



# THE LUNAR OBSERVER

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

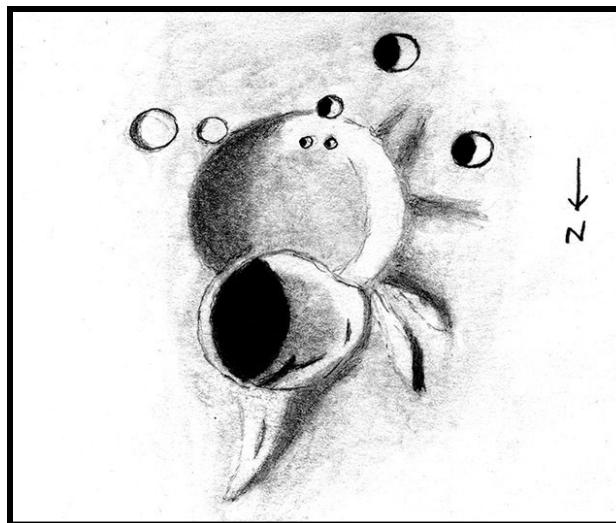
EDITED BY: Wayne Bailey [wayne.bailey@alpo-astronomy.org](mailto:wayne.bailey@alpo-astronomy.org)

17 Autumn Lane, Sewell, NJ 08080

RECENT BACK ISSUES: [http://moon.scopesandscapes.com/tlo\\_back.html](http://moon.scopesandscapes.com/tlo_back.html)

## FEATURE OF THE MONTH – NOVEMBER 2016

### Gemma Frisius D



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

**August 11, 2016 03:08-03:50 UT, 15 cm refl, 170x, seeing 7-5/10,**

I drew this crater and vicinity on the evening of Aug. 10/11, 2016. This crater is in the lunar southeast area north of Maurolycus. The main crater has a rounded east side, but its west side is irregular with a substantial notch in its southwest rim. This could be from a slump or a second impact. There is evidence of terracing inside its north and west rims. A wide pointed ridge extending from the north rim of Gemma Frisius D could be part of the broken ring Gemma Frisius G. Two more low ridges are near the west rim of the main crater. A large shallow ring, unlabelled on the Lunar Quadrant map, has its northern end obliterated by Gemma Frisius D. This ring is obviously older than the main crater, but it appears more symmetrical in shape. The interior shadows of these two craters did not merge at this time, but were separated by the rim of Gemma Frisius D. The crisp crater southwest of the old ring is Gemma Frisius F, and Gemma Frisius Z is the similar crater northwest of F. Three pale strips of shadow are nearby. A small crater sits on the south edge of the old ring, and two tiny bits of shadow, apparently craterlets, are nearby within this ring. Two shallow saucers are farther to the east.

# LUNAR CALENDAR

## NOVEMBER-DECEMBER 2016 (UT)

2016		UT	EVENT
Nov	02	19:38	Moon-Saturn: 4.1° S
	04	13:04	Moon Extreme South Dec.: 18.7° S
	07	19:51	First Quarter
	09	15:57	Moon Descending Node
	14	11:23	Moon Perigee: 356500 km
	14	13:52	Full Moon
	15	16:50	Moon-Aldebaran: 0.4° S
	17	09:32	Moon Extreme North Dec.: 18.8° N
	21	08:33	Last Quarter
	21	10:08	Moon-Regulus: 1.4° N
	22	02:48	Moon Ascending Node
	25	01:47	Moon-Jupiter: 2.1° S
	27	20:08	Moon Apogee: 406600 km
	29	12:18	New Moon
Dec	01	19:56	Moon Extreme South Dec.: 18.9° S
	03	12:34	Moon-Venus: 6.3° S
	05	10:39	Moon-Mars: 3.1° S
	06	17:35	Moon Descending Node
	07	09:03	First Quarter
	12	23:27	Moon Perigee: 358500 km
	13	04:14	Moon-Aldebaran: 0.4° S
	14	00:05	Full Moon
	14	21:43	Moon Extreme North Dec.: 18.9° N
	18	18:14	Moon-Regulus: 1.1° N
	19	04:46	Moon Ascending Node
	21	01:56	Last Quarter
	22	16:37	Moon-Jupiter: 2.7° S
	25	05:55	Moon Apogee: 405900 km
	29	03:30	Moon Extreme South Dec.: 19° S
	29	06:53	New Moon

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

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

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

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

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

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

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

**Name and location of observer**

**Name of feature**

**Date and time (UT) of observation (use month name or specify mm/dd/yyyy, dd/mm/yyyy)**

**Size and type of telescope used Magnification (for sketches)**

**Filter (if used)**

Medium employed (for photos and electronic images)

Orientation of image: (North/South - East/West)

Seeing: 0 to 10 (0-Worst 10-Best)

Transparency: 1 to 6

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

Digitally submitted images should be sent to both

Wayne Bailey – [wayne.bailey@alpo-astronomy.org](mailto:wayne.bailey@alpo-astronomy.org)

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

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

## CALL FOR OBSERVATIONS:

### FOCUS ON: Montes Taurus & Taurus-Littrow Valley

*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 **January 2017** edition will be **the Montes Taurus & Taurus-Littrow Valley**. 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):

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

**Wayne Bailey** - [wayne.bailey@alpo-astronomy.org](mailto:wayne.bailey@alpo-astronomy.org)

**Deadline for inclusion in the Montes Taurus & Taurus-Littrow Valley article is December 20, 2016**

## FUTURE FOCUS ON ARTICLES:

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

<u>Subject</u>	<u>TLO Issue</u>	<u>Deadline</u>
<b>Rupes Recta (the Straight Wall)</b>	<b>March 2017</b>	<b>February 20, 2017</b>

# Ewen Adair Whitaker

June 22, 1922 - Oct.11, 2016

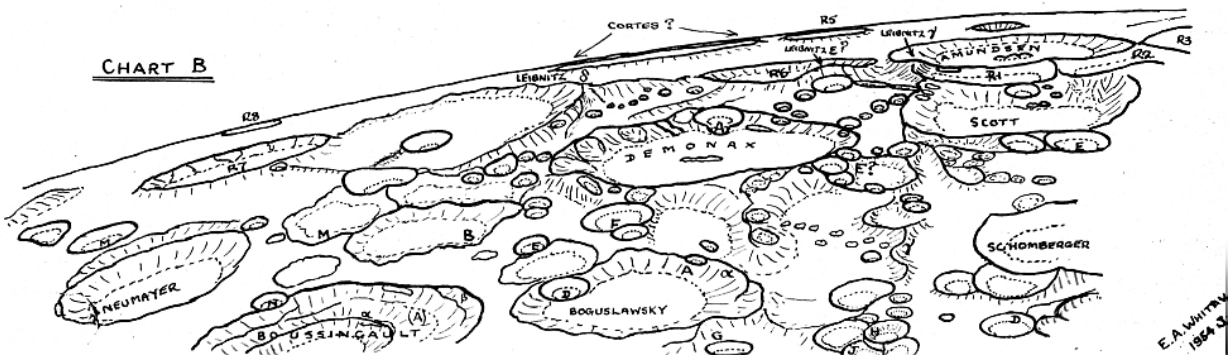
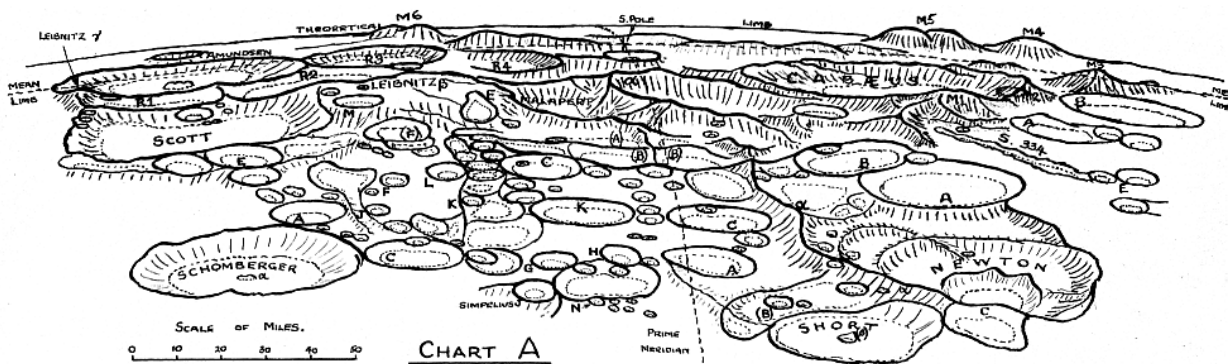


Lunar astronomy lost one of its quiet but most devoted scientists (and my friend) on Oct. 11 this year.

Ewen was born in London and from an early age he was interested in astronomy, spectra and maps. His post high school education was not what he originally planned due to onset of World War II. Instead of going to University of London as he had hoped (the Battle of Britain forced that school to be “dispersed”) he matriculated at Woolwich Polytechnic. During his schooling and for the rest of the war he worked for Siemens Bros. in “vital research” doing ultraviolet spectrochemical analysis pertaining to the secret HAIS cable PLUTO (Pipe Line Under The Ocean) project. This supplied fuel used for allied mainland invasion vehicles. Here he learned scientific methods in using large laboratory spectrographs and analysis of the data.

After the war, in 1949, he applied for and got his dream job with the Royal Observatory, at Greenwich (RGO) doing ultraviolet spectroscopy of binary stars, obtaining astrometric positions of asteroids and as a sideline pursued his love of lunar imaging using the 13” refractor and 36” Cassegrain telescopes. The next year he joined British Astronomical Association (BAA) Lunar Section.

Combining his interest in astronomy and maps, Ewen became interested in lunar cartography in 1952-53 and soon saw the shortcomings of the extant IAU map and the need for a good reliable lunar map and photographic atlas with internationally standardized nomenclature. He started towards this end with his careful mapping of the lunar South Pole in 1954 (below)



A year later, on Aug. 31, 1955, at the 9<sup>th</sup> Congress of the IAU in Dublin, Gerard Kuiper presented “Considerations on a new Photographic Lunar Map”, seeking interest in a lunar mapping project to make an high quality atlas. This addressed Ewen’s own desire for such lunar cartography. A second paper “Statement on Lunar Nomenclature” hit on another topic of great interest to Ewen. As luck would have it, Ewen was the **only person** to respond to this call! He did so in a multi-page meticulously hand written letter detailing his thoughts on both topics. This began a relationship that would have a profound effect on the rest of Ewen’s life.

The R.G.O. moved to Herstmonceux in 1956 and Ewen went along. In this same year he became the Director of the British Astronomical Association (B.A.A.) Lunar Section for what would be a short time from 1956-58. During this time Kuiper was beginning work on his atlas using the best Lick and 100” Mt Wilson negatives.

Kuiper’s “Lunar Project” became fully funded in 1958 and Ewen was hired by Kuiper along with D.W.G. “Dai” Arthur (on Ewen’s recommendation) to work at Yerkes where Kuiper was now Director. Ewen used telescopes at Yerkes Obs. and McDonald Obs. in the production of the *Photographic Lunar Atlas* (1960). Much other lunar work was done during this period revising and correcting nomenclature, improving data on the figure of the moon and initial work on the orthographic and rectified limb atlases.

The year of 1960 was to be a momentous year as Kuiper founded the Lunar & Planetary Lab at Univ. of Arizona in Tucson. Ewen was one of the first hired at the Lab. and made the move to Tucson over a 4 month period that year.

The next year, 1961, President Kennedy charged NASA with putting a man on the moon. This would require a lot of preliminary work for which Ewen was well suited and placed. Kuiper was chosen as the “Chief Experimenter” for the Lunar Ranger Project and Ewen was selected by him as one of the “NASA Lunar Ranger Project co-Experimenters” charged with selecting the impact sites for Ranger 6 & 7. Ranger 7 became the first successful US mission to photograph the moon in a region now known as Mare Cognitum.

Later, Ewen worked on the selection of Apollo landing sites. His most famous work here was the finding of the Surveyor 3 in Oceanus Procellarum so Apollo 12 could land nearby and the astronauts would visit to collect parts for return and study. The story of this feat is the subject of a wonderful article (Clow & Whitaker, 2003).

Ewen’s home study was a museum. In that room was a wall of historical momentos that was fascinating to see. He had one of the small flags taken to the moon and back on Apollo 16, mounted in a frame and signed by the astronauts of that mission. In 1969 he received a personal letter of commendation from then President Nixon for his work with Surveyor 3 and Apollo 12. Then in 1982 he received the prestigious Walter Goodacre Medal and Prize from the BAA in recognition of his contribution to the progress of lunar astronomy over many years. These too were framed and mounted on the walls of his study along with numerous other citations and awards. He was also honored with asteroid 7948 (1992HY) “Whitaker”

He enjoyed exploring astronomical history and even reconstructed some of the ancient instruments used by astronomers in previous centuries. This historical interest along with his lunar expertise in the field of lunar nomenclature, led to his writing the book “Mapping and Naming the Moon: A History of Lunar Cartography and Nomenclature” (<https://books.google.com/books?id=aV1i27jDYL8C>). It is an excellent and authoritative work that should be in the library of every lunar enthusiast.

With the Apollo program at an end, Ewen retired in 1978 and though a “research scientist emeritus” was no stranger to the Lunar & Planetary Lab. I met him there first in 1981 when my wife started work there.

Not well known is that one of Ewen’s other interests was clocks. He enjoyed repairing and restoring them, the older the better. There were over one hundred in his home, many of them of the chiming variety. It was a real treat to be at his home at the stroke of noon! Cocos and chimes of all kinds would be sounding all at once in a joyous cacophony.

Having come from amateur roots, Ewen was always glad to guide and help the amateur lunar observer along and maintained his youthful spirit of wonder and exploration. He will be greatly missed.



Ewen in front of his wall of awards and momentos in his study. He is pointing out the commendation from President Nixon.



Ewen and the author after lunch in July, 2016.

Below is a very abbreviated Bibliography from Wikipedia:

- Melosh H. J., Whitaker E. A. (June 1994). "Lunar crater chains". *Nature*. **369** (6483): 713–714. [Bibcode:1994Natur.369..713M](#). [doi:10.1038/369713a0](#).
- Whitaker E. A. (2003). [Mapping and Naming the Moon: A History of Lunar Cartography and Nomenclature](#). Cambridge University Press. [Bibcode:2003mnmm..book.....W](#). ISBN 9780521544146.
- G.L. Gutschewski, D.C. Kinsler & E.A. Whitaker, "[Atlas and Gazetteer of the Near Side of the Moon](#)", NASA SP-241.
- Gerald P Kuiper, Ewen A Whitaker, Robert G Strom, John W Fountain, and Stephen M Larson, "Consolidated Lunar Atlas", Lunar and Planetary Institute, 2005.
- David Clow & Ewen A. Whitaker, "[A Pinpoint on the Ocean of Storms: Finding the Target for Apollo 12.](#)" QUEST - The History of Spaceflight Quarterly. Vol. 10 No. 4, Fall 2003.

-Richard "Rik" Hill  
Tucson, AZ

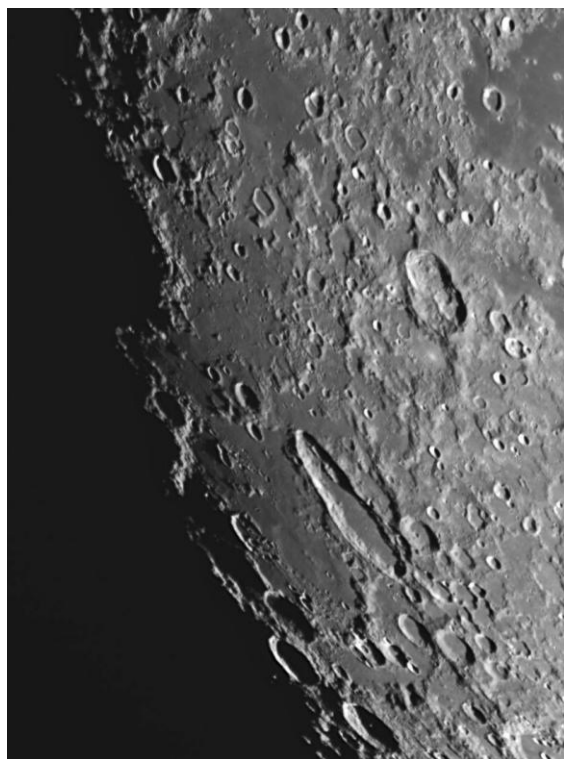


# FOCUS ON: Schiller-Zucchius Basin

**By Jerry Hubbell**

Assistant Coordinator, Lunar Topographical Studies

Continuing our studies this month of small regions of the moon, the Schiller-Zucchius Basin is another very interesting area. Spanning over 200 miles (335km) in diameter, and centered at selenographic coordinates 56.0°S, 45.0°W, the basin is named after the odd, elongated crater Schiller to the north, and younger crater Zucchius to the southeast. The basin was formed in the pre-nectarian period 4.0-4.5 billion years ago (lower portion Figure 1). The



basin is a flooded impact zone that also contains the flooded crater Segner immediately northwest of Zucchius, and other flooded craters formed billions of years ago. The recent favorable lunar librations provide an excellent view of the basin as shown in figures 1 and 2.

*Figure 1. Schiller-Zucchius Basin Region – David Teske – Starkville, MS, October 13 2016 0134UT, North/Up, East/Right, Seeing 4/10, Celestron 9.25" Edge SCT and Mallincam GMTm Camera. Crater Zucchius and Segner shown in deep shadow. The full relief of the basin is revealed in this image.*

Figures 1, and 3 shows sunrise over the crater Zucchius and provides the lighting necessary to reveal the basin in excellent relief. The image shows a very shallow, sunken area within the basin with a low range of mountains in the center. This is most likely a flooded crater that was a result of the original impact. This is not evident in other views of the region where the sun is higher up in the sky.

Crater Schiller located at selenographic coordinates 51.8°S, 40.0°W, provides a fascinating object to study with its terraced crater walls, and central mountain chain to the north. The overhead, aerial view shown in Figure 4 reveals the true shape of the basin, crater Schiller, 113x45 miles (179x71 km), and crater Zucchius, 40 miles (64 km).

*Figure 2. Schiller-Zucchius Basin Region – Jay Albert – Lake Worth, FL, August 16 2016 0157UT, North/Up, East/Left, Celestron NexStar 6" SCT and Celestron Neximage 5 Solar System Camera.*

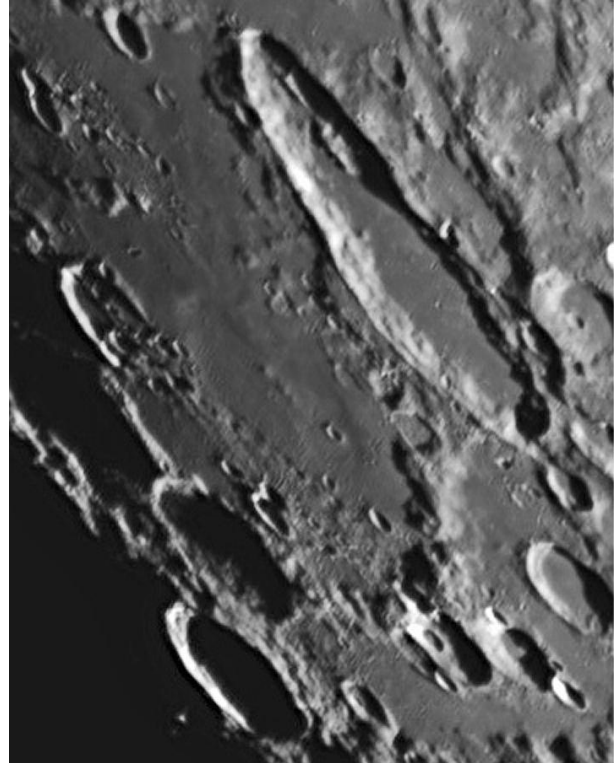
The Figure 4 view shows the basin as a generally circular area with crater Segner located northwest of Zucchius. There are several craters in



the 5 to 20-mile (8 to 32 km) range located in the basin interior. This region is worthy of further study, especially during low-light angles as shown in Figure 3. The various mountain ranges in the area are ripe for measurement using the Lunar Terminator Visualization Tool (LTVT)

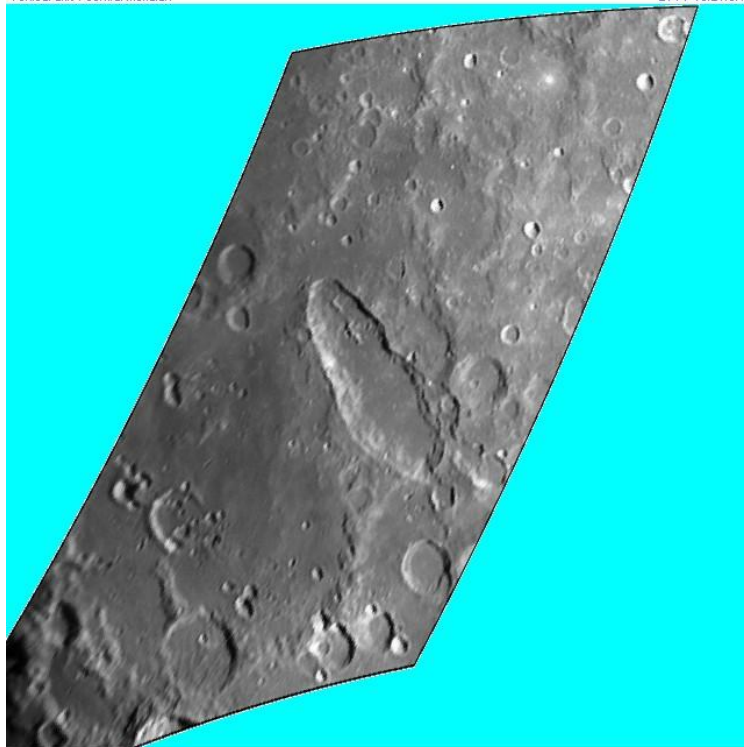
<https://lvtv.wikispaces.com/LTVT> .

**Figure 3. Schiller-Zucchius Basin Region (crop of Figure 1.)** – David Teske – Starkville, MS, October 13 2016 0134UT, North/Up, East/Right, Seeing 4/10, Celestron 9.25" Edge SCT and Mallincam GMTm Camera.



Overall, smaller impact basins < 500 km in diameter on the moon are worth our time and effort to study the topography of the region and will lead us to discover features that would not be obvious in our general photographic surveys of these regions. Keeping this in mind when planning our observations can lead to discovering new, subtle features that enhance our understanding of the formations and history of the lunar surface. Using software tools enhances our ability to study these topographical features and keep us excited about observing the moon.

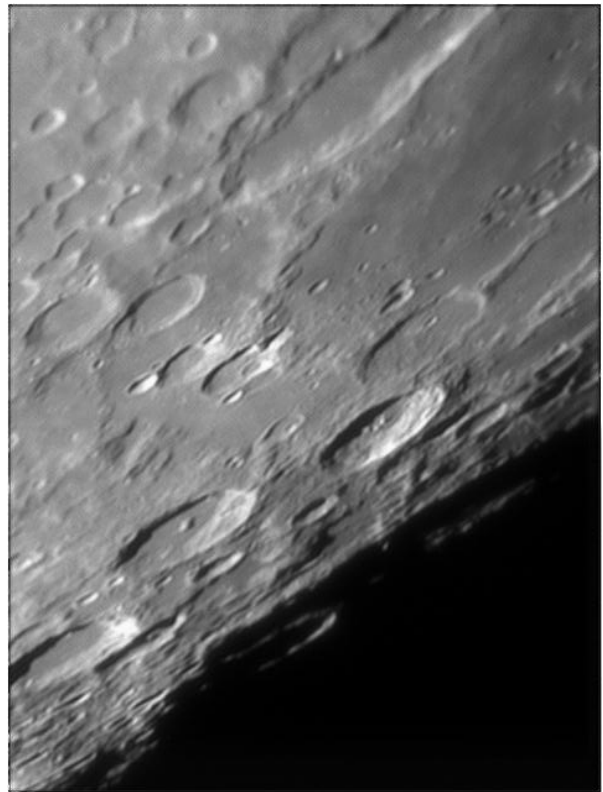
Sub-solar Pt = 22.186°E/0.833°N Sub-Earth Pt = 40.009°W/52.173°S Center = 39.573°W/52.083°S Zoom = 6.000  
Vertical axis : central meridian LTVT v0.21.3.1



**Figure 4. Schiller-Zucchius Basin** – Jerry Hubbell, Locust Grove, VA, January 16, 2012 0141UT, North/Up, East/Right, 127mm APO refractor, DMK 21AU04.AS CCD video camera. This image was processed in LTVT and shows an aerial overhead view of the basin.

Texture file: Lunar10038 12-01-06 20-41-21\_Schiller1a.jpg

*Figure 5. Schiller-Zucchius Basin – Jerry Hubbell, Locust Grove, VA, January 16, 2012 0145UT, North/Up, East/Left, 127mm APO refractor, DMK 21AU04.AS CCD video camera. This image highlights the crater Zucchius near the center of the frame. Segner is well presented to the northwest of Zucchius.*



## **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. Chong, S.M.,
- Albert C.H. Lim, & P.S. Ang. 2002. *Photographic Atlas of the Moon*. Cambridge University Press, New York.
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- Grego, Peter. 2005. *The Moon and How to Observe It*. Springer-Verlag, London. IAU/USGS/NASA. *Gazetteer of Planetary Nomenclature*. (<http://planetarynames.wr.usgs.gov/Page/MOON/target>).
- North, Gerald. 2000. *Observing the Moon*, Cambridge University Press, Cambridge.
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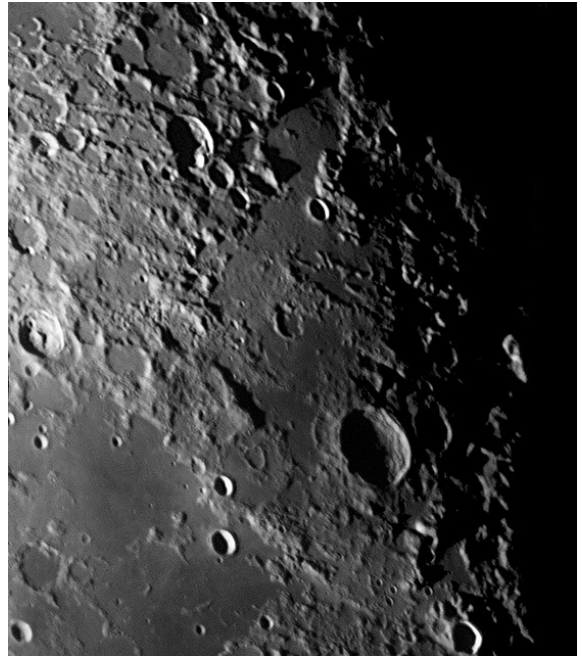
# LACUS BONITATIS

## Richard Hill

Sandwiched between Mare Crisium and Cleomedes on one side and Posidonius on the other, this region of the moon is frequently missed, but it rewards the curious. The largest crater in this image, just below center, is the 66km diameter Macrobius. It sits on the southern shore of the flat region known as Lacus Bonitatis which arcs along

*Lacus Bonitatis—Richard Hill – Tucson, Arizona, USA October 19, 2016 06:40 UT. Seeing 7/10. TEC 8" Mak-Cass, f/20, SKYRIS 445M, 656.3 nm filter*

Macrobius' northern wall. This Lacus extends only about 70km away from the crater wall and is about 100km in full length, depending on the source as there is some variance between them as to the borders of this lacus. The relatively flat region above L. Bonitatis, including the vertical oval near the top of this image, is unnamed! Even the tall peak casting that dramatic shadow into the oval is unnamed.



The crater on the left edge of this image is Romer (41km) and just left of the oval area is another good sized crater, Newcomb (also 41km). There are two relatively recent craters between Macrobius and Romer and just below. The upper one is Hill (17km and no relation) and the lower is Carmichael (20km). They sit on the edge of Sinus Amoris that extends to the lower left corner of this image. The crater in the very corner is Gardner (19km). Above it is the 41km crater Maraldi. Seems that 41km is the magic number in this region! Note the interesting ghost craters below and to the right.

Notice the striations that cover the upper half of this image aligned from the lower right to the upper left. This gouges are from the Crisium impact. How exciting it would have been to witness, and very dangerous too!

# LUNAR TOPOGRAPHICAL STUDIES

Coordinator – Wayne Bailey - [wayne.bailey@alpo-astronomy.org](mailto:wayne.bailey@alpo-astronomy.org)

Assistant Coordinator – William Dembowski - [dembowski@zone-vx.com](mailto:dembowski@zone-vx.com)

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

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

## OBSERVATIONS RECEIVED

JAY ALBERT – LAKE WORTH, FLORIDA, USA. Digital images of Schiller-Bally & Schiller Zuchius.

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

FRANCISCO ALSINA CARDINALI - ORO VERDE, ARGENTINA. Digital images of Alphonsus(3) & Mare Vaporum(2).

CÉSAR FORNARI - ORO VERDE, ARGENTINA. Digital images of Alphonsus-W. Bond, Fracastorius, Heraclitus, Menelaus-Sinus Amoris, & South pole.

DESIREÈ GODOY - ORO VERDE, ARGENTINA. Digital images of Linné, Metius & Proclus

ROBERT HAYS - WORTH, ILLINOIS, USA. Drawings of Fra Mauro A & Gemma Frisius D.

.RICHARD HILL – TUCSON, ARIZONA, USA. Digital images of Lacus Bonitatis & Sabine-Ritter.

DAVID TESKE - STARKVILLE, MISSISSIPPI, USA. Digital image of Schiller-Zuchius.

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## RECENT TOPOGRAPHICAL OBSERVATIONS

**ANAXAGORAS**– Alberto Anunziato-Oro Verde, Argentina. September 18,, 2015 04:01 UT. 250 mm LX-200 SCT, SPC900NC

*The full moon is the right time to analyse the albedo values of different features. This image was taken on September 18<sup>th</sup> 04.01 UT (colongitude 114.2, illumination 96%) and shows Anaxagoras reigning over the north limb. The ejecta mantle is so wide that covers many interesting features that we can't recognize. The copernican material of Anaxagoras obliterates the pre-nectarians Birmingham and Goldschmidt and the nectarian Barrow. Even the pre-imbrian Mare Frigoris looks invaded by ejecta that in others times of the lunation are invisible. By contrast, the copernican Philolaus is barely perceptible. A long ray crosses the Mare Frigoris and reaches the interior of Plato, passing through the illuminated Plato T. The high walls of Anaxagoras provides the only shadow of the center of the image, its west rim. We need to travel east to find another shaded spot: the west rim of Scoresby (another crater with high walls). The spots with higher albedo are the east rim of Anaxagoras, the east rim of Timaeus (wich also have small rays) and the extended region around the crater Bliss, in the border of Montes Alpes with Mare Frigoris. .*

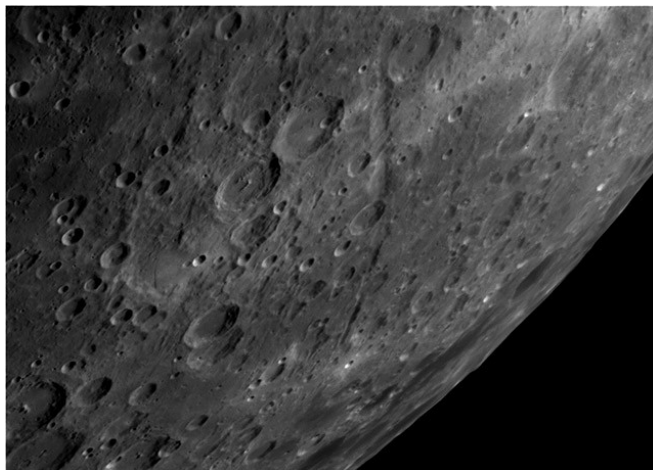
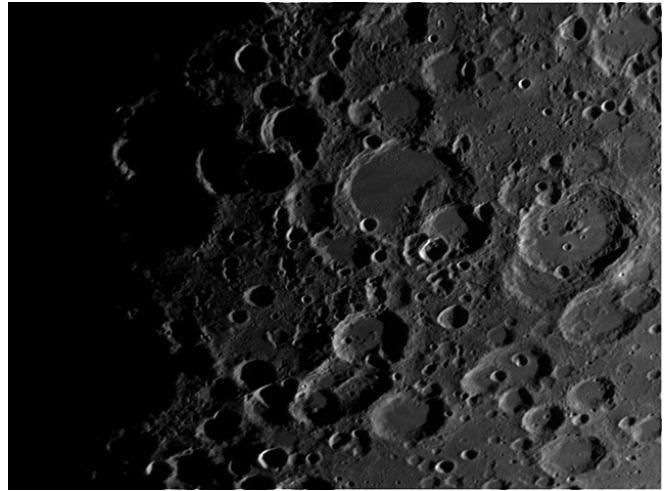


## RECENT TOPOGRAPHICAL OBSERVATIONS



**MARE VAPORUM** - Francisco Alsina  
Cardinali-Oro Verde, Argentina. October 9,  
2016 00:13 UT. C-11 Edge HD SCT, QHY5-II.

**HERACLITUS** - César Fornari -Oro Verde,  
Argentina. October 9, 2016 00:36 UT. C-11 Edge  
HD SCT, QHY5-II.



**METIUS** - Desireé Godoy -Oro Verde,  
Argentina. October 9, 2016 01:28 UT. C-11  
edge HD SCT, QHY5-II. 742nm IR pass filter.

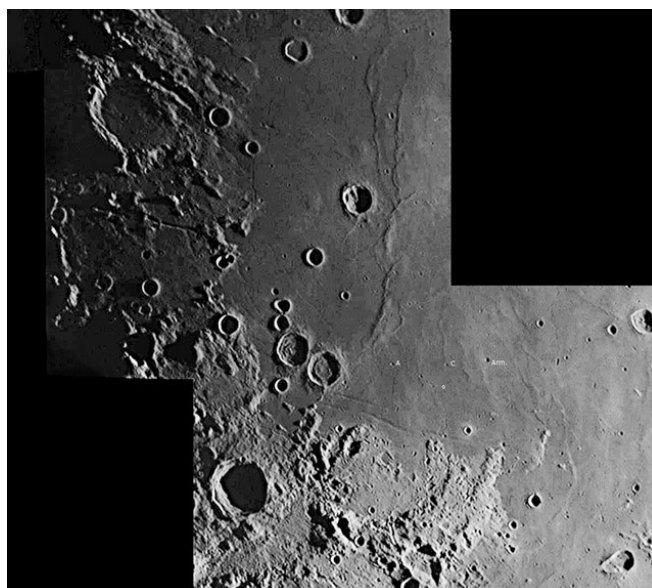
# RECENT TOPOGRAPHICAL OBSERVATIONS

**SABINE\_RITTER** – Richard Hill – Tucson, Arizona, USA July 10, 2016 02:55 UT. Seeing 7/10. 8" Mak-Cass, f20, SKYRIS 445M, 656.3 nm filter.

Above center in this 2 frame montage is the non-round 27km diameter crater Arago well seen like this about 5 days after new moon. Look at this crater closely because it has an interesting floor and western wall. Well seen at this lighting just north of Arago and also just left (lunar west) are two large domes Arago Alpha and Beta.

Below this crater are the namesakes for this image, the twin Sabine (below) and Ritter (above) 31 and 32 km diameters respectively. Notice how Sabine has a raised plateau on its floor that gives it a double walled appearance. Also take note of the tongue of ejecta to the south that lays across the southern crater wall. It is a low relief feature and not well seen with high sun. East of Sabine is a small crater I marked "Arm". This is the crater Armstrong (5km). just to the left of it is an even smaller crater marked "C" and further left another tiny one marked "A". These are Collins and Aldrin (both 3km), the three are named after the Apollo 11 astronauts that landed in the "o" just south of Collins. further south you can see Rima Hypatia running along the edge or shore of Mare Tranquillitatis. The large shadow filled crater at bottom left is Delambre (54km). Then in the lower right corner of this image is the pear shaped Torricelli

Left of Arago is another crack in the moon coming out of the terminator shadow. This is the grand Rima Ariadaeus over 220km long. Above it is the large ruined crater Julius Caesar best seen at this phase. As the sun gets higher it looks less crater-like. One the right wall of this feature is the very round, relatively fresh crater Sosigenes (19km). Between Sosigenes and Arago are several thin rimae, the Rima Sosigenes. Their width range from 2-3km. There are numerous other rimae between this and Ritter. Some, north and west of Ritter, are named Rimae Ritter but the thin shallow one directly above Sabine and Ritter is not named.



# LUNAR GEOLOGICAL CHANGE

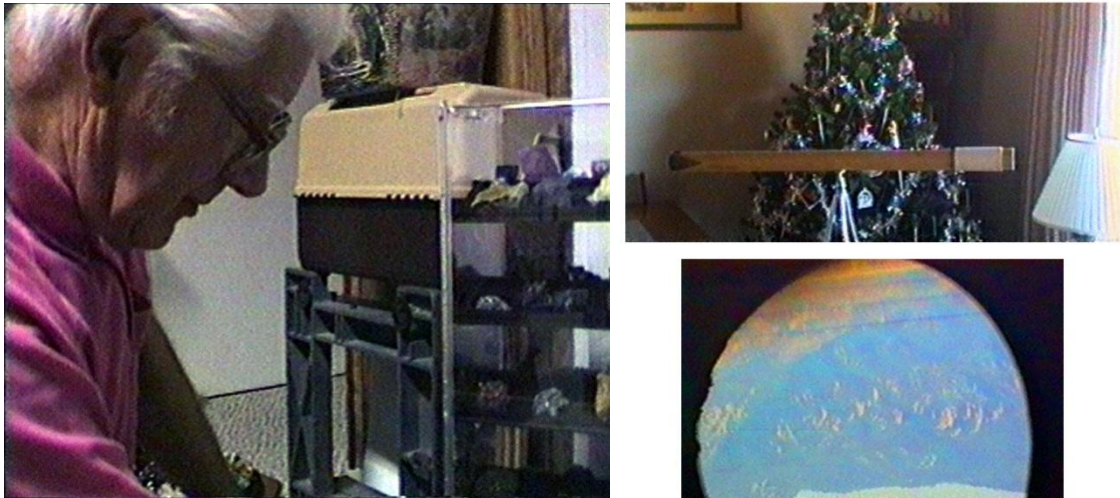
## DETECTION PROGRAM

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

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

**Observations/Studies for September** were received from the following observers: Jay Albert (Boothbay Harbor, ME, USA - ALPO) observed: Alphonsus, Aristarchus, Herodotus, Philolaus, Piazzzi Smyth, Plato and Sinus Iridum. Alberto Anunziato (Argentina – AEA) observed: Archimedes, Birt, Clavius, Endymion, Eratosthenes, Langrenus, Mare Crisium, Mons Lahire, Montes Apenninus, Plato, Proclus, and Tycho. Franco Cardinali (Argentina – AEA) observed: Proclus. Anthony Cook (Newtown, UK – BAA) observed the lunar eclipse. Marie Cook (Mundesley, UK – BAA) observed: Aristarchus, Proclus and Timocharis. Valerio Fontani (Italy, UAI) observed Agippa. César Fornari (Argentina – AEA) observed Alphonsus, Copernicus, and Posidonius. Desireé Godoy (Argentina – AEA) observed: Langrenus and Mons Hadley. Colin Henshaw (Saudi Arabia – BAA) observed the lunar eclipse. Franco Taccogna (Italy – UAI) observed Timocharis and several features.

**News:** I would like to thank Ray Dent, of the Newtown Astronomical Society (UK), for forwarding some images he had taken of the 2016 Sep 16 lunar eclipse and also a lunar perigee image from 201 – we shall include these in our database, as we would do with any old images that observers would like to send in. I would also like to correct a typographical error from the last newsletter when I mentioned an Aristarchus report by Firsoff from 1964 – this should have read: 1954. In the BAA Lunar Section version of this newsletter, I am thinking of removing the table of listings of which features to observe, as this takes up a lot of space and is available anyway on web pages below. If you wish this to remain please let me know as soon as possible.



**Figure 1. (Left)** Ewen Whitaker in December 1992 as pictured at home, with his mineral collection. **(Top Right)** A mock-up of the Digges Telescope – a possible telescope design that may have predated (1540-1559) the Dutch Lippershey invention of the telescope (1608). **(Bottom Right)** An inverted view of the nearby Catalina Mountains as seen through the Digges telescope.

I was very sad to learn of the passing of Ewen Whitaker (1922-2016) during October. Ewen, a past director of the BAA's Lunar Section, and a cartographer of the lunar South Pole, used to work at the Royal Greenwich Observatory, but left the UK to join Gerard Kuiper at the Lunar and Planetary Laboratory (LPL), at the University of Arizona, Tucson in 1960. There he worked on Photography and Mapping of the Moon, in particular the Rectified and Consolidated Lunar Atlases. He was a major player during the Apollo program, helping to select landing sites for some of the missions, and advising astronauts. In later years he introduced some methodology into the letting scheme on satellite lunar crater names. He was also interested in the history of astronomy and carried



out research into the controversial claim that the telescope was invented by [Leonard Digges](#) between 1540 and 1559 (See Fig 1 top and bottom right), several years before Hans Lippershey invented it in 1608 –though it has been suggested that optics were not of high enough quality in Digges’ time for this to have been feasible. On the subject of lunar change, Ewen published a section (29-39) in the [Apollo 16 Science report](#) on the finding of impact craters from Rangers VII-IX, various Apollo 3<sup>rd</sup> stages and spent Lunar Module ascent stages. He also wrote in a communication to me, some time ago, that he remembered (from the [1963 Oct and Nov](#) Flagstaff Lowell Observatory LTP events), James Greenacre visiting the LPL. Planetary astronomer Gerard Kuiper was present and asked a lot of questions, such as how long the events lasted. Ewen commented that “*James Greenacre struck them as a calm and level headed person, with absolutely no thoughts of self-aggrandisement. He was as baffled as we were about what the explanation might be. He had more hours experience in observing the Moon than any of us did, being his main or only job since 1961, and obviously new all the phenomena caused by seeing and other atmospheric disturbances. So we concluded that the observations were genuine, but couldn’t be explained*”. From the point of view of someone on the other side of the Atlantic, Ewen was pretty inspirational to talk to, and seemed to enjoy surprising BAA Lunar Section members by phoning them up out of the blue to discuss some recent piece in the BAA Lunar Section circular that he had just read.

Just to repeat a warning to readers, that for the next 1 to 2 months I am tied up with teaching degree level students, and so we will be doing what we did last year, mentioning observations received, listing what repeat illumination events they refer to, but there will be no time to do analysis like we normally attempt. As soon as January arrives, I will produce a summary table of what we have learnt from your observations. You may also find my response to emails will slow down during the next 2 months, but please do not hesitate to send any observations in. If you can make use of the observational upload website, to send me observations, on: <http://support.imaps.aber.ac.uk/aa/login.php> this would be greatly appreciated in order to stream line the receipt of observations directly into the database. I can send you login names and passwords if you do not have these already.

**LTP Reports:** No LTP reports were received during September, although Vincenzo Iandoli (UAI) recorded some a spot appear to be leaving the eastern limb of the Moon on 2016 Aug 29 UT 02:52. However upon checking out other video recording, using the same optical equipment, they found the effect repeated, and was caused by telescope optical effects.

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



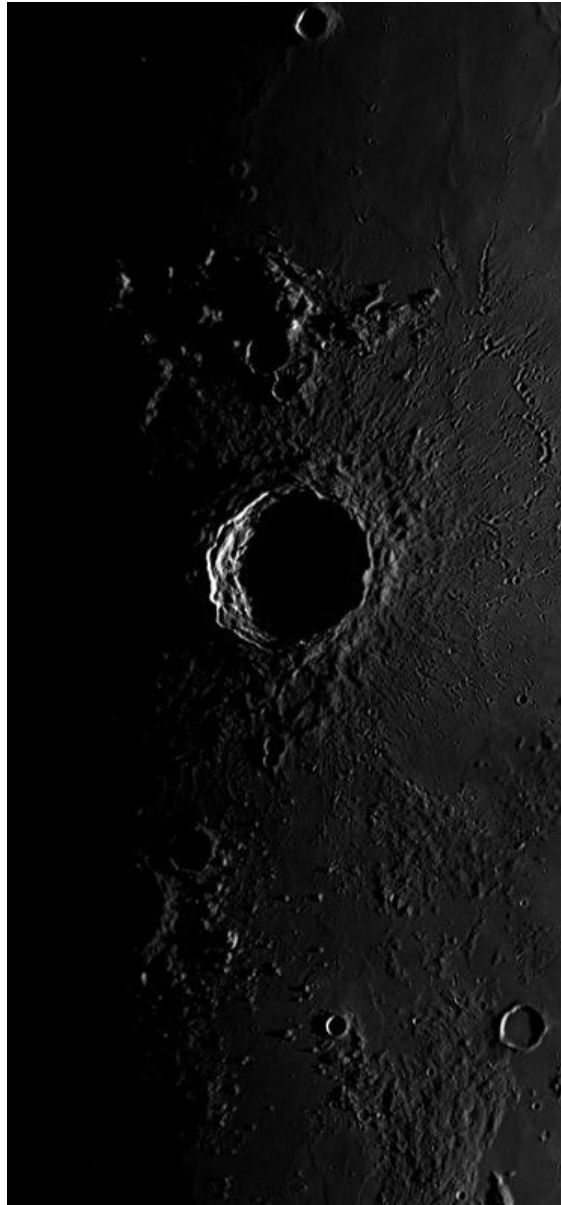
**Figure 2.** Agrippa crater (Centre) from one of the images captured by Valerio Fontani (UAI) on 2016 Sep 08 UT 18:58-19:08, and orientated with north towards the top. This image has been sharpened slightly and had its color saturation increased to 75%.

**Agrippa:** On 2016 Sep 08 UT 18:58-19:08 Valerio Fontani (UAI) imaged this crater under similar illumination (to within  $\pm 0.5^\circ$ ), to a 1966 report:

*Agrippa 1966 Nov 19/20 UT 23:58-00:14 Observed by Bartlett (Baltimore, MD, USA, 5" reflector x283, S=4, T=5) "Faint bluish tinge seen at base of NW wall beneath landslip" NASA catalog weight=4. NASA catalog ID #995.ALPO/BAA weight=3.[REF 1]*

Valerio's image (Fig 2) has a small amount of atmospheric spectral dispersion present, and I have amplified this somewhat in the figure. You can quite clearly see what Bartlett refers to as a landslip feature on the NW wall, and also some atmospheric spectral dispersion on the top and bottom of the landslip, but not blue at the base. Could a different orientation of the Moon with respect to the horizon, or indeed chromatic aberration in Bartlett's telescope, have produced the blue tinge where he said he saw it?

**Copernicus:** On 2016 Sep 10 UT 23:05 César Fornari (AEA) captured a rather scenic image, to within  $\pm 0.5^\circ$ , to a 1930's report:



**Figure 3.** Copernicus as imaged by César Fornari (AEA) on 2016 Sep 10 UT 23:05, and orientated with north towards the top.

*Copernicus 1932 Mar 16 UT 18:45-19:30 Observed by Barker (Cheshunt, England, 12.5" reflector, x310) "Term. from Cop. to lat.20S was misty & hard to define. Rest was usual sharp definition. Mistiness cleared at 1930. Cleaned his eyepiece & prism but it persisted." NASA catalog weight=3. NASA catalog ID #402. ALPO/BAA weight=2. [REF 2]*

César's image (Fig 3) is nicely sharp and well defined. I looked up further information about the Barker report and now know that the observer checked his eyepieces to make sure that they were not misting up, and the night was clear, without any trace of cloud. So it is uncertain why the area from Copernicus, down to 20°S, should ever have looked misty, though he does not comment upon his seeing conditions.

**Proclus:** On 2016 Sep 11 UT 01:01 Franco Cardinali (AEA) imaged this crater under the same illumination conditions (to within  $\pm 0.5^\circ$ ) to a 1980's report from Scotland:

*On 1980 Jan 26 at UT21:35-22:25 Blair (Renfrewshire, Scotland, 10" reflector, 83-276x, seeing=III-IV and transparency poor) discovered a bright spot on the north rim and through filters it "flashed" green, red and blue. Clouds interrupted observing, but when they cleared the effect was still present. Other craters did not show this effect. Cameron catalog ID=83 and weight=4. ALPO/BAA weight=3. [REF 3]*



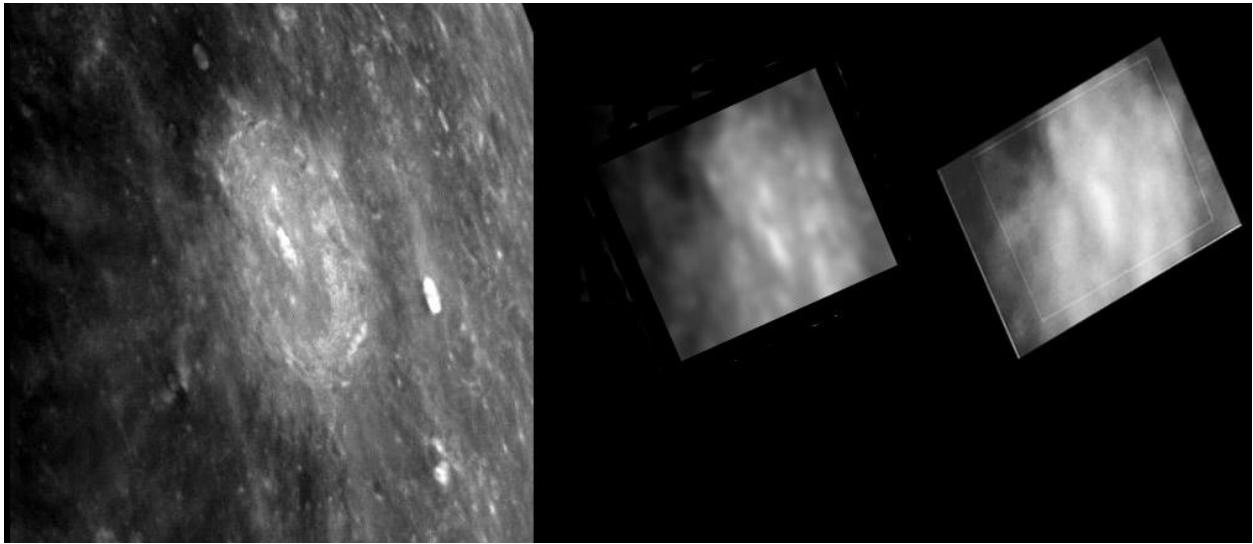
**Figure 4.** Proclus as imaged in monochrome by Franco Cardinali (AEA) on 2016 Sep 11 UT 01:01, and orientated with north towards the top.

We can certainly see the bright northern rim, in Fig 4 which Blair refers to as a bright spot. The question is, were the flashing colors that Blair saw atmospheric induced, and if so why did he not detect them on other features?

**Langrenus:** On 2016 Sep 11 UT 01:09 Desireé Godoy (AEA) imaged this crater under the same illumination conditions (to within  $\pm 0.5^\circ$ ) to a rather high weight LTP report by the famous professional planetary observer: Audouin Dollfus:

*On 1993 Jan 02 at UT 17:42 A. Dollfus (Meudon, France, 1m aperture telescope used) detected evidence for a dust cloud in Langrenus crater using CCD white light imagery and polarimetry. The ALPO/BAA weight=5. [REF 4]*

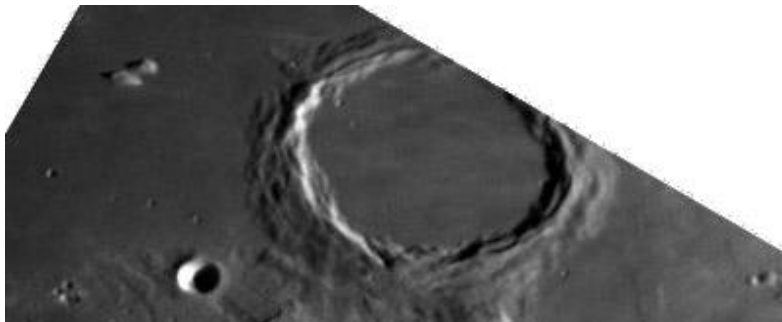
In Fig 5 I have taken a subsection out of Desireé's image (Fig 4 - Left), then blurred it (Fig 4 - Centre) to match the image resolution of the 1993 Jan 02 white light report, then compared it to the white light image by Dollfus (Fig 4 - Right). Can you see much difference which might indicate evidence for a dust cloud in white light? You can clearly see that the seeing conditions in Argentina in 2016 were better than they were with a 1 metre sized scope back in 1993 – however camera technology and imaging software have improved significantly since Dollfus' time. What we cannot comment upon is evidence that Dollfus found with the imaging polarimeter – for that a polarimeter would be needed such as was described in the paper by A. Fearnside, P. Masding, and C. Hooker: "Polarimetry of Moonlight: A new Method for Determining the Refractive Index of the Lunar Regolith" (2016) *Icarus*, 268, p156-171.



**Figure 5.** White light images of Langrenus crater, orientated with north towards the top. **(Left)** A 2016 Sep 11 UT 01:09 image by Desireé Godoy (AEA). **(Centre)** An artificially blurred version of Desireé’s image. **(Right)** A rotated and scaled white light image taken using a 1 metre diameter telescope at Meudon, France, by Audouin Dollfus on 1993 Jan 02 UT 17.7 - see Fig 3, from: Dollfus, A. (2000) Langrenus: Transient Illuminations on the Moon, Icarus, 145, 430-443.

**Archimedes:** On 2016 Sep 11 UT 04:00-04:05 Alberto Anunziato (AEA) imaged this crater under the same illumination conditions (to within  $\pm 0.5^\circ$ ) to a report published in the Moon and Planets journal:

*Archimedes 1973 Jan 13 UT 19:06-19:40 Observed by Theiss (51N, 9.67E, 75mm refractor) "Yellow to green colors at wall of Archimedes, became stronger until 19:09UT, constant brightness until 19:10UT and disappeared at 19:16UT" Ref: Hilbrecht & Kuveler (1984) Moon & Planets 30, pp53-61. ALPO/BAA weight=1. [REF 5]*



**Figure 6.** Archimedes as imaged by Alberto Anunziato (AEA) on 2016 Sep 11 UT 04:00-04:05 and orientated with north up. This has been cut out from a much larger regional image of the Montes Apenninus.

Alberto’s image (Fig 6), although in monochrome, does at least show what Theiss would have seen back in 1973, if they had been using a larger telescope. Winnie Cameron’s catalog does not include any of the LTP reports published in the above paper as most were made with small aperture telescopes. However it is still important to re-examine these low weight reports, under similar illumination in order to figure out what they were seeing.

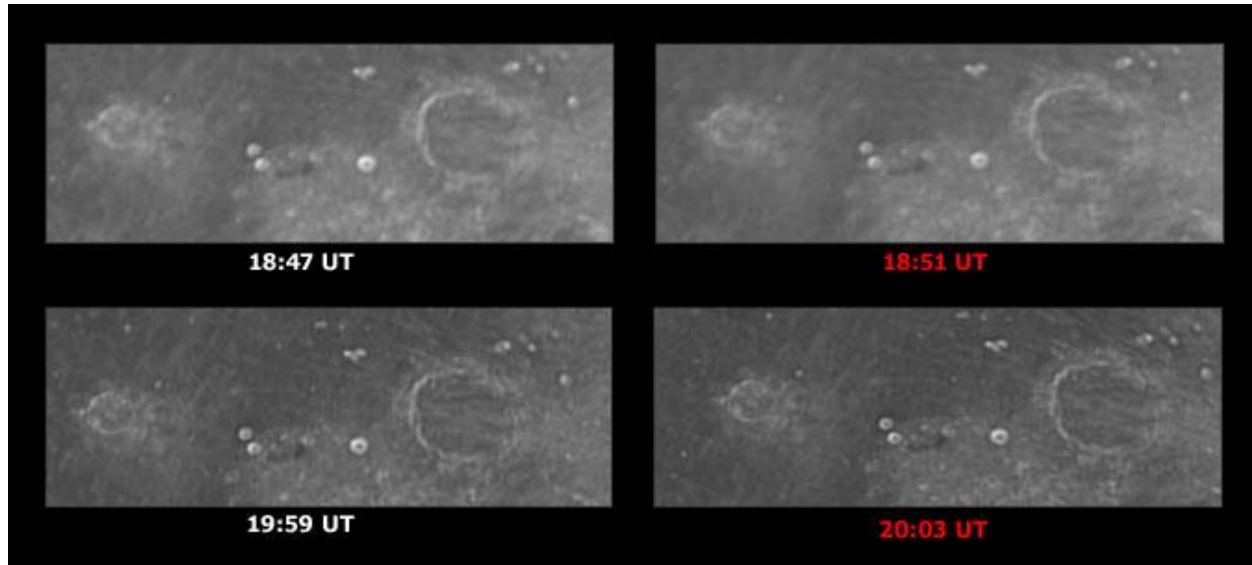
**Philolaus:** On 2016 Sep 14 UT 01:20-01:40 Jay Albert (ALPO) observed this crater under the same illumination conditions to the following 1948 report by Richard Baum:

*NE of Philolaus 1948 May 20 UT 22:00 Observed by Baum (Chester, England, 4.5" refractor) "Red glow". NASA catalog weight=3. NASA catalog ID #50. ALPO/BAA weight=3. [REF 6]*

Jay commented that I saw no “red glow” in or around the crater. The crater walls were sharply defined and there was a strip of shadow on the E floor and wall. However he was limited by the poor seeing. Jay used a 139x eyepiece on the Celestron Sky Prodigy 90mm, f/14 Maksutov he had taken with him on vacation to Maine.

**Timocharis:** On 2016 Sep 15 UT 18:47-20:03 Franco Taccogna (UAI) imaged this crater, and Marie Cook (BAA) observed visually (UT 22:35-22:45), under the same illumination conditions (to within  $\pm 0.5^\circ$ ) to a report of color in this crater, from 1955:

*Timocharis 1955 Jun 4-5 UT 23:30-00:00 Observed by Firsoff (Somerset, England, 5" reflector x70, seeing=poor) "Bright in red filter" NASA catalog weight=4. NASA catalog ID #595. ALPO/BAA weight=3. [REF 7]*



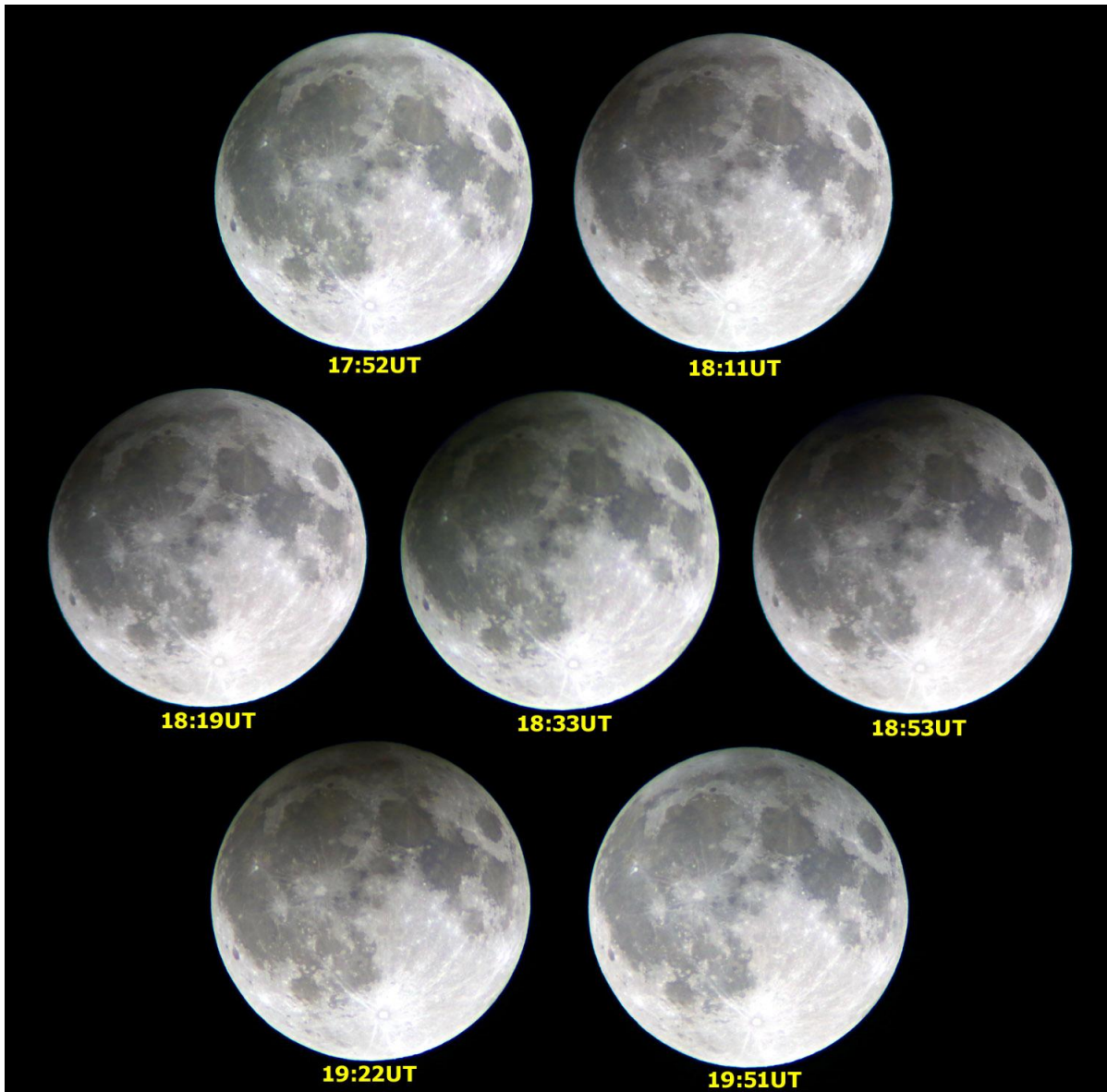
**Figure 7.** Timocharis appearing as a ghost-like crater on the left of each sub-image, with Archimedes on the right of each sub-image. Imaged by Franco Taccogna on 2016 Sep 15 and orientated with north towards the top. Images were taken in white light and through a red filter, as indicated by the color of the text used in the UT values above.

Firsoff reported color in this crater, also in Aug 1955, although on that occasion it was brighter in blue? You can compare white light and red filter images of the crater in Figure 7 and make up your own mind whether there is any indication of color. Marie Cook observed visually later in the evening from the UK and commented that the crater looked very slightly brighter in the red than in the blue, but there was hardly any difference.

**Penumbra Lunar Eclipse:** On 2016 Sep 16 UT 17:52-19:51 Colin Henshaw (BAA) imaged the eclipse. There are numerous accounts of LTPs during lunar eclipse, so I shall limit myself to penumbral reports and in this case repeat illumination and topocentric libration to within  $\pm 1^\circ$ :

*On 1959 Mar 24 at UT 1851 Chernov (Russia) observed the following in Oceanus Procellarum during a lunar eclipse: "During penumbra of ecl. separate light pts. were sharply glistening. Possibly connected with transparency of the penumbra. (time given was 0851 UT but must have been loc. time p.m. penum. phase started at 1756UT & umbral at 1916UT)". The Cameron 1978 catalog ID=717 and weight=2. The ALPO/BAA weight=1. [REF 8]*

Although I took some images from Newtown, UK, the Moon was so low down that I had to take them from the top floor of our house, and through a gap in between trees and surrounding hills – also the camera that I was using was digital compact digital camera, working on x7 zoom, and with automatic settings which I could not turn off – results were quite poor and definition was just good enough to show the “Man in the Moon” effect that you can see with the naked eye. Colin however was somewhat further south and hence had the Moon higher above the horizon. I have put together a sequence of his images in Fig 8, and you can see the penumbral shadow as a very faint smudge, reaching maximum official extent close to 18:54UT. Perhaps a hint of blue can be seen on the NNW limb at 18:53? But I cannot see anything which might represent Chernov’s “glistening effects” as seen in 1959 – unless it was ray craters and Chernov’s atmospheric seeing was bad?



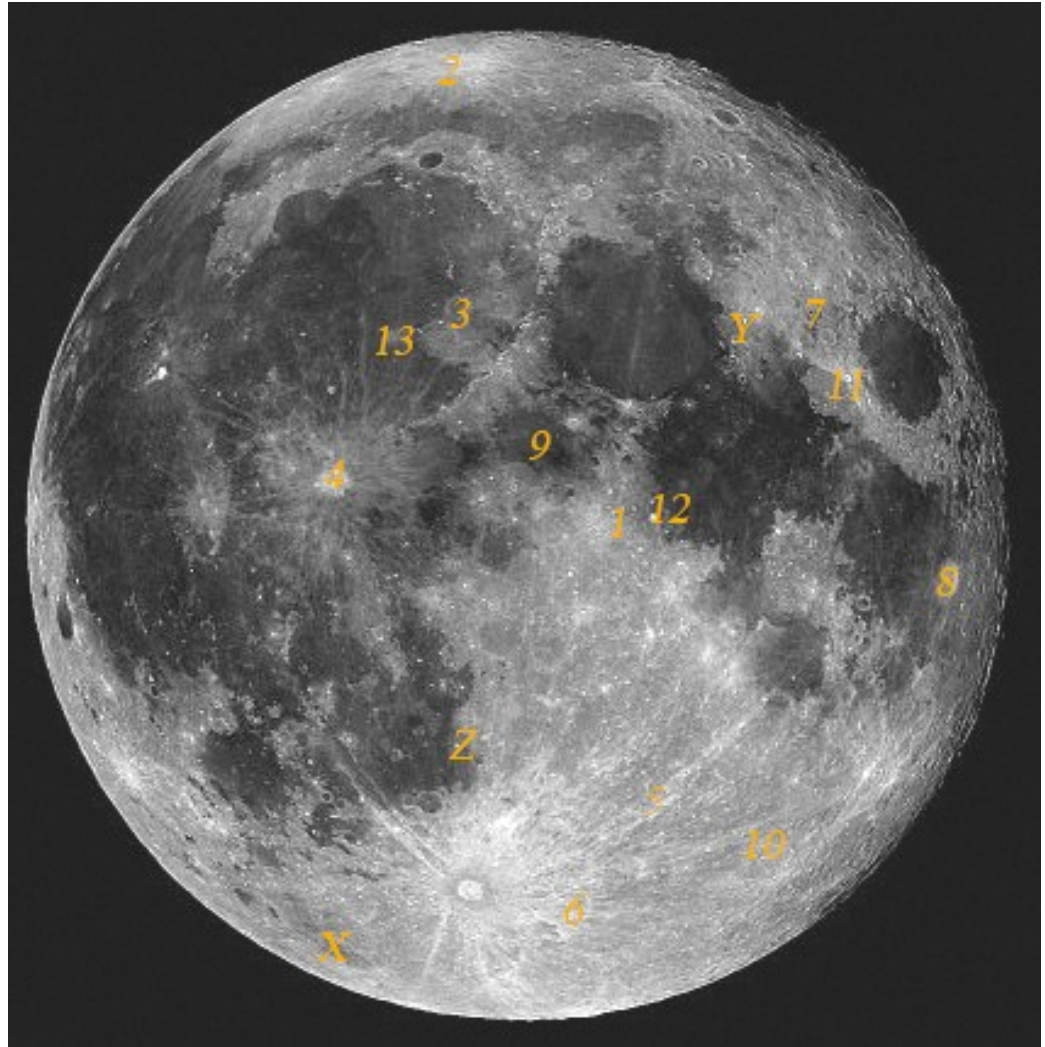
**Figure 8.** The Penumbra Lunar Eclipse of 2016 Sep 16 as imaged by Colin Henshaw (BAA), orientated with north towards the top. The images have been color normalized and then had their color saturation increased to 60%.

**General Information:** For repeat illumination (and a few repeat libration) observations for the coming month - these can be found on the following web site: [http://users.aber.ac.uk/atc/lunar\\_schedule.htm](http://users.aber.ac.uk/atc/lunar_schedule.htm) . By re-observing and submitting your observations, only this way can we fully resolve past observational puzzles. To keep yourself busy on cloudy nights, why not try “Spot the Difference” between spacecraft imagery taken on different dates? This can be found on: [http://users.aber.ac.uk/atc/tp/spot\\_the\\_difference.htm](http://users.aber.ac.uk/atc/tp/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> .

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

## KEY TO IMAGES IN THIS ISSUE

1. Agrippa
2. Anaxagoras
3. Archimedes
4. Copernicus
5. Gemma Frisius
6. Heraclitus
7. Lacus Bonitatis
8. Langrenus
9. Mare Vaporum
10. Metius
11. Proclus
12. Sabine
13. Timocharis



### **FOCUS ON targets**

- X = Schiller-Zuchius Basin**  
**Y = Montes Taurus & Taurus-Littrow Valley**  
**Z = Rupes Recta**