The Lunar Observer

A Publication of the Lunar Section of ALPO

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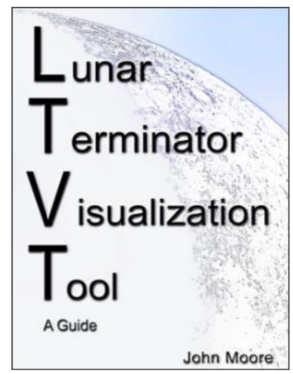
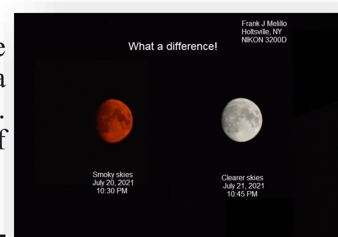
In This Issue



ALPO Conference August 13-14, 2021

See pages 33-34



A warm greetings to all. I hope that this finds you and your loved ones healthy. In the northern hemisphere, it has largely been a hot summer. In the western USA, Canada and even Asia, wildfires have caused the skies for many to become smoky and hazy. Please note the image by Frank Melillo on the right. This image describes the skies of the summer 2021 well.

This issue of *The Lunar Observer* has interesting articles about lunar topographic features by Rik Hill, Alberto Anunziato and David Teske. A number of wonderful lunar images grace the Recent Topographic Studies. As always, Tony Cook gives a detailed look at Lunar Geologic Change. Perhaps most interesting this month is the boom review, LTVT-The Book by its author, John Moore. I strongly believe that the readers of this newsletter would benefit by using the LTVT program. This book by John Moore will be an invaluable asset to future lunar studies.

A reminder that the next Focus-On article will feature Lunar targets 81-90 (see page 44). This group features small targets such as craterlets in Plato and rays around Langrenus. Images, articles and drawings are due to Alberto and myself by August 20.
Be well,
David

Lunar Topographic Studies

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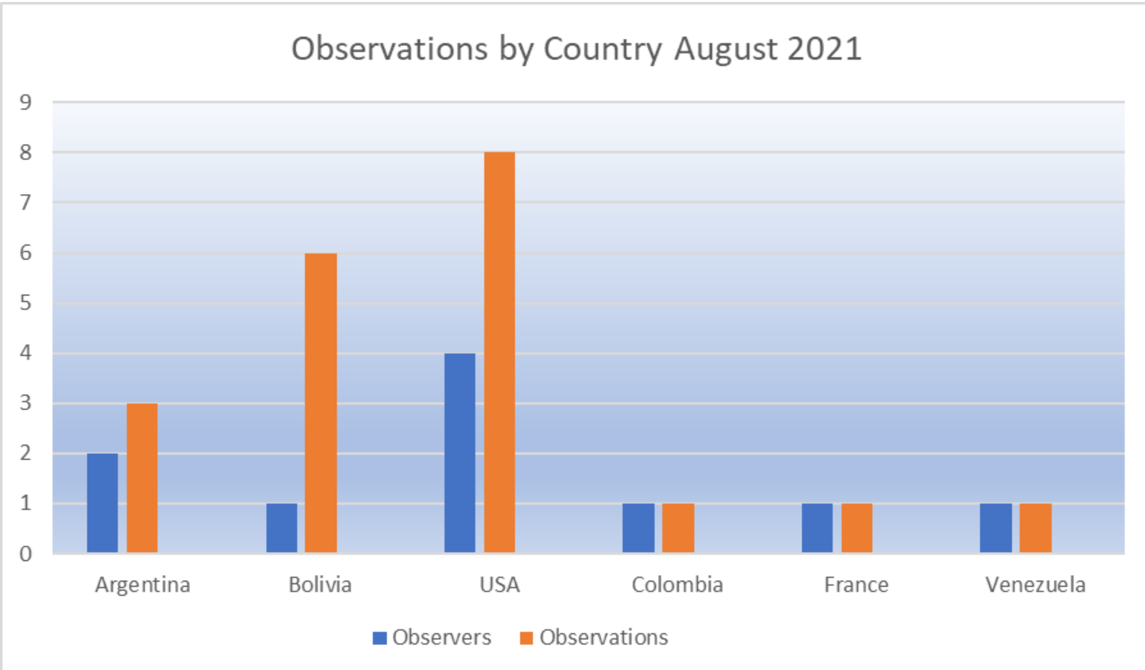
Observations Received

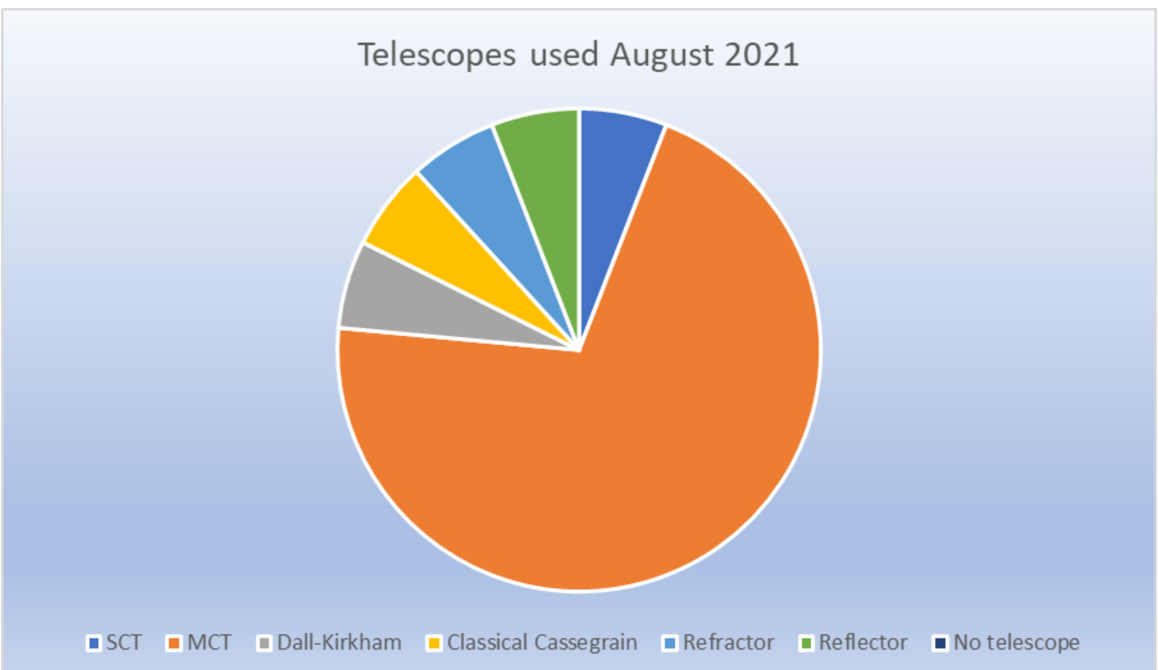
Name	Location and Organization	Image/Article
Alberto Anunziato	Paraná, Argentina	Article and drawing *Wrinkle Ridges Near Laplace A, Raman and Dorsa Burnet* and *Land of Saucers.*
Francisco Alsina Cardinalli	Oro Verde, Argentina	Article and image *Land of Saucers*.
Jairo Chavez	Popayán, Colombia	Image of the waning gibbous Moon.
Michel Deconinck	Aquarellia Observatory Artignosc-sur-Verdon - Provence - France	Pastels of Lambert
Marcelo Mojica Gundlach	Cochabamba, Bolivia	Images of Montes Riphaeus, Moretus, Sinus Iridum, Tycho, Mare Imbrium and Clavius.
Rik Hill	Loudon Observatory, Tucson, Arizona, USA	Article and image *More Moretus, Old and New, Almost Straight* and *A Most Beautiful Sunrise.*
Frank J. Melillo	Holtsville, New York, USA	Image of Moon with smoke from wildfires.
John Moore		LTVT– The Book
Jesús Piñeiro	San Antonio de los Altos, Venezuela	Image of the waxing crescent Moon.
Michael Sweetman	Sky Crest Observatory, Tucson, Arizona, USA	Images of Messier and Atlas.
David Teske	Louisville, Mississippi, USA	Article and image *Fishing in Lake Land*

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

August 2021 *The Lunar Observer*
By the Numbers

This month there were 20 observations by 10 contributors in 6 countries.



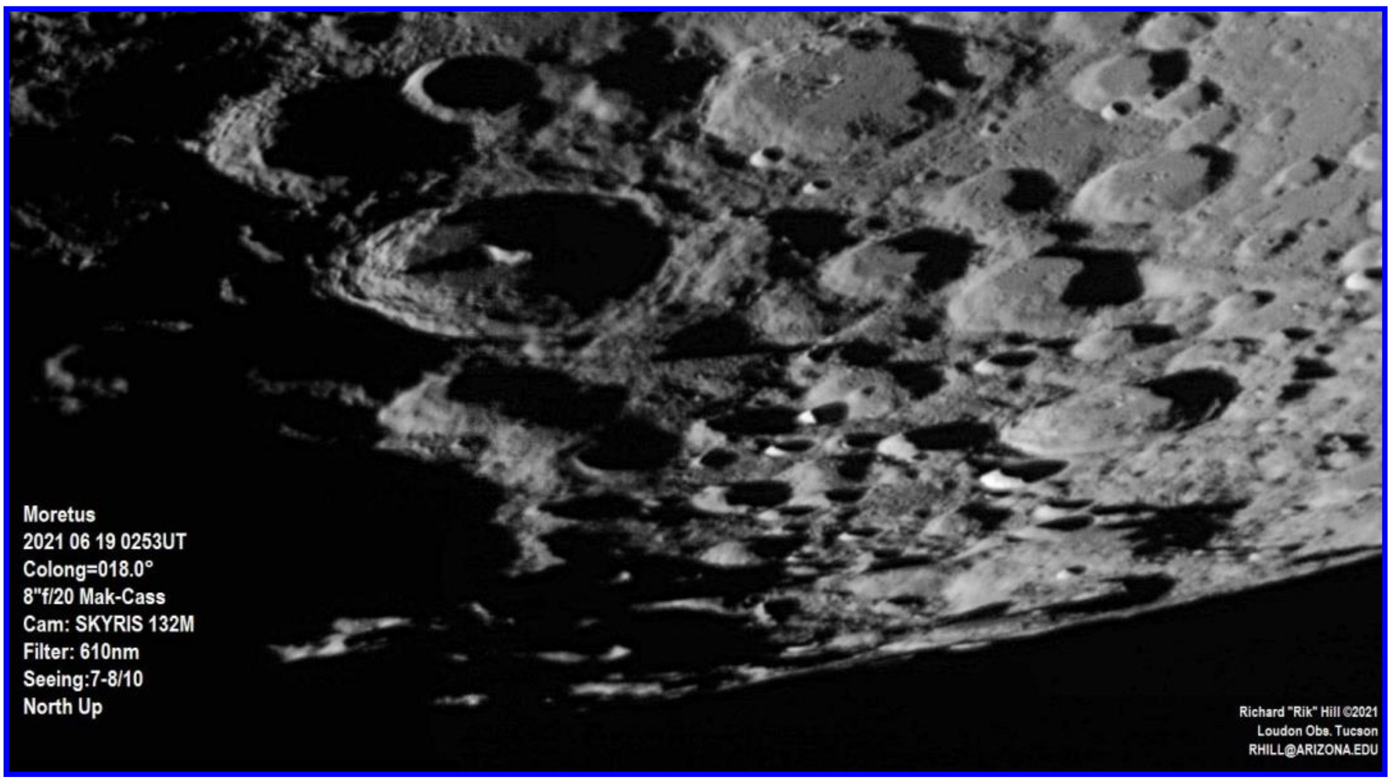


More Moretus

Rik Hill

If it were anywhere but in this crowded field the crater Moretus (117 km), bigger than Copernicus, would be given much more attention. Here the crater is above band left of center displaying beautifully terraced interior walls, a long shadow from the central peak and interesting ridges tangent to the north and south walls trailing off and converging to the right. Caught between these ridges to the right is the crater Simpelius (71 km). Below this crater is another larger crater Schomberger (88 km). Further south is another large crater Scott (11 km) and even further south, closer to the pole, on the limb is Scott's nemesis Amundsen (109 km). To the left of Amundsen, in the shadow is where the Lunar Prospector was intentionally crashed on July 31, 1999, in a permanently shadowed area of the crater Shoemaker in hopes of vaporizing water from ice hypothesized to be in the soil there. Telescopes all over the western hemisphere were watching that night including the 61 inch I was working on where we had a large echelle spectrograph set up to catch the absorption lines from the water. We watched through the whole event and well afterwards but did not see anything. In fact, no one reported positive results from the impact experiment.

Above Moretus to the right is the politest crater on the Moon, Curtius (99 km) and to the upper left in deep shadow is Gruemberger (97 km). There are a number of smaller named craters in this image. I leave it to the reader to pick them out.



Moretus, *Richard Hill, Loudon Observatory, Tucson, Arizona, USA. 2021 June 19 02:53 UT, colongitude 18.0^o. 8 inch f/20 Maksutov-Cassegrain telescope, 610 nm filter, SKYRIS 132M camera. Seeing 7-8/10.*

Fishing in Lake Land

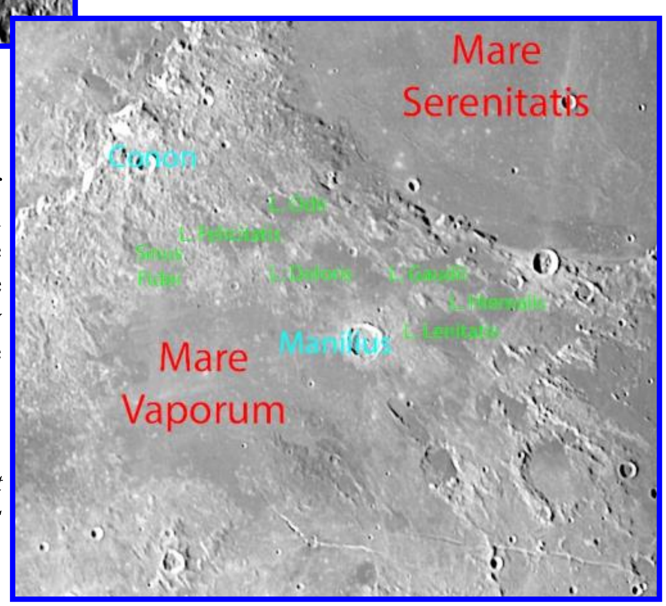
David Teske

Summer is here and the living is grand. Hot summer days bring my mind to youthful times fishing on countless lakes. Just where on our eternally dry Moon could we go fishing in those plentiful lakes? It turns out, just about in the center of the Moon's disk! Towards the bottom of this image is the Hyginus Rille spanning 220 km. To its right (east) is Rima Ariadaeus which also stretches 220 km. These spectacular rilles often steal the attention in this part of the Moon. Near the center of this image is the prominent crater Manilius with a diameter of 27 km, terraced walls and a central peak that demonstrate its youthful nature.

Manilus is on the northern shores of Mare Vaporum. Between this and Mare Serenitatis to the northeast (upper-right) is the area that I am calling Lake Land. Here reside six lunar lakes, or "Lacus". Just east (right) of Manilius is Lacus Lenitatis, the "Lake of Tenderness" with a diameter of 80 km. Just east of this is Lacus Hiemalis, the "Lake of Winter" with a diameter of 50 km. This looks like a flooded, ancient crater. Northwest (upper left) of that is Lacus Gaudii the "Lake of Joy" with an irregular shape, and a listed diameter of 100 km. Just north of Manilius is Lacus Doloris, the "Lake of Suffering" with a diameter of 110 km. Some of the names on the Moon are bummers! Northwest of this is Lacus Odii, the "Lake of Hate" (real bummer of a name!) with a diameter of 70 km. We make up for this name by the lake to its west, Lacus Felicitatis, the "Lake of Happiness" with a diameter of 90 km. Also included here is a Sinus, not a Lacus, Sinus Fidei, the "Bay of Faith" with a length of about 70 km. It will be in that bay that we find one of the toughest of Charles Woods Lunar 100 targets, Ida. It is only 1.5 km across and might be visible as a pixel or two on my image.

Rather than worry about such tiny targets, search for these lakes and a bay. Many of the lakes have cheerful names, some otherwise! Fishing on these lakes might be rough. Rather than blue, crisp waters, these lakes will be covered with mare basalts that are dark in color. They can be seen whenever sunlight falls upon them, maybe even better when the Sun is high. Happy fishing!

Lake land, *David Teske, Louisville, Mississippi, USA. 2021 June 29 09:23 UT, colongitude 141.8°. 4 inch f/15 Skylight refractor telescope, UV/IR block filter, ZWO ASI120mm/s camera.*

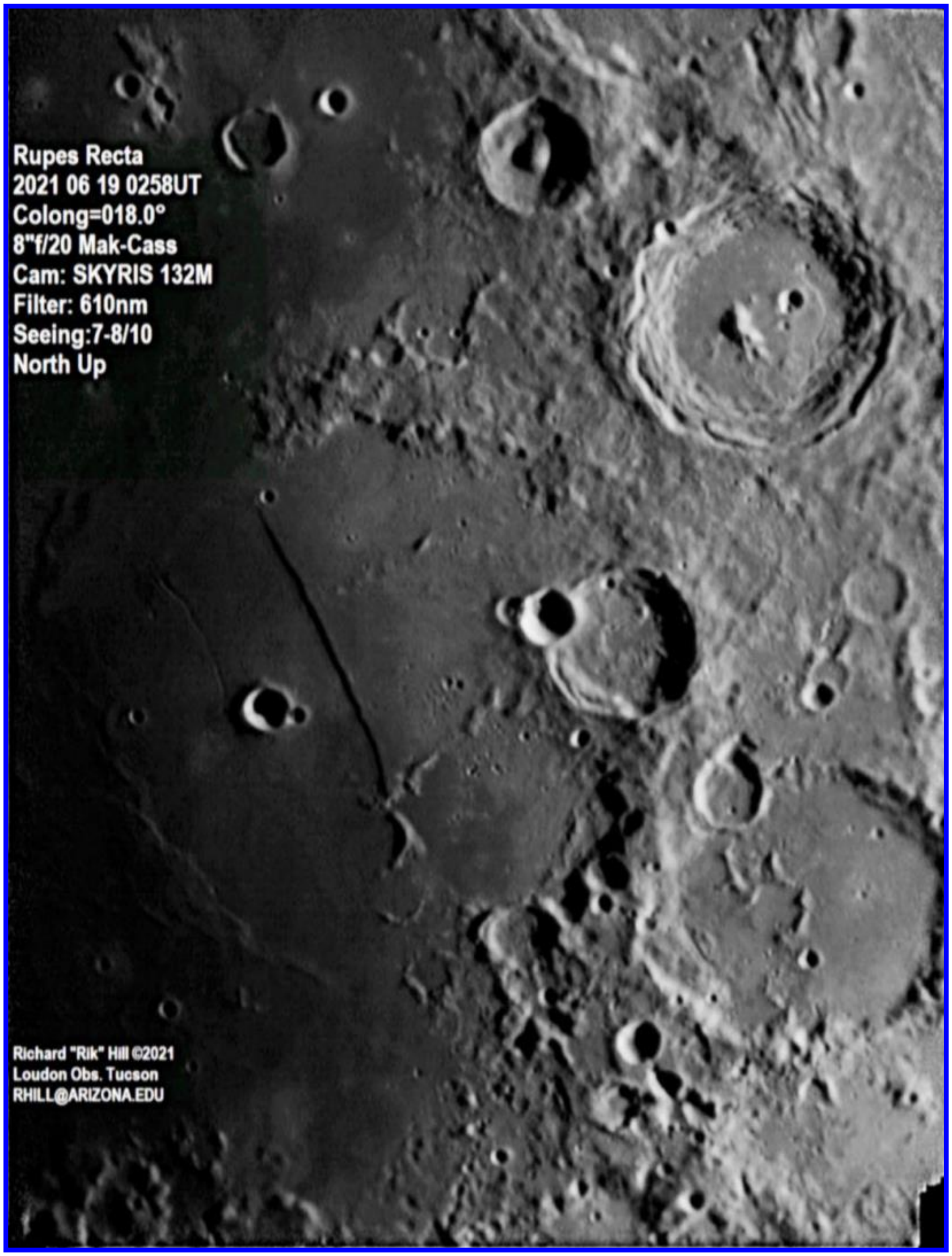


Almost Straight

Rik Hill

Our monsoon is in full swing now for the first time in two years after a record setting drought. We welcome the rain, but it means no sky! This gives me a chance to catch up with all those images passed up in earlier months of the year. This is one of them of the wonderful Rupes Recta, or as I knew it growing up, The Straight Wall. You can see here that it is not truly “straight” but raggedly and the more resolution applied the more raggedly it gets. On the south end we have a curious set of mountains, the Stag’s Horn Mountains, made of from upper fragments of now buried craters and mountains. To the left (west) of the Wall is the crater Birt (17 km) with Birt A (7 km) on the eastern wall. Northwest of Birt is a rima that runs roughly parallel with the Wall, Rima Birt. On the other side of the Wall is a good-sized crater, Thebit (60 km) the small satellite on its northwest wall, Thebit A (20 km). Below this is what we used to call a “walled plain” crater, Purbach (121 km). It has a curious central formation that appears to be an off center buried crater.

North of Thebit is a beautiful crater Arzachel (100 km) with the nice Rima Arzachel to the east of its off-center peak, just inside the east wall of the crater. Look at the spectacular terracing of the crater walls! Northwest of Arzachel is the unusual crater Alpetragius (41 km) with a central peak that has been likened to an egg-in-a-basket. Rounded and wide rising some 2 km from the floor of the crater, it is thought that this crater was enlarged through volcanic activity. A last crater is to the northwest of this. This is the shadow filled Lassell (24 km), a shallow, flat floored crater.



Rupes Recta, *Richard Hill, Loudon Observatory, Tucson, Arizona, USA. 2021 June 19 02:58 UT, colongitude 18.0°. 8 inch f/20 Maksutov-Cassegrain telescope, 610 nm filter, SKYRIS 132M camera. Seeing 7-8/10.*

Wrinkle Ridges Near Laplace A

Alberto Anunziato

Laplace A is a small crater, 9 kilometers diameter, which, however, is very conspicuous because it is located in an area, on the shore of Sinus Iridium, in Mare Imbrium, with a low density of craters. Its west wall projects the typical triangular shadow of craters of that size (with their characteristic bowl shape) when they are illuminated very obliquely by sunlight. What struck me at the time is the sheer number of wrinkle ridges segments (IMAGE 1). All present the curved shape that wrinkle ridges present when we observe them segmentally (and even more when we observe visually with a small telescope). There are interesting details, such as a segment that casts a shadow that becomes more pronounced at one end, probably indicating a summit, or the main segment much wider and more sharply shaped than the others. What most caught my attention, in that main segment, is a much brighter area, located at its edge and bordering the shadow, which seemed to even have jagged edges. To delimit it I marked it with a black line that I did not observe, it is a resource to demarcate the brightest area from the rest of the bright wrinkle ridge. I have seen these brighter areas on other occasions and I believe that they are the brightest, and therefore highest, areas of the upper segment of the wrinkle ridge (which is called "crenulated ridge", "crest" or simply "ridge"), a segment superimposed on the widest segment named "arch".

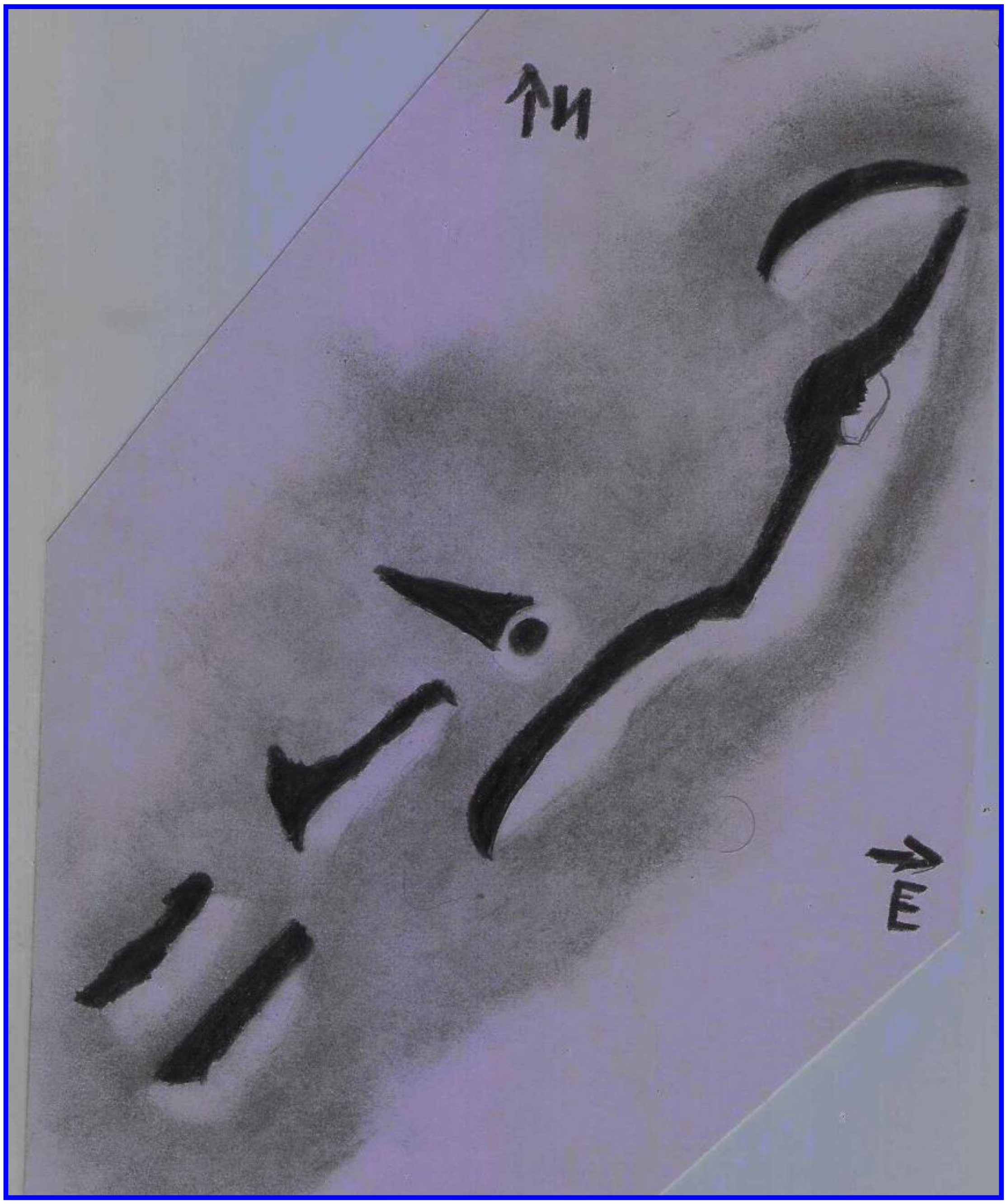


Image 1, Dorsa Near Laplace A, *Alberto Anunziato, Paraná, Argentina. 2021 June 19 22:40 to 23:00 UT. Meade EX 105 mm Maksutov-Cassegrain telescope, 154 x*

After the observation I resorted to the LRO Quickmap and the wrinkle ridges that I observed are very prominent, I include IMAGE 2 for comparison, in which you can see the wrinkle ridges (in orange) included in the "Map of lunar wrinkle ridges digitized from LROC Wide Angle Camera (WAC) global mosaic and hill shade maps generated from GLD100 Digital Terrain Model" (Thompson, TJ, MS Robinson, TR Watters, MB Johnson). It is interesting to note the limitations of visual observation if we compare both images (a segment that is visually observed as interrupted, in the lower left area, when it is actually continuous), but it is also true that the shape of the main segment corresponds to the LRO image, the bright area is the arch (wide and not very high) and that the crest (indicated by the orange line in image 2) corresponds to the brightness-shadow separation, which agrees with the morphology of wrinkle ridges: a steep slope (shaded in image 1) and a gentler slope (bright). So, I used the "Draw / Search Tool" to analyze the height of the brightest area in image 1. In image 2 of the Quickmap, the bright area would be inside the red circle, more precisely at the blue point on the orange line.

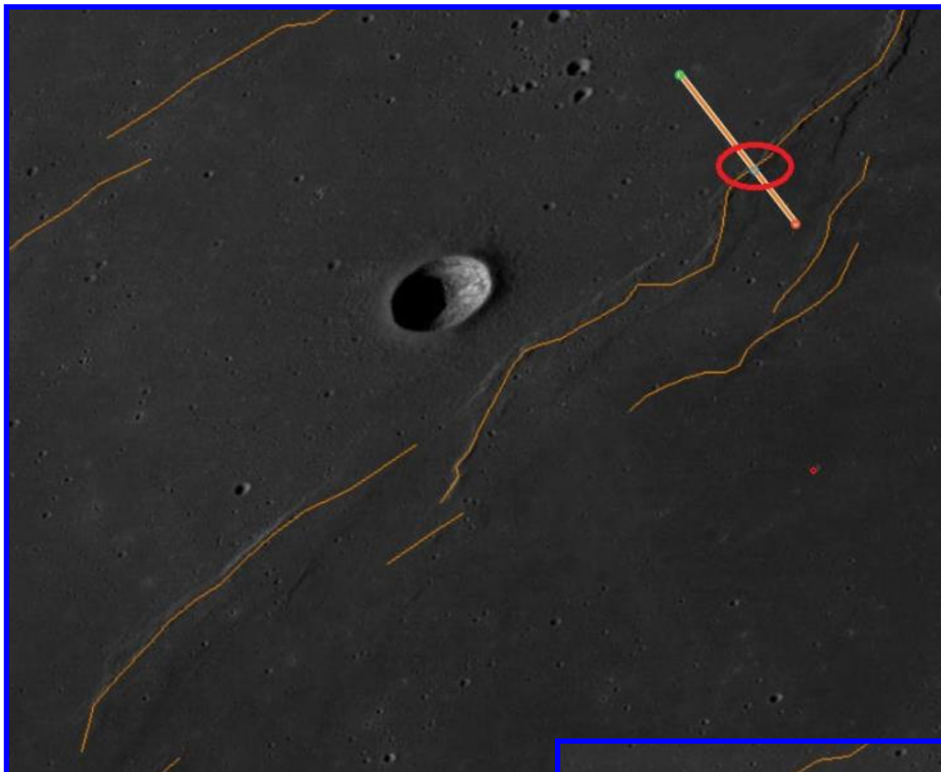


Image 2, Dorsa Near Laplace A. *LRO Quickmap.*

If we see IMAGE 3, it is image 2 with the addition of the relief line obtained with the Lunar Orbiter Laser Altimeter (LOLA) of the Lunar Reconnaissance Orbiter (also available in the LRO Quickmap), so that we can follow the height of the points included in the orange line. What we see? The typical relief of a wrinkle ridge: a steep slope (the left, which in image 1 casts shadows), a softer slope (the right, bright in image 1) and the highest point (on the west slope, the more abrupt) that coincides with the brightest area that we observe. Extremely interesting, it remains for further study to continue playing with the LOLA data on the Quickmap and to determine more precisely that "peak" in the highest part of the wrinkle ridge near Laplace A.

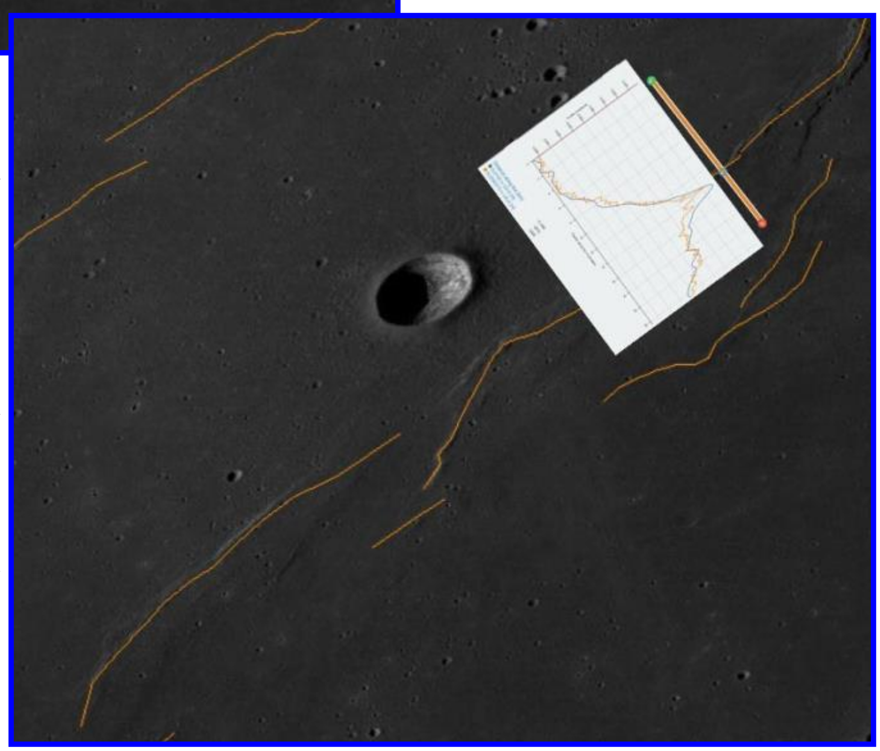


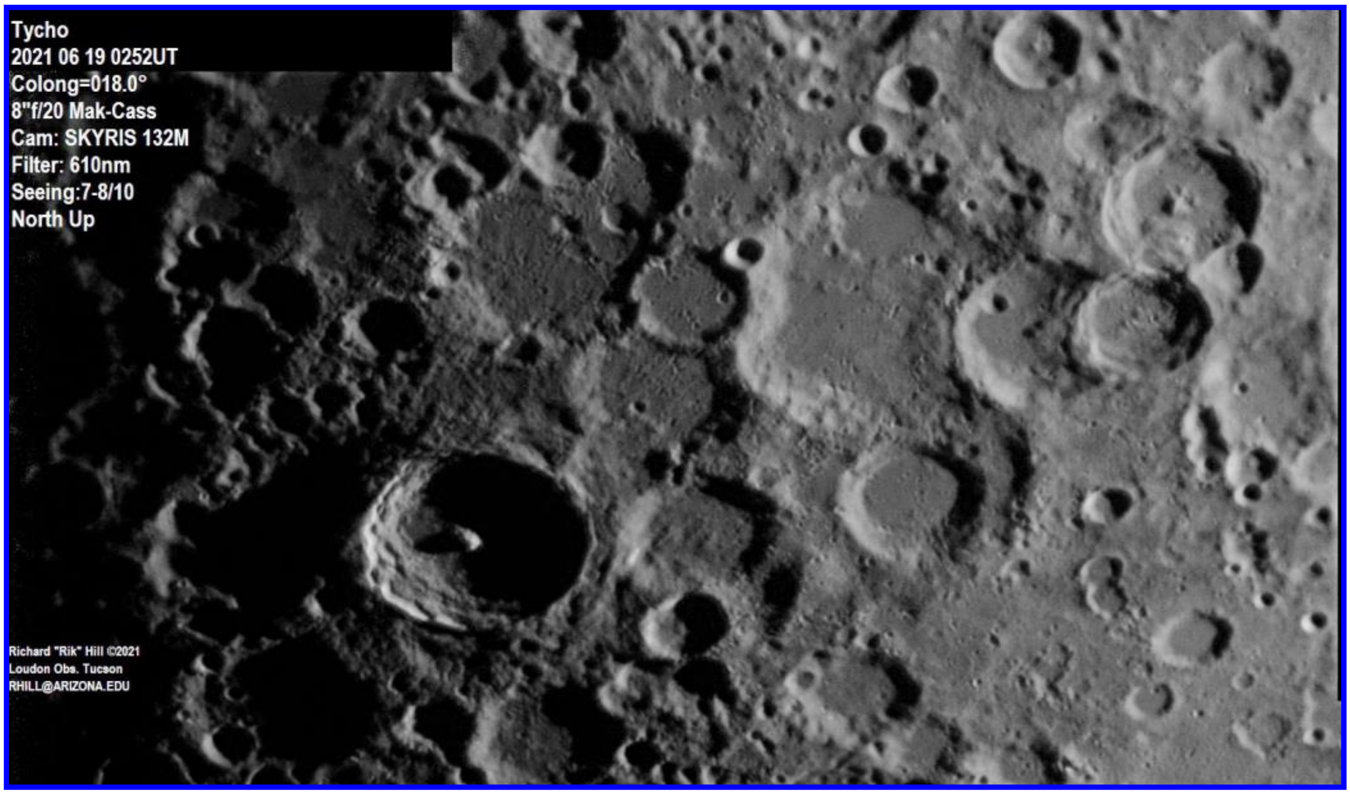
Image 3, Dorsa Near Laplace A. *LRO LOLA.*

Old and New

Rik Hill

Wonderful sights on the terminator this particular night. Chief among them was the beautiful crater Tycho (88 km), a relatively young crater of "Copernican" age. Analysis of samples of one of the rays taken during Apollo 17 led to an age determination 108 million years. Some lucky dinosaur got to see one spectacular flash in the night sky! Notice the crisp nicely terraced interior wall and the central peak catching the first rays of the morning Sun. The crater adjacent to the right is Pictet (65 km) and is much older, covered in ejecta from Tycho. Farther away is a similar sized crater Saussure (56 km) with less ejecta on and in it. Below this crater is Proctor (54 km), a much older crater some 3.8-4.5 billion years old and it looks it with many secondary craters breaching its walls.

Below Tycho, half in shadow is Street (60 km). Above Tycho is a smaller crater in full shadow, Tycho A (31 km). Between the lower wall of Tycho A and the upper wall of Tycho is the landing site of Surveyor 7. This was a highly successful mission that took over 20,000 images at 200- and 600-line modes on a vidicon. Also, this spacecraft did a lot of soil analysis and imaging of rocks and landforms all around the craft. It was z great early look at our nearest neighbor.



Tycho, *Richard Hill, Loudon Observatory, Tucson, Arizona, USA. 2021 June 19 02:52 UT, colongitude 18.0°. 8 inch f/20 Maksutov-Cassegrain telescope, 610 nm filter, SKYRIS 132M camera. Seeing 7-8/10.*

Raman and Dorsa Burnet

Alberto Anunziato

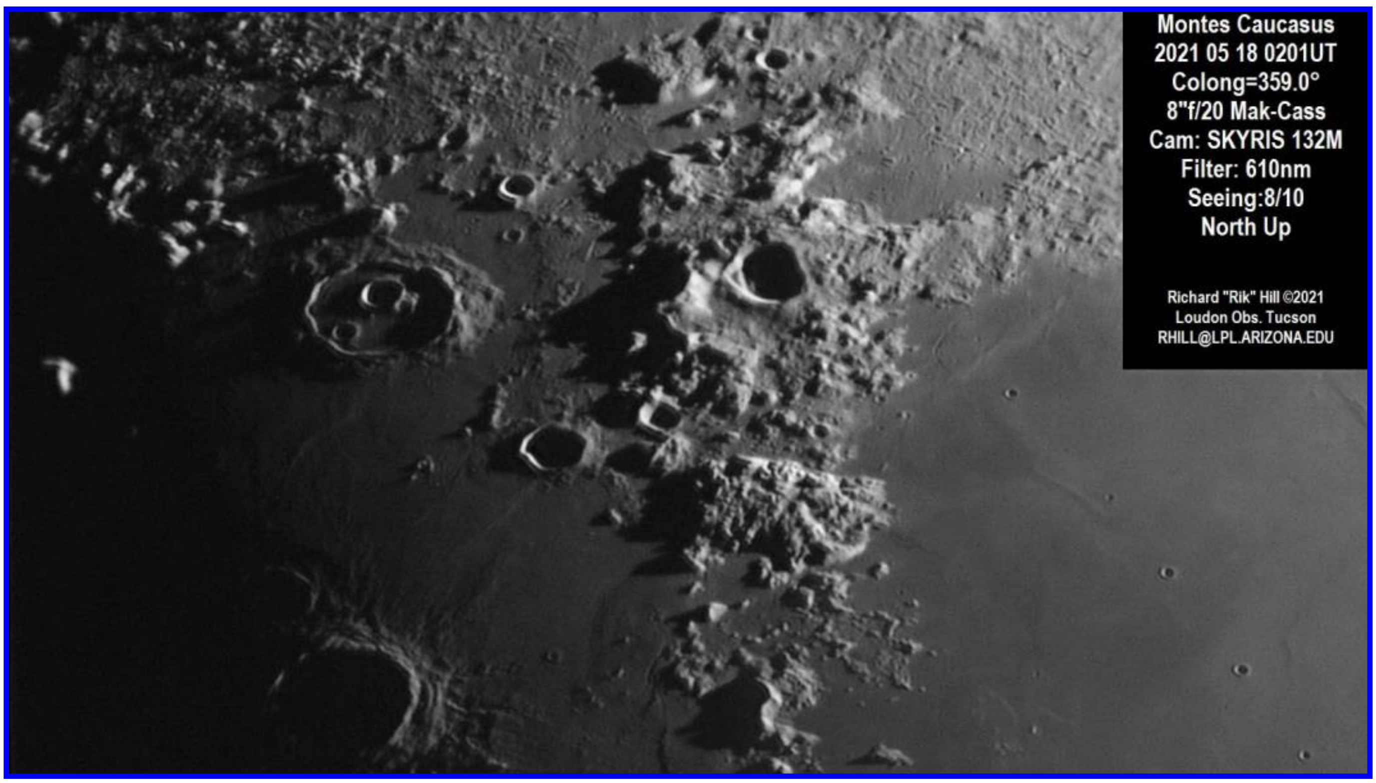
We know that the Aristarchus Plateau is darker and higher than the surrounding mare, which, when viewed through a telescope, gives the sensation of a kind of cape going into the sea, especially around the elongated Raman crater. Raman is 12 kilometers in diameter and its shape is supposed to be due to an alignment of impacts, which is seen more clearly in images in orbit, such as the Quickmap of the Lunar Reconnaissance Orbiter. We also know that its surface is undulating and marked by small hills, like the one seen south of Raman, or rather it is guessed by its shadow. Interestingly, a very dark shadow extends from the southern edge of Raman that appears to cover the northern end of the Plateau and beyond as well. It is also interesting how little distinguishable are the Montes Agricola from Dorsa Burnet. The brightest segment that casts a more extended shadow at one of its ends belongs to the Montes Agricola. The northernmost parallel segment belongs to Dorsa Burnet, as well as the segment most to the left (west), in which we can distinguish a brighter area, which stands out from the rest of the ridge, much higher, which even projects a small shadow on the widest part of the ridge, that is, on the soft slope of the arch.

Raman, *Alberto Anunziato, Paraná, Argentina. 2021 May 23 22:55 to 23:20 UT. Meade EX 105 mm Maksutov-Cassegrain telescope, 154 x*

A Most Beautiful Sunrise

Rik Hill

I've said it before, and I'll say it again, the Montes Caucasus are the most attractive mountain group on the moon. Home to spectacular cliffs and peaks that jut up from the floor of the Mare Serenitatis on the east side (right) and Mare Imbrium on the west (left). Note the wonderful shadows cast by these mountains! The large shadow filled crater in the north of these mountains is Calippus (34 km). The large flat area north of that is Alexander (85 km) listed as a circular feature but it only is barely so. Just below Alexander in the mare to the east of the Montes you can see a short rima, Rima Calippus only 41 km long and only 1.6 km wide. South of Calippus is a magnificent unnamed massif and to the west of it is another shadow filled crater, just beyond the tips of the shadows of the Montes. This is Theaetetus (26 km) and it points the way to the much larger crater Cassini (60 km) further west. This latter crater is very identifiable with two interior satellite craters A and B and great ejecta blanket tight about the crater. On the left edge of this image is the lone peak, Mons Piton rising 2250 m above Mare Imbrium. Then next is the great crater Aristillus just coming in to the sunlight at the bottom of this image. Look at the spidery splash pattern of the ejecta. To the east of Aristillus notice the swelling as you approach the Montes Caucasus. This is Aristillus 1 a lunar dome 54x35 km in size and only 85 m high. Moving slightly further east, you see the fantastic cliff just coming into view in the morning light. It would be fun to stand on top of this mountain and survey these wonderful sights!



Montes Caucasus, *Richard Hill, Loudon Observatory, Tucson, Arizona, USA. 2021 May 18 02:01 UT, colongitude 359.0°. 8 inch f/20 Maksutov-Cassegrain telescope, 610 nm filter, SKYRIS 132M camera. Seeing 8/10.*

Land of Saucers

Francisco Alsina Cardinalli and Alberto Anunziato

This image shows us an unusual aspect of the famous trio formed by three craters from different geological periods. Arzachel, Alphonsus and Ptolemaeus (IMAGE 1). Well, they are also very different from each other when we see them at the very edge of the terminator. Arzachel is a dark pit, only its central peak is bright. Alphonsus, on the other hand, shows a very bright central peak and a curiously illuminated area, which corresponds to the "slightly raised topography" mentioned by Anthony Cook and Raffaello Lena in "Emergence of low relief terrain from shadow: an explanation for some TLP", ridges and bright hills that produce a "bright effect under a sunrise illumination". At the 2020 ALPO Conference we mentioned this curious effect near the central peak of Alphonsus as an example of "Short duration bright spots on the Moon", areas of which are shown very bright near the terminator and appear as smooth relief with frontal light. This was initially why I stopped at this image: it exactly matched the Alphonsus images used by the authors of the quoted text. Let's continue with the third member of the trio, Ptolemaeus. In IMAGE 1 we see that his floor appears completely different from the completely smooth floor that we usually see in Ptolemaeus. As Charles Wood says "when the Sun is low, the real action starts-all sorts of shallow "saucers", or hollows, typically 5 to 10 km in diameter, become visible" (pages 136/137). It was precisely by gathering images for last month's Focus On, which covered places 71-80 on Charles Wood's Lunar 100 list, that I discovered these strange lunar features, represented by Ptolemaeus B (Lunar 75), the most conspicuous of all.

Image 1, Alphonsus, *Francisco Alsina Cardinalli, Oro Verde, Argentina. 2016 October 09 00:25 UT. Celestron 11 inch Edge HD Schmidt-Cassegrain telescope, QHY5-ll camera.*

In IMAGE 2, an enlargement of IMAGE 1 slightly modified to enhance contrast, we see what Thomas Elger pointed out many years ago: "it is chiefly remarkable for the number of large saucer-shaped hollows which are revealed on its surface under a low sun. They are mostly found on the western quarter of the floor. Some of them appear to have very slight rims, and in two or three instances small craters may be detected within them. Owing to their shallowness, they are very evanescent, and can only be glimpsed for an hour or so about sunrise or sunset (pages 93/94). Wood says: "in the hour or so it takes the terminator to sweeps across Ptolemaeus's floor, additional saucers seem to appear from nowhere and then quickly disappear. The champion saucerologist seems to have been Wilkins, the indefatigable British Moon mapper. His 1955 chart of him depicts more than two dozen saucers as dashed rings. How many can you see? " (pages 136/137). In IMAGE 3 I could count 14, although I am not entirely sure I have discovered all of them and maybe I mistook a craterlet for a saucer.

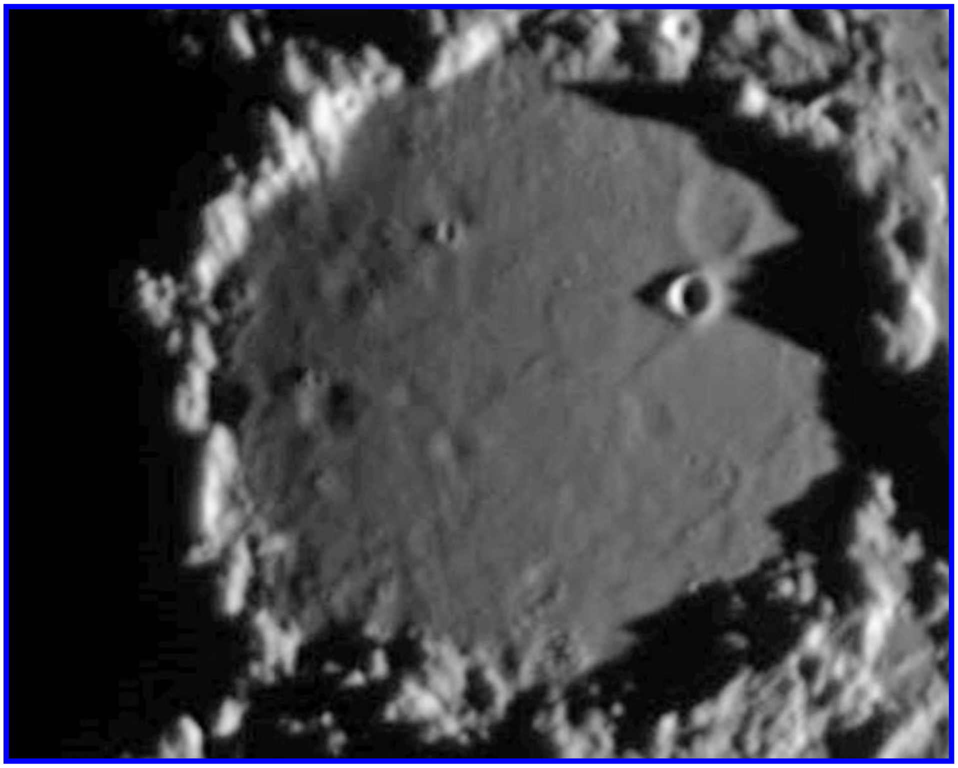


Image 2, Ptolemaeus, *Francisco Alsina Cardinalli, Oro Verde, Argentina. 2016 October 09 00:25 UT. Celestron 11 inch Edge HD Schmidt-Cassegrain telescope, QHY5-ll camera. This is a close-up of image 1.*

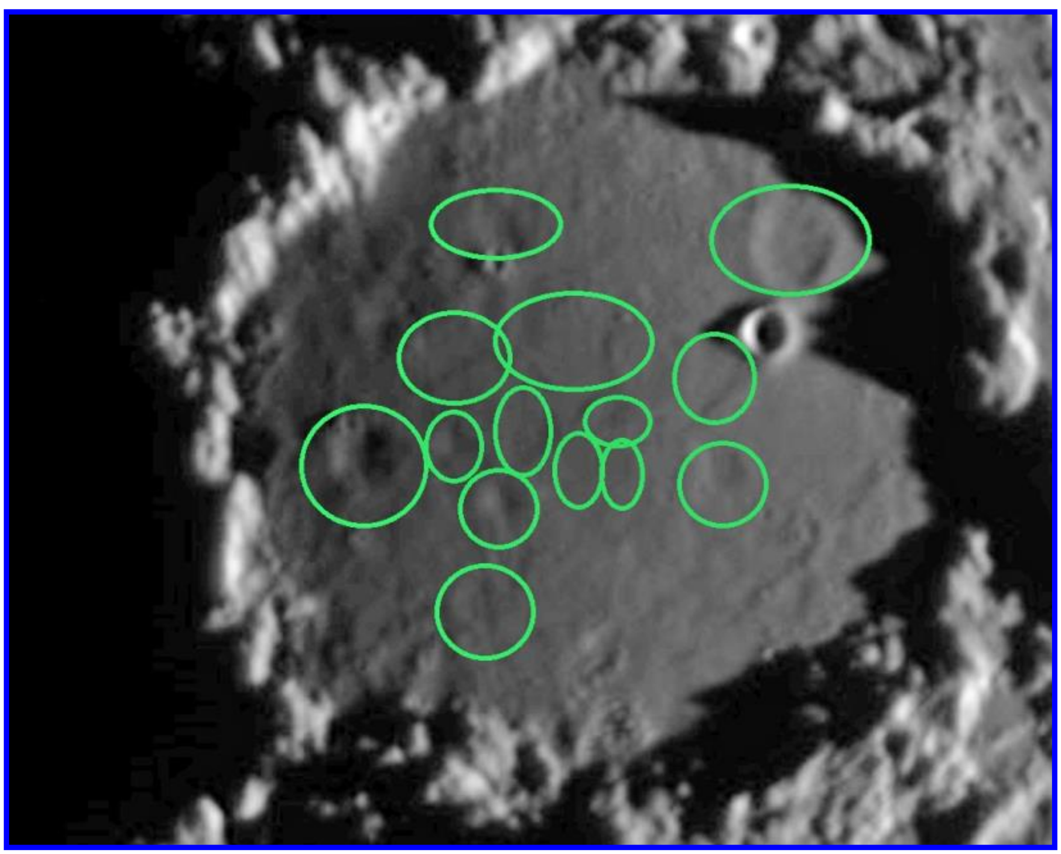


Image 3, Ptolemaeus saucers labeled, *Francisco Alsina Cardinalli, Oro Verde, Argentina. 2016 October 09 00:25 UT. Celestron 11 inch Edge HD Schmidt-Cassegrain telescope, QHY5-ll camera. This is a close-up of image 1.*

But I do know someone who counted more saucers on the floor of Ptolemaeus, and he was an old friend of ALPO. At the Sixth ALPO Convention (San Jose-California), August 24th 1960, Alika K. Herring read the paper "Saucers" in Ptolemaeus', published in Volume 15 (3-4, March-April 1961) of "The Strolling Astronomer". Herring counted 100 saucers in Ptolemaeus, as we see in IMAGE 4, which is the chart that accompanies the very interesting article. Herring points out as characteristics of the "saucers": "with few exceptions they are rimless, approximately circular in shape, and are of such shallow depth that the sunlight must fall almost at grazing incidence to bring them into relief… so shallow is their depth than an observer could be situated in the center of one of them and have absolutely no inkling of the fact; it is even entirely possible that some of our future astronauts may land their moon rockets in the middle of a saucer and be totally unaware of its existence". Regarding its origin, it maintains that "these minute irregularities could only have caused by convection currents in the melted material which persisted up to the actual moment of solidification", while Wood maintains that they are not covered by lava (which would be dark, while the Ptolemaeus floor is rather bright), they are craters covered by the bright highland-type material (Imbrium ejecta) that covers the floor of Ptolemaeus.

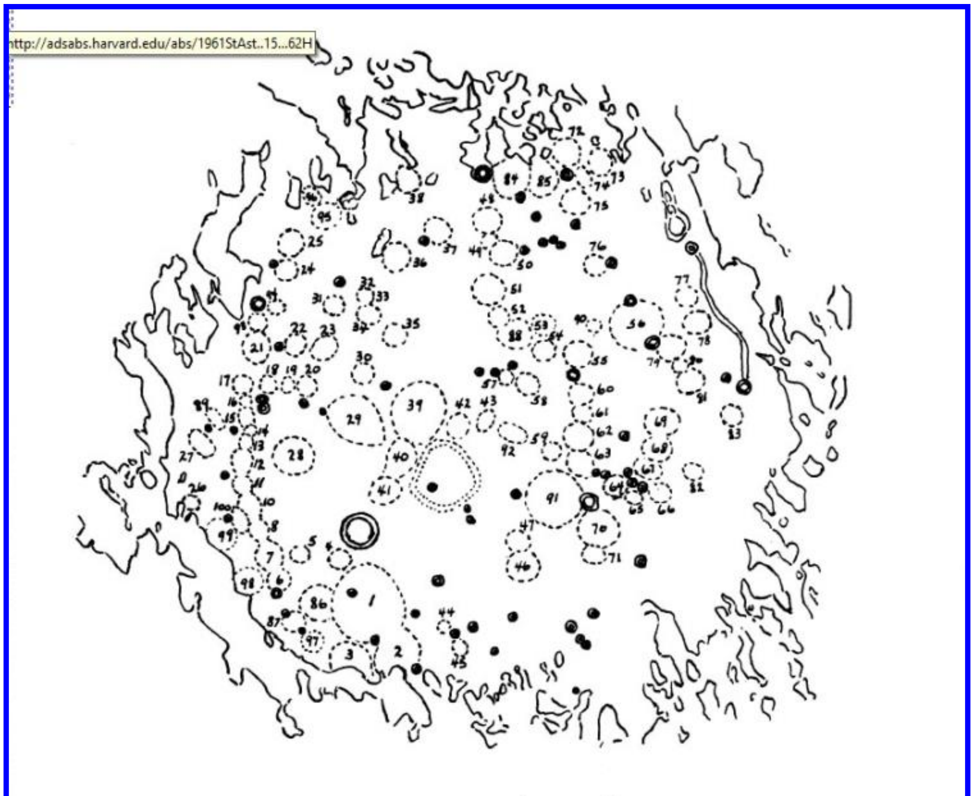


FIGURE 51. Chart by Alika K. Herring of "saucers" in lunar walled plain Ptolemaeus. Chart based upon observations in 1955-59 with 8-inch and 12.5-inch reflectors and upon a photograph by Dr. Dinsmore Alter. See also text of Mr. Herring's paper in this issue.

The "saucers", Herring continues, are limited to "walled plain type crater having the dark maria -type floors which are related to smooth and free of detail" and cites as examples of craters with "saucers" Plato, Archimedes and Fracastorius, Wood also cites Albategnius, a crater very close to Ptolemaeus. It seems like a fun task to find "saucers" in these craters.

Image 4 Ptolemaeus Saucers *from Alika , 1961.*

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LTVT - The Book

John Moore

Since its first release back in 2009, LTVT (the Lunar Terminator Visualization Tool) has been freely available to download from several sites online. Packed with many lunar applications for constructing near-impossible lighting conditions of any feature on the Moon, the software content has now been transcribed in to book format, as a guide for both the observer and astrophotographer alike.

All of the original LTVT functions are covered in the book through a simple step-by-step process, and new online content maps and files has been added - giving the software a more modern twist. If you have used LTVT in the past, or have never even heard of the software before; it might be worth looking at some of its main applications that escaped attention, or discover it from an interested, future observer/user approach.

Using your own photos in LTVT

As an observer of the Moon, you've undoubtedly taken many photos of different parts of its surface - from basins to craters, to all the other type of features e.g. rilles and dorsa and lacus alike. The one thing that such photos all have in common however is, is that they all are 2D in format. But, what if you could turn your photos in to 3D dynamic ones, allowing, for example: the automatic labelling and measurement of surface features shown; the adjustment of your photo to various views; and the reading of latitudes and longitudes for every pixel point as you rove your cursor over them. Well, now you can, using LTVT's *calibration* function (Fig 1), which, in effect, projects your photo on to a global moon as an actual, interactive texture.

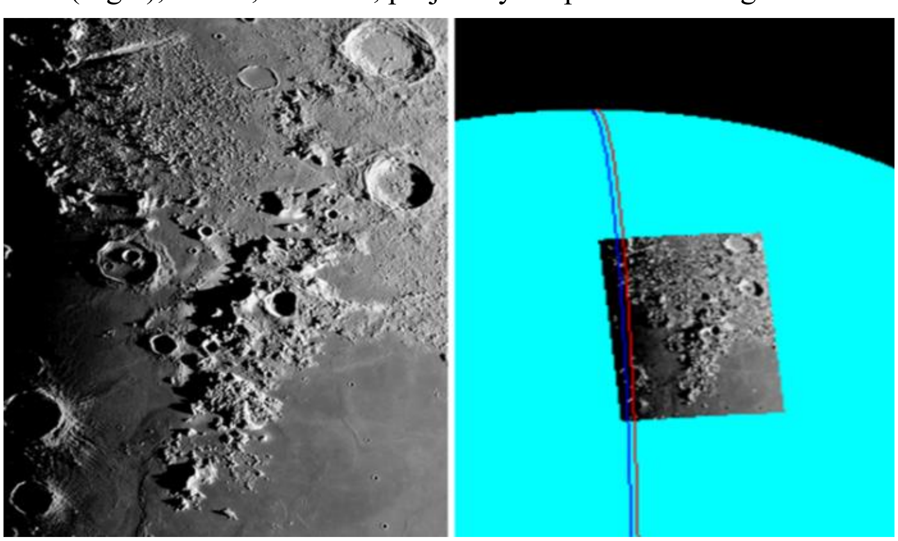


Fig 1. Left, shows the author's own photographic view of the Montes Caucasus region, while right shows the same photo after being calibrated in LTVT.

In Fig 2 below, the calibrated photo has been zoomed in on by 20X. Labelling of the various features has been applied through a simple click, and while each part of the photo is now an *active point*, measurements of crater diameters and shadow lengths (and hence heights of mountains…etc.,) can now be made. LTVT is also able to show further details like sun altitude & azimuth values of each feature in the photo (in a separate panel), and there's also access to references like LTO & Rükl maps similar to the original view used.

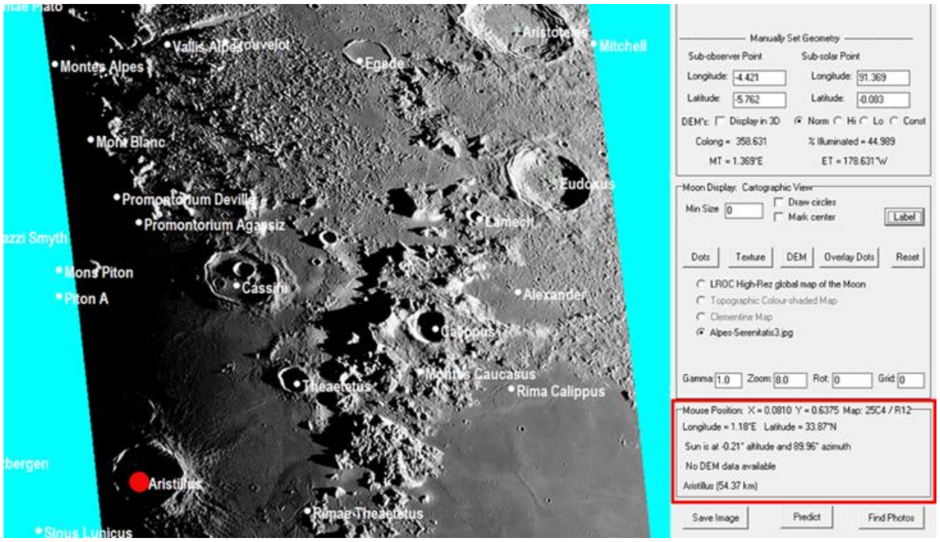


Fig 2. Roving your mouse over any feature shown in the zoomed-in view will show additional information in a separate panel in LTVT. In this case, the cursor was placed over crater Aristillus (red dot), and reading of other details is shown in the panel (red rectangle).

The calibration process is so powerful that it also allows you to create an *aerial view* of any part of your photo, as in Fig 3 below. This calibration function doesn't only apply to user-based photos, but also to old images taken by, say, the Lunar Orbiter and Apollo missions, or of modern photographs taken by the Lunar Reconnaissance Orbiter (LRO) today. Description of how to calibrate such photos is covered in the book; along with several online sources of data that aren't generally known to the observer & astrophotographer.

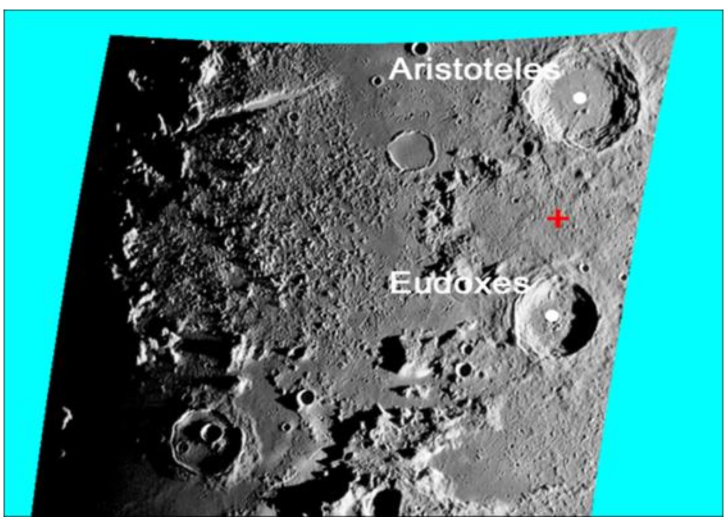


Fig 3. Here, a central point was taken between Aristoteles and Eudoxus (red plus sign), and then LTVT took an aerial view of both (note, how each craters' initial oval shape has changed to almost circular). Again, the zooming, labelling and measuring apps…etc., can be still done in the photo.

The aerial view tool is unique to LTVT only; allowing you view features on the near limbs and poles - areas of which can sometimes lead to confusion in determining what feature is what due to their perspective (Fig 4).

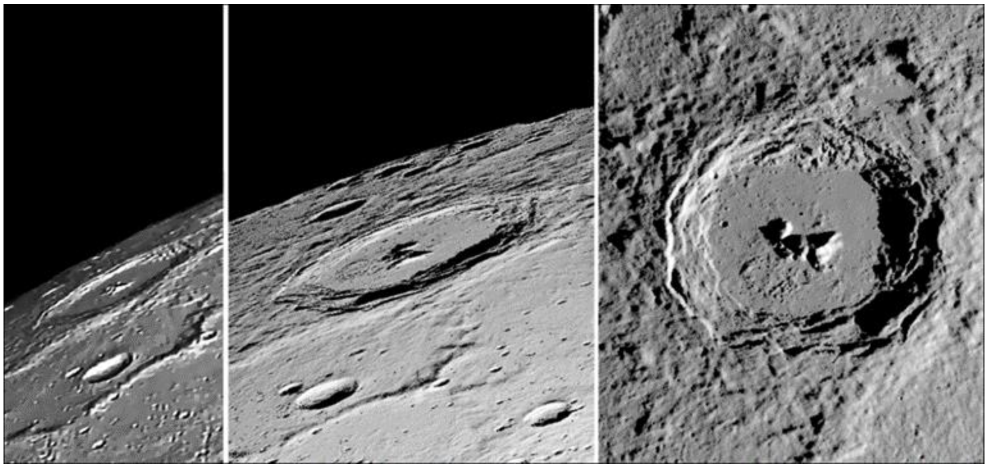


Fig 4. Left-most view is an actual photographic image of Pythagoras. The middle view was generated using LTVT, while the right-most image shows the software's ability to create an actual, aerial view of the crater with similar lighting conditions.

Using LTVT in measuring shadow tips, creating circles, contours and more

A wonderful feature of LTVT is its Digital Elevation Model function (DEM, for short), which allows for the rendered, reconstruction of shadowed & sunlit views - of any feature on the global moon, from any location on Earth, and at any time of the year (past, present and future).

As an example, let's choose Piccolomini crater found at 29.7S, 32.2E, and apply the DEM function to it for a certain month in 2022. The date is easily entered and computed in LTVT's main window, and after using the included high-rez map to center it; then with a simple click of a button, a fully rendered DEM view of the crater can be produced - with the *exact* lighting and shadow conditions for the time of month.

Fig 5. While the view of Piccolomini, and its general terrain surrounds, may look natural and photographic-like in the image at left, the view here is actually a generated work produced by the DEM function in LTVT.

If we now zoom in on the crater by, say, 40x (Fig 6), we can use LTVT's other functions on the DEM to read values like, say, distances, heights and diameters; as well as create contour elevations of Piccolomini's actual physical structure.

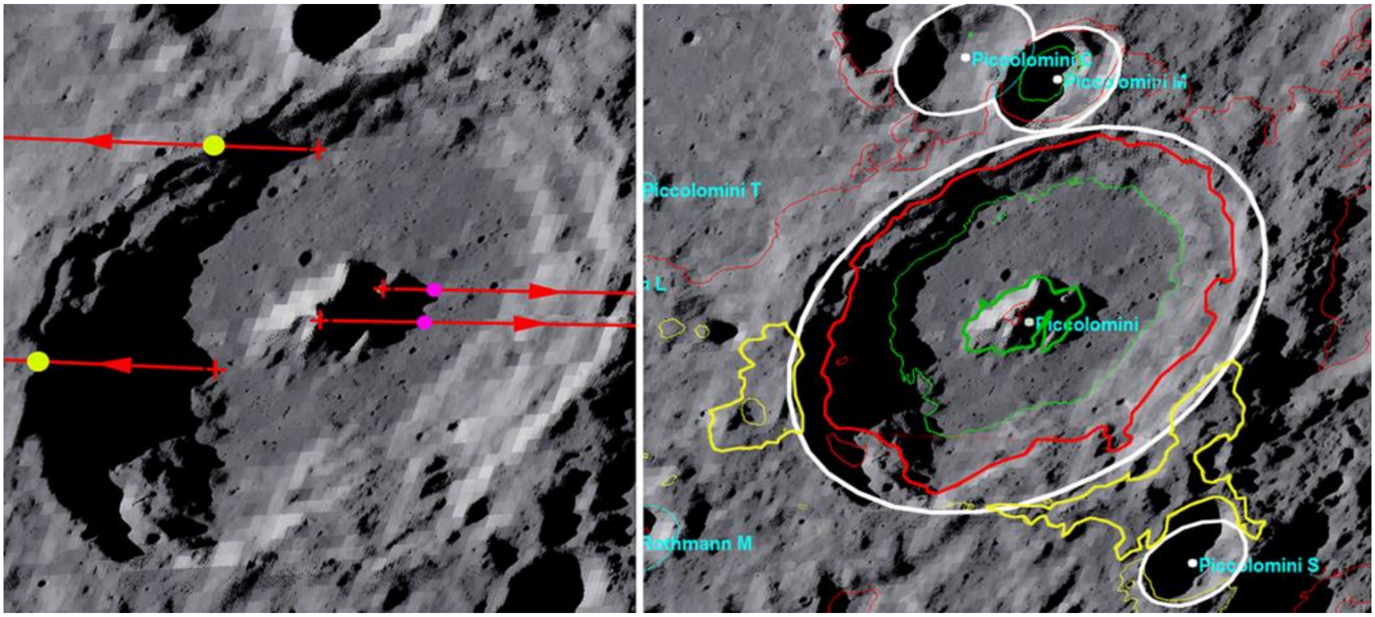


Fig 6. In the left image above, the red lines pointing towards west represent those from 'tip of shadow to terrain' references, while those pointing right are of 'terrain to shadow tip'. The right image above, shows both the diameters of craters and elevation contours in various coloured formats - each representing different increments in kilometer heights. Like in Fig 2 above, all relevant values can be read from a separate panel in LTVT.

Lighting in LTVT

Normally, sunlight conditions of features on the Moon are basically restricted to easterly and westerly effects (because of the orbital setup between the Moon, the Earth and the Sun).

However, using the *'Const'* function in LTVT, it is also possible to produce sunlit views of a feature from any angle that will never be achievable through the above orbital setup (see Albategnius in Fig 7 below).

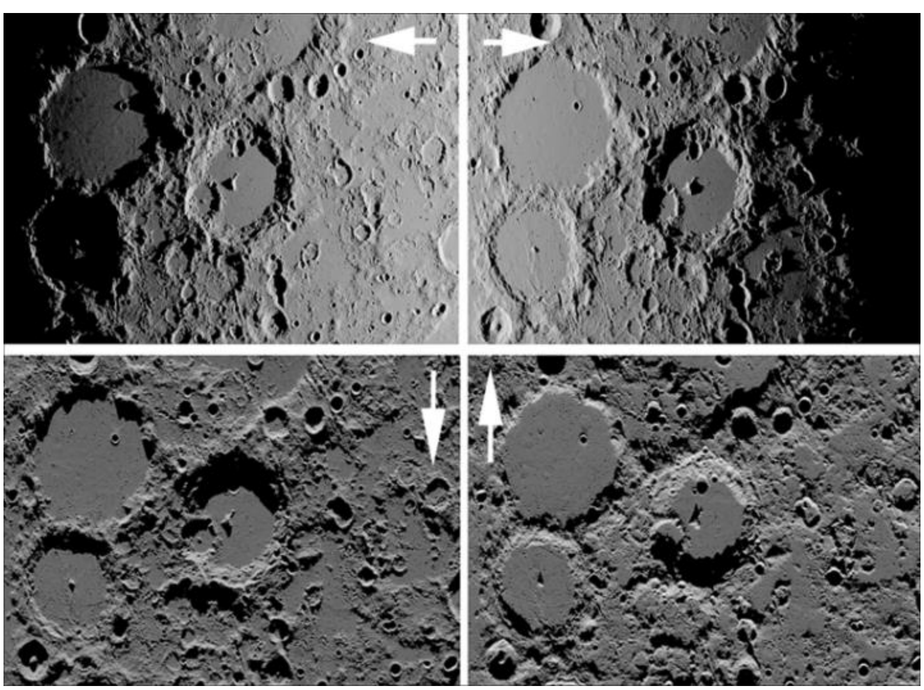


Fig 7. Four views of the Albategnius crater under different lighting conditions: the top two images show natural, sunlit views that would be expected for easterly or westerly perspectives. The bottom two images, however, show, both northerly and southerly aspect views that could never be observed by telescopes on Earth. Such use of abnormally-lit views have the potential to disclose feature effects that could be missed in normally-lit observations (e.g. some wrinkle ridges running in a west-east direction could show up better in light coming from the north or south).

And if you think that northerly or southerly views are impressive to achieve, have a look at Fig 8 below, where, using LTVT, sunlight conditions in Albategnius are being shone from all angles - both from inside and outside of the crater.

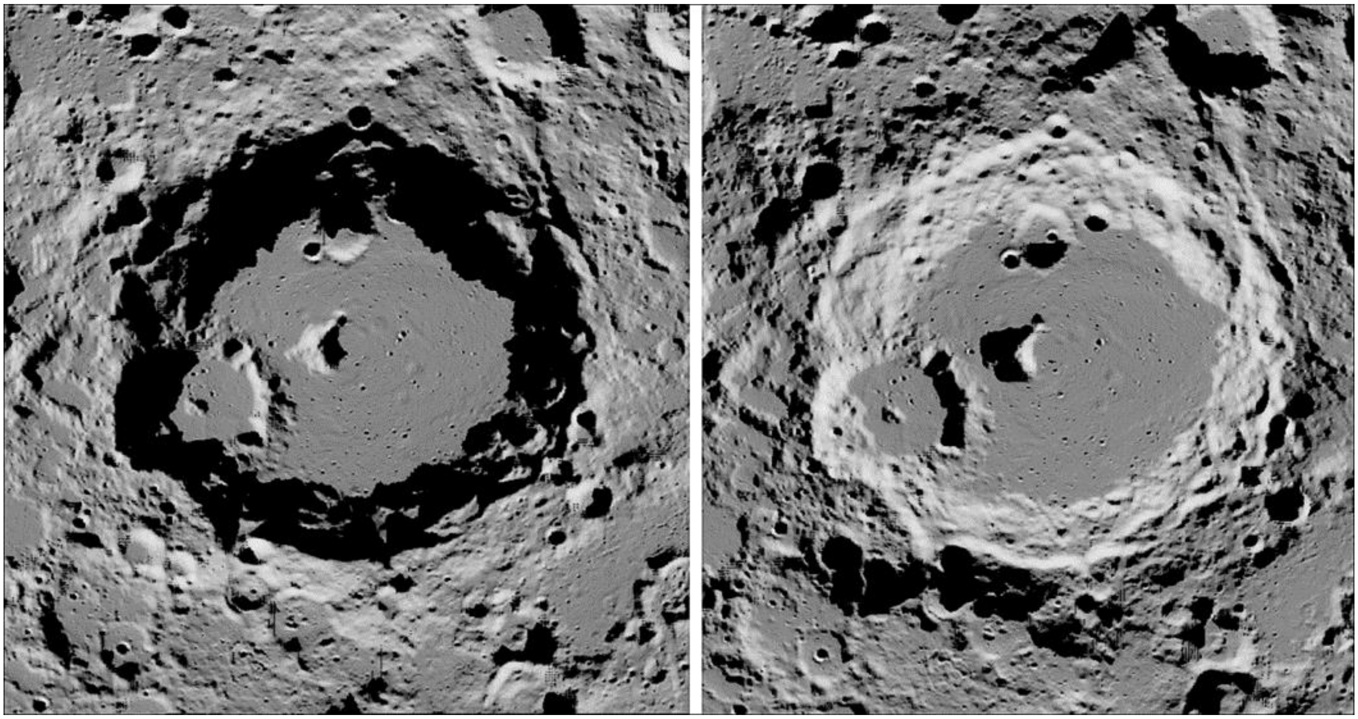


Fig 8. In the left image above, LTVT has been set up to have every piece of sunlight impinge from all angles, at a certain sun angle in to the crater (note the shadows within every part of the inner rim). The right image, however, shows sunlight being shone from all angles outwards. Note, the comparison details between the two.

Maps and their use in LTVT

While the older version of LTVT had just *one* map of very low resolution, the current available version has *four*: an LROC high-rez map, a Clementine map, and two colourful maps - both which include the latest topographic and geologic textures. While there are several other map types (mineral, slope, iron and albedo...etc.,) usable and downloadable in LTVT, it is, however, up to the user of LTVT to choose from each.

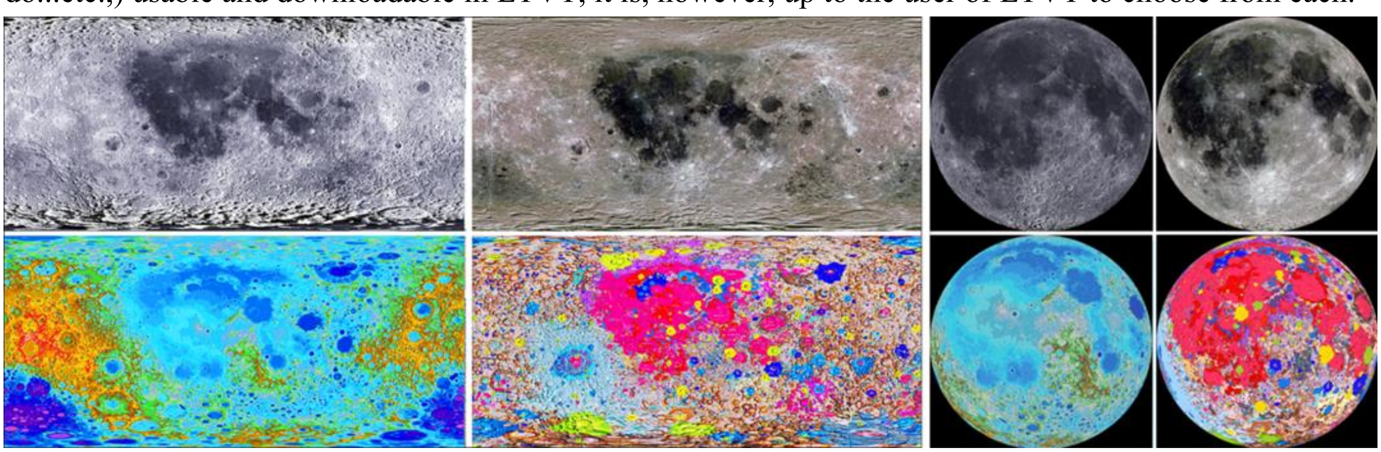


Fig 9. *The four maps included with the modern version of LTVT. These maps are of equirectangular format, which means that every part of the global Moon (nearside, farside and poles) can be viewed and used in LTVT.*

Blending of such maps in LTVT is also applicable that when utilized correctly can produce some extraordinary views (Fig 10). In effect, this function takes a DEM generated view that when blended in to any other data-researched maps, has the ability to show them up visually.

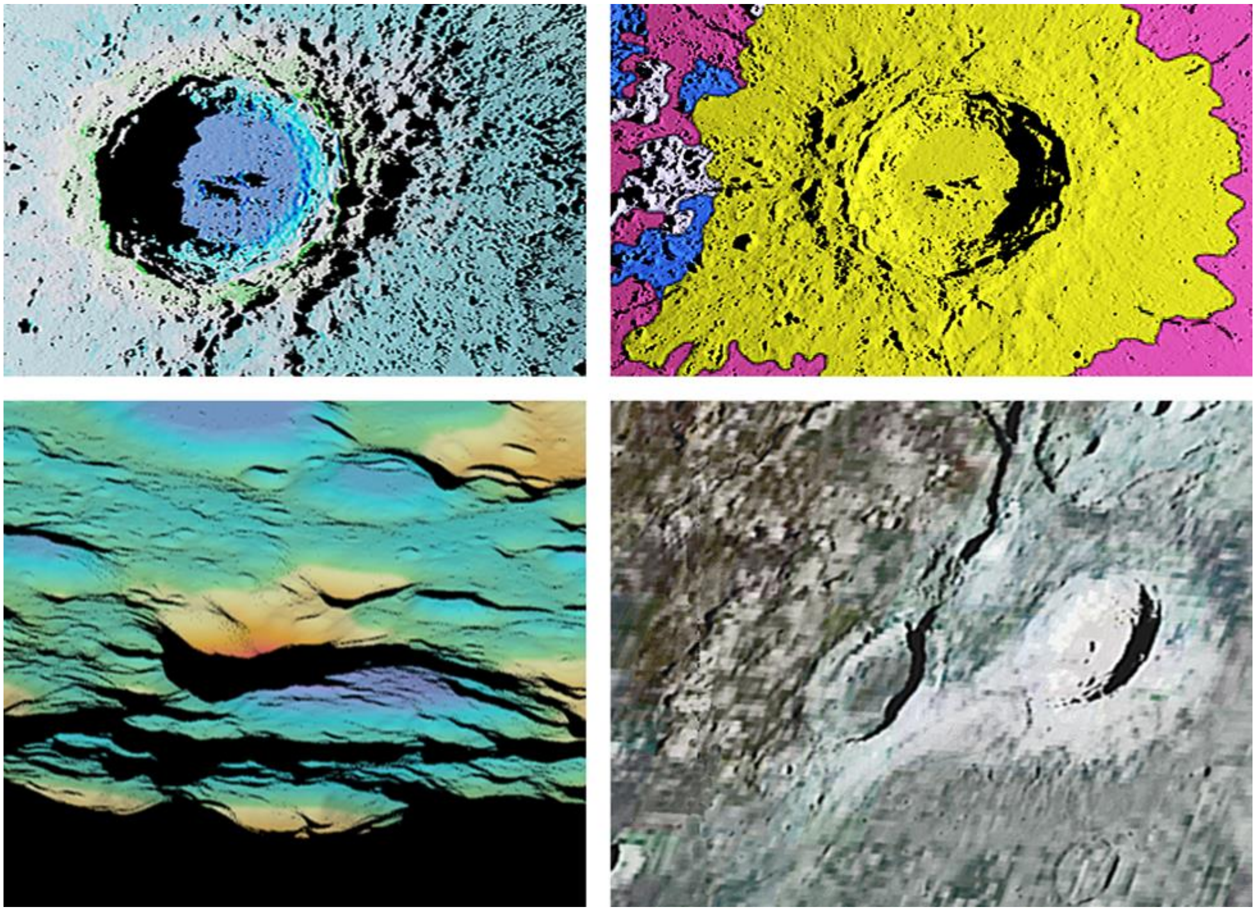


Fig 10. Top two images show crater Copernicus blended with topographic and geologic maps respectively. Bottom-left view shows those of the infamous 'M' series of mountains at the lunar South Pole using LTVT's topographic map, while at bottom-right, is a Clementine close-up version of the Aristarchus and Herodotus region.

LTVT - its potential

The examples above of LTVT's potential are just an introduction to its use; but there is so much more to the software that could never be explained in a few pages or so. Hence the book, which covers many other areas like *libration* to *predictions* to *animation* aspects and more. The book should enhance experiences in viewing the Moon and its features from different perspectives and light. But, perhaps moreover, it will also serve as a useful tool in its potential towards working with modern maps and photos taken today.

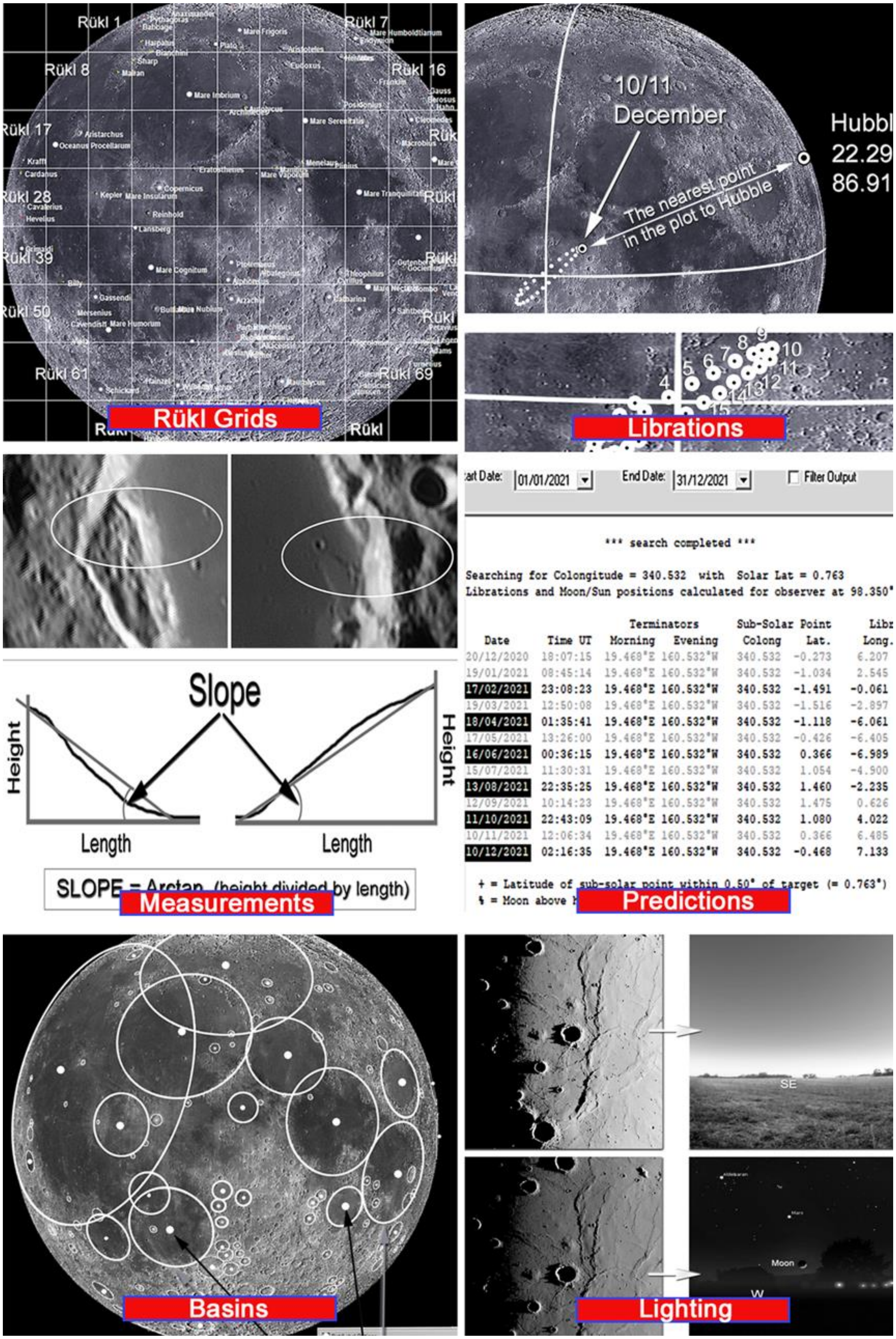
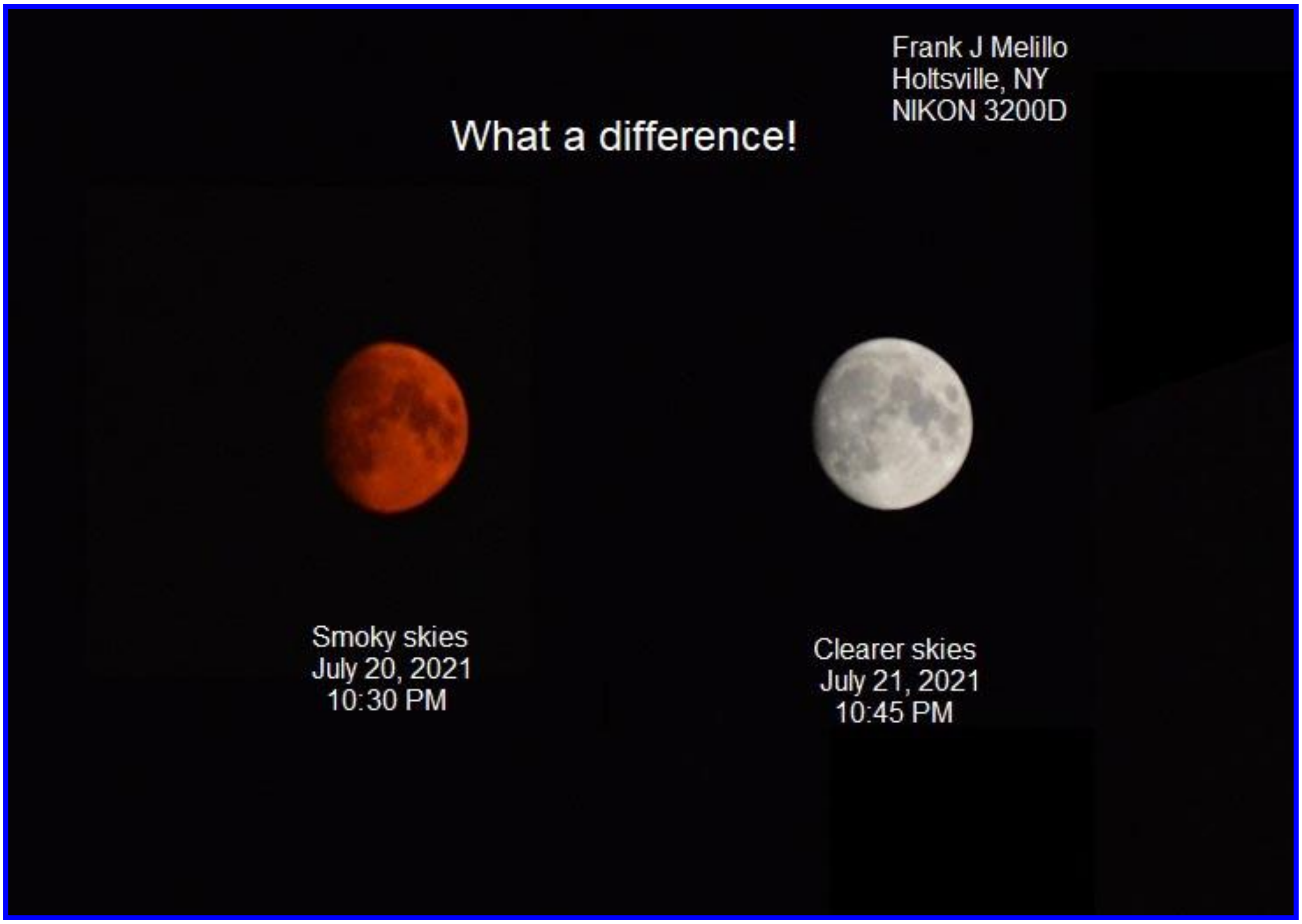


Fig 12. Above, an example series of images from LTVT's functions.

Messier, *Michael Sweetman, SKY CREST OBSERVATORY, Tucson, Arizona, USA. 27 June 2021 11:49 UT. 8-inch Guan Sheng Classical Cassegrain, telescope, f/12, Baader IR 685 nm filter, Skyris 132M camera. North up East right. Seeing-5-6/10, Transparency- 3/6.*

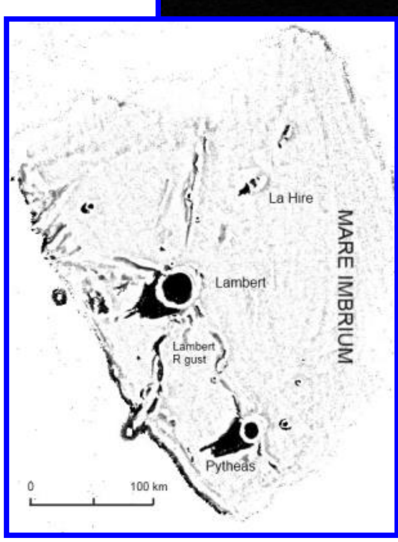
Waxing Crescent Moon, *Jesús Piñeiro, San Antonio de los Altos, Venezuela. 2021 July 15 23:52 UT. 90 mm Meade ETX Maksutov-Cassegrain telescope, UV/IR cut filter, ZWO ASI533MC camera.*



***The Moon through smoke**, Frank J. Melillo, Holtsville, New York, USA. 2021 July 21 02:30 UT and 2021 July 21 02:45 UT. Nikon 3200D camera. Much of the northern United States was covered in smoke from wildfires in the western USA and Canada in mid-July 2021.*

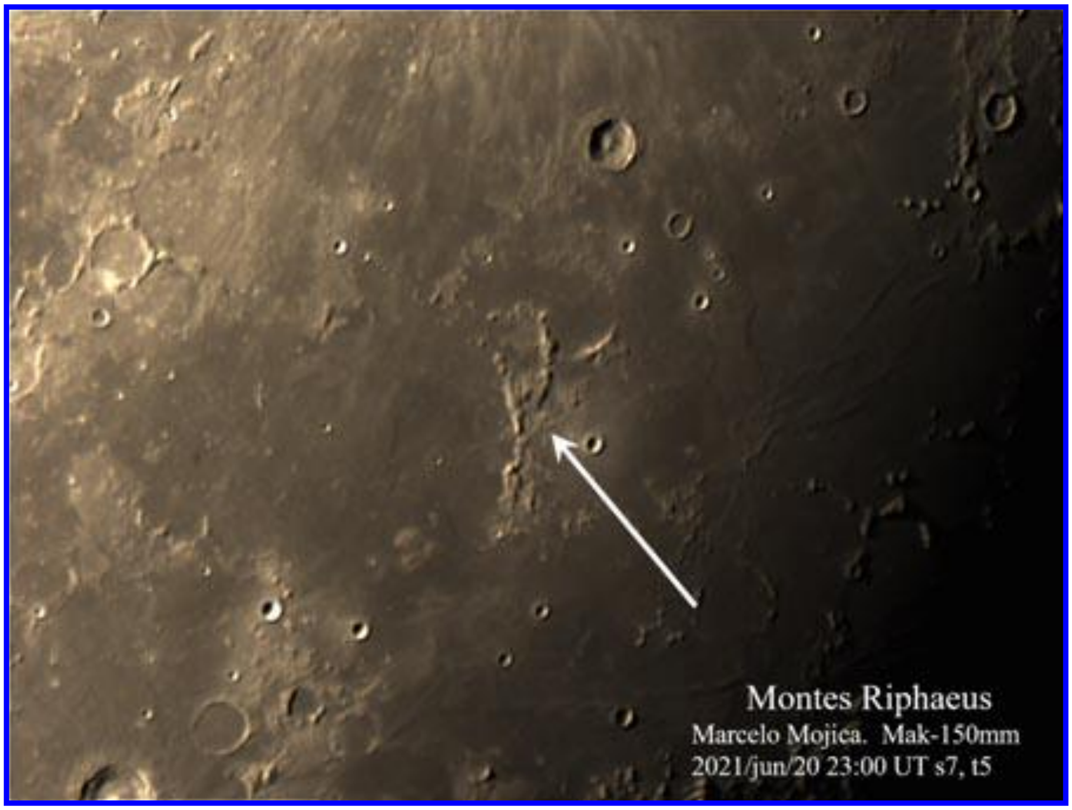
Atlas, *Michael Sweetman, SKY CREST OBSERVATORY, Tucson, Arizona, USA. 27 June 2021 12:00 UT. 8-inch Guan Sheng Classical Cassegrain, telescope, f/12, Baader IR 685 nm filter, Skyris 132M camera. North up East right. Seeing-5-6/10, Transparency- 3/6.*

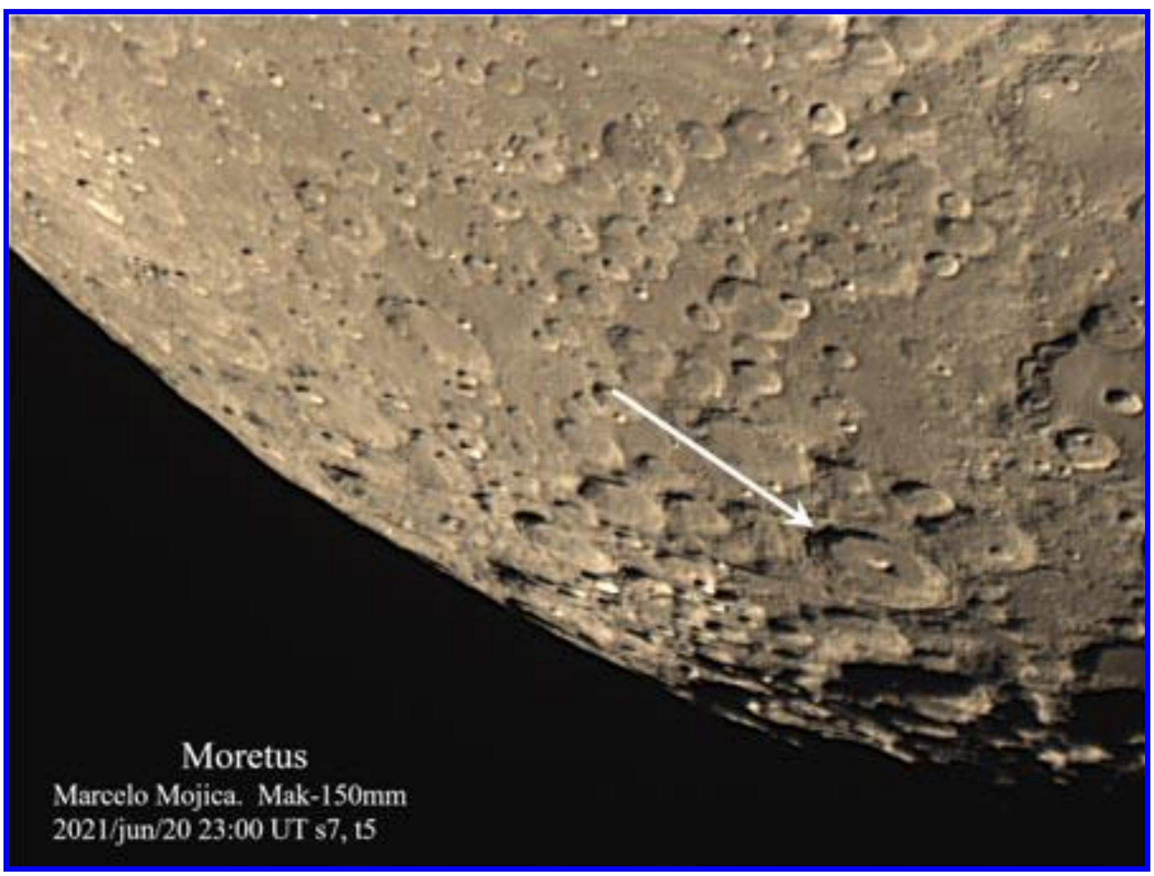
Waning Gibbous Moon, *Jairo Chavez, Popayán, Colombia. 2021 June 29 03:11 UT. 311 mm Dobsonian reflector telescope, Moto E5 Play.*



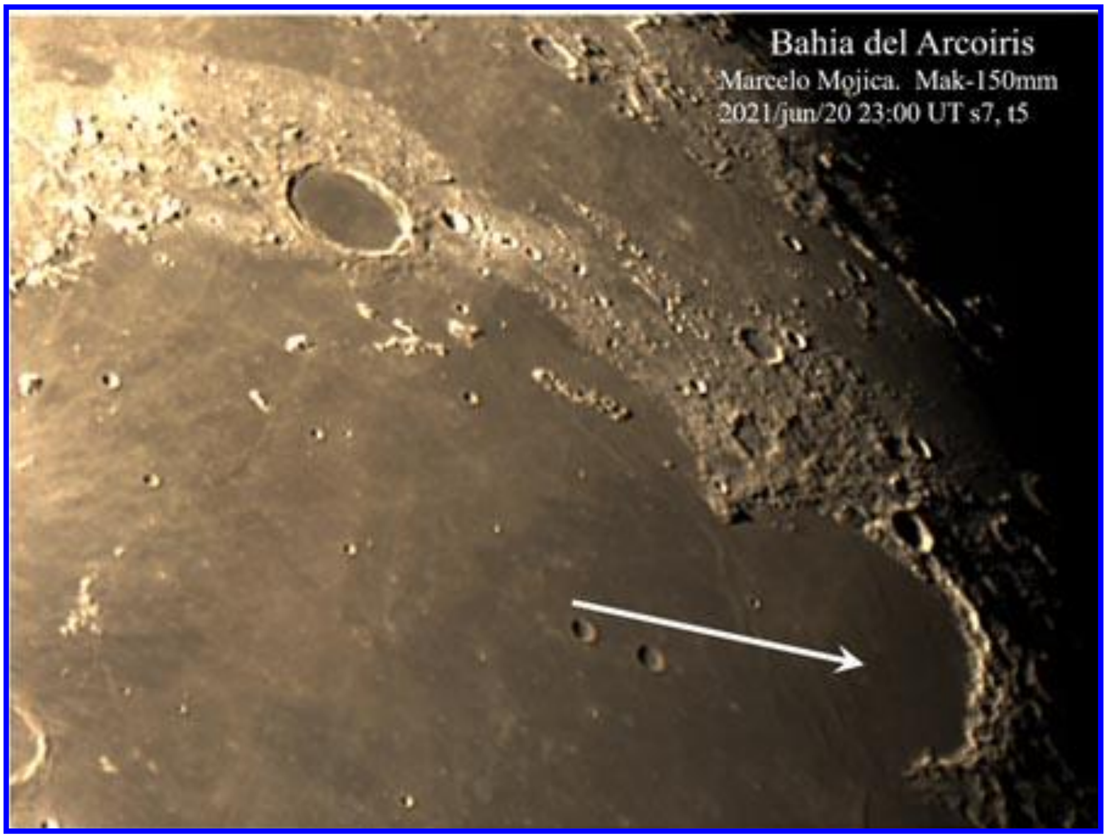
Lambert, *Michel Deconinck, Aquarellia Observatory Artignosc-sur-Verdon - Provence - France. 2018 September 04, 04:00 UT. Takahashi Mewlon 250 mm Dall-Kirkham f/0 telescope, 13 mm eyepiece. Pastel on black paper.*

Montes Riphaeus, *Marcelo Mojica Gundlach, Cochabamba, Bolivia. 2021 June 20 23:00 UT. 6 inch Sky Watcher Maksutov-Cassegrain telescope, ZWO ASI 178 B/W camera. Seeing 7/10, transparency 5/6.*

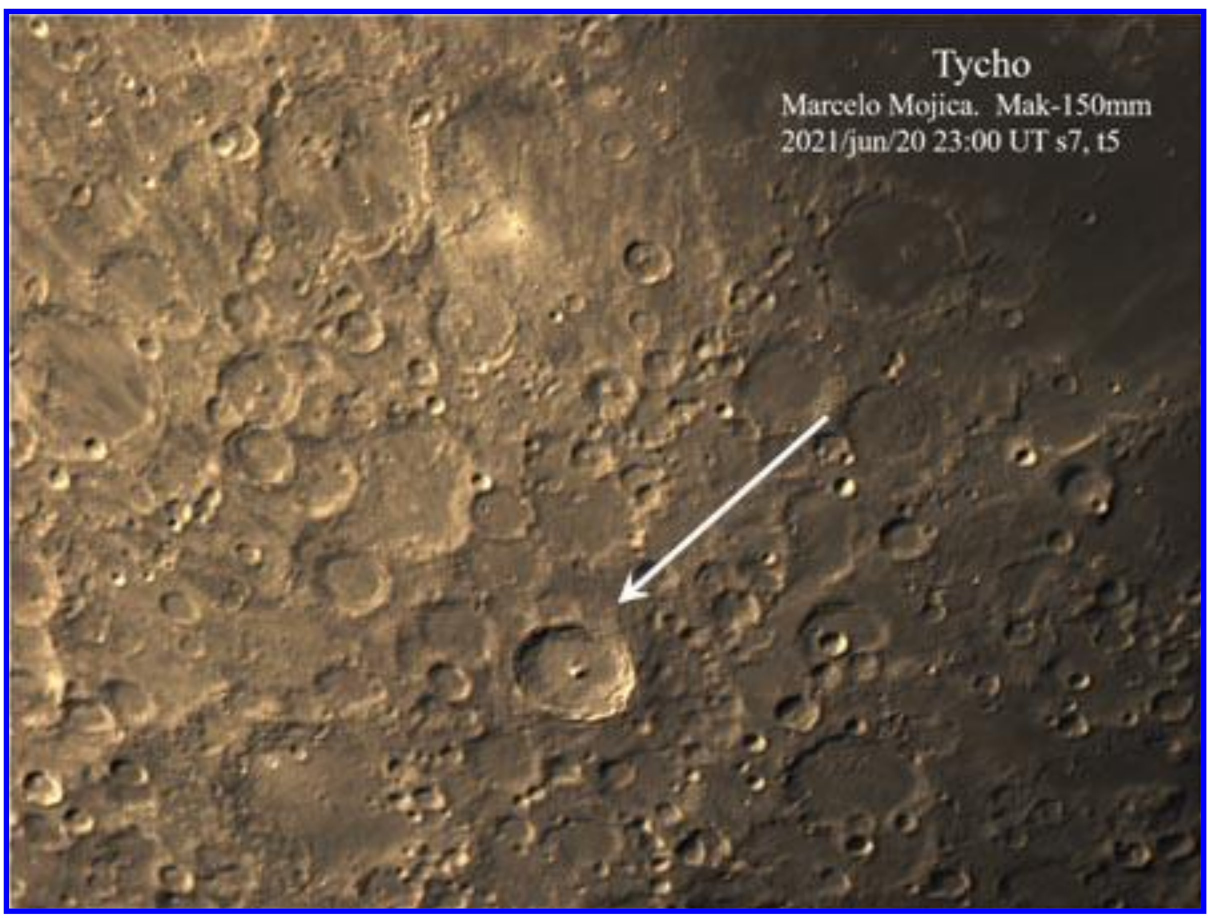




Moretus, *Marcelo Mojica Gundlach, Cochabamba, Bolivia. 2021 June 20 23:00 UT. 6 inch Sky Watcher Maksutov-Cassegrain telescope, ZWO ASI 178 B/W camera. Seeing 7/10, transparency 5/6.*

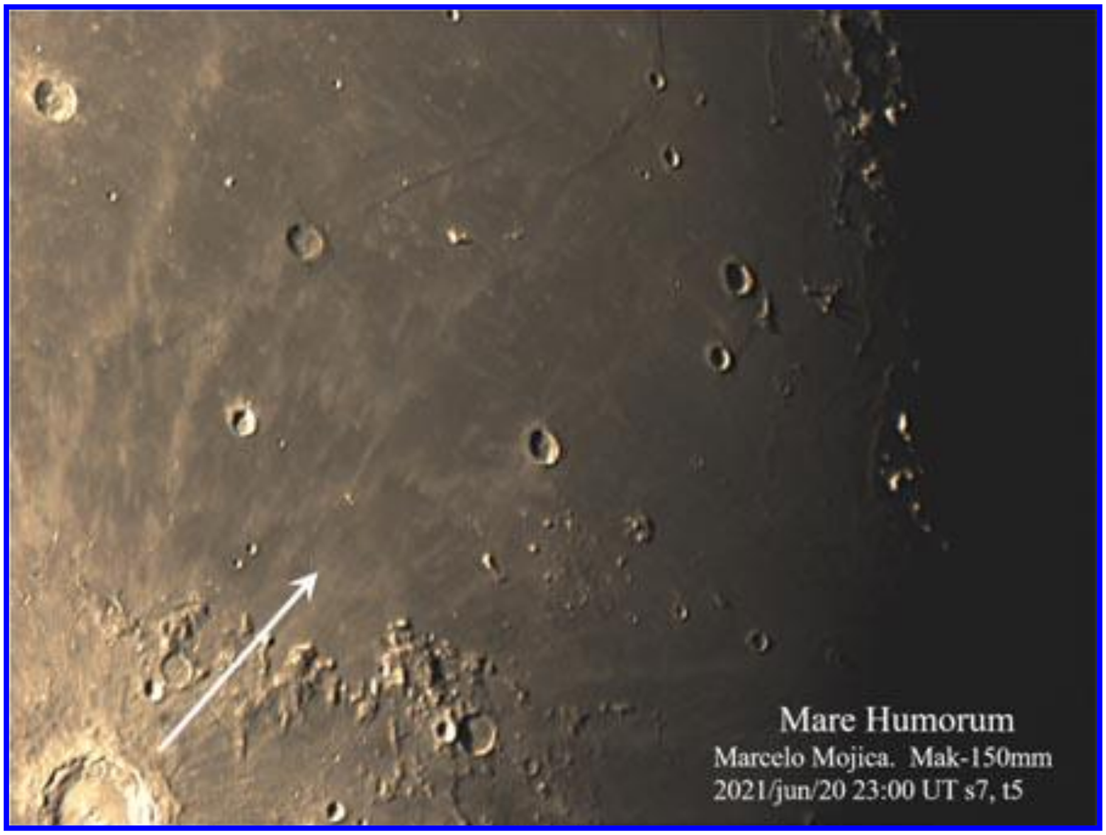


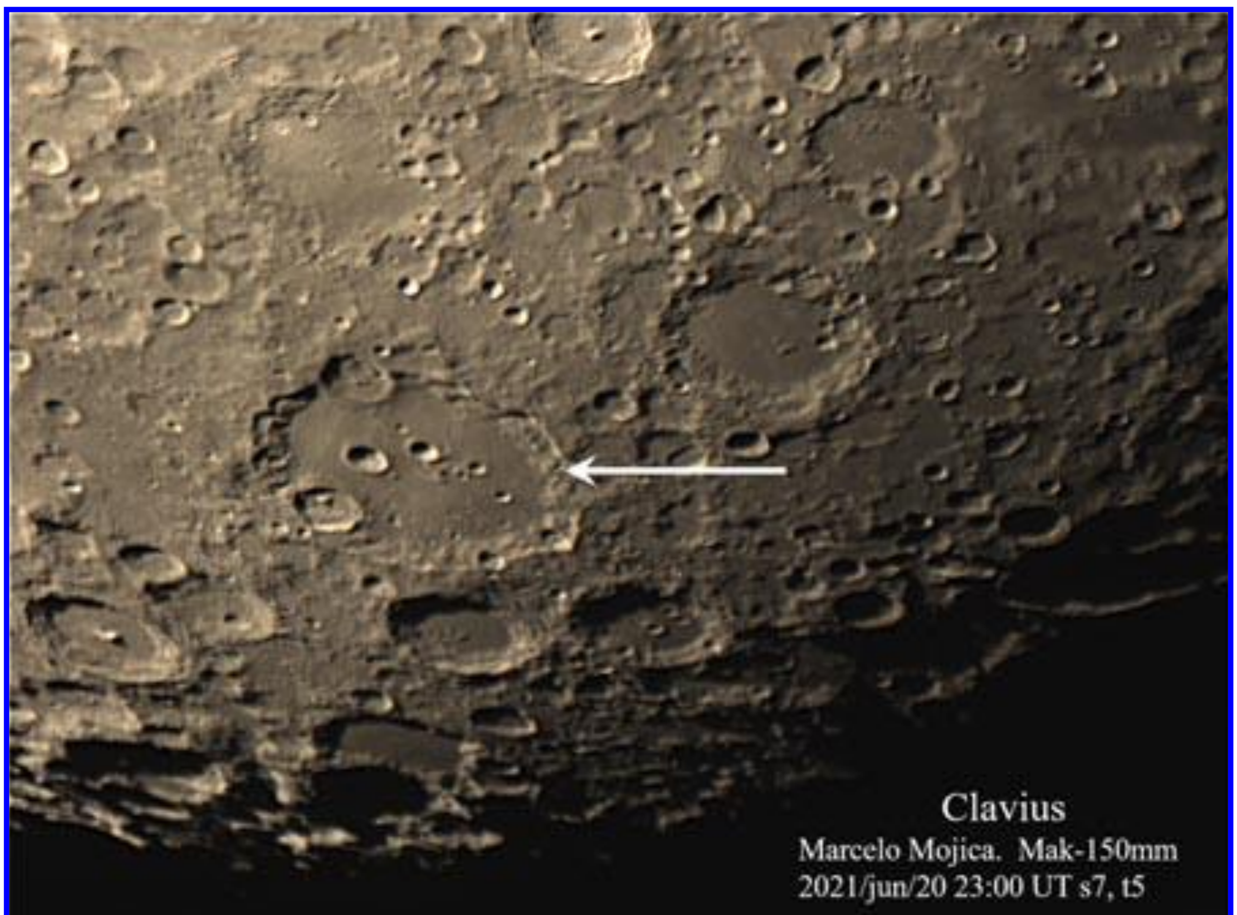
Sinus Iridum, *Marcelo Mojica Gundlach, Cochabamba, Bolivia. 2021 June 20 23:00 UT. 6 inch Sky Watcher Maksutov-Cassegrain telescope, ZWO ASI 178 B/W camera. Seeing 7/10, transparency 5/6.*



Tycho, *Marcelo Mojica Gundlach, Cochabamba, Bolivia. 2021 June 20 23:00 UT. 6 inch Sky Watcher Maksutov-Cassegrain telescope, ZWO ASI 178 B/W camera. Seeing 7/10, transparency 5/6.*

Mare Imbrium, Marcelo Mojica Gundlach, Cochabamba, Bolivia. 2021 June 20 23:00 UT. 6 inch Sky Watcher Maksutov-Cassegrain telescope, ZWO ASI 178 B/W camera. Seeing 7/10, transparency 5/6.





***Clavius,** Marcelo Mojica Gundlach, Cochabamba, Bolivia. 2021 June 20 23:00 UT. 6 inch Sky Watcher Maksutov-Cassegrain telescope, ZWO ASI 178 B/W camera. Seeing 7/10, transparency 5/6.*

Lunar Geologic Change Detection Program

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

2021 August

Introduction: In the set of observations received in the past month, these have been divided into three sections: Level 1 is a confirmation of observation received for the month in question. Every observer will have all the features observed listed here in one paragraph. Level 2 will be the display of the most relevant image/sketch, or a quote from a report, from each observer, but only if the date/UT corresponds to: similar illumination (±0.5º), similar illumination and topocentric libration report (±1.0º) for a past LTP report, or a Lunar Schedule website request. A brief description will be given of why the observation was made, but no assessment done – that will be up to the reader. Level 3 will highlight reports, using in-depth analysis, which specifically help to explain a past LTP, and may (when time permits) utilize archive repeat illumination material.

LTP reports: No LTP reports were received in June.

News: June seems to have been a very lean month for observations from around the world. I suspect that this is due to a combination of poor weather, and the low altitude of the Moon for the majority northern hemisphere observers.

Level 1 – Reports received for June included: Jay Albert (Lake Worth, FL, USA - ALPO) observed: Alphonsus Kies and Plato. Alberto Anunziato (Argentina – SLA) observed: Agrippa, Plato, Swift and several features. Anthony Cook (Newtown, UK – ALPO/BAA) obtained video of earthshine in monochrome, color images of several features, and the lunar surface in thermal IR. Rik Hill (Tucson, AZ, USA – ALPO/BAA) imaged: Clavius, Moretus, Rupes Recta and Tycho. Trevor Smith (Codnor, UK – BAA) observed: Archimedes, Aristarchus, Bullialdus, Plato, Tycho and several features. Aldo Tonon (Italy – UAI) imaged: Eratosthenes.

Level 2 – Example Observations Received:
Eratosthenes: On 2021 Jun 18 UT 20:48-21:15 Aldo Tonon (UAI) imaged this crater for the following lunar schedule request:

ALPO Request: This request comes about because of two observations. Firstly, on 2009 Nov 25 Paul Abel and others detected some color on the inner west illuminated slopes of this crater. No similar color existed elsewhere. On 2012 Aug 25 Charles Galdies imaged this crater and detected a similar color, approximately in the same location, though he also imaged color elsewhere. It is important to replicate this observation to see if it was natural surface color, atmospheric spectral dispersion, or some effect in the camera that Charles was using, namely a Philips SPC 900NC camera. The minimum sized telescope to be used would ideally be an 8" reflector. Please send any high resolution images, detailed sketches, or visual descriptions to: a t c @ a b e r . a c. u k .

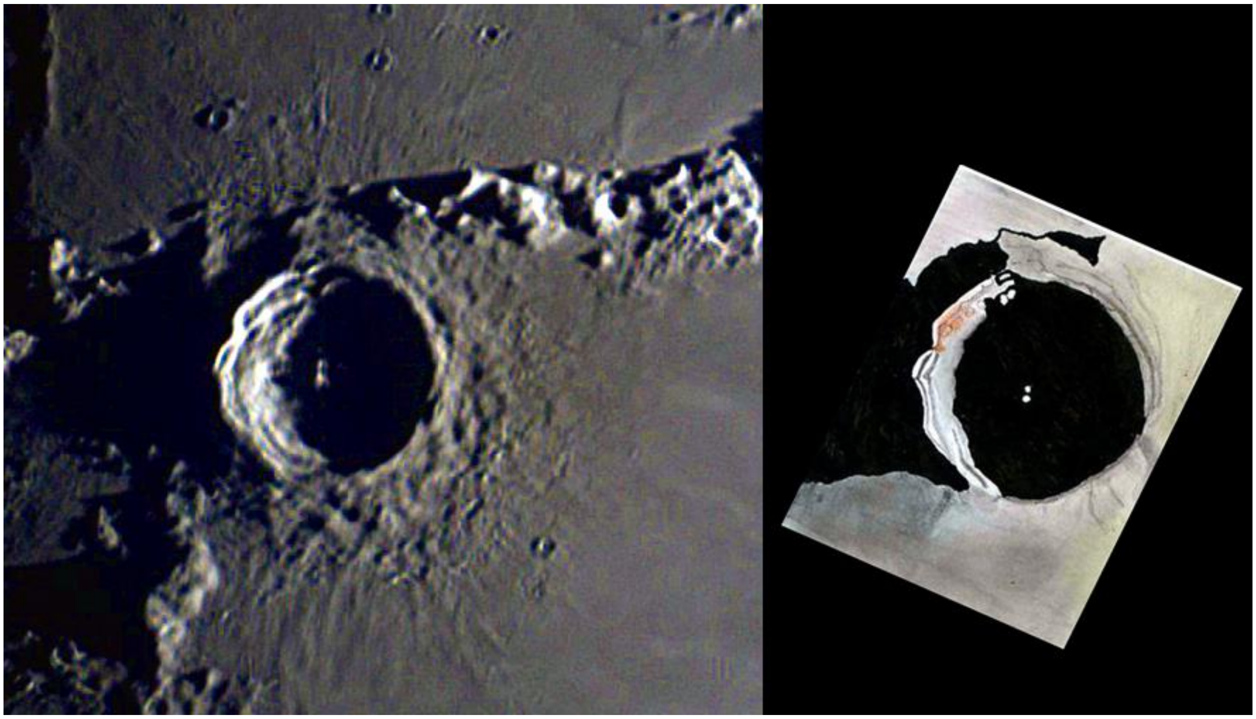


Figure 1. *Eratosthenes orientated with north towards the top.* ***(Left)*** *An image by Aldo Tonon (UAI) taken on 2021 Jun 18 UT 20:48. The image has been color normalized and had its color saturation increased to 65%.* ***(Right)*** *A sketch by Paul Abel (BAA) made on 2009 Nov 25 between 18:42 and 20:18UT. Colors have been exaggerated slightly.*

We have had several repeat illumination observations of this crater, mentioned in the following news letters: 2012 Oct (p15-16), 2016 Feb (p18-19), 2017 Sep (p19-20), 2017 Dec (p23), 2021 Apr (p56-57), 2021 Jun (p37). Aldo's image (Fig 1 Left) is very sharp, but it also most notably lacks color from atmospheric spectral dispersion and chromatic aberration. Clearly there is no natural surface color in the location (Fig 1 – Right) where Paul Abel, and others, saw a LTP back in 2009. What was interesting about the 2009 report was that the observers at Selsey, England did definitely check for false color elsewhere on the Moon but couldn't see any till much later, however it was seen by Bill Leatherbarrow up in Sheffield at the same location as Paul saw, but also elsewhere. Richard McKim over in Peterborough, and Marie Cook in Mundesley, were unable to detect any color. I wasn't able to observe till later that night, by which time 20:43UT atmospheric spectral dispersion was present on several craters, causing brown on the east exterior rim of Eratosthenes, and red on the emerging central peak. We need to keep on observing this crater under a variety of lunar altitudes to see if the effect repeats - where it was seen by Paul in 2009, and whether atmospheric spectral dispersion can be proven definitely to be the cause.

Kies: On 2021 Jun 20 UT 02:30-02:55 Jay Albert observed this area under similar illumination to the following report:

On 1984 Jun 09 at UT 04:55-05:14 P. Jean (Outremont, Canada) detected in the dark side of the Moon, a few km east of Kies crater, a bright point that should not be poking out of the shadow (according to Foley). The Cameron 2006 catalog ID=244 and the weight=3. The ALPO/BAA weight=2.

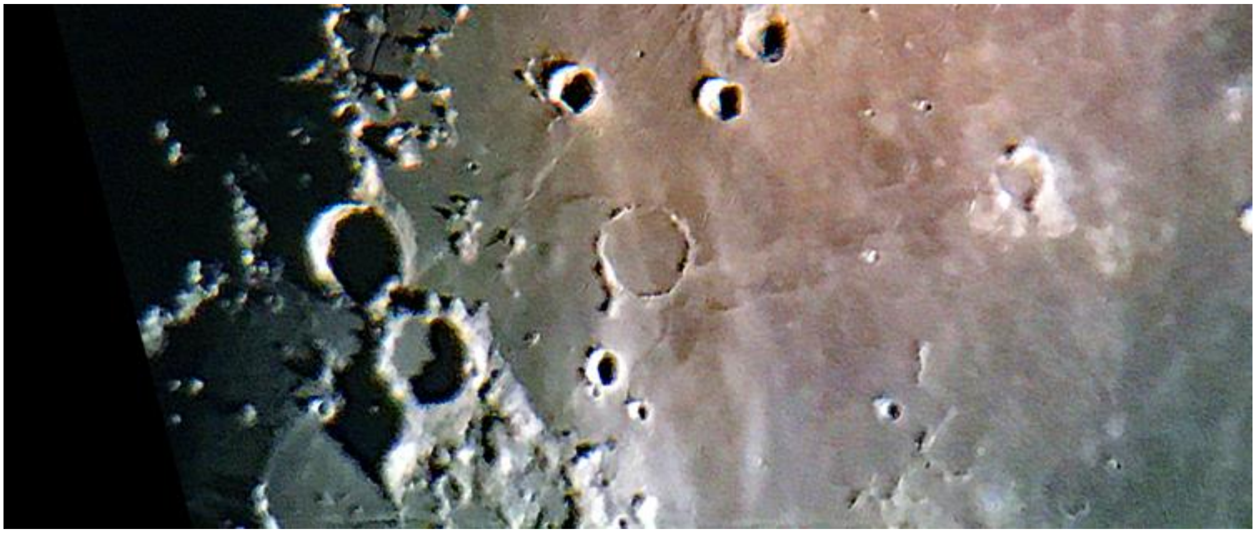


Figure 2. *A color image of the region around Kies taken by Jay Albert (ALPO) on 2021 Jun 20 UT 02:47. Captured with a cell phone through his Celestron NexStar Evolution 8" SCT using a 7mm Ortho eyepiece and a Celestron NexYZ adapter. North is towards the top. The image has been color normalized and then had its color saturation increased to 65%.*

We have covered this repeat illumination event before in the 2017 Nov (p25) newsletter. Jay used his Celestron NexStar Evolution 8" SCT with x290 magnification. The Moon was quite high up in the sky but transparency was poor. Seeing was mostly stable at 6-7/10 but deteriorated sharply at times when thin clouds passed by. Upon observing this region Jay was immediately struck by the fact that the terminator was well west of Kies and hence there was no bright point… poking out of the shadow on the dark side of the Moon. A cell phone image was taken (See Fig 2) and shows indeed that the terminator was even beyond the craters Campanus and Mercator. Perhaps Jean meant 1984 Jun 08 instead of 1984 Jun 09? It's probably worth lowering the ALPO/BAA database weight from 2 to 1, and trying out this scenario for illumination in the lunar schedule website.

Plato: On 2021 Jun 20 UT 21:37-21:55 Trevor Smith (BAA) Observed this crater under similar illumination to the following report:

Plato 1967 May 20 UT 01:13 K.Simmons (Jacksonville, FL, USA, 10" reflector) observed a large bright (intensity 6.5) oval area on near the central floor. According to Ricker and Kelsey (ALPO selected area coordinators) this is unusual. ALPO/BAA weight=1.

Trevor was using a 16" f/6 Newtonian with a 9.5mm Plossl eyepiece at x247. The seeing was Antoniadi IV. Trevor noted that the crater looked normal to him in white light, red (Wratten 25) and blue/green (Wratten 44a) filters. There was no oval at the center of the crater, just the central craterlet and nothing else visible on the floor under the poor observing conditions. Looking back at the original 1967 report, in JALPO Vol 31, p163, it mentions that out of the craterlets on the floor of Plato, only the central one was visible; however, the oval was slightly to the west (IAU) of this. So, what Trevor reports in 2021 is the normal appearance and the offset oval seen in 1967 was abnormal. We shall leave the weight of this report as 1 for now.

Level 3 - In Depth Analysis:

Agrippa: On 2021 Jun 19 UT 22:35-22:45 Alberto Anunziato (SLA) observed this crater under similar illumination to the following report:

Agrippa 1966 Oct 24 UT 01:48-02:12 Observed by Bartlett (Baltimore, MD, USA, 5" reflector, x283, S=6, T=3-2) "Shadow of c.p. light & grayish, scarcely distinguishable from floor. (Sun is quite high (39deg) so shadow ought to be nearly gone)."NASA catalog weight=4 (good). NASA catalog ID #985. ALPO/BAA weight=2.

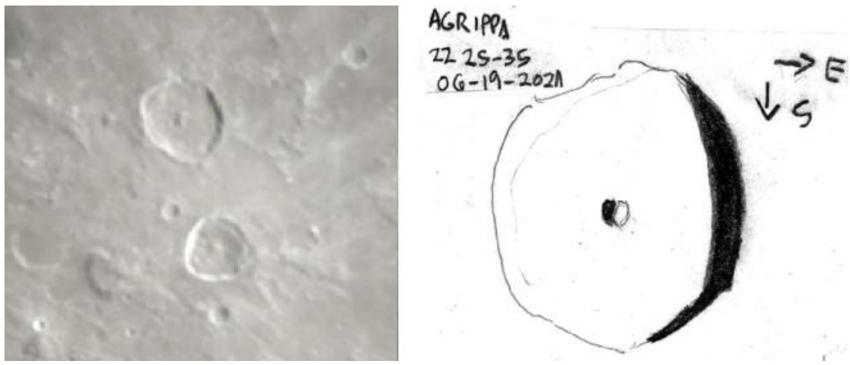


Figure 3. *Agrippa orientated with north towards the top.* ***(Left)*** *A virtual view, under similar illumination to Alberto's sketch courtesy of NASA's* *Dial a Moon*. ***(Right)*** *A sketch by Alberto Anunziato, at the date and UT stated in the sketch. Note that the labels have been re-orientated and the image mirror flipped to put north at the top and east on the left.*

Alberto was using a Meade EX 105 scope at a magnification of x154. He noted a (Fig 3 - Right) tiny grey shadow of the central peak seemed similar to the description by Bartlett.? The similarity in illumination to Alberto's sketch (Fig 3 – Right) and the Dial a Moon image (Fig 1 – Left) is in agreement too. Therefore, I think we can remove the Bartlett LTP report from the ALPO/BAA database by assigning a weight of 0.

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 .

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ALPO 2021 Conference News

Overview
Due to the continuing nearly worldwide quarantining caused by the Covid-19 pandemic and the great success we had with last year's online conference, the 2021 Conference of the ALPO will once more be held online on **Friday and Saturday, August 13 and 14.** (This is to prevent a scheduling conflict with the 2021 Astronomical League Convention (ALCon 2021) which will be held in Albuquerque, NM, on August 4 thru 7, 2021.)

The ALPO conference times will be:

- Friday from 1 p.m. to 5 p.m. Eastern Time (10 a.m. to 2 p.m. Pacific Time)

Saturday from 1 p.m. to 6 p.m. Eastern Time (10 a.m. to 3 p.m. Pacific Time).
The ALPO Conference is free and open to all via two different streaming methods:

- The free online conferencing software application, *Zoom*.

On the ALPO YouTube channel at https://www.youtube.com/channel/UCEmixiL-d5k2Fx27Ijfk41A
Those who plan to present astronomy papers or presentations must (1) already be members of the ALPO, (2) use Zoom, and (3) have it already installed on their computers prior to the conference dates. *Zoom* is free and Available at https://zoom.us/.

Those who have not yet joined the ALPO may do so online, so as to qualify to present their work at this conference. Digital ALPO memberships start at only $18 a year. To join online, go to http://www.astroleague.org/store/index.php?main_page=product_info&cPath=10&products_id=39 , then scroll to the bottom of that page, select your membership type, click on "Add to Cart" and proceed from there.

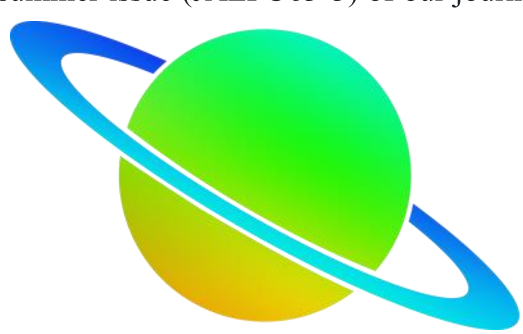
There will be different *Zoom* meeting hyperlinks to access the conference each of the two days of the conference. Both links will be posted on social media and e-mailed to those who wish to receive it that way on Thursday, August 12, 2021. The *Zoom* virtual (online) "meeting room" will open 15 minutes prior to the beginning of each day's activities.

Those individuals wishing to attend via *Zoom* should contact Tim Robertson at cometman@cometman.net as soon as possible.

Agenda
The conference will consist of initial welcoming remarks and general announcements at the beginning each day, followed by papers and research findings on astronomy-related topics presented by ALPO members with Short breaks between the various presentations.

Following a break after the last astronomy talk on Saturday will be presentations of the Walter Haas Observing Award, the Peggy Haas Service Award and the Michael D. Reynolds Astronomy Award. The last one is brand new and was presented to Ms. Pranvera Hyseni several months ago in recognition for her work over the past several years to advance the public's awareness and appreciation of astronomy.

A keynote speaker will then follow the awards presentations on Saturday. The selection of a keynote speaker is in progress and the final decision will be announced in the summer issue (JALPO63-3) of our journal, *The*



Presentation Guidelines

All presentations should be no more than 15 minutes in length; the preferred method is 12 minutes for the presentation itself plus 3 minutes for follow-up questions. The preferred format is Microsoft PowerPoint.

Send all PowerPoint files of the presentations to Tim Robertson at cometman@cometman.net .

Suggested Topics

Participants are encouraged to present research papers and experience reports concerning various aspects of Earth-based observational astronomy including the following:

- New or ongoing observing programs and studies, specifically, how those programs were designed, implemented and continue to function.
- Results of personal or group studies of solar system or extra-solar system bodies.
- New or ongoing activities involving astronomical instrumentation, construction or improvement.

Challenges faced by Earth-based observers such as changing interest levels, deteriorating observing conditions brought about by possible global warming, etc.

Information about paper presentations, the keynote speaker and other conference data will be published in our journal, *The Strolling Astronomer*, and online as details are learned.

Lunar Calendar August 2021

Date	UT	Event
2	0800	Moon at apogee 404,410 km
6		Greatest northern declination +25.6°
8	1350	New Moon, lunation 1220
9		West limb most exposed -4.9°
10		South limb most exposed -6.6°
11	0700	Venus 4° south of Moon
15	1519	First Quarter
17	0900	Moon at perigee 369,124 km
19		Greatest southern declination -25.8°
20	2200	Saturn 4° north of Moon
22	0500	Jupiter 4° north of Moon
22	1202	Full Moon
23		North limb most exposed +6.6°
24		East limb most exposed +5.4°
28	0900	Uranus 1.5° north of Moon
30	0200	Moon at apogee 404,100 km
30	0713	Last Quarter

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 September 2021 edition will be the Lunar 100 numbers 81-90. 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 81-90 article is August 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 81-90)	**September 2021**	**August 20, 2021**
Lunar 100 (numbers 91-100)	**November 2021**	**October 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 81-90 will be featured in the September 2021 *The Lunar Observer*. Submissions of articles, drawings, images, etc. due by August 20, 2021 to David Teske or Alberto Anunziato.

L	FEATURE NAME	SIGNIFICANCE	RUKL CHART
81	Hesiodus A	Concentric crater	54, 64
82	Linné	Small crater once thought to have disappeared	23
83	Plato craterlets	Small craters at the limits of detection	3
84	Pitatus	Crater with concentric rilles	54
85	Langrenus Rays	Aged ray system	28
86	Prinz rilles	Rille system near the crater Prinz	19
87	Humboldt	Crater with central peaks and dark spots	60
88	Perry	Difficult to observer polar crater	4
89	Valentine Dome	Volcanic Dome	13
90	Armstrong, Aldrin and Collins	Small craters near the Apollo 11 landing site	35

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

Key to Images In This Issue

1. Atlas
2. Clavius
3. Caucasus, Montes
4. Imbrium, Mare
5. Iridum, Sinus
6. Lambert
7. Laplace
8. Manilius
9. Messier
10. Moretus
11. Ptolemaeus
12. Raman
13. Riphaeus, Montes
14. Rupes, Recta
15. Tycho