst's catalog. The Cameron 1978 catalog ID=312 and weight=1. The ALPO/BAA weight=1.*

I came across a more detailed description of this LTP report from Popular Astronomy Vol 10, p419-420, from 1902: *"An interesting letter has recently been received by me from Mr. G.S. Jones of Philadelphia, describing a brilliant star-like point that he observed on the dark side of the Moon's terminator on August 12d 7h.5 E.S.T. It was the third or fourth magnitude and under a high power "showed a perfectly round spurious disk and at least one well marked interference ring." The instrument used was a 6.25-inch reflector, power 250. In the course of a couple of hours, as the terminator approached towards it, it resolved itself into a very brilliant spot. It apparently coincided with the little crater known as Lambert, but the exact identification was uncertain on account of clouds that later obscured the Moon."* Now according to Maurice's image, in Fig 4, there is a mountain just east of Lambert crater (invisible), now called Dorsa Stille, which is 1 km high, which would be just in the right place. I will therefore rename the feature for this LTP to be "Dorsa Stille". Also the UT should now be not just Aug 13 00:50 but 00:30-02:30. The mountain in Maurice's image is not exactly what one would describe as a "brilliant star-like point" – though it is unclear if Mr Jones, when he referred to third or fourth magnitude, was meaning as a star of the same magnitude as seen through the telescope, or by looking away from the telescope at a 3rd or 4th magnitude star in the sky. I will put the weight of this LTP report from 1 up to 2, to encourage re-observation, if possible at a repeat illumination and libration too, just in case there was some specular component to this three sided mountain peak.

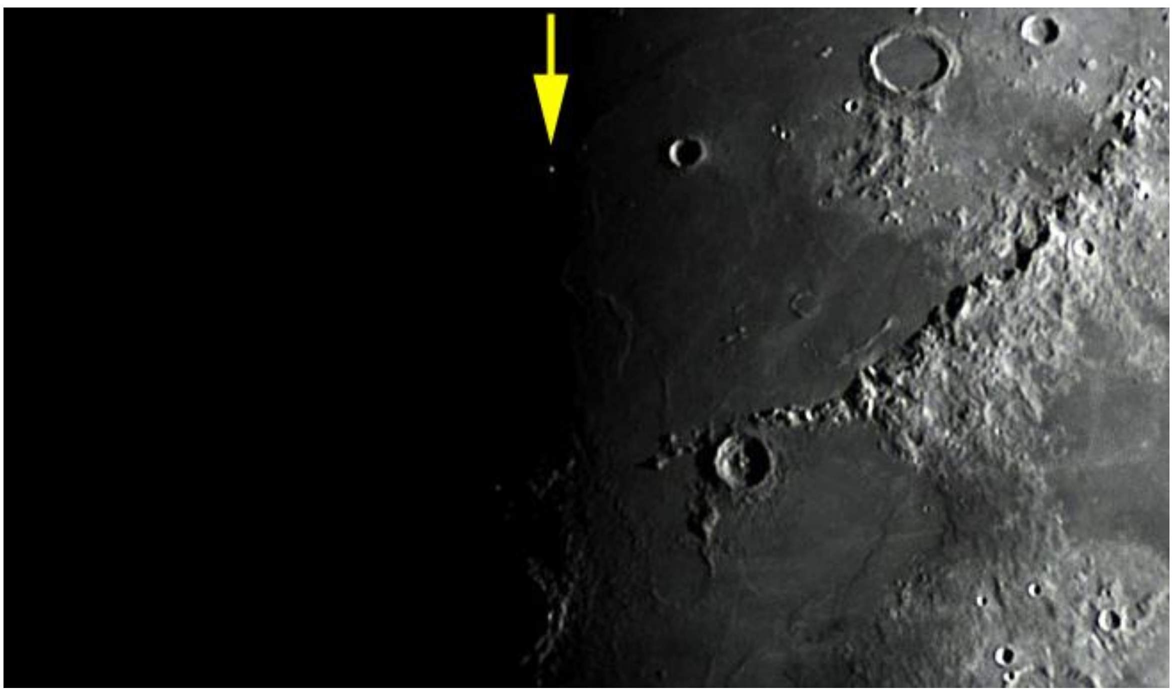


Figure 4. *The eastern Mare Imbrium as imaged by Maurice Collins on 2015 Jul 25 UT 07:45-07:48 orientated with north towards the top. The arrow shows the location of Dora Stille.*

Plato: On 2015 Jul 26 UT 02:43 Rik Hill (ALPO) imaged the Plato area under identical illumination (to with +/-0.5) to a LTP report from Brazillian observer Marko Petek from 1980:

On 1980 Apr 24 at 23:35UT Marco Petek (Porto Alegre, Brazil, using a 7.5" refractor noticed that the center of Plato was bright and opaque and the observer thought it was similar in appearance to Linne. A sketch was made and two other observers confirmed the appearance. Cameron mentions that Petek is an experienced observer. Cameron 2006 catalog extension LTP ID=91 and weight=5. ALPO/BAA weight=3.

I have since managed to locate the letter that Petek sent to the BAA Lunar section as well as a sketch. The relevant details of the 1980 LTP were as follows:

> *"Observer: Marko Petek-Horto Alegre – Brazil*
> *23h35m   April 24th 1980*
> *Location: center of Plato.LTP was bright and its form is similar to Linné*
> *The discovery was confirmed by more two members of the observatory*
> *Luiz Geraldo Mosa and Peblo Nichiporuk Kulik.*
> *The telescope used was an 190 mm O.G. equatorially with…."*

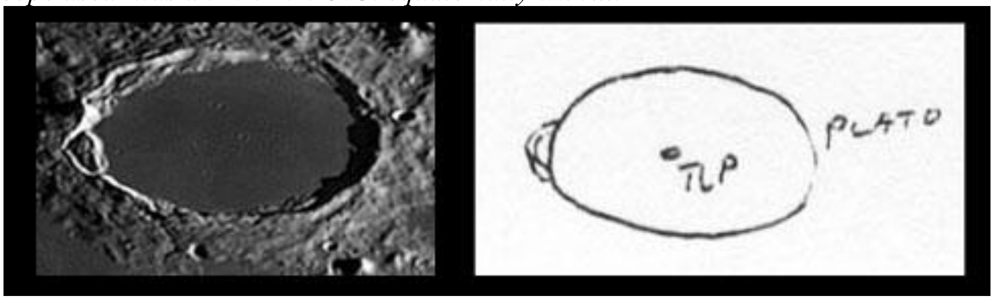


Figure 5. *Plato orientated with north towards the top.* ***(Left)*** *A "resolution degraded" version of an image supplied by Rik Hill (ALPO) from 2015 Jul 26 UT 02:43.* ***(Right)*** *A sketch from Marko Petek from 1980 Apr 24 UT 23:35.*

Fig. 5 (left) is a factor of two down-graded resolution version of Rik's original image. For comparison I have included the sketch that Marko Petek provided (Fig 5 (right)) The sketch is definitely not of high quality, and I would hope that modern era observers would provide more detail, but does at least confirm that what they regarded as a LTP was the usual central craterlet. If other information I have is correct, them Marko Petek was 18 years old at the time of the observation, but states that he had 8 years of experience observing. Although I would normally rate a confirmed observation at a weight of 4, because of the quality of the sketch, and there is no mention of how long they looked for, and whether the central craterlet/spot changed in appearance, it was originally given an ALPO/BAA weight of 3. The Rik Hill image shows that actually there is no significant bright spot here at this stage in the illumination, nor is the central craterlet fuzzy. Therefore it is a little strange the discrepancy in appearance from 1980 to 2015. Of course it could be a libration effect (viewing angle) coming into play. But anyway I do not think we ought to lower the weight of the 1980 LTP, but at the same time because little information is provided, I do not propose increasing the weight. Therefore it will remain at 3, at least until we get some repeat illumination/libration observations.

Gassendi: On 2015 Jul 28 UT 01:25-01:55 Jay Albert (ALPO) observed Gassendi under the same illumination conditions to within +/-0.5° for a 1990 LTP and to within +/-1° for both illumination and topocentric libration for a 1889 LTP:

> *On 1990 Oct 1st at 00:44-01:24UT D Darling (Sun Praire, WI, USA) observed that Gassendi still had a blink effect when viewed through blue (Wratten 38A) and red (Wratten 25A) filters. No effect was seen on Aristarchus. Gassendi was brighter in the red filter and this was confirmed by Weier. Sketches were made and brightness measurements taken. Both observers used a 12.5" reflector x159. At 01:00UT the NW wall was 7.5, the SW wall 8.0, the S. wall 7.5, the floor 6.0, the outer E. wall 8.0, the N. floor 5.5. Gassendi A W. wall was 9.5,l Aristarchus W. floor was 8.0, NW wall 8.0, shadowed floor 0.0, E. outer wall 7.0, NBP 5.5, area between Aristarchus and Herodotus 6.0, and the comet like tail: 8.2 on the E. and 8.5 on the W. The Cameron 2006 catalog extension LTP ID=412 and weight=5. The ALPO/BAA weight=4.*

> *On 1889 May 11 at 22:00? UT an unknown observer saw an ink black spot on the rampart of Gassendi. It had not been seen before or at the next lunation or indeed ever again. Cameron 1978 catalog ID=261 and weight=3. ALPO/BAA weight=2.*

Although using his Celestron 11” SCT, Jay’s observing conditions were far from ideal. The sky was both hazy with slowly passing cirrus clouds, but at least the Moon was high up in the SSE. The temperature was 25C, with 80% humidity, and no wind. Transparency was 3rd magnitude only when clear, and the seeing was 6/10 when the thin cirrus clouds were not moving over the Moon. Concerning the 1889 appearance of Gassendi, Jay did not see the *“ink black spot on the rampart…”* The crater’s inner E wall was in black shadow and there were the usual two slices in the NW rim. There was also some black shadow behind the main central peaks. The rilles on the floor were clearly seen. Concerning the Darling 1990 LTP, Jay performed several inconclusive blinks with the Wratten 25 red and 44A blue filters. He was not sure, but at times he suspected that Gassendi was the slightest bit brighter in red (maybe when the Moon was behind a cirrus cloud?). In the past he has found that the Moon is always brighter in a W25 than in a W38A because the latter is too dense to be a match for the W25. The W29 is a closer (but not perfect) match for the W38A. Having looked up David Darling’s report for the 1990 Gassendi LTP, I am was considering downgrading the weight to 3 because the original report was not very specific over where the blink effect was seen, however because David also checked other Aristarchus, and found no blink here, this goes against the theory that Jay suggests over the blink being caused by different filter density between the original Wratten 25 and 38A filters. I shall therefore keep the 1990 LTP at a weight of 4 for now. For the 1889 LTP I will also keep this at a weight of 2, though suspect a timing error.

Aristarchus: On 2015 Jul 30 UT 21:10-21:25 Marie Cook (BAA) observed this crater under the same illumination conditions (to within ±0.5°) to a 1987 LTP reported by her:

Aristarchus 1961 Jun 27/28 23:00?-01:00? Observed by Granger & Ring (England). "Enhancement of Spectrum in UV at CaII similar to May obs." NASA catalog weight=5. NASA catalog ID #741. ALPO/BAA weight=5.

Marie, using a 90mm Questar scope (x80, seeing III, transparency poor), although making a visual observation (she, like most of us, is not equipped for spectroscopy) found the crater brighter in blue, then yellow, then red light. She could also see the bands inside the crater but they were faint due to the hazy conditions. This all sounds perfectly normal. As with Thierry Speth’s repeat illumination/libration report (see above), the most likely explanation for the claimed absorption line shallowing effect is “Brillouin Scattering”, therefore I will lower the weight of this 1961 LTP report from 5 to 3.

Suggested Features to observe in September: 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. Do not forget that there will be a lunar eclipse visible on 2015 Sep 28 with the umbral phase spanning 01:07-04:27 – so it is a good time to support Brian Cudnik and video for impact flashes.

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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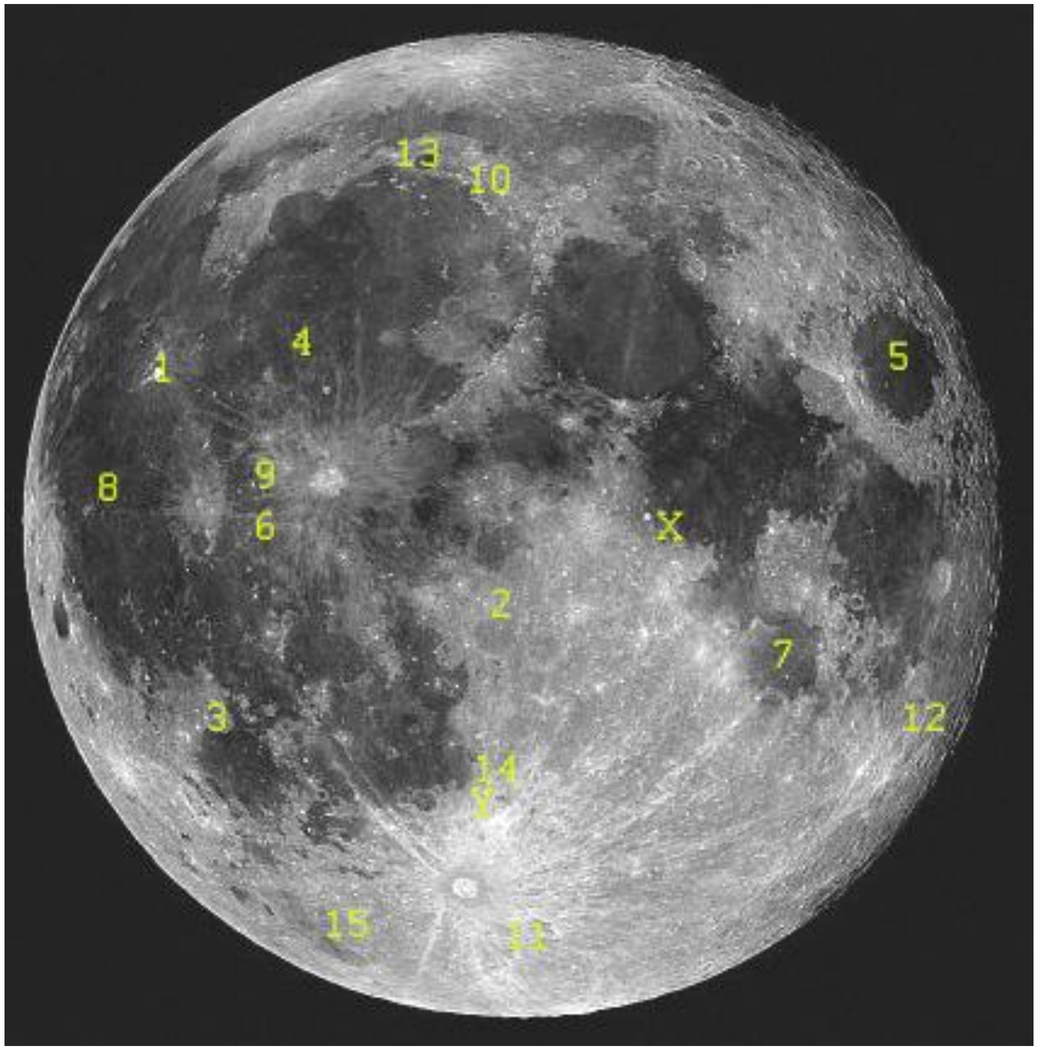
KEY TO IMAGES IN THIS ISSUE

1. **Aristarchus**
2. **Herschel**
3. **Gassendi**
4. **Lambert**
5. **Mare Crisium**
6. **Mare Insularum**
7. **Mare Nectaris**
8. **Marius**
9. **Millichius**
10. **Montes Alpes**
11. **Moretus**
12. **Petavius**
13. **Plato**
14. **Regiomontanus**
15. **Schiller**



FOCUS ON targets

X = Dionysius
Y = Deslandres