The Lunar Observer

A Publication of the Lunar Section of ALPO

Edited by David Teske: david.teske@alpo-astronomy.org
2162 Enon Road, Louisville, Mississippi, USA
Back issues: http://www.alpo-astronomy.org/

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Online readers, click on images for hyperlinks

In This Issue

Mare Crisium Focus-On observations due December 20, 2021

A warm greetings to all this October. I do hope that all is well with you and your loved ones. In the northern hemisphere, autumn is upon us and leaves are turning colors, which are a joy to behold. With this issue of *The Lunar Observer*, we explore the Moon in color with two vivid articles. The first is "Studies of the Moon Before the Telescope in Science and Art" (page 4) by Francis Graham. This is a fascinating and beautiful article exploring the Moon and just what was seen in times past. Also in this issue, Howard Eskildsen explores the "Color Saturation Enhanced Waning Gibbous Moon" (page 14). I really like his colorful image, especially the area around Lichtenberg. Please see for yourself. Also in this issue, Alberto Anunziato explores the little explored regions of Nonius, Dorsum Fontenelle and Montes Recti (with Sergio Babino). Alberto includes his drawings as does Robert H. Hays, Jr. in his article on Hippalus (page 11). These drawings are wonderful works of art featuring Luna. Rik Hill also leads us on a lunar excursion in the Southern Highlands. Tony Cook is doing double duty as he writes another interesting and thorough Lunar Geologic Change article plus is the new editor of the BAA (British Astronomical Association) *Lunar Circular*. Congratulations Tony! Plus there are many wonderful images of the Moon in the Recent Lunar Topographic Studies section. Many thanks to all who contributed to make this a wonderful, and indeed colorful issue of The Lunar Observer.

A reminder that the Focus-On submissions for the Lunar 100 numbers 91-100 are due by October 20, 2021 to Alberto and myself. Search for those images of Ina and Mare Marginis swirls! Also, please search your files for images of Mare Crisium for the following Focus-On study.

David Teske

Lunar Topographic Studies

Coordinator – David Teske - david.teske@alpo-astronomy.org
Assistant Coordinator– Alberto Anunziato albertoanunziato@yahoo.com.ar
Assistant Coordinator – William Dembowski - zone-vx@comcast.net
Assistant Coordinator – Jerry Hubbell – jerry.hubbell@alpo-astronomy.org
Assistant Coordinator-Wayne Bailey– wayne.bailey@alpo-astronomy.org
Website: http://www.alpo-astronomy.org/

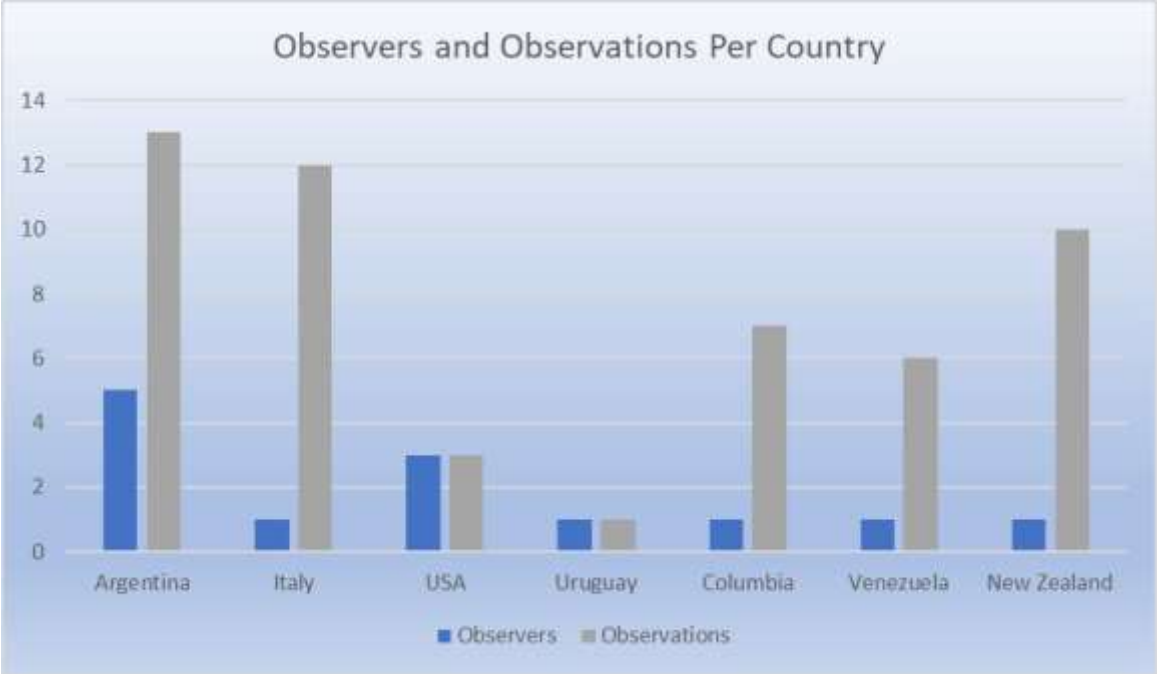
Observations Received

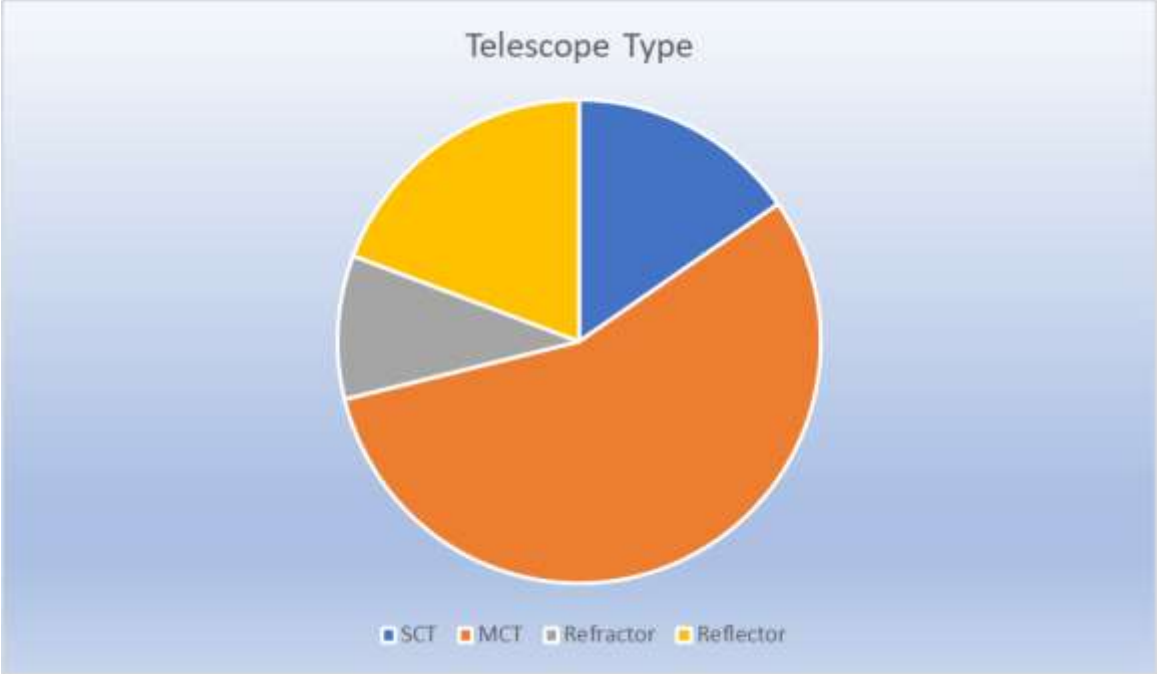
Name	Location and Organization	Image/Article
Alberto Anunziato	Paraná, Argentina	Articles and drawings *Nonius at the Terminator, Dorsum Fontenelle (and a Dome?)* and *A Trip to Montes Recti.*
Sergio Babino	Montevideo, Uruguay	Article and image *A Trip to Montes Recti.*
Jairo Chavez	Popayán, Colombia	Images of Petavius, 99% waxing gibbous Moon, waxing crescent Moon (2), Fabricius, Theophilus and Posidonius.
Maurice Collins	Palmerston North, New Zealand	Images of Petavius, Langrenus, Fracastorius, 4-day old Moon, Tycho, Aristarchus (2), Copernicus, Moretus and 11 day-old Moon.
Leonardo Alberto Colombo	Córdoba, Argentina	Images of Alphonsus, Full Moon and Archimedes.
Walter Ricardo Elias	Oro Verde, Argentina	Images of Mare Crisium and Atlas.
Howard Eskildsen	Ocala, Florida, USA	Article and image *Color Saturation Enhanced Waning Gibbous Moon.*
Francis Graham	East Liverpool, Ohio, USA	Article *Studies of the Moon before the Telescope in Science and Art.*
Robert H. Hays, Jr.	Worth, Illinois, USA	Article and drawing *Hippalus.*
Rik Hill	Loudon Observatory, Tucson, Arizona, USA	Article and image *Playing Fair*.
Eduardo Horacek-Esteban Andrada	Mar del Plata, Argentina	Images of Herodotus and Theophilus.
Jesús Piñeiro	San Antonio de los Altos, Venezuela	Images of Plato, Sinus Iridum, Tycho,, Archimedes, Clavius and Copernicus.
Fernando Surà	San Nicolás de los Arroyos, Argentina	Images of Alphonsus, Messier, Mare Imbrium and Montes Apenninus.
Fabio Verza	Milan, Italy	Images of Copernicus, Sinus Iridum, Gassendi, Schickard, Aristarchus, Byrgius, Mare Crisium, Janssen, Petavius, Messier, Posidonius and Theophilus.

Many thanks for all these observations, images, and drawings.

October 2021 *The Lunar Observer*
By the Numbers

This month there were 52 observations by 13 contributors in 7 countries.





STUDIES OF THE MOON BEFORE THE TELESCOPE IN SCIENCE AND ART

Francis Graham
Kent State University

How much of the Moon can be seen without a telescope? I wondered about this question.

Plutarch guessed from his observation that there are mountains on the Moon, which cast long shadows, as does a mountain he was familiar with, Mt. Athos, which casts a long shadow across the Aegean at sunset. But did he use a primitive telescope? To understand how much of the Moon can be seen without a telescope, I decided to look at the Dutch realist landscape painters. This is Turner's Keelmen by Moonlight:

The above shows only slight detail on the full moon, and is almost an impressionistic painting. Aert Van Der Neer did a much better rendition of the full moon which showed much more detail.

Here is some of his work:

Van der Neer liked very much to paint moonlit scenes, and one sees in his paintings the features of the Moon visible with the unaided eye, above, the Sea of Serenity and Tranquility.

Unfortunately he often covers the Moon with clouds. But below, in "Night Landscape with a River, Van der Neer shows much of the Moon seen with the unaided eye, including Oceanus Procellarum. Although Van Der Neer painted about thirty years after the invention of the telescope, I doubt if he ever looked through one.

Definitely before the invention of the telescope, Elsheimer's "Flight to Egypt" shows the Holy Family against a backdrop of a wonderful moonlit starry sky, a breathtaking masterpiece of art. This was painted in 1609, and shows a crisp, clear pre-Telescopic moon. Oceanus Procellarum is shown, as well as the eastern Maria: Serenitatis, Tranquillitatus, Foecuditatus. And LOOK CLOSELY: You can see Mare Crisium as well!!

Here is this truly breathtaking and ground-breaking landscape:

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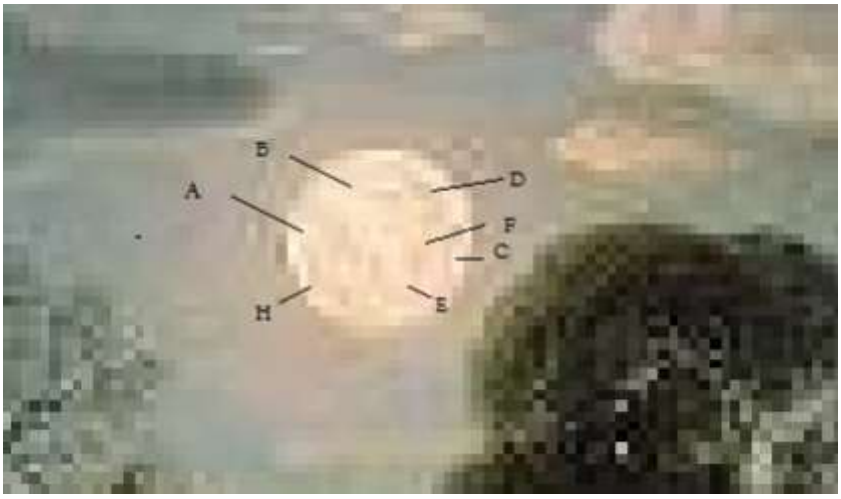


Flight into Egypt: detail. A Oceanus Procellarum; B Imbrium; C Crisium ; D Serenity & Tranquility; F--Foecunditatus; E Nectaris; H Humorum.

Also there was Tintoretto's "The Moon and the Hours" in 1580. Unfortunately, this painting was destroyed in World War II.

Here are some other pre-telescopic Moon paintings:

"Nativity", part of "Adoration of the Magi" by Gentile da Fabriano

"Miracle of the Host" by Paolo Uccello (1397-1475)

"Pan" by :uca Signorelli (1441-1523) painting at Berlin.

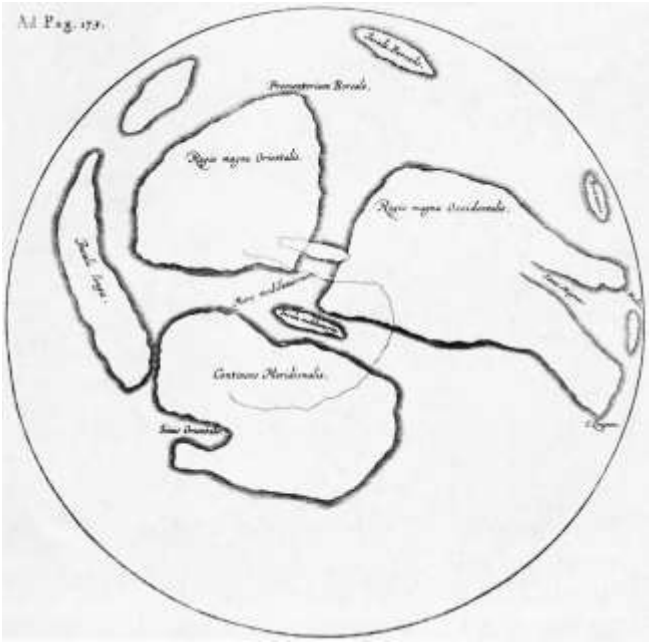
"Rain of Blood and Fire" also by Signorelli painting at Orvieto

"St. Peter" by Giovanni Santi (1440-1494) painting at the Vatican

"Judith" by Lorenzo Lotto (1480 - 1556) painting at Santa Maruia Maggiorw at Beigamo

All of the above are artistic studies. There was one notable scientific study of the selenography of the Moon by William Gilbert, more famously known for his book *De Magnete* describing what was then known about magnetism. Gilbert's 1603 map of the Moon is below, and a poster of it is available from Walmart, interestingly enough.

Gilberts moon map is below:



Procellarum is shown with Mare Imbrium; also the Serenity-Tranquility-Fecundity sequence, and Mare Crisium also. Perhaps he also caught the far eastern limb crater Petavius as well. He of course gave them different names. The southern feature corresponds to a blur of Nectaris and Humorum.

This is how the Moon was studied before the invention of the telescope.

One last question remains unanswered. It is well known that the Moon appears larger near the horizon, the famous Moon Illusion. But: can more detail be seen when this is so? One should think not, since the optical resolution should be constant. But then: does the brain "make up", or imagine additional detail? This question remains unanswered.

Acknowledgement To the staff of the University of Pittsburgh's Art Library located in the Frick Hall of Fine Arts, for help with the references used below.

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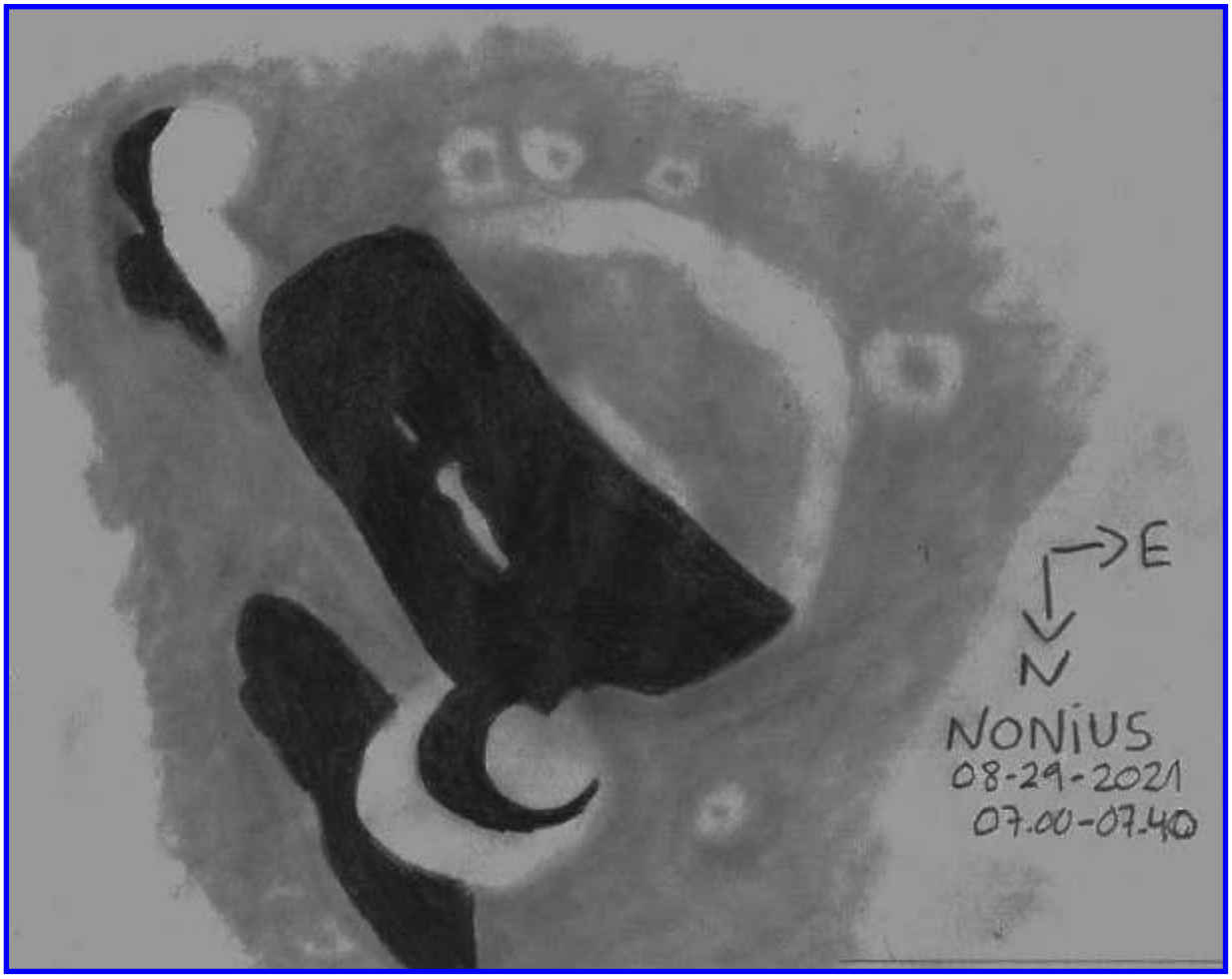
Nonius at the Terminator

Alberto Anunziato

Nonius is a pre-Imbrian 70 km diameter crater in the battered southeast of Mare Imbrium, an area of ancient craters, badly damaged and difficult to identify. What caught my attention at the time of observation was that the shadow line separated the interior of Nonius almost in half and was perfectly straight. I found it so remarkable, that I struggled for a long time to identify the crater by name… they are all so similar in the south! The walls of Nonius seem to be quite high, because of how the east wall shines and the bright spots that appear in the shadows that occupy the west part of the crater, where the west wall is located. Around Nonius there are a series of craterlets that are obviously younger than Nonius, not only by application of the stratigraphic principle but because both Nonius A (next to the east wall) and Nonius F and Nonius R on the south wall present what we do not see in the other craters around Nonius: the bowl shape of a more recent crater that we can glimpse from its dark interiors. To the north Nonius is bordered by two superimposed craters: Nonius K on Nonius L. Nonius K appears to be deep because it is almost completely covered in shadows. To the west we have two quite ancient craters partially covered by shadows, Nonius B to the north and an unnamed one to the south. If we go back to Nonius, the bright band that is observed parallel to the shadow line of the terminator would coincide with a very small elevation in the center of the crater, which illuminated by such an oblique light shines brightly.

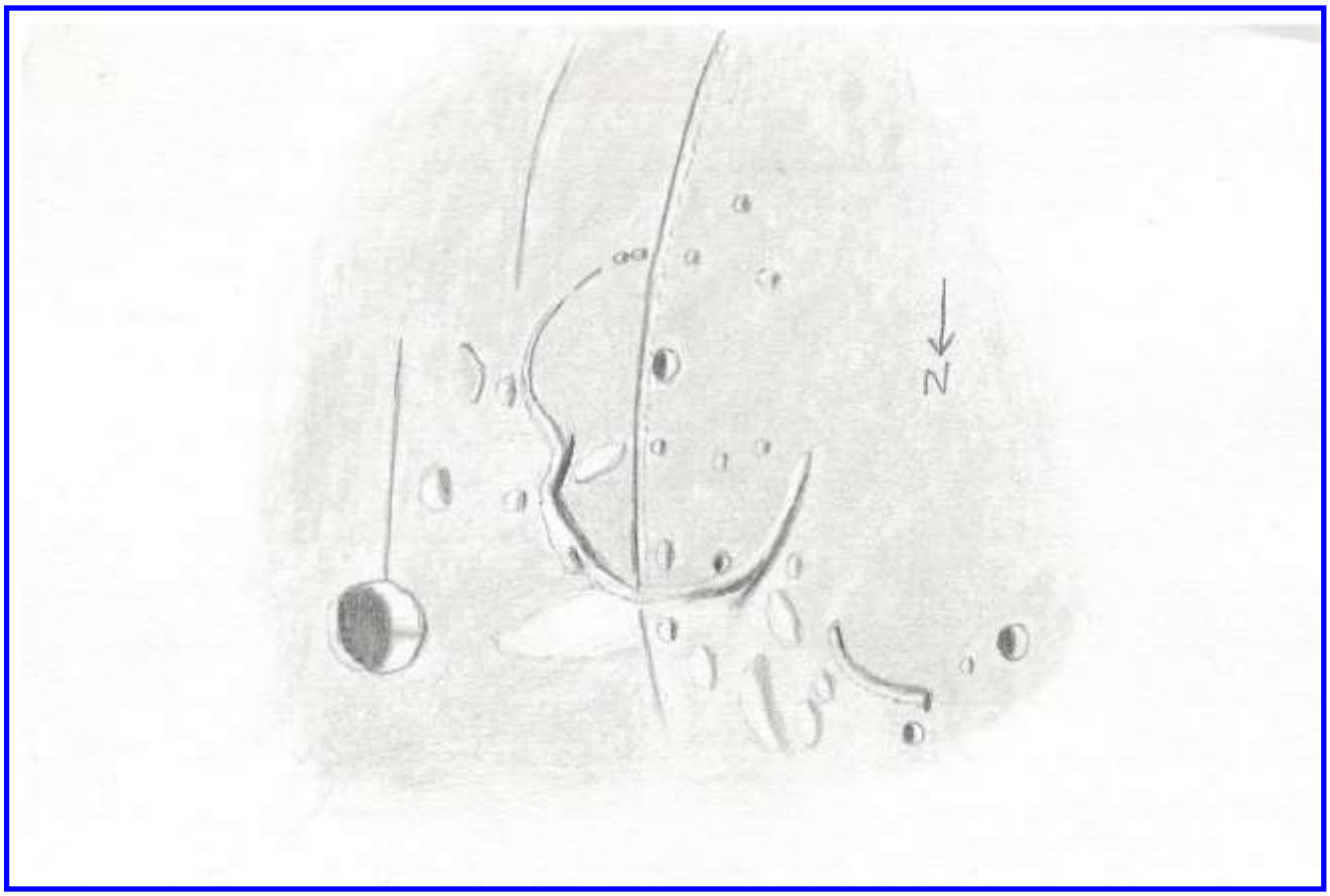


Nonius, *Alberto Anunziato, Paraná, Argentina. 2021 August 29 07:00-07:40 UT. 105 mm Meade EX Maksutov-Cassegrain telescope, 154 x.*

Hippalus

Robert H. Hays, Jr.

I observed this crater and vicinity on the evening of May 22/23, 2021. Hippalus is located on the east side of Mare Humorum. Its southwest rim has been obliterated by the mare. The north rim looks substantial, but with some irregularities. An old ring indents the east side. South of this old ring, the remnants of Hippalus are narrow ridges and detached peaks. A long, gently curving rille bisects Hippalus from south to north. This conspicuous rille is labeled Hippalus I on the Lunar Quadrant map. It is an easy target within and south of Hippalus, but it is weaker north of the crater. It is not evident at the north rim. Hippalus B is the modest crater just west of this rille with Hippalus, and two peaks are farther north along the rille. The pit Hippalus C is just inside the north rim of Hippalus, and two more peaks are to its south. A low mound is between Hippalus I and the ring indentation. A small peak just west of Hippalus I may be a remnant of Hippalus' south rim, but another peak appears to be slightly outside any ring extension. An isolated peak is south of this pair. Hippalus II is the shorter, narrower rille east of Hippalus I, according to the Lunar Quadrant map. This rille is also slightly curved, and is parallel to Hippalus I. Four detached peaks are north of Hippalus II, and may be associated with the old ring east of Hippalus. The large crater northeast of Hippalus is Agatharchides A. This crater is symmetrical except for a blunt point on its southeast rim. Agatharchides A also has a fuzzy band across its floor. This band is not sharply defined as a shadow would be. Hippalus III is the modest rille south of Agatharchides a. The rille is straight, and is not parallel with the others. A bright patch is along the northeast rim of Hippalus and east of Hippalus I. The conspicuous crater to the northwest is Hippalus A, and a small pit is to its northeast. A curved ridge nearby is likely the broken crater Hippalus D. An assortment of peaks and mounds are between Hippalus D and Hippalus I.



Hippalus, *Robert H. Hays, Jr. May 23, 2021 03:34-04:28 UT. 15 cm reflector telescope, 170 x. Seeing 8/10, transparency 6/6.*

Dorsum Fontenelle (and a Dome?)

Alberto Anunziato

On the left we see Fontenelle, with its interior completely in shadow and its bright walls, especially the northwest sector. What interested me at the time of observation was to portray the wrinkle ridge that runs towards the interior of Mare Frigoris, in which different bright sectors were perceived in the upper part of the crest. To the east we see a series of bright spots that are peaks emerging from the lava. At the time of observation, the wrinkle ridge was seen as being made up of a main segment that runs to the east and a secondary segment that seems to detach from the main one and joined it with the main mountainous outcrop. The funny thing is that this secondary segment does not appear in any atlas or in the "Map of lunar wrinkle ridges" of the LRO Quickmap. Had I discovered a new wrinkle ridge? No, what it appears to be is a dome or some kind of elevation, clearly visible on IMAGE 2, an excerpt from the Lunar Reconnaissance Orbiter Quickmap. In IMAGE 2 I added the profile of the LOLA altimeter, in which we see that the elevation is much higher than the wrinkle ridge to the west, so I perceived it as a bright area that linked the supposed main segment of the wrinkle ridge with the largest mountain peak. It is curious that the "dome" is higher than the wrinkle ridge but that the ridge has the brightest areas in its highest points. In the area there are two domes, according to the Geological Lunar Researches Catalog of Lunar Domes (Charles Kapral and Robert Garfinkle): Fontenelle 1 (longitude -17.22 latitude 60.00) and Fontenelle 2 (longitude -17.52 latitude -59.35), which do not seem to coincide with the data provided by the LRO Quickmap for the elevation east of Dorsum Fontenelle (longitude -15.93 latitude 62.03). But IMAGE 2 shows what looks like a dome at first glance. We will have to keep looking.

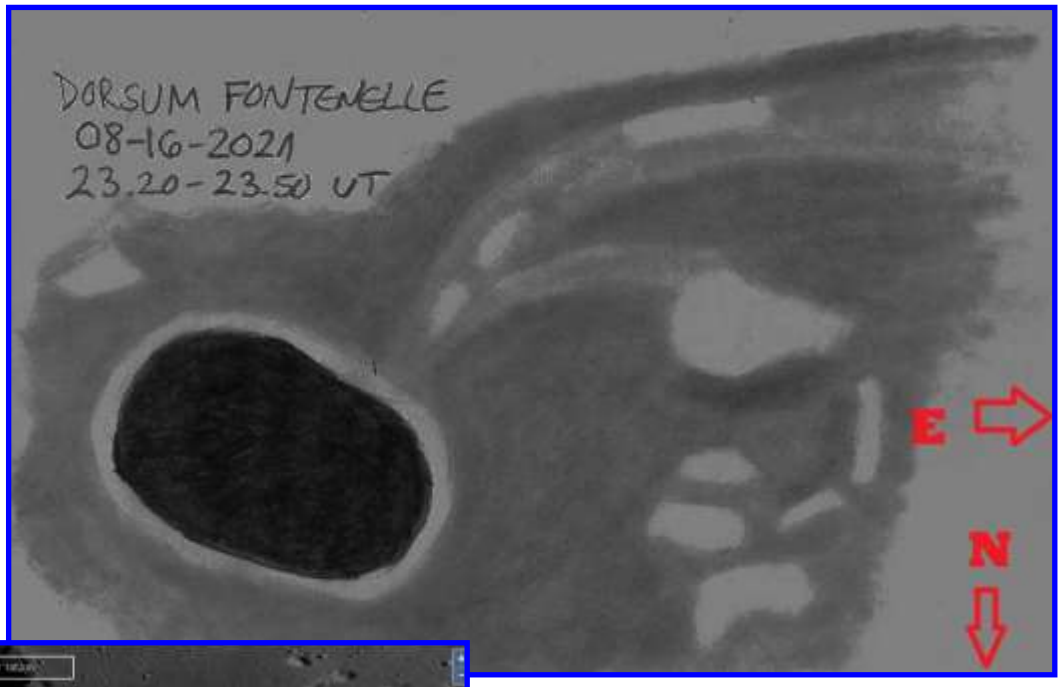


Image 1. Dorsum Fontenelle, *Alberto Anunziato, Paraná, Argentina. 2021 August 16 23:20-23:50 UT. 105 mm Meade EX Maksutov-Cassegrain telescope, 154 x.*

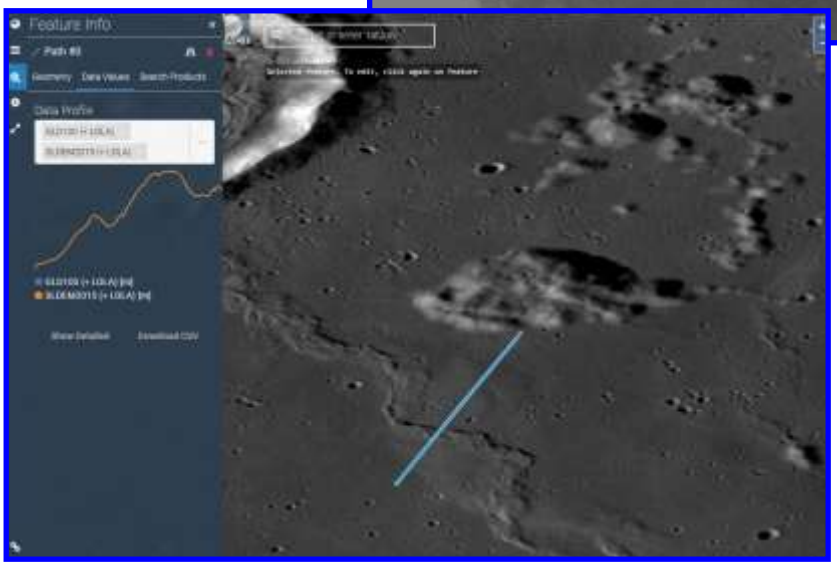


Image 2. Dorsum Fontenelle, *LRO QuickMap.*

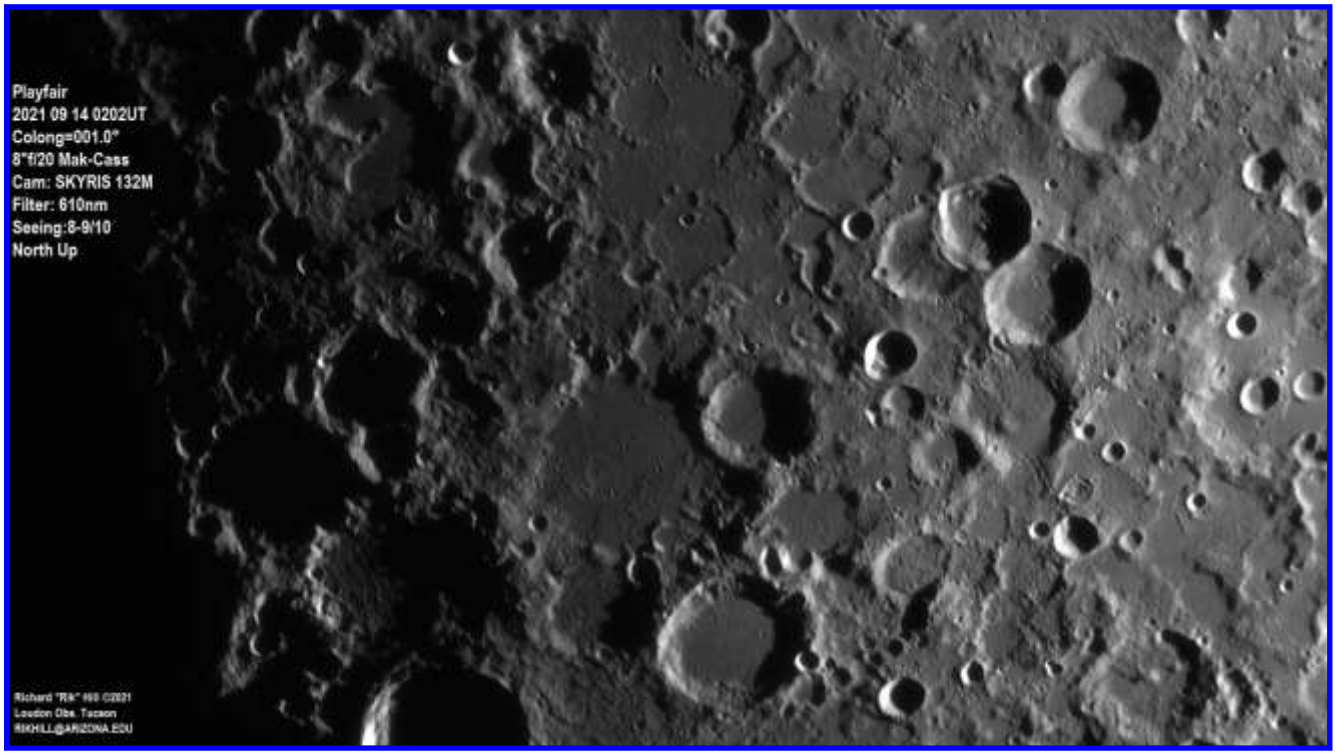
Playing Fair

Rik Hill

There are so many wonderful things to see in the lunar southern highland region around the crater Playfair (49 km dia.) seen here in the middle of this image half filled with shadow cast on its flat floor. Below it is a larger crater of similar morphology Apianus (65 km). Then to the upper right from Playfair are the twin craters Azophi (49 km) south and Abenezera (43 km) north. Notice the sharp central peak in the latter crater with sunlight catching the very tip and the straight northern wall. It overlaps an older crater that has some interesting striations on its floor. To the upper right of these is the crater Geber (46 km) with an interesting slump on the interior of its southern wall. South of Azophi on the lower edge of the image is the crater Pontanus (60 km) with a central mound rather than a true peak. It's the oldest crater mentioned so far between 3.92 and 4.55 billion years old. Between Pontanus and Azophi is a well-defined young crater Pontanus D (20 km). Just above it is an interesting double walled crater Pontanus E (13 km) and to the left of that are two of that are two parallel old heavily eroded unnamed catenae.

Going left from Playfair to the terminator we see half a crater at the lower edge of the image. This is Aliacensis (82 km) and above it is Werner (71 km) and further up is the flat floored Blanchinus (70 km) with nice shadows of the peaks of its crater wall on the floor. Next, you'll notice four shadow filled craters in a diagonal row of descending diameters. The lower, larger one is La Caille (70 km), the next one up is Delaunay (48 km), then Faye (37 km) with a tiny central peak tip catching sunlight and lastly Donati (37 km). The interesting thing here is just below La Caille and to the left of Blanchinus is the well-known fleeting "Lunar X" formed by the walls of these two craters. This is about two hours after it would have been Best seen but it still can be made out.

Of course, as usual at this resolution (1 km) there's a lot more to see here. Enjoy the exploration!



Playfair, *Richard Hill, Loudon Observatory, Tucson, Arizona, USA. 2021 September 19 02:02 UT, colongitude 1.0°. 8 inch f/20 TEC Maksutov-Cassegrain telescope, 610 nm filter, SKYRIS 132M camera. Seeing 8-9/10.*

Color Saturation Enhanced Waning Gibbous Moon

Howard Eskildsen

This two-image composite was taken with Canon 60D camera at prime focus mounted on a Celestron C 9.25 Schmidt-Cassegrain telescope. They were processed with Registax wavelets and two images were combined using Photoshop. The color saturation was enhanced with the Hue/Saturation function, and the enhanced image was saved separate from the original composite. The enhanced image suffered some loss of contrast and detail over brighter regions such as Copernicus and Tyco, so the unenhanced image was stacked over the colorized image. The unenhanced layer was adjusted to about 27% opacity to allow the color to show through while preserving detail and contrast.

The color variations are most pronounced in the maria regions and are related to composition of various flows. The darker blue/purple areas correspond to higher titanium levels while the reddish brown correspond have relatively low titanium as revealed by Clementine Color-ratio images and by LRO titanium basemap images. Clementine UVVIS FeO (iron oxide) maps show high iron content in all the mare regions while the highlands area relatively low in iron. (Source: LROC QuickMap.)

The color variations reveal some boundaries between lava flows of different ages as well. A particularly notable example can be seen by the crater Lichtenberg which lies on a boundary between red/brown and blue-colored terrain which appears above and to the left of the Aristarchus plateau on this image. The crater has rays over the red/brown terrain, but none over the blue terrain. Heisinger crater count data indicate an age of 3.5 billion years for the red/brown terrain and 1.7 billion years for the blue, which buried the southern rays from Lichtenberg. If these dates hold up, it would indicate that the rays are compositional in nature since they must be older than 1.7 billion years.

The lighter areas of the highlands correspond with high plagioclase abundance per Kaguya imagery displayed on QuickMap but are also low in iron. This makes sense since the highlands are primarily anorthositic. However, some of the reddish brown (higher iron) material seems to mix with the pale highland materials. Perhaps this is from intermixing of ejecta or from cryptomaria being uncovered by later impacts. However, there are probably other causes as well, and it is likely that several different processes combine to produce highland color variations.

Please see image on the following page.

Waning Gibbous Moon, 2021/09/25, 09:08 UT, Colongitude 138.3
Seeing 8/10, Transparency 4/6, C9.25 Schmidt-Cassegrain, f/10, FL 2395mm
Canon 60D Camera, Prime Focus, No Filter, Color Saturation Enhanced with Photoshop
Howard Eskildsen, Ocala, Florida, USA

A Trip to Montes Recti

Sergio Babino and Alberto Anunziato

I always had a kind of fascination for the Montes Recti. There is not much we can read about this miniature mountain range (at least when compared to other mountains on the Moon) in the north of Mare Imbrium, 50 kilometers from the "shore". It seems to me that I only share my fascination with Peter Grego, who in his wonderful "The Moon and How to Observe It" (Springer, 2005) describes our mountain range as follows: "Montes Recti is one of the Moon's most remarkable-looking mountain ranges. Oriented precisely east – west, this 78-km long bar of mountains averages 20 km wide, and has at least 20 individual peaks, the highest of which rise to 1,800 m. Looking much like a large, segmented centipede, the range displays a structure that reflects the radial impact sculpting of the Imbrium basin. A sizable crater, 8 km wide, dents the eastern end of the range". Montes Recti is one of the many peaks that define a large circle that marks one of the inner basin rings of the Imbrium impact, as Teneriffe, Mons Pico and Montes Spitzbergen. Being a strip of 20 kilometers wide that extends east-west, the illumination of the Sun is never oblique and therefore it is not easy to observe. Anyway, with my little 4-inch Maksutov it looks beautiful, like a necklace of little pearls shining in the sun. Very nice, but… what will it be like to explore Montes Recti? How are these mountains in detail? Good lunar images have an extra value, their sharpness allows us to zoom in on the details and discover aspects of the surface that escape a global examination, thus contributing to expand our knowledge. This spectacular panorama (IMAGE 1) by Sergio Babino, centered on Plato, is a good example, by zooming in you will find a lot of information, as can be seen in IMAGE 2, which is a very interesting detail of the shape of Montes Recti, which it even allows you to zoom in and see in even more detail.

Image 1, Plato and Montes Recti, *Sergio Babino, Montevideo, Uruguay. 2019 December 08 00:32 UT. 203 mm catadrioptic telescope, ZWO ASI174 mm camera.*

Let's start from the top down (from west to east). In the extreme west is the highest peak that Grego speaks of, identified as 1 in IMAGE 3. We see that it casts a shadow, in what looks like a cliff, and we observe details of its structure and a secondary peak shining on its right slope. After peak 1 there appears to be an elevation with a crater at the top (12), followed by a peak (2) lower than 1 but also casting a shadow to the west. A series of bright spots would indicate other peaks (3, for example), surrounding what appears to be a crater (11) or a hollow. After 3 (very bright) there appears to be a valley surrounded by hills (10), then a series of peaks separated by gorges (4, 5 and 6 for example). The crater that Grego mentions is the one indicated with the number 9, which is clearer in the overall image. Montes Recti ends, at its eastern end, as it begins at its western end (1), with a high peak (7) that shines even brighter than the highest 1, casting a shadow on a cliff (8). What will it be like to hike through those mountains on the Moon?

Image 2, Plato and Montes Recti, *Sergio Babino, Montevideo, Uruguay. 2019 December 08 00:32 UT. 203 mm catadrioptic telescope, ZWO ASI174 mm camera. Close-up of image 1.*

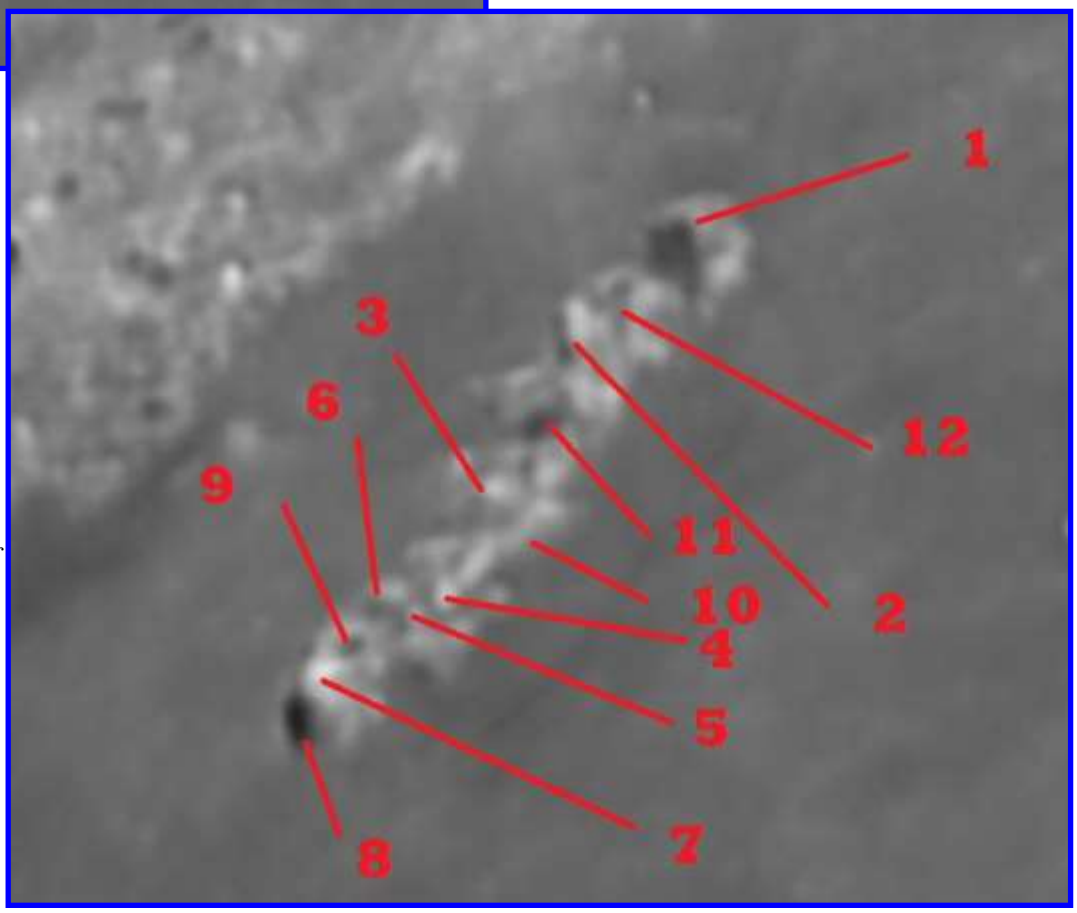


Image 3, Plato and Montes Recti, *Sergio Babino, Montevideo, Uruguay. 2019 December 08 00:32 UT. 203 mm catadrioptic telescope, ZWO ASI174 mm camera. Close-up of image 1, image 2 labeled.*

Rheita Valley, *Elias, Walter Ricardo - Oro Verde, Argentina . 2021 September 12 22:53 UT. Helios 114 mm x 900 mm reflector telescope QHY5-IIC camera.*

4-Day Old Moon, *Maurice Collins, Palmerston North, New Zealand 2021 September 11 07:41-07:47 UT. FLT 110 mm refractor telescope, f/21, QHY5lll462C camera.*

Copernicus, *Fabio Verza, Milan, Italy. 2021 August 30 05:29 UT. Celestron SE 4 inch Maksutov-Cassegrain telescope, Baader Neodymium IR Block filter, ZWO ASI 290mm camera.*

Petavius, *Maurice Collins, Palmerston North, New Zealand 2021 September 11 07:54 UT. FLT 110 mm refractor telescope, f/21, QHY5lll462C camera.*

Fracastorius, *Maurice Collins, Palmerston North, New Zealand 2021 September 11 07:48 UT. FLT 110 mm refractor telescope, f/21, QHY5lll462C camera.*

Gassendi, *Fabio Verza, Milan, Italy. 2021 August 31 05:03 UT. Celestron SE 4 inch Maksutov-Cassegrain telescope, Baader Neodymium IR Block filter, ZWO ASI 290mm camera.*

Aristarchus, *Maurice Collins, Palmerston North, New Zealand 2021 September 18 10:52 UT. Celestron 8 inch Schmidt-Cassegrain telescope, 2x barlow, QHY5lll462C camera.*

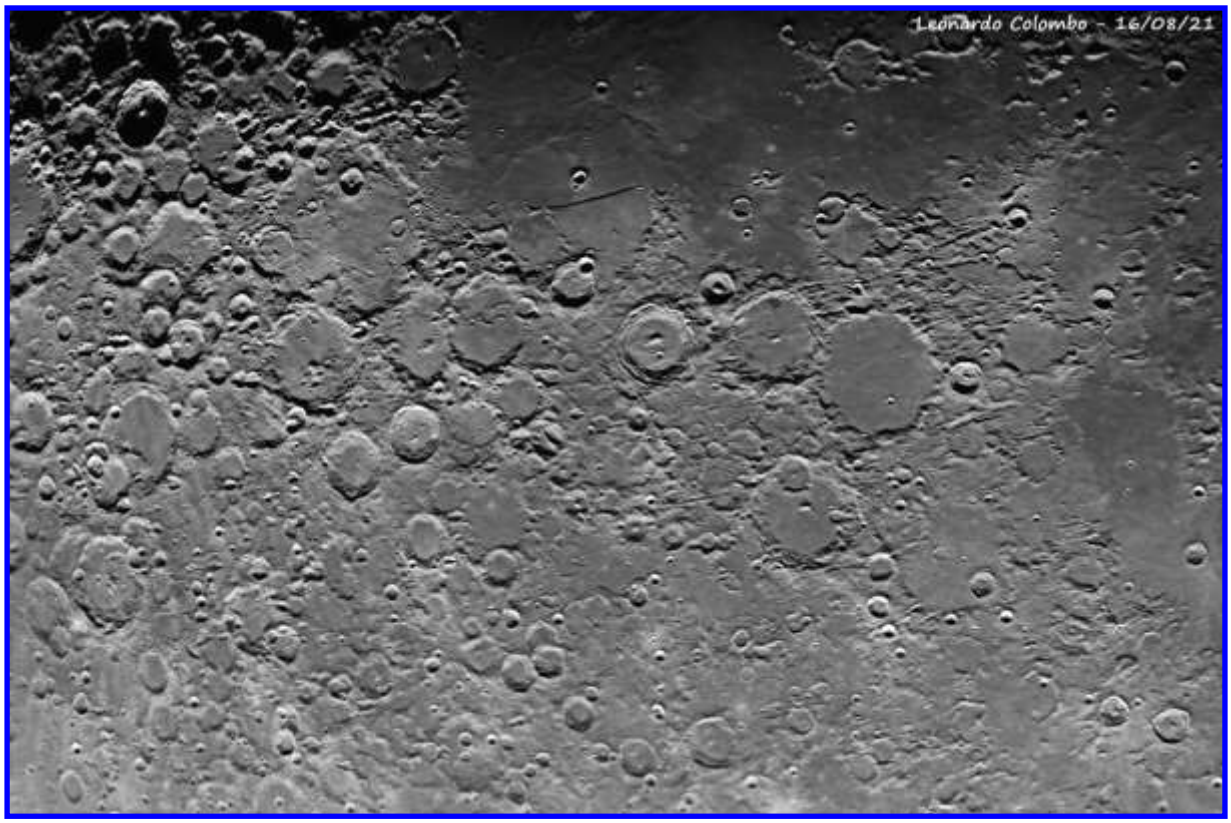
99% Waxing Gibbous Moon, *Jairo Chavez, Popayán, Colombia. 2021 August 21 23:57 UT. 311 mm truss tube Dobsonian reflector telescope, Moto E5Play camera.*

Sinus Iridum, *Fabio Verza, Milan, Italy. 2021 August 30 05:36 UT. Celestron SE 4 inch Maksutov-Cassegrain telescope, Baader Neodymium IR Block filter, ZWO ASI 290mm camera.*

Langrenus, *Maurice Collins, Palmerston North, New Zealand 2021 September 11 07:53 UT. FLT 110 mm refractor telescope, f/21, QHY5lll462C camera.*

Tycho, *Maurice Collins, Palmerston North, New Zealand 2021 September 18 10:56 UT. Celestron 8 inch Schmidt-Cassegrain telescope, 2x barlow, QHY5lll462C camera.*

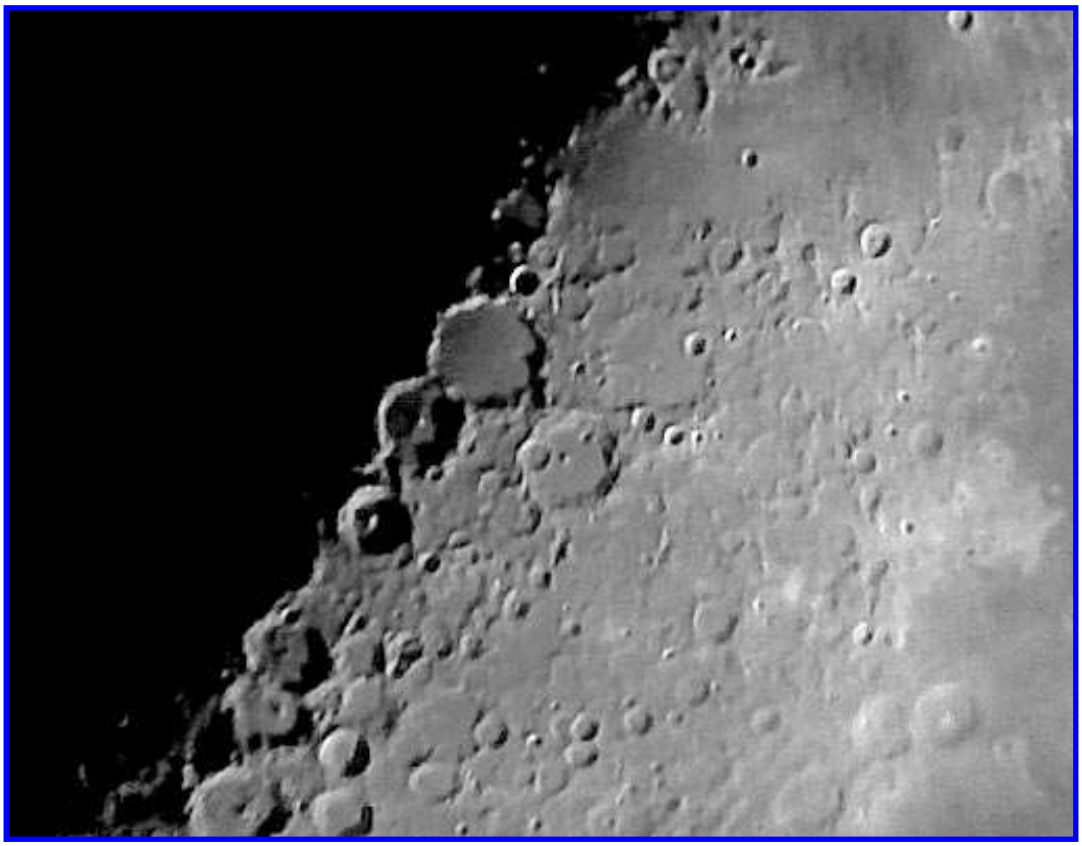
Alphonsus, *Leonardo Alberto Colombo, Córdoba, Argentina. 2021 August 17 02:18 UT. 102 mm Maksutov-Cassegrain telescope, !R pass 650 nm filter, QHY5LII-M camera.*



Herodotus, *Eduardo Horacek-Esteban Andrada, Mar del Plata, Argentina. 2021 August 20 00:22 UT. 150 mm Maksutov-Cassegrain telescope, Canon EOS Rebel T5i camera.*

Sinus Iridum, *Jesús Piñeiro, San Antonio de los Altos, Venezuela. 2021 August 17 23:59 UT. 90 mm Maksutov-Cassegrain telescope, ASTRONOMIK L2 UV-IR 2" filter, ZWO ASI533MC camera.*

Schickard, *Fabio Verza, Milan, Italy. 2021 August 31 05:32 UT. Celestron SE 4 inch Maksutov-Cassegrain telescope, Baader Neodymium IR Block filter, ZWO ASI 290mm camera.*



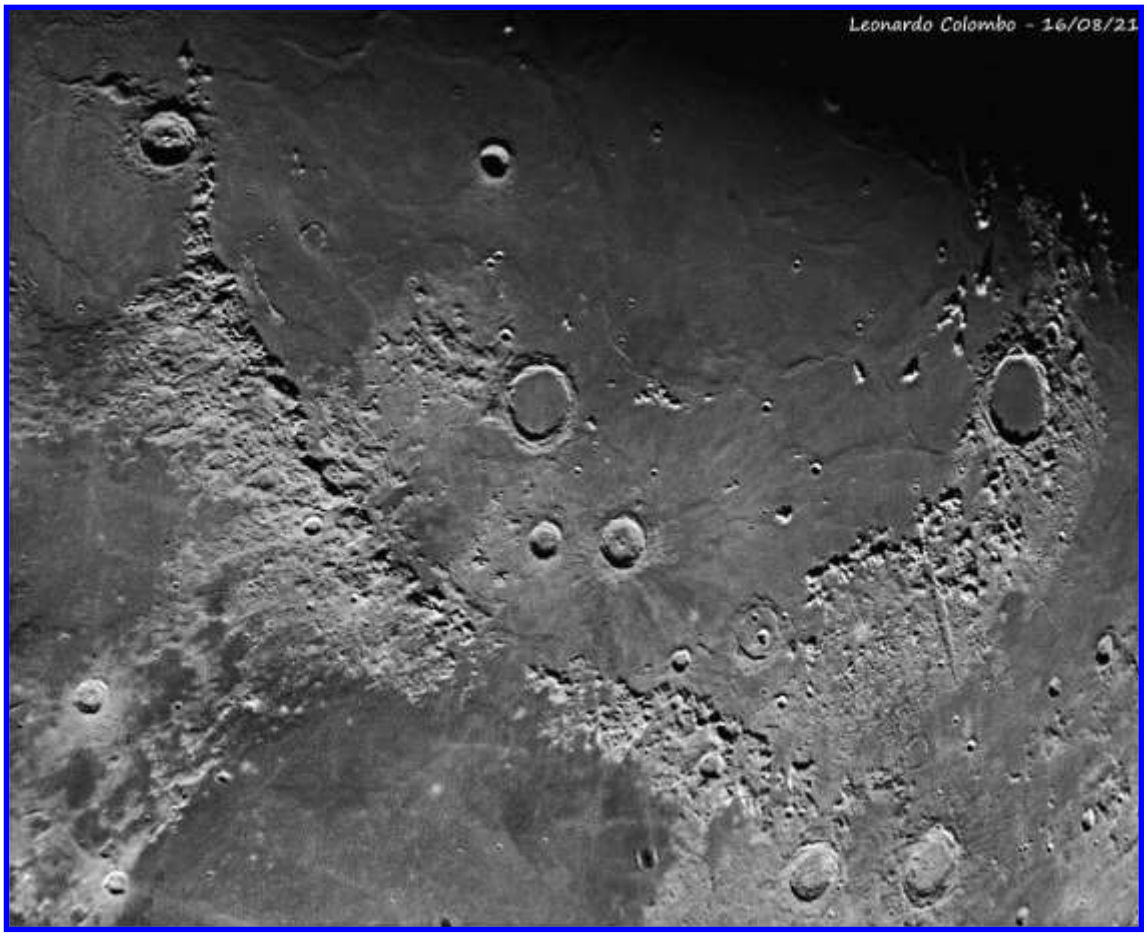
Alphonsus, *Fernando Surà, San Nicolás de los Arroyos, Argentina. 2021 April 29 01:46 UT. 127 mm Maksutov-Cassegrain telescope, J7 cell phone camera.*

Aristarchus, *Maurice Collins, Palmerston North, New Zealand 2021 September 18 10:43 UT. Celestron 8 inch Schmidt-Cassegrain telescope, 2x barlow, QHY5lll462C camera.*

Petavius, *Jairo Chavez, Popayán, Colombia. 2021 September 10 23:12 UT. 311 mm truss tube Dobsonian reflector telescope, Moto E5Play camera.*

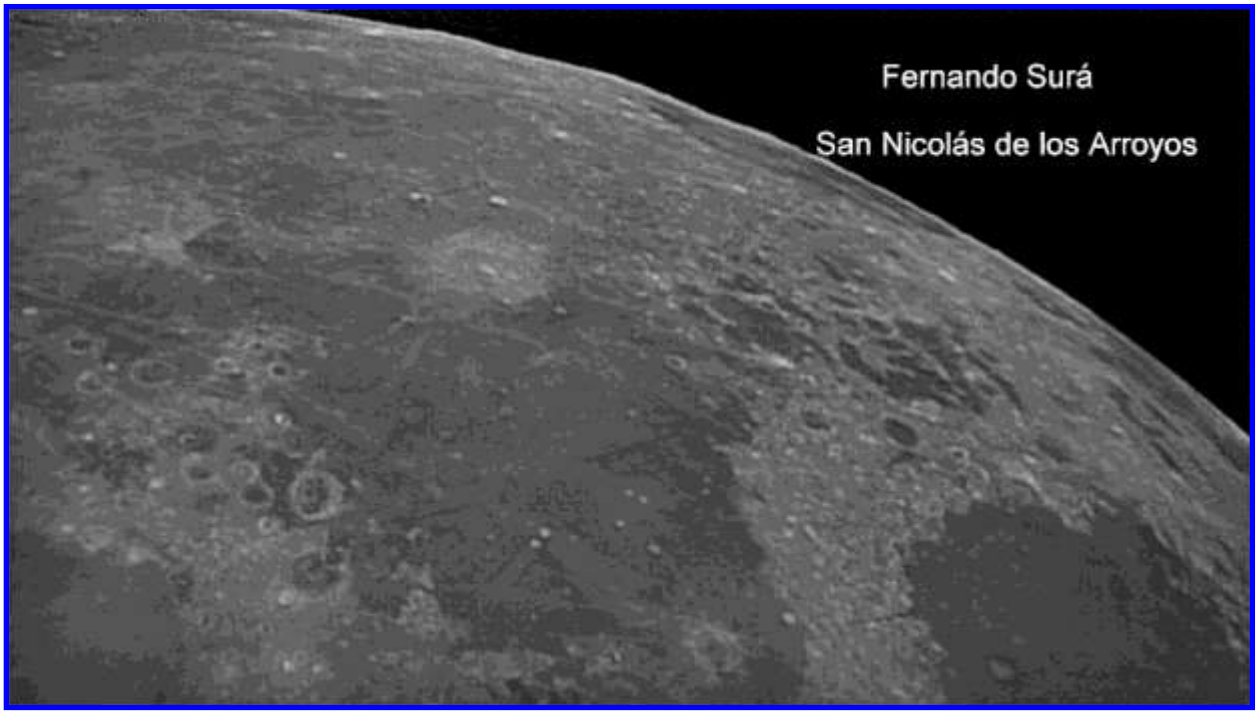
Copernicus, *Maurice Collins, Palmerston North, New Zealand 2021 September 18 10:44 UT. Celestron 8 inch Schmidt-Cassegrain telescope, 2x barlow, QHY5lll462C camera.*

Aristarchus, *Fabio Verza, Milan, Italy. 2021 September 01 04:54 UT. Celestron SE 4 inch Maksutov-Cassegrain telescope, Baader Neodymium IR Block filter, ZWO ASI 290mm camera.*



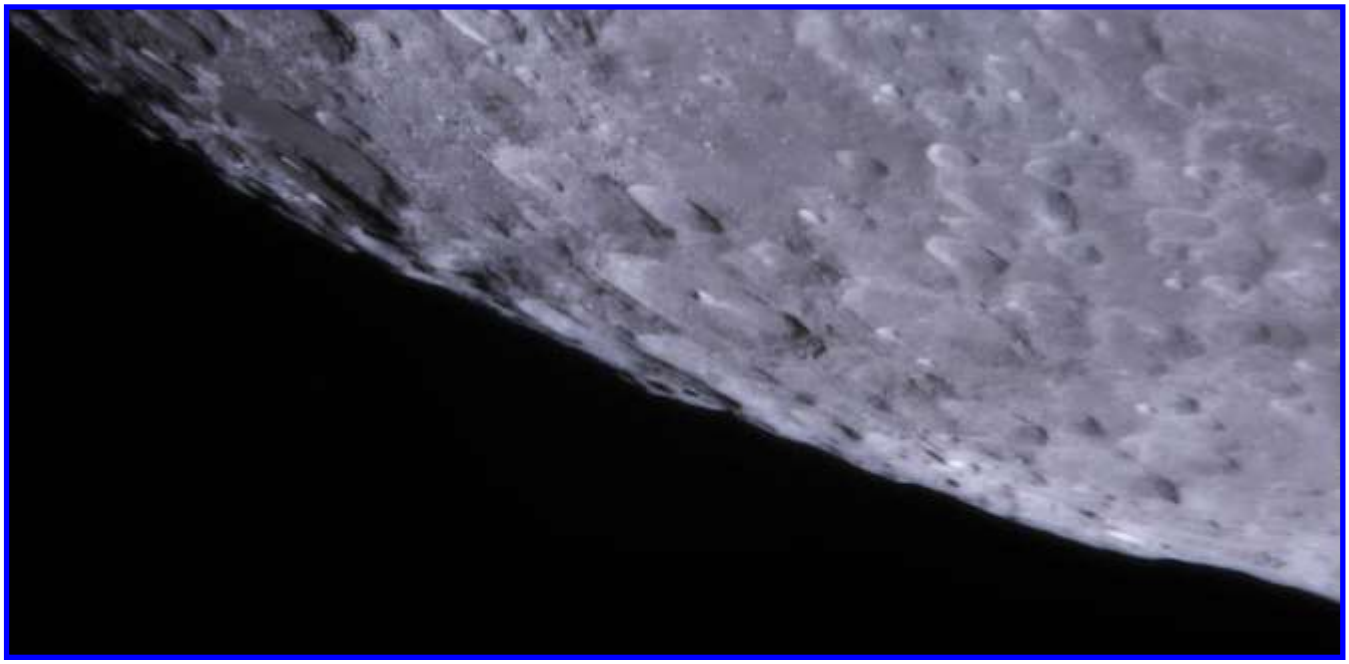
Archimedes, *Leonardo Alberto Colombo, Córdoba, Argentina. 2021 August 17 02:18 UT. 102 mm Maksutov-Cassegrain telescope, !R pass 650 nm filter, QHY5LII-M camera.*

Theophilus, *Jairo Chavez, Popayán, Colombia. 2021 September 12 00:23 UT. 311 mm truss tube Dobsonian reflector telescope, Moto E5Play camera.*



Messier, *Fernando Surà, San Nicolás de los Arroyos, Argentina. 2021 August 18 23:00 UT. 127 mm Maksutov-Cassegrain telescope, Canon RT7 camera.*

Posidonius, *Jairo Chavez, Popayán, Colombia. 2021 September 12 00:27 UT. 311 mm truss tube Dobsonian reflector telescope, Moto E5Play camera.*



Moretus, *Maurice Collins, Palmerston North, New Zealand 2021 September 18 10:56 UT. Celestron 8 inch Schmidt-Cassegrain telescope, 2x barlow, QHY5lll462C camera.*

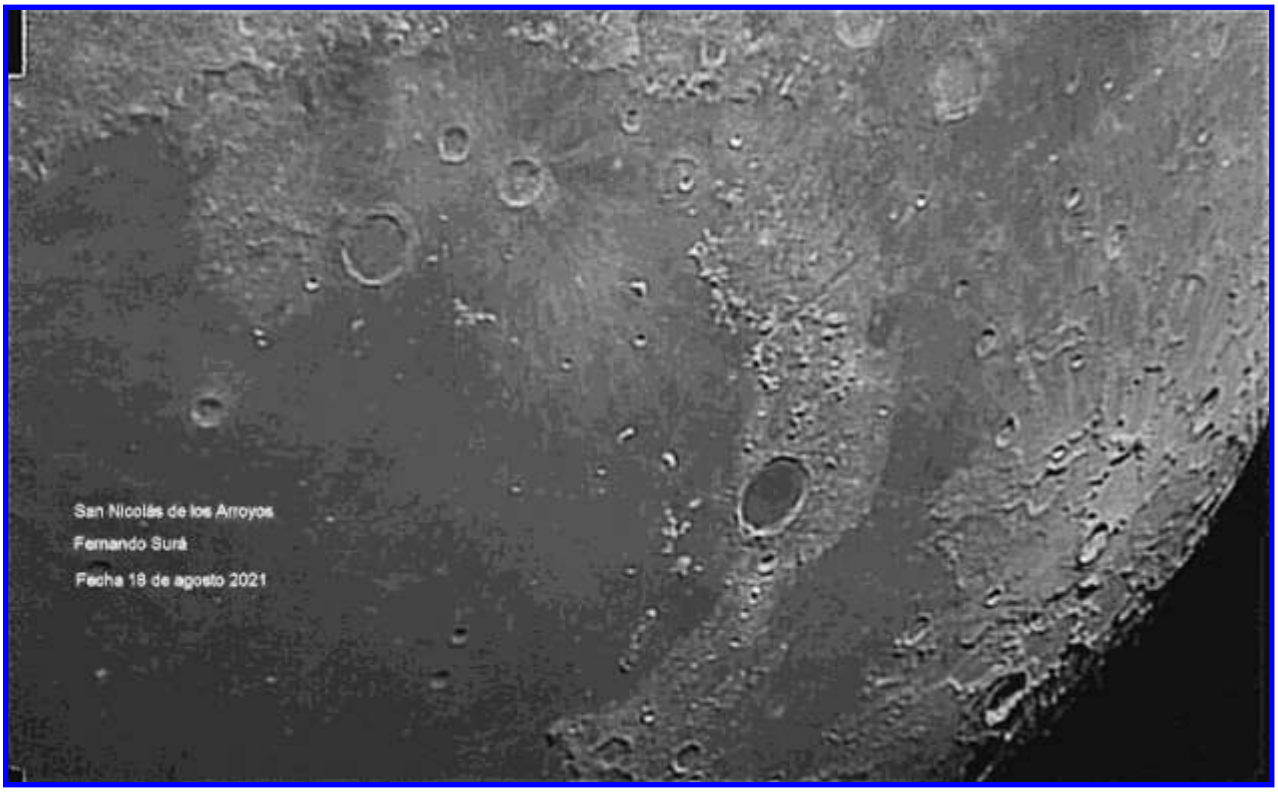
Tycho, *Jesús Piñeiro, San Antonio de los Altos, Venezuela. 2021 August 17 23:03 UT. 90 mm Maksutov-Cassegrain telescope, ASTRONOMIK L2 UV-IR 2" filter, ZWO ASI533MC camera.*

11 day-old Moon, *Maurice Collins, Palmerston North, New Zealand 2021 September 18 10:37-10:44 UT. Celestron 8 inch Schmidt-Cassegrain telescope, 2x barlow, QHY5lll462C camera.*

Full Moo, *Leonardo Alberto Colombo, Córdoba, Argentina. 2021 August 22 07:59 UT. 70 mm refractor telescope, !R pass 650 nm filter, QHY5LII-M camera.*

Theophilus, *Eduardo Horacek-Esteban Andrada, Mar del Plata, Argentina. 2021 August 13 22:57 UT. 150 mm Maksutov-Cassegrain telescope, Canon EOS Rebel T5i camera.*

Waxing Crescent Moon, *Jairo Chavez, Popayán, Colombia. 2021 September 10 23:54 UT. 311 mm truss tube Dobsonian reflector telescope, Moto E5Play camera.*



Mare Imbrium, *Fernando Surà, San Nicolás de los Arroyos, Argentina. 2021 August 18 23:00 UT. 127 mm Maksutov-Cassegrain telescope, Canon RT7 camera.*

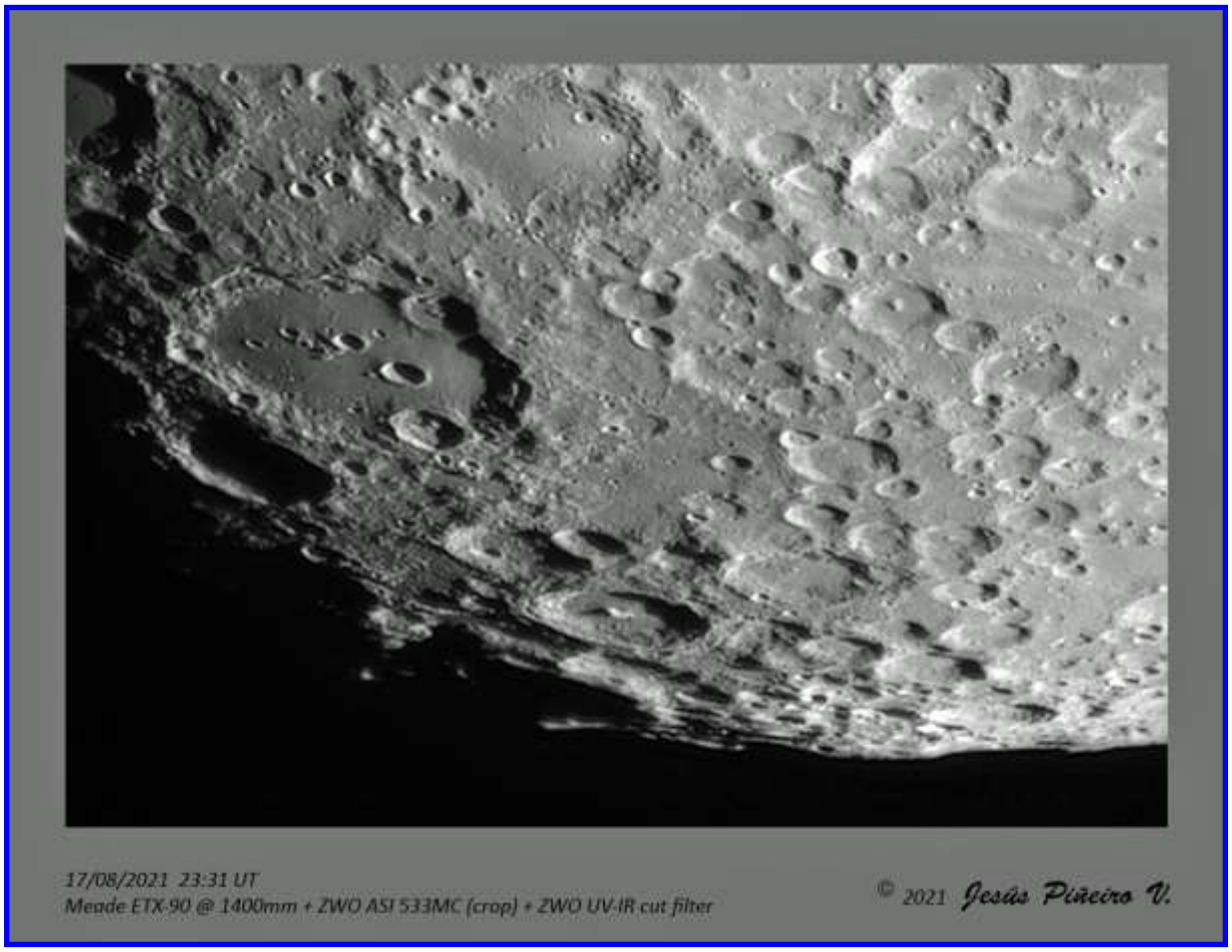
Plato, *Jesús Piñeiro, San Antonio de los Altos, Venezuela. 2021 August 17 23:29 UT. 90 mm Maksutov-Cassegrain telescope, ASTRONOMIK L2 UV-IR 2" filter, ZWO ASI533MC camera.*

Montes Apenninus, *Fernando Surà, San Nicolás de los Arroyos, Argentina. 2021 August 18 23:00 UT. 127 mm Maksutov-Cassegrain telescope, Canon RT7 camera.*

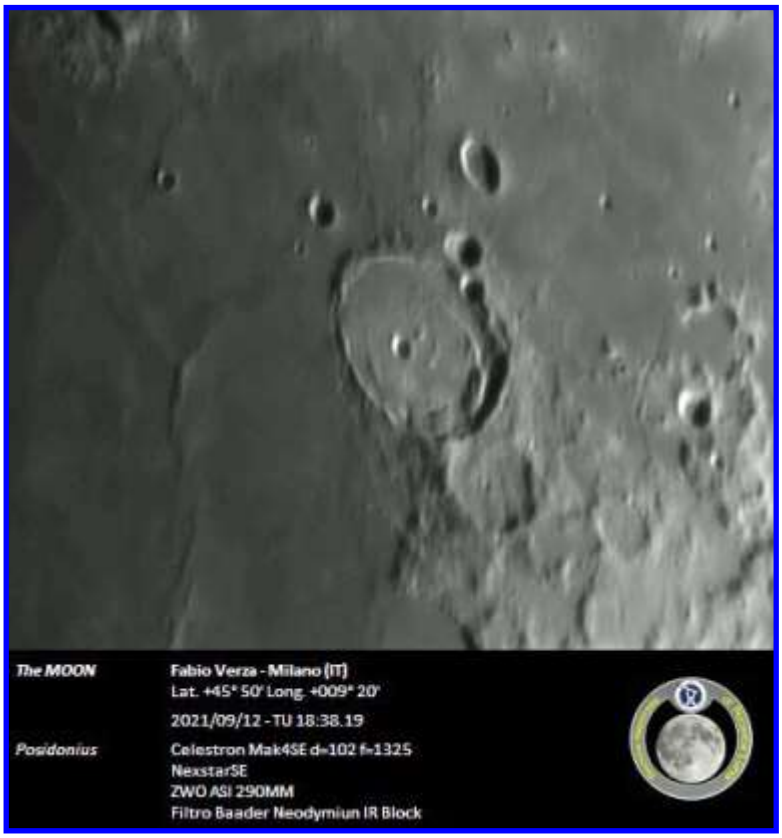
Fabricius *Jairo Chavez, Popayán, Colombia. 2021 September 10 23:56 UT. 311 mm truss tube Dobsonian reflector telescope, Moto E5Play camera.*

Byrgius, *Fabio Verza, Milan, Italy. 2021 September 01 04:43 UT. Celestron SE 4 inch Maksutov-Cassegrain telescope, Baader Neodymium IR Block filter, ZWO ASI 290mm camera.*

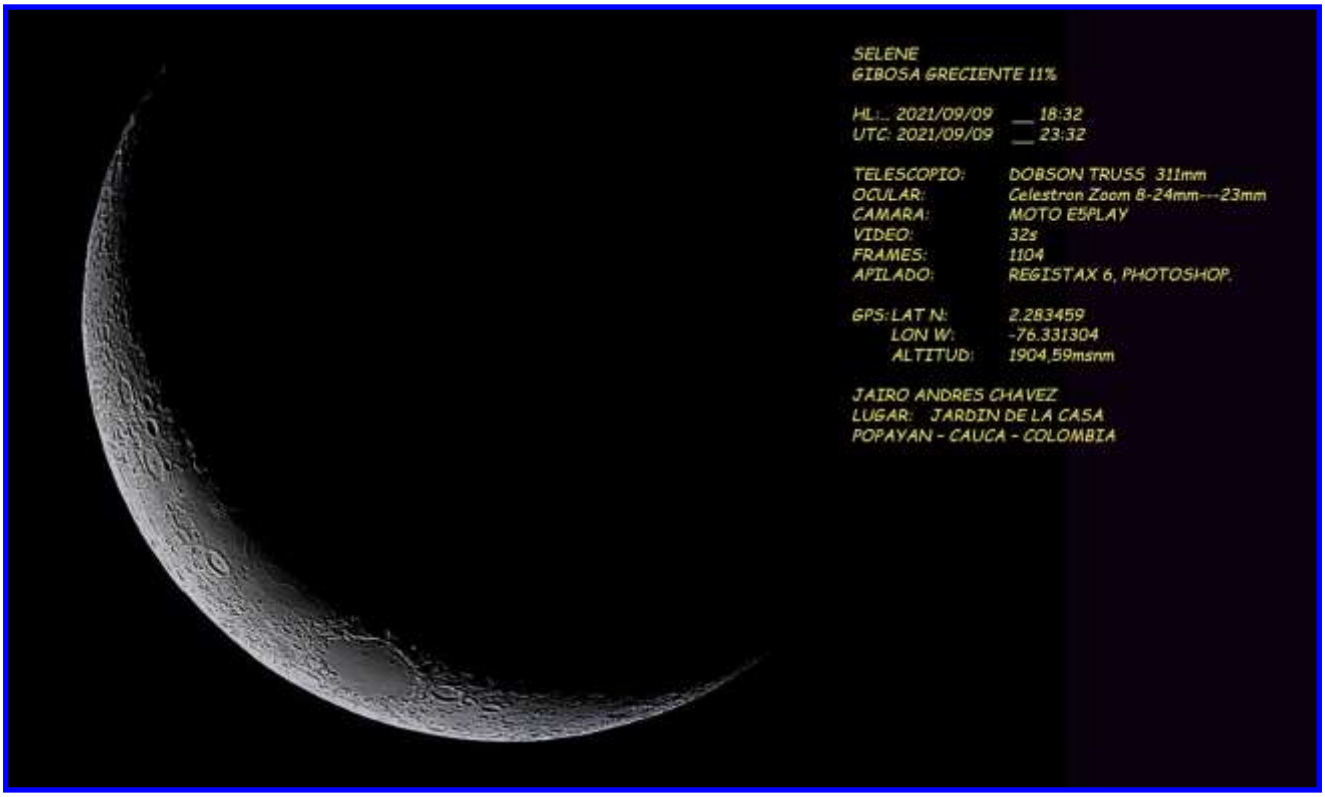
Messier, *Fabio Verza, Milan, Italy. 2021 September 11 18:00 UT. Celestron SE 4 inch Maksutov-Cassegrain telescope, Baader Neodymium IR Block filter, ZWO ASI 290mm camera.*



Clavius, *Jesús Piñeiro, San Antonio de los Altos, Venezuela. 2021 August 17 23:31 UT. 90 mm Maksutov-Cassegrain telescope, ASTRONOMIK L2 UV-IR 2" filter, ZWO ASI533MC camera.*

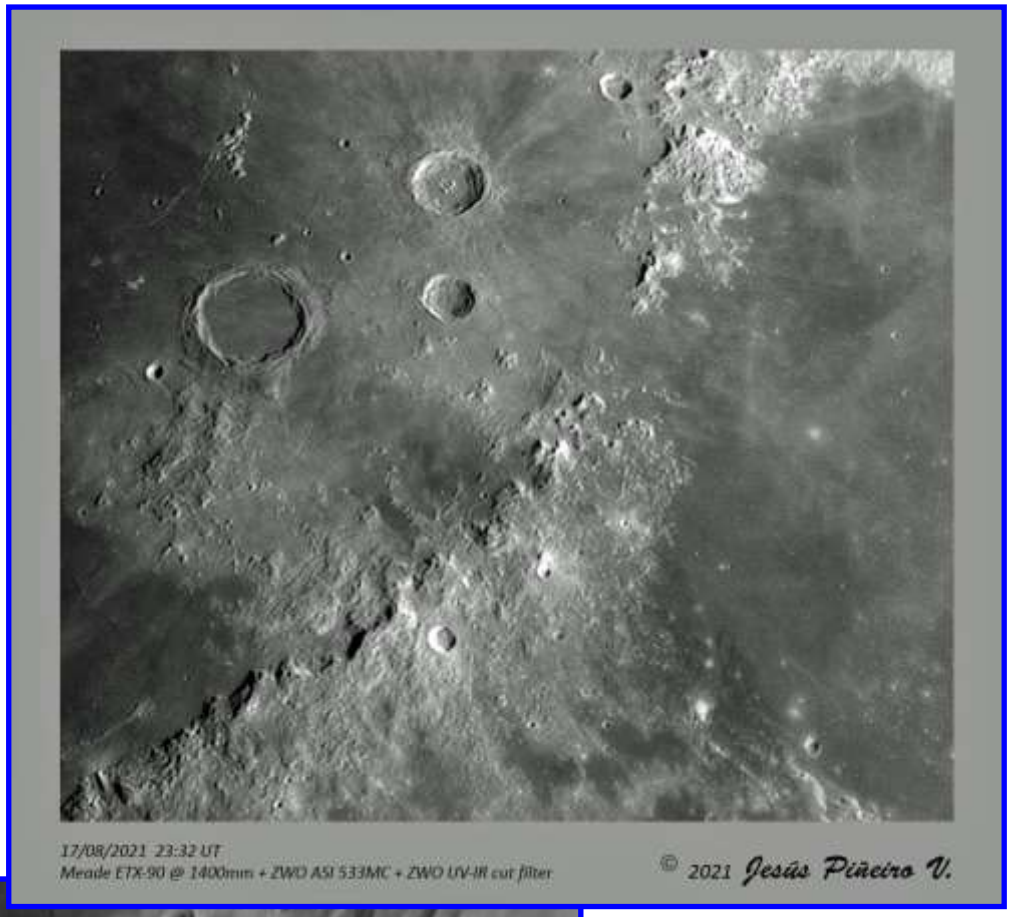


Posidonius, *Fabio Verza, Milan, Italy. 2021 September 12 18:38 UT. Celestron SE 4 inch Maksutov -Cassegrain telescope, Baader Neodymium IR Block filter, ZWO ASI 290mm camera.*



Waxing Crescent Moon, *Jairo Chavez, Popayán, Colombia. 2021 September 09 23:32 UT. 311 mm truss tube Dobsonian reflector telescope, Moto E5Play camera.*

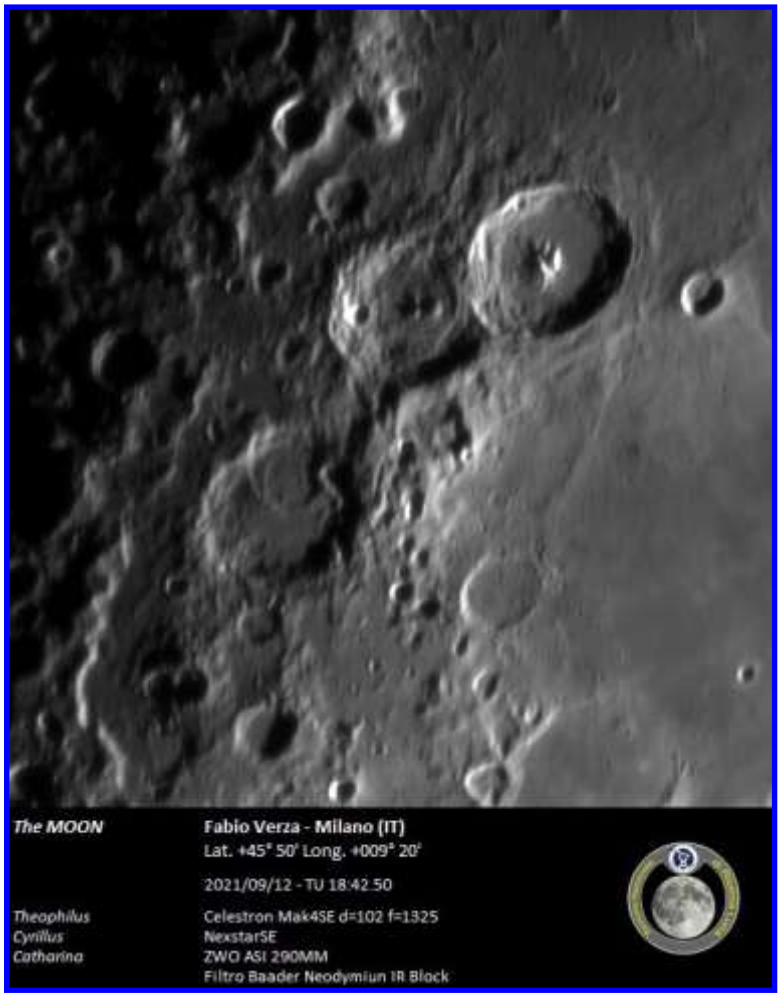
Mare Crisium, *Fabio Verza, Milan, Italy. 2021 September 11 18:03 UT. Celestron SE 4 inch Maksutov-Cassegrain telescope, Baader Neodymium IR Block filter, ZWO ASI 290mm camera.*



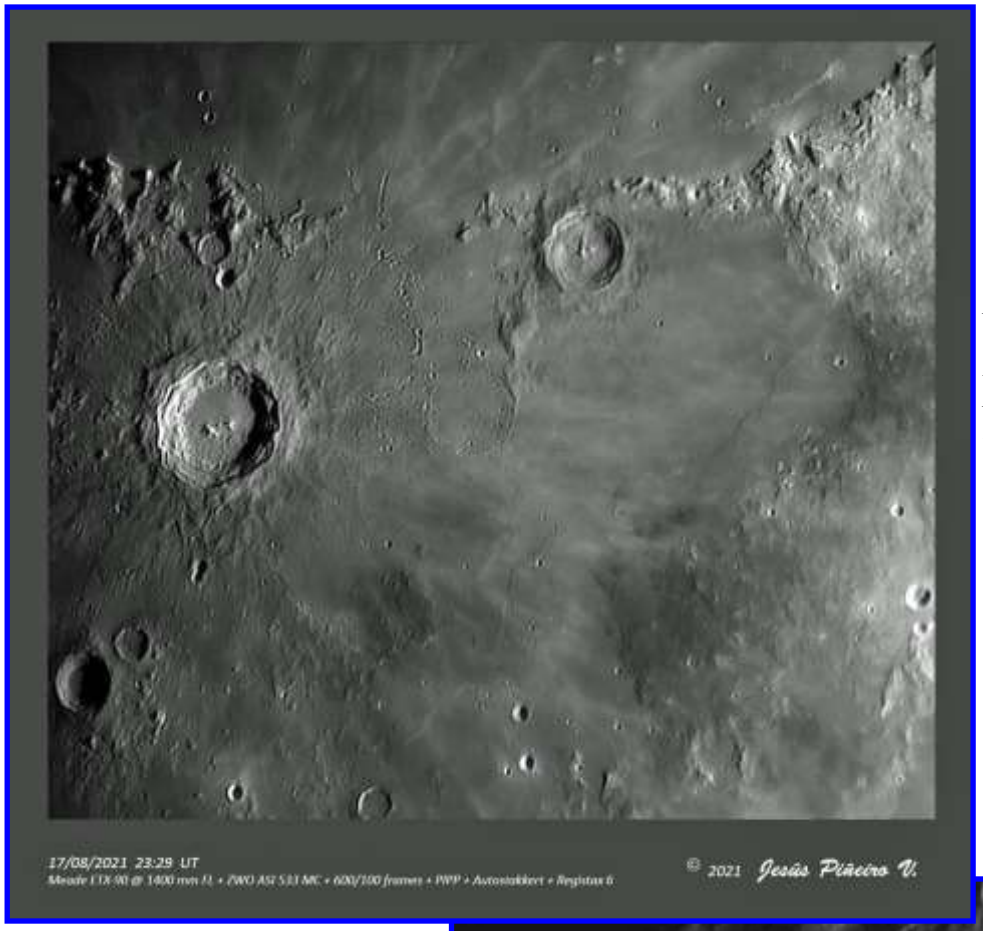
Archimedes, *Jesús Piñeiro, San Antonio de los Altos, Venezuela. 2021 August 17 23:22 UT. 90 mm Maksutov-Cassegrain telescope, ASTRONOMIK L2 UV-IR 2" filter, ZWO ASI533MC camera.*

Petavius, *Fabio Verza, Milan, Italy. 2021 September 11 17:58 UT. Celestron SE 4 inch Maksutov-Cassegrain telescope, Baader Neodymium IR Block filter, ZWO ASI 290mm camera.*

Mare Crisium, *Elias, Walter Ricardo - Oro Verde, Argentina . 2021 September 12 22:47 UT. Helios 114 mm x 900 mm reflector telescope QHY5-IIC camera.*



Theophilus, *Fabio Verza, Milan, Italy. 2021 September 12 18:42 UT. Celestron SE 4 inch Maksutov-Cassegrain telescope, Baader Neodymium IR Block filter, ZWO ASI 290mm camera.*



Copernicus, *Jesús Piñeiro, San Antonio de los Altos, Venezuela. 2021 August 17 23:29 UT. 90 mm Maksutov-Cassegrain telescope, ASTRONOMIK L2 UV-IR 2" filter, ZWO ASI533MC camera.*

Janssen, *Fabio Verza, Milan, Italy. 2021 September 11 17:56 UT. Celestron SE 4 inch Maksutov-Cassegrain telescope, Baader Neodymium IR Block filter, ZWO ASI 290mm camera.*

Lunar Geologic Change Detection Program

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

2021 October

News: In this newsletter we switch to a different format. Observations listed are those received in the past month. These go into an observation database/pool which we shall use at some point for in the future. A few of the most important observations received in the past month will undergo a deeper analysis in the current newsletter, which may include some similar illumination observations from the database of observations that people have submitted over the years.

LTP reports: No LTP reports were received in August.

Reports received for August included: Alberto Anunziato (Argentina - SLA) observed: Alpetragius, Alphonsus, and Eratosthenes. Massimo Alessandro Bianchi (Italy - UAI) imaged: Herodotus and Plato and Sketched: Herodotus. Maurice Collins (New Zealand – ALPO/BAA/RASNZ) imaged: Aristarchus and the whole lunar Moon. Anthony Cook (Newtown, UK – ALPO/BAA): videoed the Moon in the thermal IR. Jesús Piñeiro (Venezuela - SLA) imaged Plato. Leandro Sid (Argentina – AEA) imaged: Arzachel, Herschel, Mons Pico, Montes Apenninus, and Proclus. Bob Stuart (Rhayader, UK) imaged: Albategnius, Alphonsus, Archimedes, Arzachel, Birt, Clavius, Hyginus, Longomontanus, Plato, Rupes Recta, Sasserides, Sinus Medii, Triesnecker, Vallis Alpes and several features. Franco Taccogna (UAI – Italy) imaged: Herodotus and Plato. Aldo Tonon (UAI – Italy) imaged several features.

Mons Pico

Figure 1. *Mons Pico and its surrounds as imaged by Leandro Sid (AEA) on 2021 Aug 16 UT 01:53 and orientated with north towards the top.*

On 2009 Apr 13 UT 18:55-20:00 J. Adee (UK), and later A. Jarwaski (UK), saw Mons Pico to be incredibly bright. Adee reported "naked eye" visibility, though this does not show up in later CCD images that night. Jarwaski saw another nearby mountain very bright as well. This LTP has been assigned an ALPO/BAA weight of 2. Leandro Sid (AEA) imaged this area under similar illumination recently (Fig 1). The mountain is looking very bright with respect to the dark terminator and nearby mare to the east. However, if we measure the digital number brightness of Mons Pico and compare it with bright craters further to the east, on the more sunlit part of the Moon, it is not the brightest feature in the image in an absolute sense. Many observers in the past simply judged brightness relative to the immediate surrounds of the mountain. It is possible that the 2nd bright mountain that Jarwaski refers too could be just south of Mons Pico or even Mons Piton? I will lower the weight of the 2009 report to 1 as the mountain's sunward facing side is always contrasty, but as yet we cannot yet explain the naked eye visibility that was claimed by Adee.

Alpetragius

Figure 2. Alpetragius, orientated with north towards the top**. (Left)** an image by Brendan Shaw (BAA) from 2014 Dec 30 UT 16:16. **(Center)** A sketch by Alberto Anunziato (SLA) at the date and UT given in the sketch. **(Right)** An image by Walter Elias taken on 2018 Nov 17 UT 00:33.

Back in 1889 Sep 4 UT 02:30-03:00 E.E. Barnard, using Lick Observatory's 36" reflector noted that the central peak of this crater was diffuse and pale and the entire inside of the crater seemed to be filled with haze or smoke. This was despite the shadow of the east wall being black and sharp. No other crater showed this effect. On 2021 Aug 17 UT 00:30-00:34 Alberto Anunziatio was able to make a sketch (Fig 2 – Center) under similar illumination to Barnard's observation, albeit with just a Meade EX 105. Alberto noted that the shadow was nice and dark and everything was normal. There are in fact three candidate dates and UTs for Barnard's observation: 1889 Sep 04 UT 02:30-03:00, 1889 Oct 03 UT 03:00-03:45 and 1889 Oct 04 UT 03:00-03:45 and we have concentrated on the Sep 4th one. For comparison I have found a couple of example images at similar illumination from the ALPO/BAA observation database by: Brendan Shaw (Fig 2 – Left) and Walter Elias (Fig 2 – Right). At the resolutions available it is difficult to tell if there is anything definitely diffuse about the central peak. I think we need higher resolution images and also to check out the other two candidate dates and UTs. We shall keep the weight of the original report at 3 for now, pending future observations.

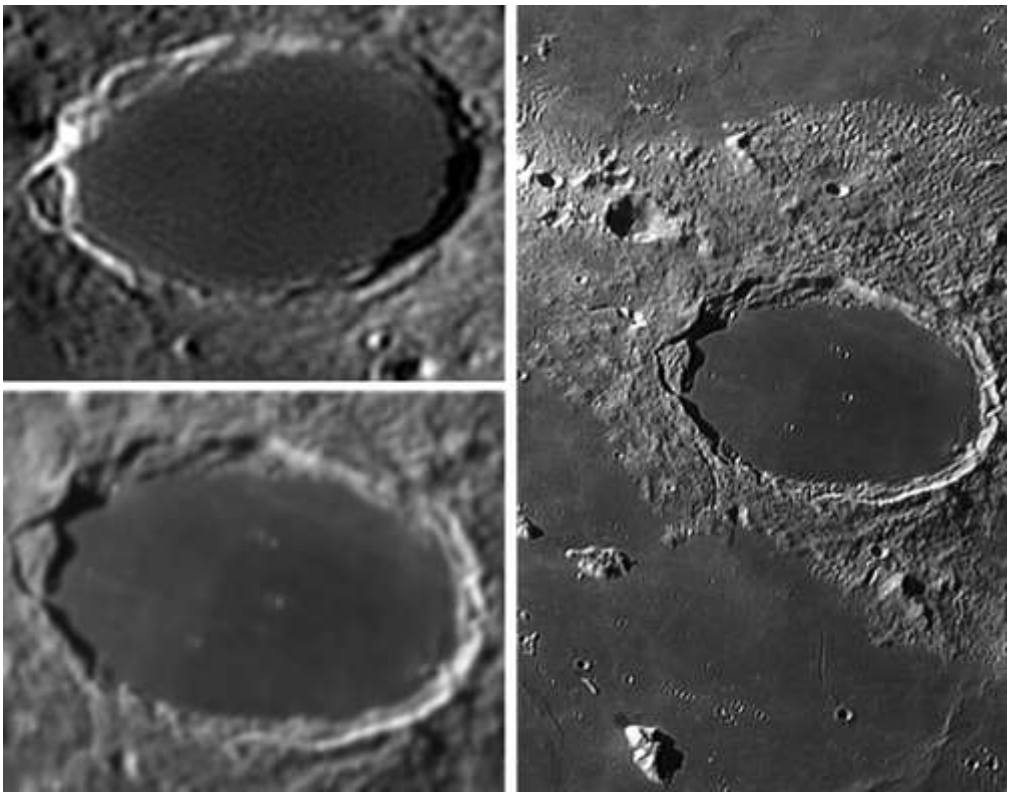


Figure 3. (Top Left) *Plato as imaged by Jesús Piñeiro (SLA) on 2021 Aug 17 UT 23:29. Size and type of telescope used: 90 mm. Maksutov-Cassegrain. Filter: IR cut UV-IR (Astronomik L2 UV-IR 2"). Camera: ZWO ASI 533MC.* ***(Right)*** *Plato as imaged by Bob Stuart (BAA) on 2021 Aug 29 UT 04:19.* ***(Bottom Left)*** *Bob's image, but degraded in resolution to match Jesús' image.*

In ALPO's Strolling Astronomer Vol 6, p86 T.A. Cragg reports that they were amazed to see not even the central craterlet on the floor of Plato on 1952 Apr 04, (before 02:45 UT), despite using a 12" reflector under fairly good seeing and fair transparency. This was assigned and ALP/BAA weight of 3. Fortunately, we now have a nice image taken by Jesús Piñeiro (Fig 3 – Top Left) under similar, illumination which also shows a total lack of detail on the floor of Plato. We can therefore lower the weight of the Cragg LTP report from 3 to 2.

Interestingly there is another account of a lack of detail on the floor of Plato, this time by F.C. Butler of SW London, UK, where he states that on 1980 Oct 30 UT 03:10-05:07 the floor of Plato seemed quite devoid of detail, apart from a vague mottling seen during the best moments of seeing. Only at the start of the observing session could he just glimpse the central craterlet under Antoniadi III (moderate) seeing, that eventually worsened, but never quite reaching IV (poor). Bob Stuart imaged (Fig 3 – Right) the crater under similar illumination and obtained quite a remarkable amount of detail on the floor. I especially find the very faint light bands across the floor of Plato interesting – presumably ray material, although it is curious that they happen to lie in the same direction as E-W shadow bands would at sunrise/set – one assumes a coincidence. Anyway, as Bob's image shows a lot of detail, even after degrading the resolution (Fig 3 – Bottom Right) we shall leave the Butler LTP report at a weight of 1.

I am fairly confident that the visibility of detail on the floor of Plato, that some people claim as obscurations, in the past, can probably be explained by a combination of seeing conditions, image contrast and telescope resolving capability. But we need more observations on a case-by-case basis to eliminate past LTPs where obscurations of floor detail have been observed.

Pseudo Peak(s) in Herodotus

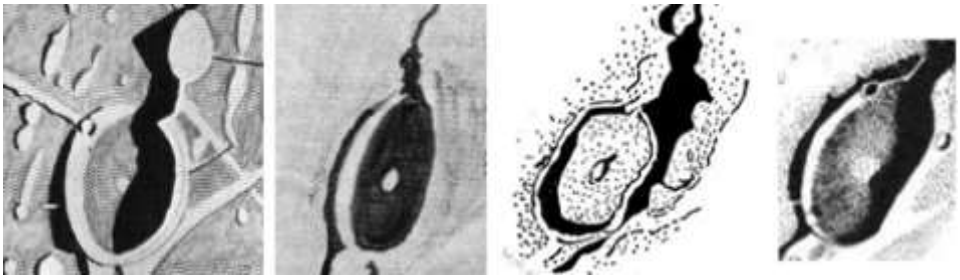


Figure 4. *Herodotus observations showing a "Pseudo-Peak" or central light spot.* ***(Far Left)*** *H.P. Wilkin's sketch from 1950 Mar 30 UT 19:00?* ***(Left)*** *Bartlett's sketch from 1950 Jun 27 UT 02:30?* ***(Right)*** *Firsoff's sketch from 1955 Jul 15 UT 03:50 - depicting a shadow from the central peak in this evening illumination configuration.* ***(Far Right)*** *A sketch by Harold Hill from 1966 Nov 24 UT 21:50 of a very faint central white diffuse spot.*

Readers are probably aware that from time to time we show observations and images which are under similar illumination to when many observers have seen a pseudo peak on the floor of Herodotus crater (Fig 4). Sometimes in these historical observations the pseudo peak is completely embedded in the shadow of the floor for the crater. At other times there is a light spot on the floor and very occasionally the pseudo peak can exhibit a shadow. Because there is no actual visible peak on the floor of Herodotus, it is not surprising that most modern attempts to observe the crater under similar illumination have nearly always failed. Spacecraft imagery show nothing there either. If readers are interested, a good article about past historic observations of the pseudo peak was written by Tom Dobbins and myself for the BAA Lunar Section's: "The Moon: Occasional Papers of the Lunar Section of the British Astronomical Association Lunar Section, 2 (2012 Dec) p22-35" and four of the observations from this are include in Fig 4. There is a southern white spot that was seen by Peter Grego and Raffaello Lena, but this is a permanent feature and always predictable – possibly due to ray material on the floor?

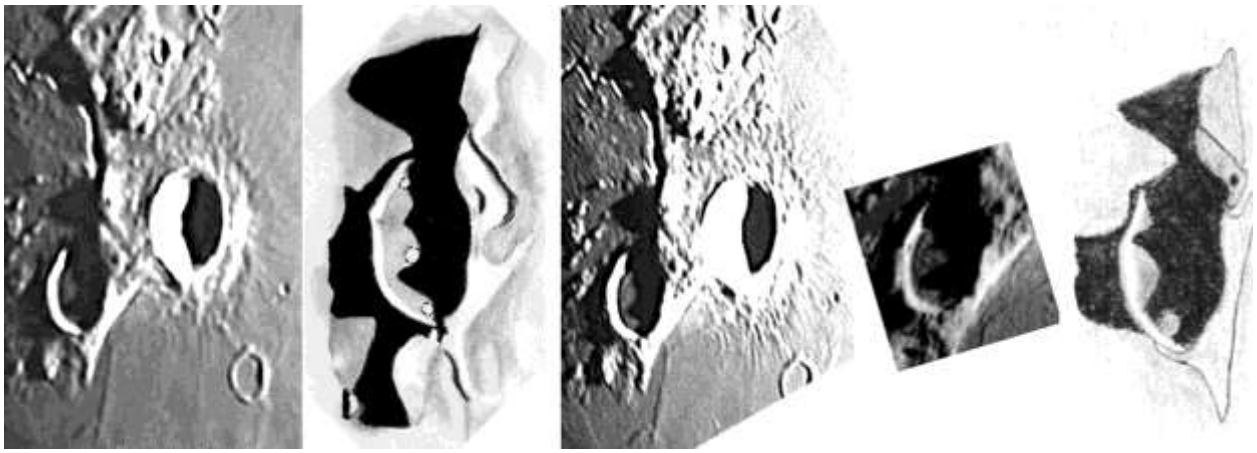


Figure 5. *Herodotus orientated with north towards the top.* ***(Far Left)*** *A high pass filtered and contrast stretched image by Massimo Alessandro Bianchi (UAI) taken on 2021 Aug 19 UT 20:53.* ***(Left)*** *A sketch made by Massimo Alessandro Bianchi (UAI) UT 20:55-21:18 showing three spots on the floor of Herodotus.* ***(Center)*** *A high pass filtered and contrast stretched image by Franco Taccogna (UAI) taken on 2021 Aug 19 UT 21:14.* ***(Right)*** *An ALVIS simulation of the interior of Herodotus based upon ephemeris data for 1966 Jun 30 UT 03:10 corresponding to yet another Bartlett observation of a pseudo peak – but alas we have no sketch for this.* ***(Far Right)*** *A sketch by Robin Gray (ALPO) made on 2002 Oct 18 UT 04:14-04:36 made under similar illumination to Massimo's sketch.*

We have a Lunar Schedule request out for people to observe the floor of Herodotus between selenographic colongitudes of 52.6° and 55.8°, and any sub-solar latititude. This encompasses the range of illumination that people have seen a central white spot or pseudo peak. On most occasions nobody see's anything. So, I was especially interested when I heard that on 2021 Aug 19 UT 20:55-21:18 Massimo Alessandro Bianchi (UAI) sketched no less than 3 spots on the floor (Fig 5 - Left). Massimo and other UAI members were imaging that night and by pushing the high pass filtering, some evidence of the spots may be hinted at – see Figs 5 Far Left and Center. However, it should be said that the filtering is getting close to the point where "ringing" artefacts are starting to show up on contrasty edges, but at least the subtle light patches lie in roughly the right locations. I also found a 2002 sketch by Robin Gray that is very close in illumination to Massimo's sketch (Fig 5 – Far Right), however the libration was different – but at least a southern spot was visible. Finally, I checked through the simulated images of Herodotus in the Dobbins and Cook publication to find the most similar illumination computer visualization which corresponded to a past pseudo peak report (Bartlett 1966 Jun 30) and although this does not show any spots, and again the libration is not the same, it does give some confidence to some of the floor detail being shown in Figs 5 Far Left and Center.

So, what can we learn? Unfortunately, we have not definitively solved the puzzle as to what the pseudo peak observations from the past were about. It is interesting though that the left of center and lower spots in Massimo's sketch (Fig 5 – Left) correspond to dimples (depressions) in the shadow. The northern spot may correspond to low level relief on the floor as there are hints of these in the two images and simulation. Another point to take into consideration is that when sketching small features on the Moon, although the sketches are usually topologically accurate, the spatial geometry can become less reliable, meaning the locations of the spots sketched could be slightly offset from where they really are. So, if Bartlett sketched a spot in the center, it could have been offset slightly which could easily mean that it might be the same as what Massimo drew? Anyway, we need more high-resolution images (ideally time lapse) as well as sketches to get a better understanding of what these old and new reports are about.

A Fuzzy Patch Near Herodotus

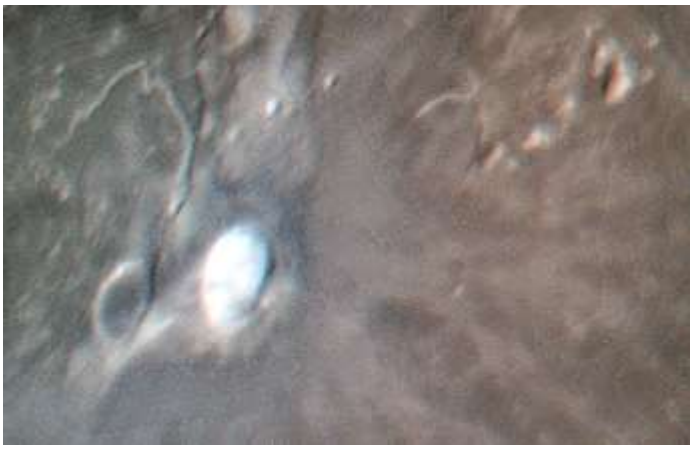


Figure 6. *Aristarchus as imaged by Maurice Collins in color on 2021 Aug 21 UT 07:45. Orientated with north towards the top and color normalized.*

On 1989 Jun 17 at UT 06:33-07:16 R. Manske (Sun Prairie, WI, USA, 1" refractor) sketched a nebulous spot near to Herodotus crater that at 06:49 (when he tried some filters out) was visible through red, blue and yellow filters, though it was slightly fainter through the red filter. The Cameron 2006 catalog ID=366 and the weight=3. The ALPO/BAA weight=2. Maurice Collins (ALPO/BAA/RASBZ) re-observed under similar illumination and obtained the image shown in Fig 6. It is very unclear what the 1989 LTP report refers to as a fuzzy patch – perhaps the SW ray from Aristarchus? Alas I can find no sketch in the archives. Certainly, the instrument that Manske used was a bit on the small side. I think we should lower ALPO/BAA the weight from 2 to 1.

General Information: For repeat illumination (and a few repeat libration) observations for the coming month - these can be found on the following web site: http://users.aber.ac.uk/atc/lunar_schedule.htm . By re-observing and submitting your observations, only this way can we fully resolve past observational puzzles. To keep yourself busy on cloudy nights, why not try "Spot the Difference" between spacecraft imagery taken on different dates? If you would like your observations to be considered for mention in the next newsletter, then they should be submitted by 17:00UT on the 24th of July, covering observations for June. Please send observations in, even if older than this as they are still very useful for future repeat illumination studies. 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 .

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

Lunar Calendar October 2021

Date	UT	Event
3		West limb most exposed -6.2°
4		South limb most exposed -6.6°
6	1105	New Moon Lunation 1222
8	1700	Moon at perigee 363,386 km
9	1900	Venus 3° south of Moon
12		Greatest southern declination -26.1°
13	0325	First Quarter
14	0700	Saturn 4° north of Moon
15	1000	Jupiter 4° north of Moon
16		East limb most exposed +6.0°
16		North limb most exposed +6.7°
20	1456	Full Moon
24	1500	Moon at apogee 405,615 km
26	0200	Moon 1.7° north of M35
27		Greatest northern declination +26.2°
28	2005	Last Quarter
31		West limb most exposed -7.1°
31		South limb most exposed -6.8°

The Lunar Observer welcomes all lunar related images, drawings, articles, reviews of equipment and reviews of books. You do not have to be a member of ALPO to submit material, though membership is highly encouraged. Please see below for membership and near the end of *The Lunar Observer* for submission guidelines.

Comments and suggestions? Please send to David Teske, contact information page 1. Need a hard copy, please contact David Teske.

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

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

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

Our quarterly journal, *The 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.

SUBMISSION THROUGH THE ALPO IMAGE ARCHIVE

ALPO's archives go back many years and preserve the many observations and reports made by amateur astronomers. ALPO's galleries allow you to see on-line the thumbnail images of the submitted pictures/observations, as well as full size versions. It now is as simple as sending an email to include your images in the archives. Simply attach the image to an email addressed to

lunar@alpo-astronomy.org (lunar images).

It is helpful if the filenames follow the naming convention :

FEATURE-NAME_YYYY-MM-DD-HHMM.ext

YYYY {0..9} Year

MM {0..9} Month

DD {0..9} Day

HH {0..9} Hour (UT)

MM {0..9} Minute (UT)

.ext (file type extension)

(NO spaces or special characters other than "_" or "-". Spaces within a feature name should be replaced by "-".)
As an example the following file name would be a valid filename:

Sinus-Iridum_2018-04-25-0916.jpg
(Feature Sinus Iridum, Year 2018, Month April, Day 25, UT Time 09 hr16 min)

Additional information requested for lunar images (next page) should, if possible, be included on the image. Alternatively, include the information in the submittal e-mail, and/or in the file name (in which case, the coordinator will superimpose it on the image before archiving). As always, additional commentary is always welcome and should be included in the submittal email, or attached as a separate file.

If the filename does not conform to the standard, the staff member who uploads the image into the data base will make the changes prior to uploading the image(s). However, use of the recommended format, reduces the effort to post the images significantly. Observers who submit digital versions of drawings should scan their images at a resolution of 72 dpi and save the file as a 8 1/2"x 11" or A4 sized picture.

Finally a word to the type and size of the submitted images. It is recommended that the image type of the file submitted be jpg. Other file types (such as png, bmp or tif) may be submitted, but may be converted to jpg at the discretion of the coordinator. Use the minimum file size that retains image detail (use jpg quality settings. Most single frame images are adequately represented at 200-300 kB). However, images intended for photometric analysis should be submitted as tif or bmp files to avoid lossy compression.

Images may still be submitted directly to the coordinators (as described on the next page). However, since all images submitted through the on-line gallery will be automatically forwarded to the coordinators, it has the advantage of not changing if coordinators change.

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-hhmm or yyyy-mm-dd-hhmm)
Filter (if used)
Size and type of telescope used Magnification (for sketches)
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

Resolution appropriate to the image detail is preferred-it is not necessary to 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:
David Teske – david.teske@alpo-astronomy.org
Jerry Hubbell –jerry.hubbell@alpo-astronomy.org
Wayne Bailey—wayne.bailey@alpo-astronomy.org

Hard copy submissions should be mailed to David Teske at the address on page one.

CALL FOR OBSERVATIONS: FOCUS ON: Lunar 100

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 2021 edition will be the Lunar 100 numbers 91-100. The subject for the January 2022 Focus-On will be Mare Crisium. Observations at all phases and of all kinds (electronic or film based images, drawings, etc.) are welcomed and invited. Keep in mind that observations do not have to be recent ones, so search your files and/or add these features to your observing list and send your favorites to (both):
Jerry Hubbell –jerry.hubbell@alpo-astronomy.org
David Teske – david.teske@alpo-astronomy.org

Deadline for inclusion in the Lunar 100 numbers 91-100 article is October 20, 2021

FUTURE FOCUS ON ARTICLES:

In order to provide more lead time for contributors the following future targets have been selected: The series of the Lunar 100 will follow on the schedule below:

Subject	TLO Issue	Deadline
Lunar 100 (numbers 91-100)	**November 2021**	**October 20, 2021**
Mare Crisium	**January 2022**	**December 20, 2021**

Focus-On Announcement

We are pleased to announce the future Focus-On topics. These will be based on the Lunar 100 by Charles Wood. Every other month starting in May 2020 , the Focus-On articles will explore ten of the Lunar 100 targets. Targets 91-100 will be featured in the September 2021 *The Lunar Observer*. Submissions of articles, drawings, images, etc. due by October 20, 2021 to David Teske or Alberto Anunziato.

L	FEATURE NAME	SIGNIFICANCE	RUKL CHART
91	De Gasparis Rilles	Area with many rilles	51
92	Gyldén Valley	Part of Imbrium radial structure	44
93	Dionysius Rays	Unusual and rare dark rays	35
94	Drygalski	Large south-pole region crater	72, VI
95	Procellarum Basin	The Moon's biggest basin?	---
96	Leibnitz Mountains	Rim of South Pole-Aitken Basin	73, V
97	Inghirami Valley	Orientale basin ejecta	61
98	Imbrium lava flows	Mare lava-flow boundaries	10
99	Ina	D-shaped young volcanic caldera	22
100	Mare Marginis swirls	Possible magnetic field deposits	27, III

Explore the Lunar 100 on the link below:

https://www.skyandtelescope.com/observing/celestial-objects-to-watch/the-lunar-100/

The Lunar 100: Features 1-10	May 2020 Issue – Due April 20, 2020
The Lunar 100: Features 11-20	July 2020 Issue – Due June 20, 2020
The Lunar 100: Features 21-30	September 2020 Issue – Due August 20, 2020
The Lunar 100: Features 31-40	November 2020 Issue – Due October 20, 2020
The Lunar 100: Features 41-50	January 2021 Issue – Due December 20, 2020
The Lunar 100: Features 51-60	March 2021 Issue – Due February 20, 2021
The Lunar 100: Features 61-70	May 2021 Issue – Due April 20, 2021
The Lunar 100: Features 71-80	July 2021 Issue – Due June 20, 2021
The Lunar 100: Features 81-90	September 2021 Issue – Due August 20, 2021
The Lunar 100: Features 91-100	November 2021 Issue – Due October 20, 2021

Jerry Hubbell –jerry.hubbell@alpo-astronomy.org
David Teske – david.teske@alpo-astronomy.org

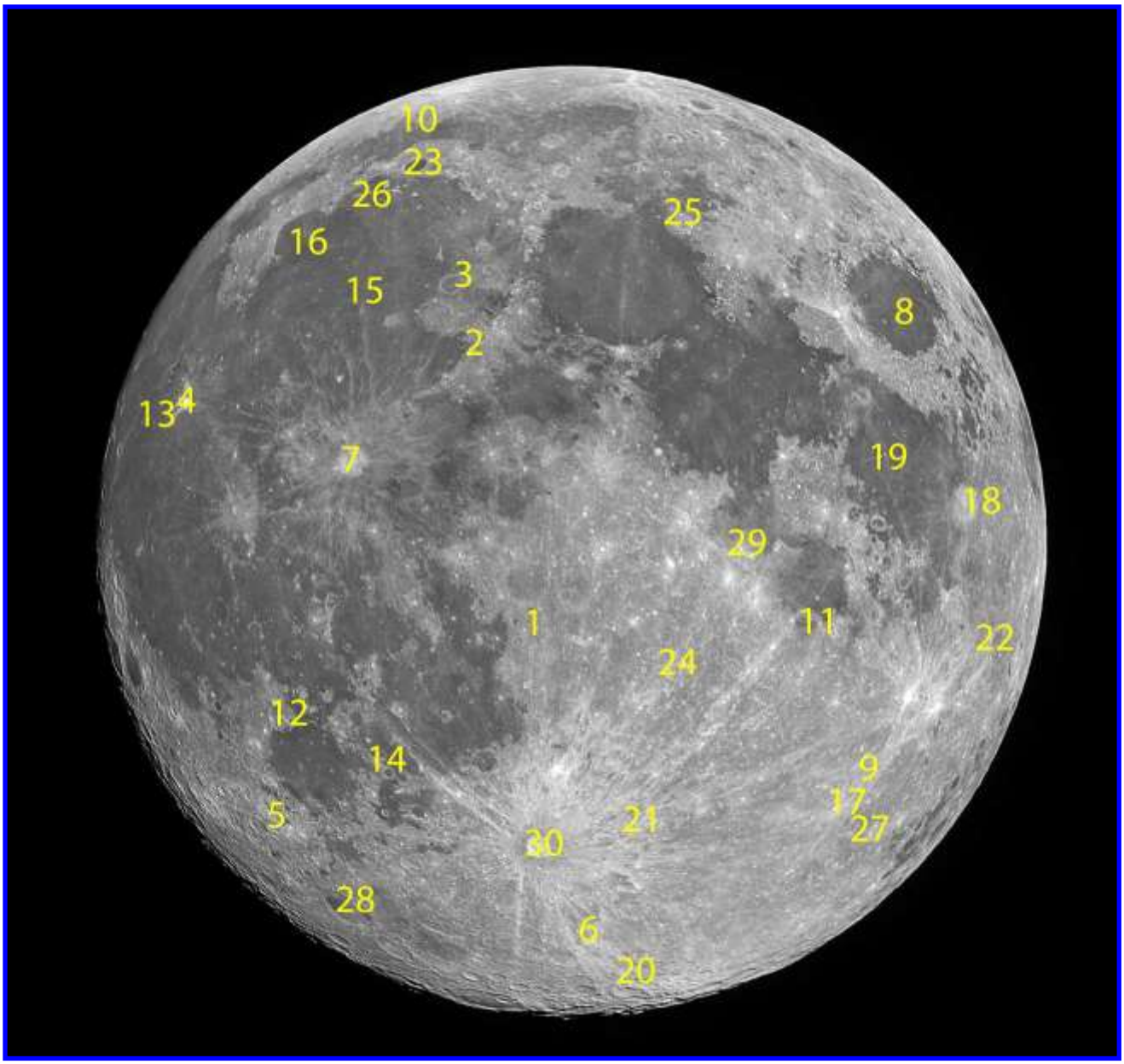
Focus-On Announcement

TAKE A TRIP TO CRISIUM COUNTRY

Mare Crisium is a place worth studying, that's why we include it as a target to FOCUS ON. It is the only basin that is not connected to the others, which makes it easily recognizable with the naked eye, its almost completely flooded interior has a fascinating, and a bit disturbing, dark hue, it is also probably the deepest in relation to the highlands. . And the trip couldn't be more attractive: one of the brightest craters with the strangest ray system (Proclus), domes, wrinkle ridges, little elusive craters. And a curiosity: the Soviet probe Luna 24 collected in Mare Crisium the last lunar sample that we have on Earth and probably the first sample of lunar water was discovered there. We're going on a trip to Mare Crisium!

Please send articles, drawings, images, etc. to Alberto Anunziato and David Teske by **December 20, 2021** for the January 2022 issue of The Lunar Observ-

Key to Images In This Issue



1. Alphonsus
2. Apenninus, Montes
3. Archimedes
4. Aristarchus
5. Byrgius
6. Clavius
7. Copernicus
8. Crisium, Mare
9. Fabricius
10. Fontenelle, Dorsum
11. Fracastorius
12. Gassendi
13. Herodotus
14. Hippalus
15. Imbrium, Mare
16. Iridum, Sinus
17. Janssen
18. Langrenus
19. Messier
20. Moretus
21. Nonius
22. Petavius
23. Plato
24. Playfair
25. Posidonius
26. Recti, Montes
27. Rheita Valley
28. Schickard
29. Theophilus
30. Tycho